

**ÇUKUROVA UNIVERSITY
INSTITUTE OF NATURAL AND APPLIED SCIENCES**

MSc THESIS

Ahmed Sadullah Najim ALNIEMI

**THE ROLE OF AGRICULTURAL DEVELOPMENT IN THE
EVOLUTION OF FOREIGN TRADE IN AGRICULTURAL
COMMODITIES IN IRAQ FOR THE PERIOD 1990-2020**

DEPARTMENT OF AGRICULTURAL ECONOMICS

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ABSTRACT

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THE ROLE OF AGRICULTURAL DEVELOPMENT IN THE EVOLUTION OF FOREIGN TRADE IN AGRICULTURAL COMMODITIES IN IRAQ FOR THE PERIOD 1990-2020

Ahmed Sadullah Najim ALNIEMI

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The study aimed to know the most important factors affecting the agricultural domestic product, which is an indicator for measuring agricultural development in Iraq during the period 1990-2020. Furthermore the impact of the values of agricultural output on the nutritional gap, self-sufficiency, agricultural exports, agricultural imports, and total agricultural foreign trade. Descriptive and quantitative methods were used to analyze the results of the study. The results of the descriptive analysis showed the existence of a large group of obstacles and intertwined and overlapping problems represented in the land problems such as salinity and desertification, water problems and environmental pollution, decrease in investments in the agricultural sector, the state's cessation of support for this sector, a significant rise in the prices of agricultural production inputs, and a decrease in the use of agricultural technology, furthermore the policy of dumping the Iraqi market with imported agricultural commodities. All of these obstacles and problems had a negative impact on the agricultural sector, which was represented in the decline in agricultural production, the emergence of a nutritional gap, and the lack of self-sufficiency in wheat and rice crops (food deficit). The study showed that the nutritional gap of strategic crops in Iraq for the period 1990-2020 was caused by a shortfall in the production of strategic crops. The nutritional gap revealed the failure of the agricultural policies that were adopted to raise production growth rates for strategic crops and reduce dependence on foreign markets. The nutritional gap also revealed that the food security of the Iraqi citizen is threatened and dependent on global markets. As for the quantitative analysis method, which is based on econometric methods, the effect of economic variables (agricultural investment values, agricultural labor force, inflation rate, agricultural loans, cultivated area, and foreign exchange rate) on agricultural output values (as a first stage), and the effect of the values of agricultural output on the values of agricultural exports (as a second stage) and the effect of the values of agricultural output on the values of agricultural imports (as a third stage) and the effect of the values of agricultural output on the values of total agricultural foreign trade (as a fourth stage). The statistical program (Eviews 10) was relied on to measure and interpret the results. The results of the standard analysis showed the significance of each of the agricultural investment values, the inflation rate, and the cultivated area in influencing the values of agricultural output, moreover the significance of the impact of agricultural output values on agricultural export values, agricultural imports values, and agricultural foreign trade values.

Keywords: Agricultural development, agricultural foreign trade, nutritional gap, self-sufficiency, Iraq.

ÖZ

YÜKSEK LİSANS TEZİ

1990-2020 DÖNEMİ İÇİN İRAK'TA TARIMSAL EMTİALARDA DIŞ TİCARETİN GELİŞMESİNDE TARIMSAL KALKINMANIN ROLÜ

Ahmed Sadullah Najim ALNIEMI

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Bu çalışma, 1990-2020 döneminde Irak'ta tarımsal gelişmeyi ölçmek için bir gösterge olan tarımsal milli hasılayı etkileyen en önemli faktörleri ölçmeyi amaçlamıştır. Tarımsal çıktı değerlerinin gıda açığı, kendi kendine yeterlilik, tarımsal ihracat değerleri, tarımsal ithalat değerleri ve toplam tarımsal dış ticaret değerleri üzerindeki etkisinin yanı sıra araştırmanın sonuçlarını analiz etmek için betimsel ve nicel yöntemler kullanılmıştır. Betimsel analizin sonuçları, tuzluluk ve çölleşme gibi arazi sorunları, su sorunları ve çevre kirliliği, devletin sektöre destek vermeyi durdurması, tarımsal üretim girdilerinin fiyatlarındaki önemli artış, tarım teknolojisi kullanımının azalması ve ithal tarım ürünleriyle Irak pazarına damping politikası, tarım sektörüne yapılan düşük yatırımlar gibi çok çeşitli engellerin ve iç içe ve örtüşen sorunların varlığını göstermiştir. Tüm bu engeller ve sorunlar tarım sektörünü, tarımsal üretimin azalması, gıda açığının ortaya çıkması ve buğday ve pirinç ürünlerinde kendi kendine yeterliliğin olmaması gibi unsurlarla olumsuz yönde etkilemiştir. Çalışma, 1990-2020 dönemi için Irak'taki stratejik mahsullerin besin açığının, stratejik mahsul üretimindeki eksiklikten kaynaklandığını göstermiştir. Gıda açığı, stratejik ürünler için üretim artış oranlarını yükseltmek ve dış pazarlara bağımlılığı azaltmak için benimsenen tarım politikalarının başarısızlığını ortaya koymaktadır. Gıda açığı, Irak vatandaşının gıda güvenliğinin tehdit altında olduğunu ve küresel pazarlara bağımlı olduğunu da ortaya koymaktadır. Ekonometrik yöntemlere dayanan kantitatif analiz yönteminde ise birinci aşama olarak ekonomik değişkenlerin (tarımsal yatırım değerleri, tarımsal işgücü, enflasyon oranı, tarımsal krediler, ekili alan ve döviz kuru) tarımsal çıktı değerlerine etkisi, ikinci aşama olarak tarımsal üretim değerlerinin tarımsal ihracat değerlerine etkisi, üçüncü aşama olarak tarımsal çıktı değerlerinin tarımsal ithalat değerlerine etkisi ve dördüncü aşama olarak tarımsal çıktı değerlerinin toplam tarımsal dış ticaret değerlerine etkisi ele alınmıştır. Sonuçları ölçmek ve yorumlamak için istatistiksel programa (Eviews 10) kullanılmıştır. Standart analiz sonuçları, tarımsal üretim değerlerini etkilemede tarımsal yatırım değerlerinin, enflasyon oranının ve ekili alanın önemini göstermiştir. Standart analiz sonuçları, tarımsal üretim değerlerinin tarımsal ihracat değerleri, tarımsal ithalat değerleri ve tarımsal dış ticaret değerleri üzerindeki önemli etkiye sahip olduğunu da göstermiştir.

Anahtar Kelimeler: Tarımsal kalkınma, tarımsal dış ticaret, beslenme açığı, kendi kendine yeterlilik, Irak.

EXTENDED ABSTRACT

The total area of Iraq is 434,128 km², or 173,651 million dunums. The area of arable land is 48 million dunums, which constitutes 28% of the total area of Iraq. The area of cultivated land is 23 million dunums, which constitutes 47% of the total arable area. The cultivated lands are divided between irrigated agriculture and rain-fed agriculture. And that approximately 60% of the total area of Iraq is considered unproductive lands, but 9% of the total percentage can be reclaimed and used by the horizontal expansion of agricultural lands. This shows the low percentage of land used for agriculture from the total area of Iraq.

According to the foregoing, and despite the large area of Iraq but it is characterized by a low percentage of arable lands that are eroded annually due to the high rate of desertification, the lack of sufficient water sources, and old irrigation networks, as well as the high percentage of salinity in those lands, which is due to the high degree of concentration of salts in the irrigation water, the increase in the volume of water used for the volume of water needed by the land, and the lack of drainage networks to drain the redundant water, furthermore the availability of groundwater, and the availability of sunlight, which increases the amount of evaporation that occurs, and therefore the high salinity of the soil, In addition, the amount of rain falling and its concentration in areas without the other. For example, the salinity rate in the irrigated lands in the Euphrates basin increased to 1500 parts per million, which is a high percentage, which led to the damage of 40% of the area of those lands in essence about 1.3 million acres, In general, the irrigated area in Iraq decreased from 70.5 million dunums to 60 million dunums in 1990 as a result of exposure to salinity.

The problems of the agricultural sector in Iraq increased after it was self-sufficient in agricultural production until the late fifties, then it decreased to 75 percent during the sixties, then 67 percent during the seventies and reached its lowest level of 30 percent during the eighties. In 2002, agricultural imports reached

80-100% of the country's total agricultural production needs including many basic materials such as wheat and rice, in addition to the problems that significantly worsened after 2003 and kept it away from its effective role in supporting the country's economy.

The problem of sustainable agricultural development in Iraq after 2003 is represented by the presence of a set of interlocking and overlapping obstacles represented in the destruction of infrastructure, land problems such as salinity, desertification, water problems, environmental pollution, low investments in the agricultural sector, the state's cessation of support for this vital sector (The lack of distribution of fertilizers and improved seeds to farmers and the lack of means to combat pests and agricultural epidemics), the scarcity of water used for agricultural purposes and desertification of most of the arable lands, the lack of irrigation and drainage networks, as well as the significant rise in the prices of agricultural production inputs, and the low use of agricultural technology, moreover the adopted trade policy and the resulting policy of dumping imported agricultural commodities on Iraqi markets. All of these obstacles had a negative impact on the agricultural sector, represented in the decline in agricultural production, furthermore the disappearance or scarcity of many local agricultural products from local markets. Which helped the Iraqi agricultural products lose the ability to compete, which led to the farmers' reluctance to cultivate their lands and to migrate from the countryside to the city. In the year 2000, part of the financial resources was allocated in the memorandum of understanding for the benefit of this sector which represented in the provision of agricultural devices, equipment, supplies, etc. But after the US occupation of Iraq in 2003, production levels reached very low levels, barely covering more than (15%) of the local demand, also the costs of production increased and the lack of adequate government support, which negatively affected agricultural production and the percentage of agriculture's contribution to the gross domestic product, and the state's inability to provide food security for the Iraqi citizen. As well as the increased demand for agricultural

products with the limited supply, which made Iraq face a food problem that worsened with the progress of time, and it turned to confront this problem by importing from abroad, which costs the Iraqi economy large sums of money in hard currencies, and then this sector is an obstacle to the development process, and all this is caused by the lack of interest in this sector as required.

From the foregoing, it is not possible to achieve sustainable agricultural development in Iraq without finding solutions to the problems and obstacles facing agricultural development. Therefore, the agricultural sector in Iraq is currently suffering from a major stagnation in most of its fields, whether crop production or the production of important foodstuffs, as well as the inability of its agricultural development plans to achieve their goals, which led to the emergence of the food gap and lack of self-sufficiency, this results in the problem of food deficit and its aggravation, and the failure to achieve the principle of food security, which can be considered a problem economic, social, and political with different dimensions.

In view of the lack of studies linking agricultural development within the country to foreign trade, our study came to cover this aspect of the relationship between the evolution of agricultural development and foreign trade. The study aims to:

First: Identifying the most important obstacles that stand in the way of developing the agricultural sector and their reflection on the availability of agricultural production in a way that negatively affected the provision of Iraq's agricultural needs .

Second: Conducting a descriptive analysis of the current reality of the Iraqi agricultural economy in terms of local production of strategic grains for the period (1990-2020), determining the volume of consumption of these grains, and then shedding light on the size of the grain nutritional gap and determining the percentages of self-sufficiency and dependence on the outside. The nutritional gap and self-sufficiency of strategic crops (wheat, rice, barley, corn) are among the main challenges facing the agricultural sector in Iraq, as this sector suffers from a

severe shortage in the production of most agricultural crops, especially in the production of strategic crops, these criteria are considered important indicators to express the adequacy of local production of these crops to meet the requirements of local consumption, as well as reveal the failure of the approved agricultural policies, furthermore revealing the risks of relying on global markets for the supply of strategic crops, and the resulting economic and political dependency, and the country's loss of hard currencies that must be spent in the development process.

Third: Conducting quantitative and standard analysis of the impact of economic variables (agricultural investment values, agricultural labor force, inflation rate, agricultural loans, cultivated area, and foreign exchange rate) on agricultural output values as a first stage, and then the impact of agricultural output values on agricultural exports as a second stage, and in the third stage, the impact of agricultural output values on agricultural imports is known, and the fourth stage is to identify the impact of the values of agricultural output on the values of agricultural foreign trade in Iraq for the period (1990-2020).

In light of what has been studied, it is possible to draw a set of conclusions, as follows:

- Agricultural development is one of the most important elements of economic development, after finding solutions to the problems and obstacles that confronted the agricultural sector of Iraq.
- The results of the descriptive analysis showed that agricultural development in Iraq faces many problems and obstacles.
- Decline in the self-sufficiency rate of wheat and rice during the study period and the continued widening of the nutritional gap.
- Iraq enjoys a high self-sufficiency rate of barley and corn.
- The nutritional gap revealed the extent of dependence on foreign markets for the supply of food to fill the food deficit.

- The increase in the values of agricultural imports (wheat and rice) over the values of agricultural exports.
- The failure of state institutions related to agricultural production in addressing the problems and obstacles facing agricultural development.
- The results of the standard analysis in the first stage showed the significance of the agricultural investment values, the inflation rate, and the cultivated area in influencing the values of agricultural output.
- The results of the standard analysis in the second stage showed the significant effect of the values of agricultural output on the values of agricultural exports.
- The results of the standard analysis in the third stage showed the significant effect of the values of agricultural output on the values of agricultural imports.
- The results of the standard analysis in the fourth stage showed the significant effect of agricultural output values on agricultural foreign trade values.

In order to ensure the sustainability and stability of agricultural production to secure the consumption needs of the population and achieve percentages of self-sufficiency, a number of recommendations are required, including:

- Strengthening the role of economic variables.
- Developing the efficiency of the agricultural labor force, using modern means.
- Giving more importance to agricultural investment.
- Develop long-term integrated plans.
- Increasing spending on agricultural machinery and equipment and providing modern technology.

- Increasing the interdependence between the commercial and agricultural sectors and the rest of the other.
- Developing productive agricultural projects and developing the economic and social.
- The necessity for the Ministry of Agriculture to provide support for strategic crops.
- Conducting future studies on the relationship between agricultural development and agricultural foreign.



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LIST OF ABBREVIATIONS

Dunum	: 2500 m ²
D – W	: Durbin Watson
R ²	: Determination coefficient test
GDP	: Gross domestic product
Cont.	: Continue





1. INTRODUCTION

As a result of the deteriorating agricultural reality in Iraq, achieving agricultural development that provides food security and forms the basis for comprehensive economic and social growth requires taking many measures to overcome the obstacles and problems facing development. And developing this economic sector, to make it able to achieve its food security, employ the workforce, and reduce dependence on the outside in providing its food requirements, and that can only be done through mobilizing the available economic resources with the highest degree of efficiency, therefore, most developed and developing countries alike seek to achieve their sustainable agricultural development that meets the food needs and decent job opportunities for current and future generations, which maintains productive capacities and renews the base of natural resources. However, in the Iraqi economy, achieving this matter faces many difficulties as a result of the existence of a set of intertwined and overlapping obstacles represented in the destruction of infrastructure after 2003 and the problems of the land such as salinity, desertification, and erosion as well as water problems, environmental pollution, low investments in the agricultural sector and the state's cessation of providing the necessary support to the agricultural sector, moreover the significant rise in the prices of agricultural production inputs, and the decrease in the use of agricultural technology, furthermore the problems of trade policy and the resulting policy of dumping the Iraqi market with imported agricultural goods.

The wars that Iraq went through, the economic embargo from 1990 to 2003, and the harsh conditions that Iraq went through after 2003 until the present time had a negative impact on the Iraqi economy in general and agriculture in particular. This decline in the growth and development of Iraqi agriculture is due to the fact that the agricultural sector has been floundering over the past three decades due to the policies that were applied to it.

The problems of the agricultural sector in Iraq increased after it was self-sufficient in agricultural production until the late fifties of the last century, then it decreased to 75% during the sixties and then to 67% during the seventies and to reach its lowest level of 30% during the eighties of the last century, and in the year 2002, agricultural imports reached 80-100% of the country's total needs of agricultural production to include many basic materials, including wheat and rice, in addition to the problems that significantly worsened after 2003 and kept it away from its effective role in supporting the country's economy. The increasing demand for agricultural products, with limited supply, made Iraq face an agricultural food problem that aggravated with the progress of time, and Iraq turned to face the problem towards importing from abroad, which costs the Iraqi economy large sums and in hard currencies, and then this sector is an obstacle to the development process.

This deterioration in agriculture has led Iraq to face a serious food challenge at the present time, the features of which are represented in the failure of its food production to meet its needs of the main food commodities, especially grains (wheat, rice, barley, corn). These grains are considered one of the most important strategic food crops in Iraq and are the main source of food for the population, and most of the cultivated area in Iraq is devoted to the cultivation of grains. These crops have witnessed great fluctuations in the levels of local production as a result of the expansion in the cultivation of other agricultural crops, as well as the drought conditions that swept the region, especially that more than half of the area planted with grains is located within dry lands. As It tends to import most of these needs from abroad, which poses a serious threat to its food security and, consequently, to its national security. The food security strategy still aims to provide food, the ability to obtain it, and its use. However Providing it at the level of strategic grains means the necessity of providing sufficient quantities of them and of good quality or importing them to maintain their availability and distribution locally, and to be within the reach of all individuals so that everyone

enjoys nutrition and health, which sufficiency in quantity and quality according to the individual's needs.

The issue of foreign trade is one of the important topics in economic analysis, as foreign trade plays an important role in linking economic sectors with each other and securing the basic needs of citizens and production requirements, in addition to its role in the disposal of the final products of these sectors, moreover to that trade also includes a wide movement of individuals, capital, technical and administrative expertise, and the provision of stores of foreign currencies. Thus, trade works on the integration of international markets, the growth of economic sectors, and driving development. The trade of agricultural and food materials is one of the most important sections of the country's general trade, as it is related to meeting the increasing demand for these commodities in order to provide food security for citizens. Examining the relationship between agricultural development and agricultural foreign trade is extremely important to decision-makers, especially as it is a changing relationship over time, depending on the direction of the relationship between the two variables in a certain period of time, an appropriate strategy can be followed for both agricultural development and agricultural foreign trade. In view of the lack of studies linking agricultural development within the country to foreign trade, our study came to cover this aspect of the relationship between the evolution of agricultural development and foreign trade. The study aims to:

First: Identifying the most important obstacles that stand in the way of developing the agricultural sector and their reflection on the availability of agricultural production in a way that negatively affected the provision of Iraq's agricultural needs .

Second: Conducting a descriptive analysis of the current reality of the Iraqi agricultural economy in terms of local production of strategic grains for the period (1990-2020), determining the volume of consumption of these grains, and then shedding light on the size of the grain nutritional gap and determining the

percentages of self-sufficiency and dependence on the outside. The nutritional gap and self-sufficiency of strategic crops (wheat, rice, barley, corn) are among the main challenges facing the agricultural sector in Iraq, as this sector suffers from a severe shortage in the production of most agricultural crops, especially in the production of strategic crops, these criteria are considered important indicators to express the adequacy of local production of these crops to meet the requirements of local consumption, as well as reveal the failure of the approved agricultural policies, furthermore revealing the risks of relying on global markets for the supply of strategic crops, and the resulting economic and political dependency, and the country's loss of hard currencies that must be spent in the development process.

Third: Conducting quantitative and standard analysis of the impact of economic variables (agricultural investment values, agricultural labor force, inflation rate, agricultural loans, cultivated area, and foreign exchange rate) on agricultural output values as a first stage, and then the impact of agricultural output values on agricultural exports as a second stage, and in the third stage, the impact of agricultural output values on agricultural imports is known, and the fourth stage is to identify the impact of the values of agricultural output on the values of agricultural foreign trade in Iraq for the period (1990-2020).

2. LITTERATURE REVIEW

2.1. Agricultural development concept, objectives and factors affecting it

(Al-Sharifi, 2006) defined agricultural development as a concerted development effort and economic developments into time stages, based on the agricultural economic reality, which aimed at increasing agricultural GDP, and striving to raise the domestic product and grow it at rates higher than the rates of domestic consumption and increasing the proportion of domestic revenue.

While (Arab Organization for Agricultural Development, 2008) clarified the concept of agricultural development and defined it as an integrated process aimed at ensuring the provision of the nutritional needs of the population in terms of quantity and quality in addition to expanding the production of other agricultural commodities and providing job opportunities, increasing income and improving the standard of living in general.

(Rasan, 2011) concluded the following objectives for agricultural development:

- Securing the food needs of citizens.
- Maximizing the contribution of the agricultural sector to the formation of the gross domestic product which consists of the total contributions of the constituent sectors of economic activity.
- Contributes to raising the standard of life for the largest mass segment.
- Securing the requirements of light manufacturing industries.
- Agricultural development provides a habitable environment free of human environmental pollution (Air, water and soil).

In 2015 (Badr al-Din, and Salhi) stated important objectives of agriculture development as following:

- Increasing the national income from agriculture, which in turn leads to an increase in the total income, which allows to raise the share of individuals in real income.
- Eliminating famine and providing food, by increasing agricultural production for consumption, to meet the needs of the local community members, who are constantly increasing.
- Contribute to the promotion of exports and the reduction of imports through an increase in agricultural productivity to advance the local economy.
- Eliminating unemployment and alleviating poverty by creating new jobs for members of society, thus improving their standard of living especially in rural areas that depend on agriculture.
- Achieving economic stability by working to produce the largest amount of material production and achieving the highest levels of exploitation of available resources such as labor and natural resources. Instability in the agricultural sector is closely related to climatic and seasonal variables, this requires the expansion of investment and land reclamation, and rationalizing water use and reducing migration from rural to urban areas.
- Contribute to economic development through the development of agricultural production by scientific research and the use of modern scientific techniques in production.
- Using local resources as inputs in the production process in order to support the national industry and advance the national economy.

Agricultural development cannot be achieved without the availability of a set of factors that will increase production and achieve food security. These factors include the following:

First: Natural resources include the following:

- 1- Farmland : (Al-Niemi, 2021a) pointed out that the soil degradation of agricultural land as a quantitative and qualitative change in the properties and characteristics of the soil which leads to a decrease in the productive capacity of this land, so that it becomes less efficient in the production of various agricultural crops.

The increase in production of agricultural land passes through three axes, as indicated by (Ghrdi, 2012), and these axes are:

- a- Increasing production by increasing the area of cultivated land (horizontal expansion).
- b- Increasing production by increasing the cropped area (crop intensification).
- c- Increasing production by increasing the productivity of the unit area (vertical expansion).

- 2- Water Resources: Water is the lifeblood and the most important component . It occupies 71% of the Earth's area and is the main determinant of agricultural development potential. Any physical or chemical change in water quality, directly or indirectly, that negatively affects living organisms, agricultural crops, and it renders the water unsuitable for the required agricultural use and it is considered polluted water.

Aljabaarayn, 2006 clarified that water resources are the main determinant of agricultural development potentials, this is due to its limitations on the one hand and the low efficiency of its use on the other hand in developing countries.

Alnimri, 2000 stated that these problems, pressures and limited water resources impose on countries especially developing ones. The need to raise the efficiency of their use in general and to develop the agricultural sector.

Second: Human Resources: It is every human effort aimed at creating or increasing the benefit. Human resources are what transform natural resources into economically beneficial resources. human resources are among the economic resources because it is scalable and development but by means of its own, which are education, training, guidance and health care. Education is the basis of human development and a major factor in agricultural development. As the level of educational attainment, basic skills training and extension services have a direct and positive impact on farmers' productivity. A farmer with a primary education is 8.4% more productive than a worker without an education. Therefore, the higher the educational level, the higher the chances of achieving a higher income using new technological methods and quickly adapting to technological changes (Abdullah, 2000).

Abd aldayem, et al. 2018 stated that the human element is an essential element and an important pillar in continuous development, It is the target of the development process and the beneficiary of its positive effects. On the other hand it is the main supplier of production, therefore the human resource is the real revolution for poor countries and one of the most important determinants of the efficiency and success of agricultural development programs for those countries.

Third: capital resources: (Saiyar,2014) stated that the critical problem in developing countries is the problem of financing, especially in the lowest-income countries. Capital is the backbone for the development process. According to the concept of economics the capital is meant the productive capital, which includes the capital invested in agriculture and all material means of production that are used in agriculture. It includes irrigation networks, roads, buildings, machinery, seeds and fertilizers.

Maheer, 2017 pointed out that the investment allocations and the expansion of the area of reclaimed lands positively affect the growth rate of agricultural production, as it reflects the extent of the success of the applied policies in meeting the continuous increase in the demand for food commodities, and the possibility of reducing imports and increasing exports, and reflects the efficiency of the economic system and economic policies in terms of their ability to achieve the goals set, so large sums are allocated for this purpose.

2.2. The concept, importance, theories and Policies of foreign trade of agricultural commodities:

Abdul Azim, 2000 explained that the foreign trade is the process of trade exchange in goods, services and other various elements of production, between several foreign countries. The goal is to achieve mutual benefits for the exchange parties.

Al-Asar and Al-Sharif, 2000 defined foreign trade as the process of exchanging goods physically across the political borders of the state, either entering the country and called imports or leaving the country and called exports. It also takes the form of services rendered from the nationals of one state to the nationals of another state. Services that are provided to others are called invisible exports, and services received from others are called invisible imports.

Gültekin, 2006 defined in a simplified way foreign trade as export and import activities.

Al-Tuwaijri, 2007 pointed out that foreign trade is the movement of total goods and services between different countries of the world in accordance with internationally recognized agreements and laws.

Al-Siryti, 2009 indicated that foreign trade is one of the branches of economics that specializes in the study of international economic transactions, represented in the movement of goods, services and capital between different countries.

The researcher (Seyidoğlu, 2009) pointed out that foreign trade is all the buying and selling activities that ensure that the goods and services produced are delivered to the end users for a certain fee. Trade is generally divided into two parts as domestic and foreign trade. Foreign trade is concerned with the flow of goods and capital across national borders. In terms of delivery of sales and purchases of foreign trade, it takes place in two ways: import and export. Export has an important place in the country's economic development. For this reason, increasing exports and decreasing imports in countries are among the important objectives. The decisions and actions taken by countries to achieve these objectives constitute foreign trade policy.

Çakmak, 2012 explained that foreign trade is all the shopping, export and import operations of a country with a foreign country, and it is also expressed as all trade exchanges between independent countries that relate to goods and services and are expressed in economic activities.

Al-Qaisi, 2016 stated that foreign trade is a branch of economics concerned with the study of economic deals and trade exchange that takes place between the state and the outside world in three forms represented by the transfer of goods, services, capital and individuals.

The importance of foreign trade is summarized in the following points:

- Foreign trade is important for harmony in the world when trade is between developing and developed countries (Karluk, 1991).
- Foreign trade is one of the vital sectors in any country, whether developed or developing, as it helps in expanding the marketing capacity by opening new markets for the country's products (Al-Asar and Al-Sharif, 2000).
- Foreign trade gives all countries the opportunity to obtain some products and services that they do not have, either because its climatic conditions or

its natural capabilities do not allow it to produce it, or the state produces it but at a higher cost than importing it (Abd Al-Rahman and Harbi, 2004).

- It works to enrich and develop countries (Gültekin, 2006).
- Maximizing the benefits of economic units (Gültekin, 2006).
- Foreign trade is an essential indicator of a country's productive and competitive ability in the international market, because this indicator is related to the available productive capabilities and the state's ability to provide foreign currencies and the impact of this on the trade balance (Al-Siryti, 2008).
- Foreign trade is the means that different countries resort to in order to raise their hard currency balance, because import and export are carried out outside the country and in different currencies. The increase in the volume of exports over the volume of imports results in obtaining a surplus of financial resources that can be invested in new projects (Ben Zeidan, 2012).
- Increase the level of well-being of countries (Köksal, 2016), The level of well-being increases by increasing the satisfaction of individuals' needs for goods and services, and also increases by expanding the base of choices in the areas of consumption, investment and the allocation of productive resources in general (Al-Sawaei, 2006).
- Exporting higher than imports leads to closing the deficit in countries, that is, any slight increase in countries' exports or a slight decrease in their imports will lead to filling the deficit in a simpler way (Köksal, 2016).
- Foreign trade is an important factor for developing countries that seek to develop their economies, As it gives these countries the opportunity to obtain loans from industrialized countries. International borrowing is nothing but a form of the transfer of goods and services from one country

to another. The borrowing country repays the loans by exporting the goods and services, it produces to the lending countries (Salih, 2019).

The foreign trade theories are summarized in the following:

Hussain, 2009 touched upon the theories of foreign trade in his study (Economic analysis of foreign trade of agricultural products in Iraq for the period 1990-2004). He pointed out that not all countries are equal in terms of their ability to produce all goods, so they benefit from their specialization in the production of goods that suit their conditions better than others and obtain their other needs of goods through trade exchange with the rest of the countries and this is called (relative advantages). This theory was developed by the english economist (Ricardo), that is, the difference in the relative costs of production in different countries, and that what determines these costs is the relative productivity of work, and accordingly it is determined which goods are exported and which goods are imported by the concerned country. This theory expresses the view of the classical economists in the interpretation of foreign trade. There is another theory that explains the reasons for the establishment of foreign trade, which is the modern theory of foreign trade for the two scholars (Ohlin) and his Professor (Heckscher) that trade comes from the possession of different amounts of production resources by countries. This method is more useful than the classical method, it emphasizes the role of production factors and studies the interrelationship between the prices of goods and services and the prices of production factors on the one hand, and the amounts of these factors and their production on the other hand, so countries benefit from trade among them from the difference in the available resources. For example, a country that owns the land resource and has less labor, its products that use the land intensively will be relatively cheap, while its products that contain labor intensity are relatively high. Therefore, it will export goods in which the proportion of the land is high, such as agricultural and food commodities, while it imports goods in which the proportion of labor is abundant as industrial goods.

Thus, this theory differs from the classical theory in that it gives a larger and more accurate explanation of foreign trade, as it emphasizes a greater number of factors of production instead of only relative costs.

Foreign trade policies of agricultural commodities in Iraq are summarized in the following:

Al-Najjar and Shalash, 1991 defined foreign trade policy as a set of procedures adopted by the state in regulating import and export relations with abroad and is considered of great importance, especially for developing countries, as exports of raw materials represent the largest proportion of their revenues and the main source of economic surplus to meet the country's requirements of capital goods and imported expertise. The foreign trade policy is of particular importance in facing the international market conditions and reducing the negative effects resulting from their fluctuations. It is worth noting that foreign trade policy is linked with a number of other economic policies such as production policy, marketing policy, exchange rate policy and international stability policy.

Hussain, 2009 clarified that, before the imposition of the embargo on it (from August 1990 until the US occupation of Iraq in 2003), Iraq was one of the countries importing productive and consumer goods, and it was the crude oil exports that filled the deficit in the trade balance, which made it positive, but without oil exports, the trade balance would be negative, and so was the case in the agricultural trade balance, the reason for this is due to the low local production in general and agricultural production in particular, and because there is a large local demand for goods, services and food products, which leads to a large deficit between demand and local production, and on this basis, trade covers this deficit through imports.

Proceeding from Iraq's belief in the unity of the Arab economy and Arab trade, it was and still gives priority to supplying its needs of food commodities and agricultural production requirements from Arab countries such as Egypt, Jordan, Syria, Saudi Arabia, Sudan, Algeria, Tunisia and Lebanon. Iraq participated in the

General Agreement on Trade and Customs Tariffs (GATT) at the end of the forties, as Iraq believed that the best way to deal with this organization is through the formation of an Arab economic bloc that enhances a common Arab market. Iraq was not free to enter the World Trade Organization due to the restrictions of the embargo imposed on it at the time.

2.3. The relationship between agricultural development and agricultural foreign trade .

The role of agricultural development in foreign trade for agricultural commodities, It means studying the repercussions of the most important indicators of development and some relevant economic variables in the development of foreign trade for agricultural commodities.

El-Abbasy, et al. 2008 stated that exports are one of the most important development issues in developed and developing countries alike, the issue of export occupied a distinguished position on the map of economic priorities to achieve development programs in many countries of the world, and they found a direct relationship between the value of agricultural GDP and each of the value of agricultural investments and the value of agricultural exports.

Salih, 2019 pointed out that agricultural development is one of the most important elements of economic development through which it is possible to raise agricultural growth rates and thus increase exports and reduce agricultural imports⁷, whereas agricultural development plays an effective role in agricultural foreign trade through the state of interdependence between production factors. This is a means of encouraging agricultural investment in strategic projects and infrastructure projects, which affects the increase in the agricultural sector's export revenues. The increase in the values of agricultural imports over the values of agricultural exports in many developing countries, this is due to the decrease in the value of financial allocations directed to agricultural development and the increase in domestic consumption rates, which led to its dependence on external sources to

secure its agricultural needs.(Al-Jubouri, 2021) indicated to the increase in agricultural imports since 2003 until the present time due to trade openness to foreign markets, which allowed foreign products to compete with their Iraqi counterparts and made Iraq a market for the disposal of surplus foreign agricultural production.

Zaidan, 2005 explained in her study " The impact of agricultural investment on the growth of the agricultural sector in Iraq for the period 1980-2000 ". Despite the investment allocations directed towards the agricultural sector as a general trend, the actual spending percentage was not proportionate and consistent with these allocations, this indicates a deficit in the efficiency of the agencies supervising the implementation of the spending programmers. This led to the weakness of the elements of agricultural development in Iraq. Investment spending has focused on long-term projects (dams, reservoirs, and land reclamation projects), that is, foundation infrastructure projects, and agricultural production projects. Both plant and animal, were neglected during the study period. The results showed that the compound annual growth rate of total agricultural crop production amounted to 1.01%, which is a low percentage if compared with the values and volume of investment in this sector, as well as the increased demand for foodstuffs as a result of the population increase and the high incomes of individuals, It was also clear that the compound annual growth rate of total livestock production had reached -0.2%, and this forced the country to import these products from abroad.

Kadhim, 2007 also published a study entitled "A Study in the Prospects of Agricultural Development in Iraq." The researcher pointed out that Iraq possesses an integrated and effective economic formation if its economic resources are used in a rational manner that can play an effective role in the development process by liquidating the semi-feudal production relations prevailing in the countryside and encourage the base of individual and collective investment and give way to the forces of competition to work on expanding the scope of agricultural production, in

order to ensure the achievement of self-sufficiency from it while remaining a surplus for export, because it is the main channel through which the foreign currency needed to stimulate investment and agricultural production in Iraq is supplied.

The two researchers (Henneberry and Khan, 2008) explained in their study "The nature of the links between economic growth and agricultural exports in Pakistan" that economic growth has a large and positive role in increasing the values and development of agricultural exports.

(Al-Abbasy, et al. 2008) confirmed in their study "Economic analysis of the relationship between agricultural development and agricultural foreign trade" in Egypt there is a direct relationship between the value of agricultural domestic product and each of the value of agricultural investments and the value of agricultural exports and the value of agricultural imports of intermediate and capital goods. They also found a direct relationship between agricultural investments and each of the value of loans granted to the agricultural sector by the banking system, the value of agricultural exports, and the value of agricultural imports of intermediate and capital goods. They pointed to the emergence of a positive relationship between the value of agricultural exports and the value of agricultural investments. The results of the study confirmed the existence of an inverse relationship between the value of agricultural exports and the value of the exchange rate. The positive relationship between the value of agricultural imports of intermediate and capital goods and the value of agricultural investments was confirmed, while the effect of the exchange rate change on the value of those imports was not proven. The results also indicated the existence of a positive relationship between the volume of agricultural employment and the value of investments. There is a direct relationship between the average annual wage of an agricultural worker and the value of agricultural domestic product, and this average annual wage increases when the value of agricultural investments increases. The

results confirmed an inverse relationship between the average annual wage of an agricultural worker and the size of agricultural employment.

In a study conducted by (Erdem et al. 2010), the effect of exchange rate and exchange rate volatility on agricultural foreign trade in Turkey was investigated. In the study, the agricultural import and export data of Turkey and its twenty major agricultural foreign trade partners for the years 1980-2005 were processed annually and a cointegration panel analysis was performed. According to the results of the research, it was determined that the volatility of the exchange rate is more effective than the level of the exchange rate. Exchange rate volatility is more effective in imports than in exports. On the other hand, the effect of the real exchange rate on agricultural exports was found to be negligible, while it was found to be positive in agricultural imports.

(Al-Azzawi, 2011) dealt with in his study "The impact of agricultural output on trade in agricultural commodities under the policies of agricultural economic openness". He pointed out that economic openness has a positive role in the growth and development of agricultural trade. The fact of economic openness lies in opening the door to liberating the productive capacities from all obstacles and liberating the private sector from all fears and obstacles, and attracting foreign investments in the agricultural sector because of its very important role as it uses the latest types of agricultural technology and employs more money in order to achieve a certain amount of production to meet a need domestic demand and export of its surplus, this leads to reducing the volume of agricultural imports and saving more foreign currencies. Among the findings of the researcher is that the agricultural domestic product is still growing slowly in the arab world in general and the sample countries in particular, with its plant and animal parts, which is reflected in different effects in the development of agricultural foreign trade.

The study by (Izuchukwu, et al. 2012) included "an assessment of the impact of foreign direct investment in the development of the agricultural sector in Nigeria for the period 1980-2009", that despite the governmental efforts made, the

agricultural sector is still characterized by low yields and limited cultivated lands, due to the government's dependence on the existing mono-economy on oil.

(Salih, 2019) concluded in his study, "The effect of some agricultural development indicators on the foreign trade of agricultural products for selected Arab countries". Agricultural development is the most important element of economic development through which it is possible to raise agricultural growth rates and thus increase exports and reduce agricultural imports as well as the advancement the reality of the local economy. Agricultural development plays an active role in agricultural foreign trade through the state of interdependence between production factors, and this is a way to encourage agricultural investment in strategic projects and infrastructure projects, which affects the increase in agricultural sector export returns. Data on the reality of agricultural development in developing countries (Egypt, Morocco and Syria) indicate the low performance indicators of their agricultural sector, and this has affected the increase in the values of their agricultural imports, which led to an exacerbation of their external debt rates and a high percentage of deficit in their public budget. The increase in the values of agricultural imports over the values of agricultural exports in the countries (Egypt, Morocco and Syria) due to the exposure of the agricultural sector to conditions of risk and uncertainty, the decrease in the value of financial allocations directed to developing agriculture, and the increase in domestic consumption rates, which made developing countries dependent on external sources to secure their agricultural needs.

(Musi, 2020) in "an analytical study of foreign exchange policies and their impact on foreign trade - Sudan during the period 2005-2018", reached several results. The most important of which is that an inverse relationship between the exchange rate and both agricultural and industrial financing, financing of the foreign trade sector, total bank financing granted, imports and exports, whereas the exchange rate rises, the amount of bank financing granted to the above sectors

decreases. The study recommended increasing bank financing for both the agricultural sector and the foreign trade sector.

The researchers (Shakur and Obaid, 2020) indicated in their study "an economic analysis of the most important factors affecting sustainable agricultural development in Iraq for the period 2000-2017" that there is no correlation between time (technology changes) and the amount of local agricultural production, which is an indicator for measuring agricultural development. Thus the inability to compete with imported agricultural commodities. They found the lack of clarity of price and financial policies that could encourage an increase in the cultivated area in Iraq, which was reflected in the deterioration of the cultivated areas and the migration of agricultural labor. They pointed to the existence of a dumping policy that made the agricultural sector products in Iraq unable to compete with imported products.



3. MATERIALS AND METHODS

This study relied in extracting the results on two directions, the first (descriptive analysis) and the second trend (quantitative analysis), which is based on the use of economic and standard methods in analyzing data of a time series extending for 30 years (1990-2020) using the statistical program Eviews 10, and the study data were obtained from its main sources as follows:

- 1- Ministry of Planning - Central Statistical Organization - Agricultural Statistics Department.
- 2- Ministry of Agriculture - Planning and Follow-up Section - Department of Agricultural Statistics.
- 3- Food and Agriculture Organization.
- 4- World Bank.

The methodology of the theoretical part of the study consists of the following:

- 1- The reality of agriculture development in Iraq, problems and solutions to be taken for efficient agricultural development,(See part 4 of the study)
- 2- Productivity, nutritional gap, % self-sufficiency and percentage of dependence on foreign imports, (See part 5 of the study). How to calculate these economic Indicators:
 - Crop productivity: In this study, we will focus on strategic grain crops (wheat, barley, rice) and corn. The productivity of these crops per dunum of land ($\text{dunum} = 2500 \text{ m}^2$), which is calculated according to the following equation:

$$\text{Productivity (kg/dunum)} = \frac{\text{Total production (kg)}}{\text{Total area of cultivated land (dunum)}}$$

- The size of the nutritional gap: The size of the nutritional gap is calculated as follows:

Nutritional gap = Production quantities - Available quantities for consumption.

- Self-sufficiency ratio for a particular crop: The self-sufficiency ratio for a particular crop is calculated as follows:

$$\% \text{ Self-sufficiency} = \frac{\text{Production quantities}}{\text{Available quantities for consumption}} \times 100$$

- Import dependency ratio (%) = 100 - self-sufficiency ratio

The data-analytical standard method was adopted, which consists of four stages

The first stage : Estimation and analysis of the standard model of the factors affecting the values of agricultural output in Iraq for the period 1990-2020. In order to estimate and explain the factors affecting the values of agricultural output, a number of economic factors have been adopted that represent the independent variables that affect the values of agricultural output, which is the dependent variable. The independent variables included (agricultural investment values X_1 , agricultural labor force X_2 , inflation rate X_3 , agricultural loans X_4 , cultivated area X_5 , and foreign exchange rate X_6). The values of the independent variables and the dependent variable were converted from the local currency to the US dollar in order to exclude the inflationary effects that occur in the values of the local currency. The time series that was adopted in the study had a range of 31 years (1990-2020), and the multiple linear regression method was used for the presence of more than one independent variable in the first stage.

This stage included calculating the values of the parameters using the ordinary and weighted least squares method, based on the statistical program

Eveiws10 because this method is characterized by giving the best unbiased linear estimates. Below is the equation for the first stage of the Standard Model.

$$Y_1 = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \dots + U_i$$

Where:

Y_1 = Dependent variable (agricultural output values).

β_0 = absolute limit

$\beta_1, \dots, \beta_6$ = Model Parameters

$X_1, \dots, X_6$ = independent variables

U_i = A random variable that represents non-explanatory variables that were not included in the model.

Below is some information about the dependent variable and the independent variables for the first stage.

Agricultural output values (Y_1): Iraq relies on foreign trade to fill its production deficit. The decrease in the local production of crops leads to an increase in imports, and there is an inverse relationship between this variable and the values of agricultural imports.

Agricultural Investment Values (X_1): Agricultural investment means the allocations that allow the expansion of the production base of agriculture, therefore, agricultural investment is concerned with the development of the material means of production and works to improve them and raise their productive efficiency. The expansion of agricultural investments also leads to an increase in agricultural productivity, which sometimes leads to a surplus that can be exported abroad (Zaidan, 2005).

Agricultural labor force (X_2): Agricultural labor force is one of the important production elements in agricultural activity, as it constitutes the human

force that affects the final results of this activity and makes an effective contribution to improving the performance of the agricultural sector, which in turn will be reflected in the increase of agricultural domestic product (Al-Salmi, 1997). The success of production units depends on their economic efficiency and the abundance of the labor force. The efficiency of agricultural work is measured by dividing the value of agricultural output by the number of agricultural workers and the high value of this criterion indicates better efficiency of the agricultural worker (The World Bank, 2008).

Inflation rate (X_3): Inflation is one of the macroeconomic problems that Iraq suffers from. For reasons related to the nature of its economic structure, its integration into the global market, and its compliance with the specifications of the International Monetary Fund, the World Bank, and the World Trade Organization. Inflation became increasing year after year and began to exercise its negative impact in increasing imports by raising the costs of agricultural production inside Iraq. It is defined as a large amount of money chasing a smaller amount of goods and services (Grimes, 2002). High inflation rates mean an increase in the prices of local goods, and local goods are high in price for the foreign importer.

Agricultural loans (X_4): Agricultural loans are defined as amounts provided to farmers to help them grow and harvest agricultural crops. The main objective of the loans is to make the capital available to all farmers and provide job opportunities for them to advance the agricultural reality and support the agricultural development process (Al-Taei and Jerio, 2015).

Cultivated area (X_5): Iraq needs to pay attention to the issue of food security, as well as the importance of productive agricultural investment to increase the area of agricultural land with high production. As the cultivated areas are expanded to achieve economic agriculture, which ensures access to self-sufficiency in agricultural products (Mudhi, 2006).

Foreign exchange rate (X_6): The foreign exchange rate is one of the macroeconomic variables, and it is defined as the number of domestic currency

units that are exchanged for one unit of foreign exchange (Bosworth, 1985). The foreign exchange rate is the link between the country and the outside world, and it is the ratio through which a national currency is exchanged for a foreign currency. The rise in exchange rates increases imports because local prices are higher than international prices. When the exchange rates drop, this leads to a decrease in imports because local prices are lower than international prices.

The second stage: Estimation and analysis of the standard model for the values of agricultural output affecting the values of agricultural exports in Iraq for the period 1990-2020. The simple linear regression method was used at this stage. Below is the equation for the second stage of the Standard Model:

$$Y_2 = \beta_0 + \beta_1 Y_1$$

Where :

Y_2 = Dependent variable (agricultural export values)

β_0 = absolute limit

β_1 = Model Parameter

Y_1 = Independent variable (agricultural output values)

Below is some information about the dependent variable (Y_2 = agricultural export values)

Exports are one of the important indicators for measuring the volume and level of foreign trade, and they play an important role in covering imports. The most important agricultural commodities exported in Iraq are dates, leather, and wool.

The third stage: Estimation and analysis of the standard model for the values of agricultural output affecting the values of agricultural imports in Iraq for the period 1990-2020. The simple linear regression method was used at this stage. Below is the equation for the third stage of the Standard Model.

$$Y_3 = \beta_0 + \beta_1 Y_1$$

Where :

Y_3 = Dependent variable (agricultural import values)

β_0 = absolute limit

β_1 = Model Parameter

Y_1 = Independent variable (agricultural output values)

Below is some information about the dependent variable (Y_3 = agricultural import values)

Agricultural imports work to alleviate the food deficit that Iraq suffers from, as they work to increase the food supply and enable individuals to meet their food needs and requirements. In order to address this food gap, it is necessary to increase local production in order to reduce the volume of agricultural imports.

The fourth stage : Estimation and analysis of the standard model for the values of agricultural output affecting the values of agricultural foreign trade in Iraq for the period 1990-2020. The simple linear regression method was used at this stage. Below is the equation for the fourth stage of the Standard Model.

$$Y_4 = \beta_0 + \beta_1 Y_1$$

Where:

Y_4 = Dependent variable (values of agricultural foreign trade)

β_0 = absolute limit

β_1 = Model Parameter

Y_1 = Independent variable (agricultural output values)

Statistical and standard tests that were used in the study**First: The statistical tests**

- **t-test** : This test is used to check the significance of the obtained estimates. It is necessary to clarify whether the independent variables affect the dependent variable or not, because the hypothesis to be tested are the null hypothesis and the alternative hypothesis, as in the following formula:

Null hypothesis $H_0 : \beta = 0$

Alternative Hypothesis $H_1 : \beta \neq 0$

- **F-test** : This test is used to ascertain the significance of the assumed linear relationship between the dependent variable and the independent variables.
- **Determination coefficient test (R^2)**: This test is used to determine the extent to which the independent variables are able to explain the changes that occur in the dependent variable. It shows the percentage of total deviations in the dependent variable as a result of the changes occurring in the independent variables.

Second: The Standard tests

- **Durbin-watson test**: This test is used to detect the phenomenon of autocorrelation between the values of successive random variables, on the basis of calculating the residuals resulting from the use of linear regression of ordinary least squares.
- **Klein test** : This test is used to detect whether or not there is a problem of linear interference between the independent variables.

Third: Causality tests

- **Granger Causality Test:** The causal method will be used to find out the causal relationship between the variables, and among these causations is Granger's causality in the model, because the main axis of this test is to discover the direction of causation in the first stage of the standard analysis because it contains co-integration in the light of which agricultural plans and strategies are drawn.

The test is done by means of the null hypothesis, which states that there is no causal relationship between the two variables, according to what Granger presented in his research (Verifying the causal relationship in econometric models and the common spectrum method) in the year (1969). This method is applied to identify the nature of the relationship between the variables, after making sure that there is co-integration between two variables, this means that there must be a causal relationship between them in at least one direction, but the cointegration does not explain the direction of the causal relationship between the variables, and to determine the causal relationship Engle and Granger (1987) proposed a more comprehensive procedure known as causal relations. According to Granger, variable X causes variable Y if the prediction of current values of variable Y is improved by using past values of variable X, however, if variable X causes variable Y, it means that variable X contains some useful information about variable Y that would efficiently predict the values of variable Y. The Granger causality test determines whether the direction of the causal relationship extends from variable X to variable Y, or extends from variable Y to variable X, which is called directional causality, besides that, it also determines whether variable X and variable Y cause each other, which is called bilateral causality, or there is no direct relationship between variables X and Y, meaning that each is independent of the other (Independence Case). The Granger Causality Test includes estimating the following two equations (Granger, 1969):

$$X_t = \sum_{j=1}^m a_j X_{t-j} + \sum_{j=1}^m b_j Y_{t-j} + \varepsilon_t$$

$$Y_t = \sum_{j=1}^m c_j X_{t-j} + \sum_{j=1}^m d_j Y_{t-j} + \eta_t$$

Where ε_t , η_t represent uncorrelated white-noise.

Granger introduced the concept of causality into econometrics in 1969, where he introduced a new method of causation that it has later called Granger causality. Granger causality is based on the wisdom that the cause precedes the result, and this concept enables the distinction between external variables and internal variables, and the statistical detection of the direction of the causal relationship between the variables includes the cause-and-effect relationship (Rashad, 2011). Granger's contributions led to the clarification of the concept of co-integration between two or more variables from a statistical point of view, which is the existence of a long-term balance between these two variables, and it has become used, especially in cases where long-term relationships affect the current value of the variables studied, as well as the importance of co-integration in time series analysis. Rashad defined the causal relationship of (Granger) in a simplified manner, which is: that the random variable (X) causes a change in the random variable (Y) if there is information in the past of (X) useful in predicting (Y), and this information does not exist in the past (Y). So we have two postulates here:

1. The causal relationship applies only to random variables.
2. The past and present can cause the future and vice versa.



4. THE REALITY OF AGRICULTURE DEVELOPMENT IN IRAQ. PROBLEMS AND SOLUTIONS

Ahmed Sadullah Najim ALNIEMI

4. THE REALITY OF AGRICULTURE DEVELOPMENT IN IRAQ, PROBLEMS AND SOLUTIONS

Iraq is characterized by the abundance of fertile agricultural land, which is estimated at 48 million dunums, which constitutes 28% of the total area of Iraq, and the exploited of it does not exceed 23 million dunums, i.e. up to 47% of the total arable agricultural land (Abdul Sattar, et al.1987). This means that there are energies of agricultural land that are still untapped, which can constitute a strong incentive to support agricultural development.

Surface water resources are the first and main source of water in Iraq, represented by the Tigris and Euphrates rivers and their tributaries. The annual rate of their water imports is about 77 billion m³ in a moderate water year, and about 44 billion m³ in a dry water year (Ministry of Agriculture, Annual Report of Agricultural Development in Iraq, 2001). The water revenue of the Euphrates river is 100% from outside Iraq, while 68% of the water revenue of the Tigris river is from outside Iraq, this shows the extent to which the country's water revenues from these two rivers are subject to the will of the interests of multiple countries. As Iraq's water supplies were negatively affected by the huge irrigation projects in Turkey and Syria. Iraq's water deficit reached about 5 billion m³ in 2002, to reach about 15 billion m³ in 2005 (Rashid, 2005). Noting that Iraq consumes about 53 billion m³ of these water imports, of which 34 billion m³ are in the Tigris river basin and about 19 billion m³ in the Euphrates river basin for all different purposes of the country, which entails great risks to agricultural production.

4.1. Problems and challenges of agricultural development in Iraq

Iraq faced, and is still facing at the present time, a very important food challenge, one of the most prominent features of this challenge was the inability of its food production to meet its needs of the main food commodities, especially

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grains. Iraq imports most of these needs from abroad, due to its low productivity and its decline year after year for many reasons, which poses a threat to its food security (Hassan, 2007). The most important problems and obstacles of the agricultural sector in Iraq are as follows:

First: Environmental problems and constraints:

1- Decreased proportion of arable land:

The total area of Iraq is (435,000 km), equivalent to (43505 million hectares), and the area of arable land is about (11.1 million hectares), or (26%) of the total area of Iraq (Ahmed 1999). There are approximately (60%) of the area of Iraq, which represents unproductive lands, While there are 9% of the total percentage of lands that can become agricultural lands in the event of reclamation and disposal of salinity. Usually, the lands in Iraq are divided into four regions:

- The desert region: which is located in western Iraq and represents about 40% of the area of Iraq.
- The Plains region: It is represented in the Mesopotamian plain, including the sedimentary plain, and includes the marshes and lakes region.
- The mountainous regions: which are located in the north and north-east of Iraq.
- The undulating region: It is an area located between the plains in the south and the mountainous region. The division of land, its area and the ratio of each to the total area can be clarified through the table (4.1.) : (Ministry of Planning and Development Cooperation, 2007)

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Table 4.1. The division of land, its area and the ratio of each to the total area

Land type	Area in km ²	Percentage of the total area
Plains (including marshes and lakes)	132500	30.2
Undulating area	42000	9.6
Mountains	92000	21.0
Deserts	168552	39.20
Total	435.052	100

2- Environmental pollution problem:

Environmental pollution means the corruption of the components of the environment, which leads to the transformation of its beneficial elements into harmful elements and thus loses its role in making life. Pollution is an imbalance in the balance of the components of the environment, disrupting its components and their interaction causing damage to them (Talaat, 1999). Very serious environmental pollution occurred in Iraq after 2003, and the resulting use of internationally prohibited weapons led to air pollution. In addition to the water pollution caused by throwing industrial, agricultural and urban wastes into the course of the Tigris and Euphrates rivers by the upstream countries Turkey, Syria, Iran and even Iraq, where the salinity rate rose from 250 parts per million to 3000 parts per million in the waters of the Shatt al-Arab and the pollution rate from 1/3. Thus, the water has become unfit for drinking and irrigation and has led to the destruction of fish wealth in Iraq's rivers. In addition to a very large drop in agricultural productivity in return for the high costs of agricultural production resulting from the control of crops for several times and the high prices of pesticides (Khalaf, 2010).

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3- The problem of salinization of agricultural land:

Ibrahim 2013 indicated that 75% of the irrigated lands in Iraq suffer from salinity, and this phenomenon would increase the area of desertified lands, which amounts to about 167,000 km², which constitutes 38% of the total area of Iraq, in addition to the area threatened by desertification, which amounts to 338,000 km², which is 54.7% of the area of Iraq, and when the two percentages are combined, it is about 93% of the total area of Iraq that is subject to desertification. Soil salinity is the result of wastage in the use of irrigation water by farmers in agricultural lands irrigated by the wrong traditional irrigation methods used in agriculture (Arab Organization for Agricultural Development, 1983). In addition, river water contains a high percentage of salt, for example, the Euphrates River contains more than 500 parts per million and about 330 parts per million in the Tigris River. With the effective absence of drainage, the ground water level rose, which led to an increase in soil salinity at the surface, which reduced its productivity (Al-Metwally 2004). The area of unproductive lands in Iraq due to salinization reached 4017.9 thousand hectares, which is a relatively large area when compared to the area of arable land, which amounted to 9150.2 thousand hectares (Arab Organization for Agricultural Development, 2007).

4- The problem of desertification and erosion:

Desertification in Iraq is the result of natural and human factors, represented by mismanagement of natural resources and their investment in agriculture which considered the most important factor of desertification in Iraq. The surface irrigation and flood irrigation have exacerbated the problem of soil waterlogging and thus salinization. The overgrazing and the failure to adopt modern methods of animal husbandry led to the elimination of bushes and weeds,

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which exposed the soil to the danger of erosion. The non-use of agricultural cycles, the lack of interest in green belts, the development of vegetation cover and its investment in a rational and balanced manner, as well as the urban encroachment on the neighboring agricultural areas is a working form for the swallowing of agricultural lands. This opinion was supported by the World Conference on Desertification, which was held in Nairobi in 1997 under the auspices of the United Nations (Ibrahim, 2017). It can be said that desertification is any transformation of arable lands into unsuitable lands, or a decrease in their productive capacity and a deterioration in ecosystems. As a result of human activities and natural factors that led to soil erosion or as a result of soil salinization or as a result of the encroachment of sand dunes or the extension of desert conditions on humid and non-desert areas. Desertification is widespread in large parts of Iraq, but it is most severe in the south. The areas affected by desertification and desert encroachment in this region are about 104,200 km² and they are on the increase. Active sand dunes have begun to appear in many parts of it, which threatening agricultural and urban lands and other projects adjacent to them (Mohammed, 2010).

5- The problem of low water levels:

(Ibrahim, 2017) indicated that Iraq is located in an arid and semi-arid region and the annual rate of rainfall does not exceed 200 mm in dry years. Almost half of the area of Iraq is a desert area where the rainfall does not exceed 50 mm/year. Climate change and global warming have led to the phenomenon of drought that affected the Middle East (including Iraq), which resulted in a significant decrease in the amount of rain and snow in the upper Tigris and Euphrates rivers consequently. The water revenues coming into the two rivers and their tributaries decreased, as the amount of rain falling in Iraq decreased from 310.8 mm in the climatic cycle (1941-1975) to 242.6 mm in the climatic cycle

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(1999-2009) with a change of - 78.2 mm. The areas of the outer Euphrates and Tigris basins also witnessed a clear decrease in the amount of rain falling from its general average of (510) mm to 385.8 mm for the period (1941-2009) in the Turkish Erzurum station. The total water revenue from the Tigris and Euphrates rivers was (68.16) billion m³ / year for the period (1930-2009), it decreased in 2011 to 47.6 billion / m³ as shown in the table (4.2.). It is expected that most of Iraq's rivers will witness a decrease in their water revenues, as the discharge of the Tigris and Euphrates will decrease by 30-50%, during the next fifty years (United Nations Environment Program, 2010).

Table 4.2. Water revenues (billion m³) for the year 2010 and 2011 in Iraq.

River/ Tributary		Year 2010	Year 2011
Tigris (including the Khabur)		20.4	15.4
Tributaries	Alzab alkabir	14.1	11.8
	Alzab alsaghir	6.7	3.4
	Aleazim	0.7	0.3
	Diyala	5.8	2.1
The total revenue of the Tigris River		47.7	33.0
The total revenue of the Euphrates River		19.3	14.6
Total summation		67.0	47.6

Source: Central Statistical Organization, Agricultural Statistics Directorate, Water Resources Reports for the Year 2010 and 2011, pg. 4.

(Hussain and Al-Kinani, 2019) defined the water crisis as an imbalance between renewable and available water resources and the increasing demand for them, which results in a deficit in the water balance that ultimately hinders sustainable agricultural development. This deficit is called the water gap that leads to economic and social damages that threaten the structure of the state and the seriousness of this crisis may lead to the scarcity of this natural resource, especially

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after the establishment of the riparian countries many agricultural projects on the courses of the Tigris and Euphrates rivers from dams and reservoirs, and the annual imports of the Tigris and Euphrates rivers became captive to projects Turkish, Syrian and Iranian, since the seventies of the last century, specifically in the year 1973-1974. The rate of water imports of the Euphrates River reached 9.2 billion m³ as a result of filling both of Turkey and Syria two reservoirs (Kiban and Tabqa) at the same time and the seriousness of this crisis will be clearer if we know that a percentage of (68.4%) of Iraqi water imports come from abroad (Al-Badri and Mahmoud 2010). The Tigris and Euphrates rivers originate in southeastern Turkey, and the Tigris River passes through three countries, namely Iraq, Iran and Syria. The Tigris River is the second longest river in southwest Asia, with a length of about 1,718 km, and the distance it travels in Iraq is estimated at about 1,419 km, or approximately 74.63% Its flow is inside Iraqi territory (Ministry of planning, 2015). The area of its basin is 472.606 km², which passes through Turkey (17%), Syria (2%), Iran (29%) and Iraq (52%) (Ansari, 2018).

As for the length of the Euphrates River, it is estimated at about 2,940 km, and the distance it travels in Iraq after passing through Syria is about 1,160 km, or 39.45% of the total length of the river lies within Iraqi territory (Ministry of planning, 2015). Its basin area is 444,000 km², of which (28%) is located in Turkey, (17.1%) in Syria and the remainder (39.9%) in Iraq (Ansari,2018).

Many statistics indicate a decrease in the annual revenues of the Tigris and Euphrates rivers recently, after the total revenue of the two rivers was (89.53) billion m³ for the water year 1994-1995, it became estimated at (37.49) billion m³ in the water year 2016-2017, with a decrease rate of (41.7%) (Ministry of planning, 2017). As Iraq's share of the Euphrates River reached one third of the quantities that it received before the construction of the dams, and the levels of the Tigris river decreased to reach (47%) of the annual need of the river, and this led to the emergence of several risks, including agricultural risks represented in the decrease

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in the amount of crop production, especially grains thereof, It is also expected to lose (40%) of its arable lands, whose area is estimated at (7.25) million acres. In addition, the flow of the Diyala River coming from Iran has finally stopped due to Iran's construction of a dam on this river, which led to the depletion of water in it, as for Lake Saadiya, one of the largest lakes in Iraq, it has also dried up after the water receded since 2003 (Al-Maamouri, 2008).

(Ibrahim, 2017) indicates that this apparent fluctuation in the revenues of the Tigris and Euphrates rivers is due to several reasons, foremost of which is the change in climate conditions from a dry season and a lack of rain, the decrease in the water levels of the two rivers as a result of the water policy adopted recently by the riparian countries, namely Turkey, Iran and Syria, through building dams and reservoirs, and controlling water and what it withdraws for its irrigation projects, As the rate of decrease in the levels of water flowing from the riparian countries has reached nearly 50% compared to previous years, especially from neighboring Turkey, this contributed to a decrease in the water reserves in the Tigris and Euphrates rivers, as 66.55% of the Tigris River's revenues and all the Euphrates' revenues come from outside Iraq, which increased the water crisis on Iraq. That is, a large percentage of surface water resources are under the control of multiple countries, and this in turn negatively affected agricultural output and the water deficit in Iraq reached approximately (5) billion m³ in 2002, then increased in 2005 to reach (15) billion m³.

(Al-Shammari, 2008) indicated that the limited water resources on the one hand, and their consumption patterns on the other hand, have led to the emergence of a clear imbalance between the available water resources and the demand for them in many countries. Iraq is one of those countries that suffers from a clear imbalance represented in the high percentage of the country's dependence on water resources originating outside its borders, which makes it more vulnerable to shortage and deterioration in quantity and quality, in addition to the non-optimal

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use of the available water resources. This imbalance may lead to the emergence of a water deficit that is expected to reach during the next ten years to 13 billion cubic meters if water policies continue in the future on the same contexts (Al-Mashhadani, 2002).

Second: Obstacles to agricultural ownership and tenure:

The agricultural lands that are subject to division and fragmentation due to inheritance are estimated at 2 million dunums, It is occupied by more than 157 thousand Iraqi families, and here the role of agricultural policy in limiting the fragmentation and scattering of agricultural lands as a result of inheritance is weak and limited, since inheritance is a legitimate right imposed by custom and religion and it is not possible to prevent or limit it. The agricultural reform laws, especially Law No. (30) for the year 1958 and Law No. (117) for the year 1970, have worked to break up agricultural ownership into small and medium agricultural units whose areas are (5-10-15-20-30) dunums (Khalaf, 2008). Khalaf indicated in this aspect in earlier reference (Khalaf, 1993) that the agricultural reform laws 117 and 90 of 1970 and 1975, respectively, clarified that an amount of 157,050 agricultural families for properties less than 10 dunums and 492,300 families for properties more than 10 dunums and less than 20 dunums. While the number of properties with an area of more than 120 dunums was 28,300, and more than 300 dunums was 5214 agricultural properties. This led to the creation of small agricultural investment units that could not use the agricultural cycle and modern mechanization in it on a large scale in the cultivation of some agricultural crops, especially strategic ones such as grains, as well as in the cultivation of oilseeds and industrial crops to support national industries .

Third: Weak infrastructure and deteriorating social services:

The agricultural sector in Iraq suffers from several problems that have led to its backwardness as a result of the severe weakness of the infrastructure(Al-Ashram, 2007) and the lack of necessary social services such as (transportation,

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communications, electricity, water and sanitation, and the use of modern technology). This reflects negatively on the development of the agricultural sector in the country due to the high costs of agricultural productivity (Ibrahim, 2013). (Ali, 2014) indicated that the structural and institutional obstacles are the most important factors affecting the other factors of production such as land, water, capital and technology. As well as the difficulty of implementing and establishing it due to the huge capital that it requires and the length of time required to complete it. In the following, we will address the most prominent of these obstacles and the most impact on agricultural development in Iraq. Infrastructure represents all the facilities that are the basis for economic life, which represents the ground for the structure of the national economy and includes means of transportation, storage, energy, water, irrigation and drainage systems, dams, health and social care institutions and education. The unavailability of the service structure in the agricultural rural areas of Iraq leads to slow progress towards achieving the agricultural development process and the difficulty of fully exploiting the available agricultural and economic resources. Among the most prominent infrastructure obstacles in the Iraqi countryside are:

- 1- Inadequate transportation and means of transportation, as well as the limited good roads and high transportation costs as a result of high fuel prices.
- 2- Limited distribution centers for the main production requirements such as fertilizers, improved seeds and chemical pesticides, as well as the distance between distribution centers and production areas, which impedes the arrival of production requirements on time, moreover the high prices.
- 3- Limited modern storage means, as fruits, vegetables, dairy and meat products suffer in particular from this problem due to their rapid

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deterioration. Furthermore the great shortage of irrigation and sewage networks, bridges, training institutes and educational institutions.

Forth: The problem of unstable agricultural policies:

All previous agricultural policy strategies since the beginning of the last century and until the present time have targeted achieving a high percentage of food security, but this has not been achieved, especially in the period extending from the end of the eighties until now due to known reasons such as wars, siege, security and economic conditions and it caused the production to not develop in a way that parallels the growth of the society's needs for food (Ministry of Planning and Development Cooperation, 2009). The food gap in Iraq is characterized by fluctuation from year to year due to the change in agricultural production (vegetable and animal), the volume of consumption and fluctuations in the high prices of food commodities. Iraq suffers from a severe food gap that has been increasing with time since the 1990s. There is a shortage in most foodstuffs, and grains, especially wheat, are considered one of the most important imported food commodities, as the proportion of their imports represents about 65% of food imports, as what is produced from this strategic food is very few and does not fit with the size of the population and the area of agricultural land in the country. Iraq also imports 100% of its needs of sugar and the same percentage of its needs of oils and legumes, while the rate of self-sufficiency in vegetables, fruits, chicken meat and fish is about 65% (Al-Taei, 1995). After the American occupation of Iraq, agriculture has deteriorated and the problems it suffers from increased, and the reasons that led to the low level of agriculture and agricultural production and the migration of farmers to their lands due to hunger and unemployment (Al-Baghdadi, 2011).

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Fifth: Obstacles and human problems:

- 1- The problem of security and political instability in Iraq: The problem of security and political instability, continuous changes to regulations and laws, and sectarian, religious and political conflicts are among the most important reasons for the decline in the ability of all sectors, including the agricultural sector, to plan for work and production due to the serious and persistent imbalances in prices. In general (whether it is the prices of raw materials and fuel or the prices of transport or the prices of production factors) Which generates great difficulties with regard to the possibility of predicting production costs and expected profits, as well as reflecting the instability in economic policy at the level of the country as a whole(Al-Jubouri, 2021).
- 2- The problem of financial and administrative corruption in the economy and society of Iraq: Iraq is a country with a high degree of corruption, ranking 178 out of 180 countries (Rahi, 2006). Corruption leads to an increase in production costs and consequently a decrease in profits or lack thereof in some cases, in addition to the fact that financial and administrative corruption harms economic growth and raises production costs in general as a result of increased spending on production-related transactions in the public and private sectors, and this in itself is a harmful factor for the agricultural sector.
- 3- The problem of mismatch between planning and implementation:
The shortcomings of the implementation devices, especially the administrative ones, and their failure to understand the importance of this pattern(Mohammed, 1990). The deviation in the implementation of agricultural projects from the engineering basis of projects, including (irrigation and drainage networks and infrastructure for rural development) for the following reasons:

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- The basic design of agricultural projects is carried out according to multiple and sequential implementation stages. Each stage complements the stage that precedes it and is organically linked to the next, and in most agricultural projects because of the absence of precise and prior identification of the sites of plans projects and the absence of spatial planning and its institutions, in addition to the various technical reasons(Mahboub, 1976).
 - Most of the secondary contracts are entrusted to contractors who are financially and technically incompetent.
 - Neglecting the stage of maintenance, sustainability and follow-up to address the negatives before they escalate after receiving the projects (Rahi, 2006).
- 4- The problem of weak control and inspection bodies: The weakness of the follow-up devices specialized in monitoring and diagnosing the negatives in the cadres of agricultural projects leads to the spread of cases of lawlessness and poor job performance without fear of a deterrent or censor(Mahdi, 2010).
- 5- The problem of government management of irrigation and drainage projects: Irrigation and drainage projects that have been completed, it was clear that they were unable to sustain them and repair what was damaged, Irrigation projects depend on irrigation and drainage networks at their main, secondary and field levels, and what they include of regulators, gates, and pumping stations that require regular programmed maintenance. However, the majority of project administrations neglected this aspect, which led to the disruption of irrigation and drainage channels and the partial or complete suspension of pumping stations for a long period, which negatively affects the productivity of projects(Ibrahim, 2017).

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- 6- The problem of widespread poverty, ignorance and lack of knowledge: This led to the deterioration in Iraqi agriculture and to human mismanagement of agricultural resources in general and land resources in particular. As well as unstudied human practices such as removing vegetation through logging, cutting and burning trees, overgrazing and unstudied urban expansion at the expense of fertile agricultural lands. The misuse of agricultural mechanization and the indiscriminate use of chemical fertilizers and pesticides, and the resulting pollution of soil and water. As well as mismanagement of livestock, wrong applications in grazing, excessive withdrawal of groundwater, digging underground wells to irrigate livestock in dry areas, etc. (Arab Organization for Agricultural Development, 2007).

Sixth: Obstacles to agricultural investment and financing:

Financial and investment obstacles can be considered one of the most important obstacles to agricultural development. The importance of these obstacles is evident from the observation of the significant decline in investments in the agricultural sector after 2003 where government investment has stopped almost completely, while private investments are also very weak due to the lack of government investments on the one hand, and the financial capabilities of private agricultural activity on the other hand, and the specialists stress the importance of investments allocated to the agricultural sector in developing countries. They stress the necessity of these investments not less than 20% of the total public investment as a necessity to confront the food crisis (Ali, 2014).

Seventh: Obstacles to using the technology package:

Technology package means everything related to the application of science in the development of agricultural production inputs, such as agricultural machinery and equipment (automated mechanization), methods of use and

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maintenance, improved seeds and original seedlings and their suitability, as well as irrigation systems and methods of operation and methods of combating local agricultural pests and epidemics. The agricultural sector suffers from a backward technological level, as the old, primitive agricultural methods are still used in agricultural operations. It can be said that scientific progress and the introduction of technological achievements represented in the use of agricultural pullers in agricultural production processes reflect positive effects on increasing production and productivity. Expansion in the use of technology leads to raising the level of development of the productive forces, then leads to a higher level of performance for these forces, and then leads to an increase in production through increased productivity (Ibrahim, 2017). Ali, 2014 indicates that the reason for the limited use of improved seeds is the lack of varieties suitable for different conditions inside Iraq. The lack and inefficiency of multiplication of improved seeds as a result of the lack of material and technical capabilities, and the limited research capabilities in devising new varieties that are more suitable for the Iraqi agricultural environment. In terms of agricultural mechanization, the rate of its use is still marginal and low compared to rates in developed countries. Which led to a decrease in the efficiency of agricultural performance in Iraq, as it was estimated at about 14% of the efficiency of agriculture in some countries, and this in turn has led to a significant shortcoming in agricultural production, which contributed to dependence on the outside in obtaining food to meet the needs of the population. The reason for the limited agricultural mechanization in Iraq is due to its high prices as a result of being subject to monopoly by a limited number of companies in developed countries, the complexity of the maintenance problem due to the multiplicity of modern agricultural machines. The small size of agricultural holdings and their scattering in a way that hinders the process of introducing modern agricultural mechanization, and the lack of government support after 2003. As for chemical fertilizers, we find that the rates of their use in Iraq for the period

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from 1998-2002 were (781) thousand tons annually, while the need for the cultivated area was estimated at more than (1500) thousand tons. After 2003, and what the fertilizer factories were exposed to, the production of fertilizers decreased to the limits of (400) thousand tons annually, and this does not cover more than 20% of the need for agriculture. In addition to the cessation of government support, which led to an increase in the price of a ton from (60) thousand dinars per ton in 2002 to (600) thousand dinars per ton in 2007 for urea fertilizer. As for the compound fertilizer, the price has increased from (100) thousand dinars per ton to (1250) thousand dinars per ton. Most of the fertilizers are imported from abroad by the private sector, which led to a significant increase in the costs of agricultural production (Khalaf, 2009). As for agricultural pests of various kinds, they are considered one of the main obstacles to agricultural production in Iraq, where the annual losses resulting from these pests are estimated at about (35-50%) of the total agricultural production as a result of the fact that the use of pesticides in Iraq was not at the required level, the reason for the decline in the use of chemical pesticides is due to the lack of sufficient information about the environment, the weak financing capacity of farmers, the lack of experience and technical knowledge for most farmers, and the high prices of chemical pesticides after 2003 and the lifting of government support for them in a very large way (Ali, 2014).

Eighth: Trade Policy (Dumping Policy in Iraqi Markets):

After the exposure of the Iraqi market, the opening of borders with neighboring countries, and the disruption of the role of relevant institutions such as customs, economic security, the standardization and quality control system, health control departments and other institutions. The Iraqi market has turned from a controlled market to an open market, as bad and fraudulent types of goods have entered in very large quantities, as a result of the collapse of the Iraqi state with all its institutions, and the lack of knowledge of the risks of dumping on the national economy represented in the increase in unemployment and the leakage of hard

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currencies abroad and damage to industry and agriculture and inevitably the consumer for not existence of consumer protection and environmental protection laws. The policy of dumping the Iraqi market occurred as a result of many factors, some of which are internal and some are external, the internal factors were represented in the direction of the owners of dirty money to launder their money towards trade, especially since the Iraqi market was complaining of a great shortage of goods and services after economic sanctions that lasted (13) years. Therefore, types of electrical goods, cars, household appliances and foodstuffs were imported, and the owners of dirty money succeeded in laundering their money in this way as a result of the lack of taxes and the absence of financial and legal administrative procedures that prevent the transfer of funds abroad. As for the external factors, they were represented by foreign companies exploiting the Iraqi market after its exposure to global markets by introducing fraudulent goods and bad types of agricultural crops to achieve their political and economic goals to harm the environment and society and other goals, especially the neighboring countries that are trying to destroy the Iraqi economy in order for it to remain a market for selling their products(Khalaf, 2012).

4.2. Solutions and treatments for sustainable agricultural development in Iraq:

Hussein 2017 indicated that the advancement of the agricultural situation in Iraq requires exceptional efforts by the government to take real and serious steps to provide all means to ensure this advancement, including:

First: With regard to addressing the problem of agricultural land from desertification, salinity and erosion:

Iraq has 42 million dunums of arable agricultural land, but only 14 million dunums are exploited due to the low level of land productivity as a result of

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desertification, and to address this problem, the following measures should be taken:

- 1- Cultivation of seedlings capable of tolerating drought and salinity in desert areas, and preventing logging and overgrazing in desert areas. The government has worked to establish the desert oases project, which is one of the effective projects implemented by the Public Authority to Combat Desertification, to confront the phenomenon of desertification and reduce its risks, by planting trees and shrubs that are resistant to salinity and drought, such as (olive, pistachio, acacia and eucalyptus) and other grazing plants, these trees are watered using drip irrigation to achieve optimal use of water. The source of water is from groundwater through drilling wells, and an amount of 20 billion dollars has been allocated to meet the requirements of confronting the phenomenon of desertification in Iraq.
- 2- Regional cooperation between the Iraqi government and neighboring countries and entering into agreements to establish major projects on its land that are financed by neighboring countries and that benefit Iraq and contribute to the eradication of desertification, as most dust storms come from Syria enter Iraq, and then go to Iran, and this means harm to all these countries.
- 3- Forming governmental committees comprising the relevant ministries such as the Ministry of Agriculture, Environment, Water Resources, Science and Industry and allocating a budget for them in order to advance their work by stabilizing sand dunes and establishing green belts to break the winds and create a good environment, and the establishment of natural pasture stations in remote desert areas that lead to the return of natural vegetation and serve animal breeders to settle in the desert through the reclamation of agricultural land and the improvement of agricultural

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methods and the use of what suits the dry and semi-arid areas. The use of the robotic plow often leads to the disintegration of the soil and its atomization and contribute to its desertification, and the practice of the agricultural cycle system, which is one of the effective means to protect the soil and prevent its erosion, and the use of fertilizers and work to raise the awareness of the farmer through the intensification of agricultural extension programs, and practicing the mixed farming system and reserving the largest amount of rain to benefit from it in agriculture on the one hand and to reduce erosion activity on the other hand, and establishing appropriate irrigation projects to relieve pressure on the lands of permaculture.

- 4- The use of some methods to save the soil from erosion, including the use of a mixture of herbs, plant leaves and branches and leaving agricultural crop residues scattered over the soil, especially during rainy times, as these organic materials contribute to soil cohesion and supply it with nutrients that it lost as a result of erosion factors, and staying away from deep plowing because it affects the soil also in soil cohesion.

Second: solutions to address the problem of tenure and ownership.

The necessity of legal reform of the agricultural sector through the development of important legislation, including:

- 1- Limiting the tenure of agricultural lands to two basic types:
 - Ownership of persons or groups.
 - State owned land.
- 2- Attention to the issue of common property.
- 3- Reconsidering all laws and decisions that govern agricultural relations with one comprehensive law that is consistent with the new reality.

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- 4- Amending the Agrarian Reform Law No. 117 of 1970 to allow the beneficiary farmer to enjoy the ownership of the land distributed to him, including the right to assign to others who are more capable and connected to the agricultural sector, which stipulates that the farmer obtains 50% of the entire agricultural land that he planted and cultivated under a planting contract between him and the farmer who owns the land.
- 5- Application of Law 35 of 1983 amended (Leasing Land for Companies and Individuals) on large areas only.
- 6- Titling of land to actual investors.

Third: Solutions to address the water problem:

There are many economic trends to confront the problem of water scarcity, including agricultural intensification, which is currently considered an effective way to confront the threat of water scarcity, as it leads to efficient water use and economic returns, especially when heading towards high-value crops that consume the least amount of water and raising the efficiency of irrigation networks used in agriculture.

The intensification of agricultural production helps to develop production to meet the continuous population increase and the rise in living standards to achieve the desired food security. This intensification is done by increasing production from the same unit of area used.

Increasing agricultural production is the main entrance to achieving sustainable agricultural development, through the vertical expansion of rain-fed agriculture and the application of modern irrigation methods to increase the efficiency of irrigation water use, such as sprinkler and drip irrigation, lining of irrigation channels, expansion of covered irrigation to reduce losses and attention to night irrigation, especially in the summer and work To reduce evaporation from

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surface water reservoirs and to cover streams to keep water from evaporation and pollution.

There can also be a clear role for the state through the following:

- 1- Providing the necessary facilities to farmers, in coordination with the Ministry of Finance, to purchase units to desalinate water from saline wells that are dug to irrigate crops.
- 2- Construction and rehabilitation of dams and water reservoirs, which leads to the storage of any surplus of irrigation water in the spring and winter seasons, and sufficient for the needs of the population and agriculture in the summer season.
- 3- Activating the diplomatic effort to pressure the riparian countries with Iraq on the Tigris and Euphrates rivers to reach an agreement on the water balance. Since Iraq is one of the downstream countries of these rivers, and it spent many investment funds to build dams to prevent the problem of floods in previous eras.

Fourth: Solutions to address the problem of dumping policy in the Iraqi markets:

Addressing this problem is focused on the necessity of enacting laws and legislation to ensure the protection of local agricultural products from competition with their imported counterparts, by imposing customs duties and applying the globally applicable quota system to encourage the Iraqi farmer to increase production. Crops that are not available in the country or whose production does not satisfy the local need can be excluded.

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It should also pay attention to strategic agricultural crops such as wheat, rice, corn, dates and other important crops and give priority to them, and pay attention to palm trees and increase their numbers due to the abundance of their giving. The state should also take the following measures:

- 1- Setting import controls and controlling imports and combating dumping and smuggling policy.
- 2- Exempting imported inputs and used in the production of export agricultural commodities from taxes.
- 3- Approval of the Iraqi products protection and anti-dumping bill and the consumer protection bill.
- 4- Establishing an anti-dumping apparatus and supplying it with specialized expertise to receive complaints from the Iraqi producer to determine and study the dumping incident and build an information base to monitor this phenomenon and find appropriate solutions to it, in coordination with the various ministries.
- 5- Tightening the customs control through the establishment of warehouses at the border ports of the general customs authority and in coordination with the relevant authorities such as the Ministry of Health and Industry and the Central Organization for Standardization and Quality Control to complete the inspection process before the goods enter the Iraqi markets.

Fifth: Solutions to develop technology and use modern methods in agriculture:

Increasing productivity in agriculture represents the main entrance to the development of the agricultural sector, achieving this requires strengthening the Iraqi research capacity and enabling it to keep pace with global technical, scientific developments, employing and adapting it according to the conditions of the Iraqi

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local environment, as well as activating the role of agricultural extension in transferring agricultural research results to the field and transferring observations from the field to research centers, which is related to setting the necessary institutional frameworks and providing sufficient human cadres in number, quality and the necessary financial support. The activation of the role of agricultural research in Iraq to increase productivity through the following:

- 1- Coordination between research centers and their activities in Iraq and Arab countries with the aim of developing and increasing mutual expertise and technical skills.
- 2- Providing scientific and technical equipment and specialized laboratories.
- 3- Providing a security, scientific and professional environment that preserves scientists and researchers in this field.
- 4- Supporting the national industrialization of modern technologies in the country and preparing programs to localize technology in the agricultural sector, to establish factories for agricultural machinery and equipment, and to establish factories to produce agricultural production inputs such as improved seeds, fertilizers and pesticides, as they are among the most important agricultural production inputs, especially since most of these inputs are in the hands of monopoly companies.

Sixth: Means to address the high costs of agricultural production requirements:

It is necessary for the country to adopt a price and marketing policy that supports the requirements of agricultural production to encourage agricultural producers to use advanced production inputs such as improved seeds, chemical fertilizers, pesticides, modern equipment, and others. As the liberalization of the prices of these inputs and the lifting of subsidies on them leads to a rise in their

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prices, which contributes to increasing the financial burdens on farmers and limits their ability to purchase sufficient quantities of agricultural inputs to expand agricultural production. Therefore, the main challenge facing sustainable agricultural development depends on the state's ability to provide agricultural production requirements and technological packages in the appropriate quantities and qualities at the specified times.

wherefore, we should benefit from the experiences of developed countries in this field. After the First World War, European countries were the largest importers of foodstuffs, but in a few years they were able to become the largest exporter of these materials due to their use of modern agricultural production requirements and the financial support obtained by European farms. As well as the protection policy that necessitated an increase in customs duties on competing agricultural products imported from outside the European Common Market.

From all this, it is clear that Iraq, with its sufficient agricultural capabilities and resources, can reach the level of achieving self-sufficiency. In basic agricultural commodities and dispensing with importing them from abroad if it adopts an appropriate price policy and financial support for producers to help them use modern technological methods in agriculture to achieve sustainable agricultural development.

Seventh: Treatments regarding investment policies in the agricultural sector:

This is achieved by giving priority to the agricultural sector, both plant and animal, through the investment program of the country's national plans, so that investments in the agricultural sector must be distributed fairly to the governorates and in proportion to the comparative advantage of each governorate and the agricultural capabilities available in it and to invest these capabilities and comparative advantages in an efficient and balanced manner. This will be done in coordination between the Ministries of Agriculture and Planning to organize an

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investment map in which all data on promising investment opportunities are placed in order to provide a database for investors to benefit from.

The state should also provide support to the private sector to invest in the agricultural sector, through the following:

- 1- Encouraging the private sector to invest in integrated plant and animal production projects.
- 2- Encouraging the establishment of shareholding agricultural companies through the development and evolution of capital markets.
- 3- Adopting credit policies that encourage the private sector to rehabilitate its stalled agricultural projects and to establish new ones.
- 4- Supporting agricultural inputs and outputs and protecting them from imported products especially in the short term.
- 5- Supporting and encouraging investment in promising areas in the desert, through the establishment of oases, mud coverage, and the development of natural and grazing plants through the activity of the Public Authority to Combat Desertification.
- 6- Formation of specialized committees in the Ministry of Agriculture to study the issue of subsidies and determine the most important crops to which this support can be directed, with continuous follow-up to the farmers who receive the subsidy.

Below, we will mention a number of researchers who pointed ways to raise the level of Iraqi agriculture, develop it, and find solutions to its problems and obstacles, as it is a vital sector, especially when its performance is related to achieving food security. In this field, the researcher (Ali, 2014) touched on the role of the state in agricultural development in Iraq, and pointed out that it is imperative to develop an effective agricultural policy from several axes aimed at developing

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and advancing the agricultural sector. Among the most important aspects of the proposed policy are:

- 1- The necessity of providing technology and developing research centers.
- 2- Paying attention to the agricultural's price and marketing policy.
- 3- Developing the national agricultural human resources.
- 4- Paying attention to agricultural infrastructure and activating the role of supporting institutions.
- 5- The formation of a strategic reservoir of strategic grains.
- 6- Paying attention to the water resource and activating the means for its development and preservation.
- 7- Activating the role of agricultural trade policy in Iraq.
- 8- Preserving the Iraqi environment.
- 9- Expanding agricultural lending and financing and attracting direct investments.

In this regard, (Ibrahim, 2017) also mentioned the requirements for the development of the agricultural sector in Iraq:

- 1- Good and effective planning.
- 2- The use of technology.
- 3- Developing the price policy to support the price of the product.
- 4- Development of training and rehabilitation.
- 5- Confronting environmental fluctuations.
- 6- Developing the agricultural marketing system.
- 7- Developing and preserving the water resource.
- 8- Developing the agricultural research system.
- 9- Developing rural requirements and infrastructure.

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- 10- Maintaining an adequate stock of food.
- 11- Developing and activating quality control devices.
- 12- Developing the role of agricultural credit and finance institutions.
- 13- Introducing the latest production methods in the agricultural sector.
- 14- Working on developing agricultural productivity through developing agricultural crop productivity, developing livestock and developing fisheries.
- 15- Human development in the countryside, and the main lines in the path to achieving this development are:
 - Education and continuing education for women.
 - Reviving the work of developing the rural handicraft industry.
 - Revitalizing illiteracy eradication curricula.
 - Building clubs and centers for the development of rural youth and strengthening their talents.
 - Reviving and revitalizing agricultural extension activities.

(Al-Jubouri, 2021) touched on ways to raise the level of agricultural productivity in Iraq, through:

- 1- Working to reduce the gap between the harvested area and the cultivated area.
- 2- Reliance on irrigated agriculture by taking advantage of modern irrigation projects.
- 3- The use of fertilizers and pesticides in quantities and quality, at appropriate times and with technical specifications, to raise the level of productivity of the unit area.
- 4- Paying attention to soil reclamation operations and making a network of model troughs.

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- 5- The introduction of technology in agricultural production.
- 6- Improving the cultural and social level in the countryside through the means and methods of agricultural extension.
- 7- Adopting sound and deliberate economic policies that are far from improvisation.
- 8- Addressing with administrative and financial corruption.
- 9- Supporting the prices of agricultural products to encourage local agricultural production.

4.3. Did the problems and obstacles for the Iraqi agricultural sector create a nutritional gap for the strategic agricultural crops for the period 1990-2020?

First: The concept of the nutritional gap and self-sufficiency.

- **The concept of the nutritional gap.**

The food gap expresses the adequacy of local food production to meet consumption requirements at the local level, and it is measured by the difference between the total domestic production and the total needs of different food products (Alabdali and Ghaidan, 2010). Thus it shows the extent of dependence on the external import of food commodities, as the size of the food gap changes from year to year depending on the quantities produced within the country and the continuous increases in the demand for food, as well as the change in the prices of food commodities in the local market, as there has become a direct link between self-sufficiency and the size of the food gap. The larger the size of the food gap the lack of self-sufficiency and the country becoming more exposed to food-exporting countries, and this results in the depletion of foreign currencies abroad (Abdulrahmman, 2016).

The food gap is defined as the difference between domestic production and net imports of various types of food commodities (Murad and Muhammad, 2016). It is also defined as the net imports of the main food commodities, and this mean the difference between the quantities produced locally and the total quantities needed for consumption (Albatran, 2017). It was also defined as the difference between what the state produces itself and what it needs for consumption of food, as it is also expressed by the inability in local production to cover consumption needs of food commodities that are secured by importing from abroad (Adam, 2016).

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The nutritional gap in Iraq

Iraq faces a serious nutritional gap, which is likely to widen, with the decrease in the volume of agricultural and food production on the one hand, and the increasing population growth on the other hand, which has become a serious threat. The nutritional gap, as indicated by (Al-Shammari, 2008), is characterized by fluctuation from year to year due to the change in agricultural production, volume of consumption and price fluctuations for agricultural commodities in foreign markets, as Iraq suffers from an increasing nutritional gap since the beginning of the nineties. This is explained by the fact that a large proportion of the local consumption of food depends on imports from abroad, and these are dangerous indicators with the rise in prices, which will threaten the food security of the Iraqi citizen.

- **The concept of self-sufficiency.**

The meaning of self-sufficiency is the dependence of each country on its own resources to meet its general needs, which requires reducing imports and expanding the production of all the goods that the country needs. Food self-sufficiency is an ideal situation for food security that can be achieved by the state (Ahmed, 1999). It should be noted that self-sufficiency does not mean isolation from the outside world, but rather it means providing the necessary food commodities to members of the community that locally produced in quantity and quality that secure their needs and spare them from facing sharp fluctuations in global food prices abroad, which often lead to economic, social and political damages and disadvantages that are reflected Its effects on the overall economic and living life of individuals within society. Self-sufficiency can be defined as (the ability to produce a sufficient quantity of food prepared to meet the needs of local demand in the first place, as well as to provide a surplus for emergency storage and for export so that members of society are safe from external fluctuations in the quantity and price of food supplied) (Alnajafi, 1999). It must be pointed out that

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achieving self-sufficiency for a country does not stop at achieving a balance or surplus in the trade balance of basic foodstuffs for that country, rather it is necessary to provide the necessary food for all members of society.

The rate of food self-sufficiency in Iraq since the beginning of the nineties has also tended to deteriorate and has become very low in recent years, as a result, Iraq is considered one of the world's most food-importing countries at the present time. The deterioration of self-sufficiency rates poses a threat to food security, which is one of the basic components of national security. Food security means the ability of society to secure its consumer needs of basic food commodities by producing them locally or importing them from abroad. It is not the achievement of self-sufficiency, which often means the production of all basic food needs locally, but it goes beyond it to securing sources of food access locally or internationally. That Iraq in the years after the events of the American occupation depends on imports from abroad to fill the deficit in its food needs, and here it should be noted some facts related to this situation:

- 1- The commodity composition of agricultural food imports reflects the importance of commodities necessary for human life and which are difficult to dispense with or reduce their consumption easily such as grains, which are sensitive commodities in the consumer system.
- 2- The nature of foreign food markets that are monopolized by a few countries and multinational companies, and what these forces have from the possibility of influencing these markets and controlling the prices of food commodities, agricultural crops and the use of food as a means of pressure and punishment to tame governments from the viewpoint of these dominant parties.
- 3- Weak bargaining power of food-importing countries because of their unilateral dealings with the active forces in international food markets, and the weakness of the bargaining margin as a result of food sensitivity and its role in political and economic stability.

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From the foregoing we can conclude that the growing food gap and the deterioration of self-sufficiency rates in Iraq allow us to say that food security is still a dream that has not been achieved so far, and its achievement in the future requires taking a number of measures to remove the problems that hinder the process of economic development in general and agricultural development in particular. Achieving food security for any country was a pivotal issue that should not be left to changing circumstances, nor to external factors to control it, rather, it must be sought with all seriousness to ensure sustainable security by increasing attention to the agricultural sector, expanding the base of productive work and improving productivity.

Second: The reality of the nutritional gap for strategic crops for the period (1990-2020)

The food gap for strategic crops in Iraq has been generated and expanded due to the rapid growth in demand for these crops for many reasons, including the population increase at rates that exceed the increase in the production of strategic crops. On the other hand, there is a shortfall in the production of these crops and the failure to meet the requirements for their provision due to the problems and obstacles that faced agricultural development. The economic sanctions imposed on Iraq before 2003 and subsequent policies revealed the widening of this gap and the weak ability of local production to achieve self-sufficiency in strategic crops, which led to dependence on foreign trade to cover the deficit in the provision of these crops through import, and the consequent financial burdens borne by the state and society on the one hand, and the negative effects on the state of stability and national security on the other hand (Al-Dulaimi, 2005).

The strategic crops (wheat, rice, barley, and corn) are one of the most important factors in maintaining national food security, given the nutritional importance they pose in the life of the Iraqi citizen. Wheat and rice represent the basic food that

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cannot be dispensed with in the Iraqi food pattern, as they are at the forefront of food items on the table of the Iraqi individual, but their production currently only meets very low percentages of the needs of its residents, Hence the need to clarify the size of the gap between the production and consumption of strategic crops in the light of current data, relying on real numbers reflected in the reality of production and consumption of these crops. To clarify this, the reality of the nutritional gap of strategic crops in Iraq for the period (1990-2020) will be discussed in the results and discussion part of our study.

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5. RESULTS AND DISCUSSIONS**5.1. Did the problems and obstacles facing agricultural development affect the agricultural output for the period 1990-2020?**

The agricultural sector has been negatively and significantly affected, as the area of agricultural land has receded in all parts of Iraq, leaving behind hectares of deserts after its farmers abandoned it due to the problems and obstacles that confronted the agricultural sector, as well as the period of the economic embargo on Iraq starting from August 1990 until the US occupation of Iraq in 2003. The decline in the productivity of the land continued until the following decades. This decline in the productivity of the agricultural sector was reflected in the effectiveness of this sector's contribution to the Iraqi economy through its low contribution to the gross domestic product (GDP). It is noted from the table 5.1. a decrease, in the share of the agricultural sector's output in the GDP, to 3.8% in 2008 to reach 3% in 2017 , 2.8% in 2018 and 3.7% in 2019.

Table5.1. The % of the contribution of agricultural output to the gross domestic product in Iraq for the period 1990-2020

Years	The share of the agricultural sector's output in the gross domestic product (GDP) %
1990	8.2
1991	15.6
1992	20
1993	15.5
1994	20.1
1995	20.6
1996	18.6
1997	8.5
1998	10.9
1999	7.2
2000	4.6
2001	6.9
2002	8.6
2003	8.4
2004	6.9
2005	6.9
2006	5.8
2007	4.9
2008	3.8
2009	5.2
2010	5.2
2011	4.6
2012	4.1
2013	4.8
2014	4.9
2015	4.2
2016	4
2017	3
2018	2.8
2019	3.7
2020	5.9

Source: The World Bank

Abdul-Hussein et al. 2019 indicated that despite the fact that the agricultural sector's contribution to the GDP was low during the nineties meantime of international sanctions (1990-2003, the period of the economic blockade on Iraq), it was much higher than the agricultural sector's contribution to the GDP. The reason for this is that, during the period from 1990 to 2003, agriculture witnessed a distinct interest, given the pressing and urgent need to produce food and fill the deficit in it due to the closure of the borders. As for the period after 2003, the contribution of the agricultural sector to the GDP was significantly low, and the reason for this was due to the remarkable and significant decline of agriculture, which increased the backwardness of the agricultural sector, leaving the land and increasing migration from the countryside to the city due to the increase in oil revenues and the high prices of oil barrels. Iraq has obtained very large oil revenues, especially during the period 2004-2014, and these surpluses were not exploited in the development of development sectors, especially the agricultural sector, which is the most neglected among other sectors. Mismanagement, planning, and confusion in setting development policies are the main reason for the deterioration of the agricultural sector and the state's loss of many of the revenues that can be obtained from this sector.

The Ministry of Agriculture attributed the decline in the agricultural sector's contribution to the gross domestic product in general, especially during the period 2004-2020, which is estimated between 2.8% to 6.9%, to the water scarcity that Iraq suffers from and to the lack of support provided by the government to farmers to purchase fertilizers, seeds, pesticides and modern agricultural machinery.

5.2. The reality of production and productivity of strategic grain crops (wheat, barley, rice and corn)

Production is of prime importance in economic studies, and agricultural production plays an important role in the economies of any country because it is

linked to the lives of its residents first and because it is one of the important sources of economic activity secondly, as indicated by the two researchers (Cox and Mak, 2001), especially if the production is related to major crops such as wheat, rice, barley and corn.

Cereals (wheat, rice, barley, and corn) are one of the most important strategic agricultural crops in Iraq because they are the main food source for the population, and most of the cultivated area in Iraq is devoted to the cultivation of grain. These crops have witnessed great fluctuations in the levels of local production as a result of the expansion in the cultivation of other agricultural crops, as well as the drought conditions that swept the region, especially since more than half of the area planted with grains lies within the rain-fed region.

Cereals are the subject of our study and its one of the most important factors in maintaining national food security. Wheat and rice are the staple food in the Iraqi diet, as these two crops cannot be dispensed with. As for barley and maize, they are also among the main crops that ensure food security for the citizen through what they provide of the main fodder for the animals that humans depend on to obtain meat, dairy products, and eggs.

5.3. The reality of the cultivated area, production, and productivity of the wheat crop in Iraq for the period (1990-2020)

It is noted from (Table 5.2.) that the general trend of the area planted with wheat crop was characterized by fluctuation, as its minimum reached 3154 (1000 dunum) in 2018, while its maximum reached 10041 (1000 dunum) in 1991, the average cultivated area of the wheat crop during the study period 1990-2020 amounted to 5854 (1000 dunum), and the average cultivated area during the period 1990-2003 amounted to 5769 (1000 dunum), and the average cultivated area did not decrease during the period 2004-2020, reaching 5925 (1000 dunum), an increase of 156 (1000 dunum).

The production of the wheat crop reached its minimum 854 (1000 tons) in 1994 and the highest 6238 (1000 tons) in 2020, and the production rate for the period 1990-2020 amounted to 2287 (1000 tons), the production rate during 1990-2003 reached 1407 (1000 tons) and the production rate increased during 2004-2020 and reached 3,013 (1000 tons). As for the productivity of the wheat crop, it ranged between its minimum 147 kg/dunum in 1991 and the highest 826 kg/dunum in 2016. The productivity rate of wheat crop reached 396 kg/dunum during the period 1990-2020 and reached the productivity rate 246 kg/dunum during 1990-2003, and the rate of productivity increased during 2004-2020 and reached 520 kg/dunum.

The increase in the rate of production and productivity for the years 2004-2020 (Table 5.3.) Compared to what it was for the years 1990-2003, is due to the increase in the rate of the cultivated area (Table 5.2.) as well as the increase in the productivity rate per dunum of agricultural land, and to Iraq's ridding of the economic blockade that It was imposed on it by America starting from August 1990 until 2003, which led to the restriction of exports and imports on all commodities, including agricultural commodities such as machinery, fertilizers, and agricultural pesticides.

Table5.2. Cultivated area, production quantities, and productivity of the wheat crop in Iraq for the period 1990-2020

Years	Cultivated area (1000dunum) (dunum=2500m ²)	production quantities (1000 tons)	Productivity (kg/dunum)
1990	4784	1196	250
1991	10041	1476	147
1992	4802	1311	273
1993	4744	911	192
1994	5083	854	168
1995	5712	1091	191
1996	5555	1150	207
1997	5505	947	172
1998	5784	1475	255
1999	5956	1102	185
2000	4126	1040	252
2001	5218	2219	425
2002	6595	2590	393
2003	6855	2329	340
2004	6159	1832	298
2005	6411	2221	348
2006	6054	2286	378
2007	6280	2204	351
2008	5741	1255	219
2009	5050	1700	337
2010	5544	2748	496
2011	6543	2809	429
2012	6914	3062	443
2013	7376	4175	566
2014	8528	5055	593
2015	4147	2645	638
2016	3697	3054	826
2017	4216	3419	811
2018	3154	2170	688
2019	6331	4343	686
2020	8574	6238	728
average	5854	2287	396
highest value	10041	6238	826
lowest value	3154	854	147

Source: Ministry of Planning and Development Cooperation, Central Bureau of Statistics, Republic of Iraq, Baghdad.

Table5.3. Average cultivated area, production, and productivity of the wheat crop for the period (1990-2020).

The details	1990-2003	2004-2020
Cultivated area (thousand dunum)	5769	5925
Production (1000 ton)	1407	3013
Productivity (kg/dunum)	246	520

5.4. The reality of consumption, the nutritional gap, and the self-sufficiency rate of the wheat crop in Iraq for the period (1990-2020)

Consumption means the use of goods and services to satisfy the needs and desires of people. These needs are the starting point of all economic activities and therefore consumption represents the final demand for goods and services, because consumption is the last component of the economic process. This can be clarified in (Table 5.4.), we note in general, a continuous increase in the consumption of the wheat crop during the study period, and that the consumption rate of the wheat crop during 1990-2020 amounted to 3409 (1000 ton), and the consumption rate during the period 1990- 2003) 2022 (1000 ton), while the consumption rate of wheat increased during 2004-2020 to 4552 (1000 ton), and this increase may lead to an increase in the quantities imported from the wheat crop due to the increase in the population during the study period.

It is noted from (Table 5.4.) that there is a fluctuation in the size of the nutritional gap for the wheat crop in Iraq during the period 1990-2020 as a result of a shortfall in the domestic product and the growth of consumption, where the lowest value of the nutritional gap of the wheat crop in Iraq amounted to 14 (1000 ton) in 2001, and the highest value was 4804 (1000 ton) in 2007. As for the self-sufficiency of the wheat crop in Iraq during 1990-2020, it reached in 1990 (54%), and the percentage of self-sufficiency increased and reached (124%) in 1991-1992, in order to increase the production of the wheat crop and decrease the consumption rate compared to the population in that period. The percentage of self-sufficiency

continued to fluctuate during the study period, as it decreased in 2000 and reached (28%). For the years 1999, 2007 and 2018, the self-sufficiency percentage decreased to 34%, 31% and 34%, respectively, as a result of the lack of local production due to water scarcity. While it returned to rise In 2020, and it became 111%.



Table5.4. Production quantities, available quantities for consumption , nutritional gap and the % Self-sufficiency for wheat crop in Iraq for the period 1990-2020

Years	Production quantities(1000 ton)	Available quantities for consumption(1000 ton)	Nutritional gap(1000 ton)	% Self-sufficiency
1990	1196	2216	1020 -	54
1991	1476	1188	288	124
1992	1311	1055	256	124
1993	911	1158	247 -	79
1994	854	1334	480 -	64
1995	1091	926	165	118
1996	1150	1714	564 -	67
1997	947	2301	1354 -	41
1998	1475	2551	1076 -	59
1999	1102	3202	2100 -	34
2000	1040	3756	2716 -	28
2001	2219	2233	14 -	99
2002	2590	2300	290	113
2003	2329	2370	41 -	98
2004	1832	2442	610 -	75
2005	2221	2523	302 -	88
2006	2286	6623	4337 -	35
2007	2204	7008	4804 -	31
2008	1255	3180	1925 -	39
2009	1700	4650	2950 -	37
2010	2748	3992	1244 -	69
2011	2809	4707	1898 -	60
2012	3062	4132	1070 -	74
2013	4175	4223	48 -	99
2014	5055	5223	168 -	97
2015	2645	2696	51 -	98
2016	3054	4517	1463 -	68
2017	3419	3981	562 -	86
2018	2170	6425	4255 -	34
2019	4343	5438	1095 -	80
2020	6238	5616	622	111
average	2287	3409		74
highest value	6238	7008	4804 -	124
lowest value	854	926	14 -	28

Source: Ministry of Planning and Development Cooperation, Central Bureau of Statistics, Republic of Iraq, Baghdad.

5.5. The reality of the cultivated area, production and productivity of the barley crop in Iraq for the period (1990-2020)

It is noted from (Table 5.5.) that the general trend of the area planted with the barley crop was characterized by fluctuation, as its minimum reached 601 (1000 dunum) in 2018, while its maximum reached 18,5440 (1000 dunum) in 1990. The average cultivated area of the barley crop during the study period 1990-2020 amounted to 4313 (1000 dunum), while the average cultivated area during the period 1990-2003 amounted to 5693 (1000 dunum), and the average cultivated area decreased during the period 2004-2020, reaching 3237 (1000 dunum).

The production of the barley crop, its minimum reached 191 (1000 tons) in 2018, while its maximum reached 1854 (1000 tons) in 1990, and the production rate for the period 1990-2020 was 805 (1000 tons), where the production rate was 791 (1000 tons) during 1990-2003 and increased during 2004-2020, reaching 816 (1000 tons). The productivity of the barley crop ranged between its minimum 68 (kg/dunum) in 1999 and the highest 470 (kg/dunum) in 2016, the productivity rate of barley crop reached 222 (kg/dunum) during the period 1990-2020, while the productivity rate of the barley crop was 154 (kg/dunum) during 1990-2003, the productivity rate increased during 2004-2020 and reached 277 (kg/dunam).

Table5.5. Cultivated area, Production quantities and productivity of barley crop in Iraq for the period 1990-2020

Years	Cultivated area (1000dunum) (dunum=2500m ²)	production quantities (1000 tons)	Productivity (kg/dunum)
1990	18540	1854	100
1991	5120	768	150
1992	9331	1353	145
1993	6333	890	141
1994	5554	853	154
1995	4671	712	152
1996	4164	647	155
1997	3999	492	123
1998	4180	629	150
1999	4181	283	68
2000	2300	193	84
2001	2213	713	322
2002	3862	833	216
2003	4253	860	202
2004	3829	805	210
2005	4252	754	177
2006	4103	919	224
2007	4374	748	171
2008	5394	404	75
2009	2814	501	178
2010	4027	1137	282
2011	3651	820	225
2012	2850	832	292
2013	3364	1003	298
2014	4632	1355	293
2015	1003	330	329
2016	1062	499	470
2017	820	303	369
2018	601	191	317
2019	3721	1518	408
2020	4528	1756	388
average	4313	805	222
highest value	18540	1854	470
lowest value	601	191	68

Source: Ministry of Planning and Development Cooperation, Central Bureau of Statistics, Republic of Iraq, Baghdad.

Table 5.6. Average cultivated area, production and productivity of barley for the period (1990-2020)

The details	1990-2003	2004-2020
Cultivated area (thousand dunum)	5693	3237
Production (1000 ton)	791	816
Productivity (kg/dunum)	154	277

5.6. The reality of consumption, the nutritional gap and the self-sufficiency rate of the barley crop in Iraq for the period (1990-2020)

It is noted from (Table 5.7.) that there is a fluctuation in the consumption energy of the barley crop during the study period. The consumption rate of the barley crop during 1990-2020 was 762 (1000 tons), and the consumption rate during the period 1990-2003 amounted to 803 (1000 tons), and the consumption rate of barley decreased during 2004-2020 to 728 (1000 tons), and this decrease did not generate any quantity imported from this crop. In (table 5.7.) also notes the existence of a nutritional gap during some years of the unjust economic blockade in 1991, 1993, 1994, 1995, 1996, and 2000. It is also noted that there is no nutritional gap for the barley crop for the study period 1990-2020, with the exception of the siege years mentioned above. The reason for this is due to the increase in local production and the decrease in local demand for barley for human consumption (during the period of the unjust economic blockade on Iraq for the period 1990-2003) and the restriction of demand for barley to industry and animal feed after the country imported the quantities it needed of wheat, which led to the barley not being mixed with flour which is given to the Iraqi citizen within the ration.

The rate of self-sufficiency of the barley crop in Iraq during the study period 1990-2020 fluctuated between 100% self-sufficiency and less than 100%, as the years in which the value of the nutritional gap was negative showed a self-sufficiency rate of less than 100%, especially during the period of the unjust economic blockade on Iraq, as well as in the years 2017 and 2018, when the self-

sufficiency ratio was 75.8 and 95.5, respectively. The reason for the high rate of self-sufficiency in general is due to the increased production of the barley crop.

Table5.7. Production quantities, available quantities for consumption, nutritional gap and the % Self-sufficiency of the barley crop in Iraq for the period 1990-2020

Years	production quantities(1000 Ton)	Available quantities for consumption(1000 ton)	nutritional gap(1000 Ton)	%Self-sufficiency
1990	1854	1851	3	100.0
1991	768	868	100 -	88.5
1992	1353	1353	0	100.0
1993	890	1075	185 -	82.8
1994	853	1095	242 -	77.9
1995	712	766	54 -	93.0
1996	647	768	121 -	84.2
1997	492	492	0	100.0
1998	629	629	0	100.0
1999	283	282	1	100.0
2000	193	393	200 -	49.1
2001	713	319	394	223.5
2002	833	591	242	141.0
2003	860	759	101	113.3
2004	805	497	308	162.0
2005	754	754	0	100.0
2006	919	919	0	100.0
2007	748	748	0	100.0
2008	404	404	0	100.0
2009	501	501	0	100.0
2010	1137	1137	0	100.0
2011	820	820	0	100.0
2012	832	832	0	100.0
2013	1003	1003	0	100.0
2014	1355	1355	0	100.0
2015	330	330	0	100.0

Table 5.7 cont.

2016	499	499	0	100.0
2017	303	400	97 -	75.8
2018	191	200	9 -	95.5
2019	1518	970	548	156.5
2020	1756	1008	748	174.2
average	805	762		107
highest value	1854	1851	200-	223.5
lowest value	191	200	9-	49.1

Source: Ministry of Planning and Development Cooperation, Central Bureau of Statistics, Republic of Iraq, Baghdad.

5.7. The reality of the cultivated area, production and productivity of the rice crop in Iraq for the period (1990-2020)

Rice is of great economic importance, as it occupies the second place in the world after wheat. In Iraq, it is one of the main summer grain crops and is indispensable on the table of the Iraqi individual.

It is noted from (Table 5.8.) that the general trend of the area planted with the rice crop was characterized by fluctuation, as its minimum reached 11,252 (1000 dunum) in 2001, while its maximum reached 669,533 (1000 dunum) in 1992, and the average area of the rice crop during the study period 1990- 2020 amounted to 343 (1000 dunum), and the average cultivated area during the period 1990-2003 amounted to 388,632 (1000 dunum), while the average cultivated area decreased during the period 2004-2020, reaching 305457 (1000 dunum). The production of the rice crop reached its minimum 5 (1000 tons) in 2001 and its maximum reached 575 (1000 tons) in 2019 and the production rate for the period 1990-2020 amounted to 266 (1000 tons), while the production rate during 1990-2003 reached 218 (1000 tons), and the production rate increased during 2004-2020, reaching 305 (1000 tons). The productivity of the rice crop ranged between its minimum 354 kg/dunum in 1992 and its maximum reached 2229 kg/dunum in 2018. The productivity rate of the rice crop reached 880 kg/dunum during the

period 1990-2020, while the productivity rate of the rice crop during 1990-2003 reached 593 kg/dunum, and the productivity rate increased during 2004-2020 and amounted to 1117 kg/dunum. The reason for the increase in the productivity rate for the period 2004-2020 compared to the period 1990-2003 is due to the end of the economic blockade period, which facilitated the process of using fertilizers, pesticides and agricultural machinery.

Table5.8. Cultivated area, production quantities and productivity of the rice crop for the period 1990-2020

Years	Cultivated area (1000dunum) (dunum=2500m ²)	production quantities (1000 tons)	Productivity (kg/dunum)
1990	338746	228	673
1991	385454	189	490
1992	669533	237	354
1993	518607	261	503
1994	651020	382	587
1995	657398	312	475
1996	436580	282	646
1997	460956	274	594
1998	604747	389	643
1999	350761	218	622
2000	16803	12	714
2001	11252	5	444
2002	216511	194	896
2003	122485	81	661
2004	351793	250	711
2005	428224	309	722
2006	502565	363	722
2007	497365	393	790
2008	339043	248	731
2009	219735	173	787
2010	191895	156	813
2011	263810	235	891
2012	318767	361	1132

Table 5.8 cont.

2013	383800	451	1175
2014	317200	403	1270
2015	110400	109	987
2016	110500	181	1638
2017	125000	266	2128
2018	114400	255	2229
2019	511366	575	1124
2020	406900	464	1140
average	343000	266	880
highest value	669533	575	2229
lowest value	11252	5	354

Source: Ministry of Planning and Development Cooperation, Central Bureau of Statistics, Republic of Iraq, Baghdad.

Table 5.9. Average cultivated area, production and productivity of the rice crop for the period (1990-2020).

The details	1990-2003	2004-2020
Cultivated area (thousand dunum)	388632	305457
Production (1000 ton)	218	305
Productivity (kg/dunum)	593	1117

5.8. The reality of consumption, the food gap and the rate of self-sufficiency of the rice crop in Iraq for the period (1990-2020)

In general it is noted from (Table 5.10.) that there is a continuous increase in the consumption energy of the rice crop during the study period. The consumption rate of the rice crop during 1990-2020 amounted to 1042 (1000 ton), and the consumption rate during the period 1990-2003 amounted to 801 (1000 ton). The consumption rate of rice increased during 2004-2020 to 1240 (1000 ton), and this increase leads to a rise in the imported quantities of the rice crop, due to the increase in the population during the period 2004-2020 compared to the population in 1990-2003.

It is noticed from (Table 5.10.) fluctuations in the size of the nutritional gap for the rice crop in Iraq during the period 1990-2020 as a result of a shortfall in the domestic product and the growth of consumption where the lowest value of the nutritional gap for the rice crop in Iraq reached -200 (1000 tons) in 1994, and the highest value of the nutritional gap for the rice crop in Iraq was -1384 (1000 tons) in 2012. The rate of self-sufficiency of the rice crop in Iraq during the period 1990-2020 was also fluctuating, as the lowest percentage was found in the years 2000 and 2001, which is (1% and 0.5%) respectively, while the highest rates of self-sufficiency were in the years 1994, 1995 and 1996, where the percentages reached (66%, 58%, and 54%) respectively. The increase in these percentages may be due to the increase in the production of the rice crop and the decrease in the nutritional gap in these years compared to other years as noted in (Table 5.10). (Table 5.10) also indicated that the self-sufficiency rates for the period 1997-2020 were lower than in the years 1994-1996. This due to the lack of production, which caused the nutritional gap to rise as well as the increase in consumption as a result of the increase in the population.

Table5.10. Production quantities, available quantities for consumption, nutritional gap and the % Self-sufficiency for rice crop in Iraq for the period 1990-2020

Years	production quantities(1000 Ton)	Available quantities for consumption(1000 ton)	nutritional gap (1000 ton)	%Self-sufficiency
1990	228	571	343 -	40
1991	189	489	300 -	39
1992	237	687	450 -	34
1993	261	916	655 -	28
1994	382	582	200 -	66
1995	312	537	225 -	58
1996	282	523	241 -	54
1997	274	958	684 -	29
1998	389	1018	629 -	38
1999	218	974	756 -	22
2000	12	1152	1140 -	1
2001	5	950	945 -	0.5
2002	194	1346	1152 -	14
2003	81	513	432 -	16
2004	250	899	649 -	28
2005	309	1133	824 -	27
2006	363	1510	1147 -	24
2007	393	826	433 -	48
2008	248	942	694 -	26
2009	173	929	756 -	19
2010	156	1278	1122 -	12
2011	235	1357	1122 -	17
2012	361	1745	1384 -	21
2013	451	1669	1218 -	27
2014	403	1334	931 -	30
2015	109	1100	991 -	10
2016	181	1105	924 -	16
2017	266	1066	800 -	25
2018	255	1112	857 -	23
2019	575	1514	939 -	38
2020	464	1559	1095 -	30
average	266	1042		28
highest value	575	1745	1384 -	66
lowest value	5	489	200 -	0.5

Source: Ministry of Planning and Development Cooperation, Central Bureau of Statistics, Republic of Iraq, Baghdad.

5.9. The reality of the cultivated area, production and productivity of corn crop in Iraq for the period (1990-2020)

It is noted from Table 5.11 that the general trend of the area planted with corn crop was characterized by fluctuation, as its minimum reached 56 (1000 dunum) in 2018, while its maximum reached 877 (1000 dunum) in 1998, and the average cultivated area of the corn crop during the study period 1990-2020 amounted to 476 (1000 dunum), and the average cultivated area during the period 1990-2003 amounted to 473 (1000 dunum), while the increase was slight in the average cultivated area during the period 2004-2020, reaching 479 (1000 dunum). The production of the corn crop reached its minimum 63 (1000 tons) in 2018, and its maximum reached 831 (1000 tons) in 2013, and the production rate for the period 1990-2020 amounted to 325 (1000 tons), where the production rate during 1990-2003 reached 295 (1000 tons) whereas the production rate increased during 2004-2020, reaching 349 (1000 tons). The productivity of corn crop ranged between its minimum 484 (kg/dunum) in 1994 and its maximum 1134 (kg/dunum) in 2018, and the productivity rate of corn crop reached 689 (kg/dunum) during the period 1990-2020, and the productivity rate of corn crop during 1990-2003 amounted to 603 (kg/dunum), then this rate of productivity increased during 2004-2020 and reached 766 (kg/dunum). The reason for the increase in the production and productivity of the corn crop for the period 2004-2020 compared to the period 1990-2003 is due to the lifting of the economic embargo on Iraq and the increase in the use of fertilizers and agricultural pesticides, as well as the use of modern agricultural machinery.

Table5. 11. Cultivated area, production quantities and productivity of the corn crop for the period 1990-2020

Years	Cultivated area (1000dunum) (dunum=2500m ²)	production quantities (1000 tons)	Productivity (kg/dunum)
1990	286	172	602
1991	452	297	657
1992	555	313	564
1993	339	171	503
1994	266	128	484
1995	201	101	503
1996	540	358	663
1997	647	410	633
1998	877	574	654
1999	679	388	572
2000	291	170	585
2001	393	232	589
2002	734	579	788
2003	363	236	650
2004	738	416	564
2005	694	401	578
2006	647	399	617
2007	620	385	620
2008	490	288	587
2009	456	238	522
2010	468	267	570
2011	514	336	652
2012	606	503	831
2013	798	831	1042
2014	378	289	765
2015	229	182	796
2016	304	260	854
2017	223	185	832
2018	56	63	1134
2019	515	473	918
2020	405	419	1034
average	476	325	689
highest value	877	831	1134
lowest value	56	63	484

Source: Ministry of Planning and Development Cooperation, Central Bureau of Statistics, Republic of Iraq, Baghdad.

Table5.12. Average cultivated area, production, and productivity of corn crop for the period (1990-2020).

The details	1990-2003	2004-2020
Cultivated area (thousand dunum)	473	479
Production (1000 ton)	295	349
Productivity (kg/dunum)	603	766

5.10. The reality of consumption, nutritional gap, and the self-sufficiency rate of the corn crop in Iraq for the period (1990-2020)

It is noted general from (Table 5.13) that there was a continuous increase in the consumption energy of corn crop during the study period. The consumption rate of corn crop during 1990-2020 amounted to 322 (1000 tons), and the consumption rate during the period 1990-2003 amounted to 295 (1000 tons), while the consumption rate of corn during (2004-2020) increased to 339 (1000 tons).

(Table 5.13) also indicates that there was no nutritional gap for corn crop for the period 1990-2020, except for the years 2019 and 2020, where the values of the nutritional gap were positive, 67 and 2 respectively. The reason for the absence of a negative nutritional gap for corn crop is due to the increase in local production on the one hand, and directing the local production for industrial purposes and animal feed on the other hand, after it was part of the corn production, mixed with wheat and served with flour to individuals within the ration during the period of the economic embargo 1990-2003. As for self-sufficiency in general the percentage was 100% throughout the study period.

Table5.13. Production quantities, available quantities for consumption, nutritional gap and the % Self-sufficiency for corn crop in Iraq for the period 1990-2020

Years	production quantities(1000 Ton)	Available quantities for consumption(1000 ton)	nutritional gap	%Self-sufficiency
1990	172	172	0	100
1991	297	297	0	100
1992	313	313	0	100
1993	171	171	0	100
1994	128	129	0	100
1995	101	101	0	100
1996	358	358	0	100
1997	410	410	0	100
1998	574	574	0	100
1999	388	388	0	100
2000	170	170	0	100
2001	232	232	0	100
2002	579	579	0	100
2003	236	236	0	100
2004	416	416	0	100
2005	401	401	0	100
2006	399	399	0	100
2007	385	385	0	100
2008	288	288	0	100
2009	238	238	0	100
2010	267	267	0	100
2011	336	336	0	100
2012	503	503	0	100
2013	831	831	0	100
2014	289	289	0	100
2015	182	182	0	100
2016	260	260	0	100
2017	185	185	0	100
2018	63	63	0	100
2019	473	406	67	117
2020	419	417	2	100
average	325	322		101
highest value	831	831	67	117
lowest value	63	63	0	100

Source: Ministry of Planning and Development Cooperation, Central Bureau of Statistics, Republic of Iraq, Baghdad.

Table5.14. The percentage of dependence on abroad in the import of grain and corn crops

Years	Wheat	Barley	Rice	Corn
1990	46	0	60	0
1991	0	0	61	0
1992	0	0	66	0
1993	21	0	72	0
1994	36	0	34	0
1995	0	7	42	0
1996	33	0	46	0
1997	59	0	71	0
1998	41	0	62	0
1999	66	0	78	0
2000	72	0	99	0
2001	1	0	100	0
2002	0	0	86	0
2003	2	0	84	0
2004	25	0	72	0
2005	12	0	73	0
2006	65	0	76	0
2007	69	0	52	0
2008	61	0	74	0
2009	63	0	81	0
2010	31	0	88	0
2011	40	0	83	0
2012	26	0	79	0
2013	1	0	73	0
2014	3	0	70	0
2015	2	0	90	0
2016	32	0	84	0
2017	14	0	25	0
2018	66	0	77	0
2019	20	0	62	0
2020	0	0	70	0
average	29	0	71	0
highest value	72	0	100	0
lowest value	0	0	34	0

From the foregoing in the results and discussion chapter, we conclude that the difficulties and problems that confronted agricultural development in Iraq have led to a noticeable decrease in production, productivity and cultivated areas of agricultural land (Tables 5.2., 5.5., 5.8. and 5.11.), which generated a nutritional gap in the strategic grain crops, wheat and rice (Table 5.4. and 5.10.) which led to the failure to reach self-sufficiency (Table 5.4. and 5.10.) of these two crops for the purpose of human consumption, and this in turn led to the emergence of an urgent need to import these two crops (Table 5.14.) from outside Iraq.

It is noted in (Table 5.14) the reliance on foreign trade in bridging the nutritional gap for wheat and rice crops. The average dependence on imports for wheat for the period from 1990-2003 was 27 and for rice 69, while the average for the period from 2004-2020 was 31 and 72 for both wheat and rice, respectively. The high rate of dependence on imports for the period 2004-2020 than it was in the years 1990-2003 may be due to the country's population increase, which leads to an increase in the population's consumption. As for the barley and corn crops, and despite the lack of self-sufficiency in the barley crop in some years (Table 5.7.), especially during the period of the economic embargo on Iraq for the period 1990-2003. Iraq did not import any amount of barley to cover this shortage. For the corn crop, Iraq also did not import any amount of this crop, because there was no nutritional gap for the corn crop, informed that the self-sufficiency rate was 100% (Table 5.13). It is worth noting that we did not find any statistical data during the study period indicating that Iraq imported any quantity of barley and corn crops, and this was confirmed by a study (Mudhi, et al. 2012).

5.11. The results of the quantitative analysis of the impact of agricultural development indicators on agricultural foreign trade in Iraq for the period 1990-2020

In order to estimate the impact of agricultural development variables on agricultural foreign trade in Iraq. During the research period, the practical aspect

was divided into four stages. The first stage, in which the impact of agricultural development indicators on the values of agricultural output was estimated. The second stage, in which the impact of agricultural output values was calculated as an independent variable on the values of agricultural exports. In the third stage, the effect of agricultural output values on import values was calculated. In the fourth stage, the impact of agricultural output values on the total agricultural foreign trade values was calculated, as follows:

The first stage: The impact of agricultural development variables on the values of agricultural output in Iraq for the period 1990-2020.

In order to estimate the impact of agricultural development variables, which were represented by:

X_1 = Agricultural investment values (Million US dollars)

X_2 = Agricultural labor force (Thousand people)

X_3 = Inflation rate (Percentage)

X_4 = Agricultural loans (Million US dollars)

X_5 = Cultivated area.....(Thousand dunums)

X_6 = Foreign exchange rate..... (US dollars)

As independent variables and their impact on the values of agricultural output (Y_1), the double logarithmic formula in the short term gave the following best results:

$$\text{Log } Y_1 = -0.342 + 142.851 \text{ Log } X_1 + 0.327 \text{ Log } X_2 + 2449.257 \text{ Log } X_3 - 4.033 \text{ Log } X_4 + 183.031 \text{ Log } X_5$$

$$t = \quad (1.861) \quad (0.471) \quad (2.271) \quad (0.905) \quad (2.108)$$

$$+ 0.603 \text{ Log } X_6$$

$$(1.619)$$

$$R^2 = 0.79$$

$$F = 5.841$$

$$D - W = 1.961$$

The explanatory power of the estimated model represented by the value (R^2) indicates that 79% of the changes that occur in the values of agricultural output Y_1 are explained by the changes that occur in the independent variables included in the estimated model. The calculated F value showed the significance of the estimated model from a statistical point of view. There was no autocorrelation problem between the values of random variables, according to the D-W test. Also there was no problem of linear overlap between the independent variables, according to the Kliein test.

The elasticity of agricultural investment values X_1 (Table 5.15) was 142.851 units, and the positive sign for the parameter of this variable agreed with the concepts of economic theory that stipulated in its literature the direct relationship between the two variables. The reason for this, is that agricultural investment is one of the most important means by which modern technological methods are used to develop the reality of Iraqi agriculture, the efficiency of the exploitation and expansion of cultivated areas, the improvement of the use of improved seeds, the adoption of agricultural mechanization and modern irrigation methods, as well as the development of genetic assets by adopting methods of biotechnology and genetic engineering, which reflected its impact on increasing the values of agricultural output (Al-Saour, 2014).

The significance of the agricultural labor force variable X_2 (Table 5.15) did not appear in the increase in the values of agricultural output, as the reason for this, is that the agricultural labor force in Iraq is not qualified to expand the scope of extensive agricultural work, in addition to its low experience in fertilization, pesticide spraying, harvesting, and marketing, which hid the significance of this variable in increasing agricultural output values during the study period (Izz al-Din and al-Tahir, 2022).

The elasticity of the inflation rate X_3 (Table 5.15) amounted to 2449,257 units, and the positive indication of the parameter of this variable violated the concepts of economic theory, as the reason for this lies in the fact that high

inflation rates in developing countries are one of the means used by most of these countries to finance their public budget, including Iraq because the public budget suffers from a deficit in addition to the inefficiency of the tax system in meeting Iraq's financial needs for development purposes. Therefore, monetary policy resorts to adopting the inflationary financing method, whose effect is reflected in the redistribution of national incomes in a way that increases the volume of investment spending in the agricultural sector through financing new agricultural projects, operating stalled projects, and exploiting more agricultural resources until additional real incomes are generated from them, thereby contributing to an increase in agricultural output values (Al-Taei, 2015). This method was adopted in Japan during the period (1933-1935) and in India's experience in its five-year plan for the period (1951-1956) because high inflation rates are reflected in the increase in agricultural investment rates.

The significance of the variable values of agricultural loans X_4 (Table 5.15) did not appear in influencing the values of agricultural output Y_1 , as the reason for this, is the reluctance of most farmers to receive agricultural loans because they are tied to a certain interest rate upon repayment, and this makes most farmers refrain from agricultural borrowing due to religious motives (Al-Mashhadani, 2012).

The elasticity of the cultivated area variable X_5 (Table 5.15) amounted to 183.031 units, and the positive sign for the parameter of this variable agreed with the concepts of economic theory, which stipulated in its literature that the increase in cultivated areas leads to an increase in the quantities of agricultural production as well as the use of the land for more than one agricultural cycle per year, accompanied by the expansion of agricultural production and for more than one crop during the agricultural season, which made this variable has a positive relationship with the values of agricultural output. As for the long period, the results of the estimation showed that the variable of the cultivated area was associated with a non-positive relationship with the dependent variable. The reason

for this is the presence of large areas of agricultural land in Iraq that are abandoned due to the lack of capital needed to cultivate them and the migration of large numbers of individuals from the countryside to the city in search of occupational work other than agricultural work accompanied by the fact that most agricultural workers are not at the level of awareness and realization that enables them to increase and develop agricultural production because most of them depend on inherited methods in agriculture and rural work, which made this variable related to a non-positive relationship with the dependent variable in the long period (Hussain, 2011).

Also, the significance of the foreign exchange rate variable X_6 (Table 5.15) did not appear in influencing the values of agricultural output, as the reason for this lies in the depreciation of the Iraqi currency compared to the US dollar to the extent that the change in the value of the Iraqi dinar relative to the US dollar has become an increase or decrease that does not affect the increase or decrease in the amount of output agricultural (Al-Mashhadani, 2012).

Table 5.15. Results of the quantitative analysis of the effect of agricultural development variables on the values of agricultural output in Iraq for the period 1990-2020

ARDL Cointegrating And Long Run Form
Dependent Variable: LOGY1

Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGX1)	142.851862	76.721607	1.861951	0.0800
D(LOGX2)	0.327407	0.694496	0.471431	0.6433
D(LOGX3)	2449.257416	1078.189828	2.271638	0.0364
D(LOGX3(-1))	3726.555540	1084.923346	-3.434856	0.0032
D(LOGX4)	-4.033064	4.455738	-0.905140	0.3780
D(LOGX5)	183.031396	86.805009	2.108535	0.0501
D(LOGX6)	0.603350	0.372476	1.619835	0.1237
CointEq(-1)	-0.342471	0.126717	-2.702647	0.0151
Cointeq = LOGY1 - (41.1212*LOGX1 + 1.9560*LOGX2 + 28805.2017 *LOGX3 + 7.0197*LOGX4 -304.1262*LOGX5 + 1.7617*LOGX6 -6154.1294)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGX1	41.121185	23.094634	1.780552	0.0004
LOGX2	1.956014	0.925123	2.114329	0.0000
LOGX3	28805.20168	14626.688238	1.969359	0.0654
LOGX4	7.019730	12.580603	0.557980	0.0841
LOGX5	-304.126221	264.264938	-1.150838	0.2657
LOGX6	1.761756	1.055117	1.669726	0.0587
C	-6154.129416	4859.541719	-1.266401	0.2224

As for the Granger causality test (5.16.), the results of the analysis showed that the dependent variable Y_1 causes the independent variable X_5 in the long term, and the independent variable X_5 causes the independent variable X_1 in the long term, as well as the independent variable X_6 causes the independent variable X_3 in the long term.

Table 5.16. Granger causality test between variables for the first stage.

Null Hypothesis:	Obs	F-Statistic	Prob.
X1 does not Granger Cause Y1 Y1 does not Granger Cause X1	29	0.66912 17.2925	0.5215 2.E-05
X2 does not Granger Cause Y1 Y1 does not Granger Cause X2	29	0.49683 0.85708	0.6146 0.4370
X3 does not Granger Cause Y1 Y1 does not Granger Cause X3	29	1.07353 0.69649	0.3577 0.5081
X4 does not Granger Cause Y1 Y1 does not Granger Cause X4	27	1.37509 0.53783	0.2737 0.5915
X5 does not Granger Cause Y1 Y1 does not Granger Cause X5	29	1.64103 3.95155	0.2148 0.0329
X6 does not Granger Cause Y1 Y1 does not Granger Cause X6	29	2.21575 1.36016	0.1309 0.2757
X2 does not Granger Cause X1 X1 does not Granger Cause X2	29	0.14807 0.70649	0.8632 0.5033
X3 does not Granger Cause X1 X1 does not Granger Cause X3	29	0.11728 2.00804	0.8898 0.1562
X4 does not Granger Cause X1 X1 does not Granger Cause X4	27	0.28977 0.80966	0.7512 0.4578
X5 does not Granger Cause X1 X1 does not Granger Cause X5	29	10.4474 2.31144	0.0005 0.1208
X6 does not Granger Cause X1 X1 does not Granger Cause X6	29	0.66561 3.14846	0.5232 0.0611

Table 5.16. cont.

X3 does not Granger Cause X2	29	1.31511	0.2871
X2 does not Granger Cause X3		0.62516	0.5437
X4 does not Granger Cause X2	27	0.37098	0.6943
X2 does not Granger Cause X4		0.83630	0.4466
X5 does not Granger Cause X2	29	0.75493	0.4809
X2 does not Granger Cause X5		0.67049	0.5208
X6 does not Granger Cause X2	29	0.91888	0.4125
X2 does not Granger Cause X6		0.51219	0.6056
X4 does not Granger Cause X3	27	0.10983	0.8965
X3 does not Granger Cause X4		1.27295	0.2998
X5 does not Granger Cause X3	29	1.67950	0.2076
X3 does not Granger Cause X5		0.16413	0.8496
X6 does not Granger Cause X3	29	3.27658	0.0552
X3 does not Granger Cause X6		0.88700	0.4250
X5 does not Granger Cause X4	27	1.21711	0.3153
X4 does not Granger Cause X5		1.23179	0.3111
X6 does not Granger Cause X4	27	1.42165	0.2626
X4 does not Granger Cause X6		2.70719	0.0889
X6 does not Granger Cause X5	29	1.83664	0.1811
X5 does not Granger Cause X6		3.04002	0.0666

The second stage: The results of the quantitative analysis of the impact of agricultural output on the values of agricultural exports.

In order to estimate the effect of agricultural output values on the values of Iraqi agricultural exports during the research period, the linear formula gave the best results, which are as follows:

$$Y_2 = 104.199 + 0.038 X$$

$$t = (0.997) \quad (1.861)$$

Where:

Y_2 = Agricultural Export Values

X = Agricultural output values

$R^2 = 0.10$

F = 3.403

D – W = 0.367

The results (Table 5.17.) of the estimation showed a decrease in the explanatory power of the estimated model, which amounted to 10%. This is due to the low values of Iraqi agricultural exports in the global market, in addition to that they are not at the level at which they can compete with their counterparts in the rest of the countries. However, the results of the analysis showed the significance of the agricultural output values variable in affecting the values of agricultural exports with flexibility amounted to 0.460 units, and the positive sign of the agricultural exports variable parameter agreed with the results of the practical side of the study (Ababah, 2019), in which he explained the direct relationship between the two variables, and this must be explained through the role that agricultural exports contribute to increasing foreign exchange returns that are used in agricultural and economic development processes, as well as their role in providing incentives to agricultural producers with the aim of exporting their goods through the adopted agricultural policies and increasing the ability to produce agricultural commodities capable of competing in foreign markets, so that agricultural exports, in most developing countries, became an engine of agricultural growth (Ababah, 2019).

Table 5.17. Results of the quantitative analysis of the effect of agricultural output values on the values of agricultural exports in Iraq for the period 1990-2020

Dependent Variable: Y2

Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X	0.038384	0.020625	1.861036	0.0729
C	104.1991	104.4591	0.997510	0.3268
R-squared	0.106688	Mean dependent var		262.6929
Adjusted R-squared	0.075884	S.D. dependent var		350.3353
S.E. of regression	336.7807	Akaike info criterion		14.53908
Sum squared resid	3289216.	Schwarz criterion		14.63160
Log likelihood	-223.3558	Hannan-Quinn criter.		14.56924
F-statistic	3.463455	Durbin-Watson stat		0.367184
Prob(F-statistic)	0.072905			

The third stage: The results of the quantitative analysis of the impact of agricultural output values on the values of agricultural imports.

In order to estimate the effect of agricultural output on the values of Iraqi agricultural imports and during the research period, the linear formula gave the following best results:

$$Y_3 = 7.685 + 0.540 X$$

$$t = (0.017) \quad (6.278)$$

where:

Y_3 = Agricultural import values

X = Agricultural output values

$$R^2 = 0.57$$

$$F = 39.417$$

$$D - W = 2.344$$

The explanatory power of the estimated model reached 57%. This result (Table 5.18.) means that 57% of the changes that occur in the values of agricultural imports are explained by the changes that occur in the values of agricultural output.

The elasticity of the agricultural output values reached 0.767 units, and the positive sign for the parameter of this variable agreed with the concepts of economic theory, which stipulated in its literature the direct relationship between the two variables, given that agricultural imports contribute an important role in raising the rate of agricultural growth, as it works to increase the food supply and enable individuals to provide their food needs and requirements and contribute to an effective role in correcting agricultural structural imbalances. Therefore, agricultural imports have positive effects on agricultural growth and development (Al-Jubouri, 2021).

Table 5.18. Results of the quantitative analysis of the impact of agricultural output values on the values of agricultural imports in Iraq for the period 1990-2020.

Dependent Variable: Y3

Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X	0.540244	0.086048	6.278371	0.0000
C	7.685360	435.8112	0.017635	0.9861
R-squared	0.576135	Mean dependent var		2238.465
Adjusted R-squared	0.561519	S.D. dependent var		2121.894
S.E. of regression	1405.074	Akaike info criterion		17.39591
Sum squared resid	57252755	Schwarz criterion		17.48842
Log likelihood	-267.6366	Hannan-Quinn criter.		17.42607
F-statistic	39.41795	Durbin-Watson stat		2.344270
Prob(F-statistic)	0.000001			

The fourth stage: The results of the quantitative analysis of the impact of the value of agricultural output on the values of agricultural foreign trade.

The linear formula gave the best description of the relationship between the values of agricultural output and the values of agricultural foreign trade in Iraq, as follows:

$$Y_4 = 109.402 + 0.579 X$$

$$t = (0.250) \quad (6.708)$$

where:

Y_4 = Agricultural foreign trade values

X = Agricultural output values

$$R^2 = 0.60$$

$$F = 45.008$$

$$D - W = 2.440$$

The value of R^2 (Table 5.19.) indicates that 60% of the changes that occur in the values of agricultural foreign trade are explained by the changes that occur in the values of agricultural output.

The elasticity of the foreign trade values variable amounted to 2.145 units, and the positive sign for the parameter of this variable means that the values of agricultural output contribute to positive effects on the values of agricultural foreign trade by increasing the values of agricultural investments whose impact is reflected in the increase in agricultural output and exports, as well as its role in reducing the deficit in the trade balance, increasing the employment opportunities, achieving efficiency and reducing the cost of production, and enabling the local product to compete in foreign markets (Al-Abbasi and others, 2008).

Table5.19. Results of the quantitative analysis of the impact of agricultural output values on agricultural foreign trade values for the period 1990-2020.

Dependent Variable: Y4

Method: Least Squares

Variable	Coefficient	Std. Error	t-Statistic	Prob.
X	0.579018	0.086307	6.708836	0.0000
C	109.4026	437.1194	0.250281	0.8041
R-squared	0.608153	Mean dependent var		2500.287
Adjusted R-squared	0.594641	S.D. dependent var		2213.508
S.E. of regression	1409.292	Akaike info criterion		17.40190
Sum squared resid	57596995	Schwarz criterion		17.49442
Log likelihood	-267.7295	Hannan-Quinn criter.		17.43206
F-statistic	45.00848	Durbin-Watson stat		2.440353
Prob(F-statistic)	0.000000			



6. CONCLUSION AND RECOMMENDATION

6.1. Conclusions

In light of what has been studied, it is possible to draw a set of conclusions, as follows:

1. Agricultural development is one of the most important elements of economic development, after finding solutions to the problems and obstacles that confronted the agricultural sector of Iraq, through which it is possible to raise agricultural growth rates and then increase agricultural exports, and reduce agricultural imports.
2. The results of the descriptive analysis showed that agricultural development in Iraq faces many problems and obstacles, which in turn led to a decline in the values of agricultural output. This decline in the reality of agriculture has caused the emergence of a nutritional gap in strategic grain crops, the emergence of non-self-sufficiency, and an increase in the values of agricultural imports.
3. The volume of grain production is not commensurate with the volume of local consumption, which led to a decline in the self-sufficiency rate of wheat and rice during the study period and the continued widening of the nutritional gap.
4. Iraq enjoys a high self-sufficiency rate of barley and corn, as the state did not import any quantity during the study period because of self-sufficiency in its local production.
5. The study showed that the nutritional gap for strategic crops (wheat and rice) in Iraq for the period 1990-2020 was caused by a shortfall in the production of these crops and a failure to keep pace with the increase in demand growth.

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6. The nutritional gap revealed the extent of dependence on foreign markets for the supply of food to fill the food deficit of the most important strategic crops, which means more economic dependence on the outside. The gap also revealed the failure of agricultural policies that were adopted to raise production growth rates for strategic crops.
7. The increase in the values of agricultural imports (wheat and rice) over the values of agricultural exports, and this is due to the problems and obstacles that faced agriculture in Iraq, the low financial allocations directed to agriculture, and the increase in domestic consumption rates, which made Iraq depend on external sources to secure its agricultural needs.
8. The failure of state institutions related to agricultural production in addressing the problems and obstacles facing agricultural development, especially those facing strategic crops (wheat, barley, rice, and corn) in addition to the weak production base of these crops due to the low rates of investment allocated to them, and this required Iraq to rely on external sources to feed its population.
9. The results of the standard analysis in the first stage showed the significance of the agricultural investment values, the inflation rate, and the cultivated area in influencing the values of agricultural output.
10. The results of the standard analysis in the second stage showed the significant effect of the values of agricultural output on the values of agricultural exports.
11. The results of the standard analysis in the third stage showed the significant effect of the values of agricultural output on the values of agricultural imports.
12. The results of the standard analysis in the fourth stage showed the significant effect of agricultural output values on agricultural foreign trade values.

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In order to ensure the sustainability and stability of agricultural production to secure the consumption needs of the population and achieve percentages of self-sufficiency, a number of recommendations are required, including:

6.2. Recommendations

In order to overcome challenges and obstacles, achieve agricultural development, raise levels of self-sufficiency and reduce the nutritional gap, a set of recommendations can be presented that may have a positive role in reducing and eliminating the agricultural and food crisis in Iraq. These recommendations have been divided into short-term and medium-to-long-term recommendations, as follows:

First: short-term recommendations:

- Stressing the need to activate the local product protection law by preventing the entry of competing agricultural commodities. Adopting policies and programs to regulate the import of agricultural commodities in a way that helps regulate and stabilize prices to protect local products. Paying attention to the agricultural price policy and following the policy of subsidizing the price of the agricultural product and raising this price to close to international prices so that it is at remunerative and encouraging levels for the agricultural product to continue the production process.
- Encouraging agricultural producers to use modern technologies in irrigating agricultural crops (sprinkler and drip irrigation) while providing these technologies in a subsidized manner. As well as the use of modern means and methods in agriculture, including the use of advanced technology, and this thing requires collecting small areas either through the establishment of productive associations or capitalizing the countryside and relying on large-scale production in order to reduce costs and increase the production and productivity of a dunums.

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- Allocating a budget for the agricultural sector to achieve sustainable development, as this sector is vital and pioneering. Large banks for loans and credits must also be opened to help farmers develop their farms through the purchase of agricultural machinery, land reclamation, and financing of farming and harvesting expenses. Work to provide agricultural credit on concessional terms and support the interest rate on agricultural loans.
- The need for the government to provide technological support to the private agricultural sector, to purchase production requirements such as improved seeds, fertilizers, and mechanization. In addition to subsidizing the prices of the final product according to certain controls and conditions based on the expansion of the production of strategic crops based on the agricultural plans drawn up for farmers by the agricultural departments in the governorates of the country.
- There must be laws and controls for customs protection for food commodities entering Iraq, which leads to an increase in demand for local food commodities as a result of the high prices of imported food commodities.
- Improving the performance of the agricultural sector and raising agricultural productivity by paying attention to scientific and agricultural research and formulating serious agricultural policies to advance the agricultural situation. Especially since Iraq does not lack the capabilities for this and the development of agricultural methods used in crop production to raise the efficiency of the exploitation of agricultural areas.
- Preserving political and security stability because of its great importance in providing an appropriate environment for foreign and domestic investment in all sectors, including the agricultural sector.

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- Reducing farmer migration to the city by providing farmers with subsidized production inputs, agricultural supplies, and encouraging price policies. In addition to addressing the salinity problem that most agricultural lands suffer from, which could be an incentive for many farmers to exploit agricultural lands and thus increase agricultural productivity.

Second: Recommendations for the medium - long term:

- Paying attention to the problem of water shortage and making it a national problem that all relevant parties contribute to solving, through the Ministry of Water Resources continuing to negotiate with neighboring Turkey and Iran regarding their water policy in accordance with international laws. And serious work on dredging the Tigris and Euphrates rivers, starting from their entry into Iraqi territory, in order to raise the water level and reduce the salinity levels in them. As well as building more huge dams to absorb the largest possible amount of incoming water.
- Increasing the financial budget allocated to the Ministry of Water Resources to enable it to establish strategic projects such as dams and huge reservoirs to secure water in times of scarcity. As well as equipping the ministry with equipment that guarantees the maintenance of water resources, and the rationalization of the use of water resources by eliminating waste. Expansion of protected agriculture, which consumes less water due to lower evaporation rates.
- Emphasizing the link between water security and food security as an effective means of achieving sustainable agricultural development. Preparing policies for developing surface and groundwater resources and protecting them from pollution, in addition to raising the efficiency of using fresh irrigation water and reducing the rates of water loss and waste.

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- Crystallizing integrated and advanced production systems, which integrate research that deals with agricultural processes and crystallizing them into a production system or a complete farming system for a specific agricultural commodity, in the sense of transferring research results to the field and transferring field observations to research centers. Concerted efforts between researchers, extension workers, and agricultural producers, and this requires the establishment and construction of central laboratories and work on developing new hybrids with high productivity and specifications that can withstand soil salinity, epidemics, and diseases. In addition to the development of pesticides and herbicides to produce grain crops free of impurities and resistant to environmental conditions.
- Work to build a strategic stock of the most important commodities and food products, especially grains, on a condition that is commensurate with the size of the population, which helps to enable the individual to obtain food permanently and in various circumstances to achieve food security.
- Developing the industrial sector that supports the agricultural sector, such as making fertilizers and chemical pesticides, and providing them at subsidized prices to farmers, while obliging them to invest their lands for agricultural purposes and for various crops, which helps in developing agricultural production and reducing the nutritional gap.
- Constructing and building modern, air-conditioned silos and warehouses with correct scientific methods, besides that restoring existing ones, in addition to modernizing their laboratories to determine the levels of humidity and impurities in order to accommodate the largest amount of strategic grain crops in Iraq in quantity and quality in order to reduce the loss of those crops during the storage process.

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- Horizontal and vertical agricultural investment must be encouraged in Iraq, and it must acquire special importance stemming from the importance of the agricultural sector, especially investment in the reclamation of agricultural lands that have gone out of service due to salinity and desertification.
- Agricultural exports must be developed in Iraq, especially the agricultural commodities that Iraq enjoys producing such as dates, wool, and leather, which will be reflected in the increase in the agricultural domestic product, which is an indicator of sustainable agricultural development in Iraq.
- Reducing the fragmentation of agricultural land and its scattering as a result of inheritance. The fragmentation of agricultural ownership into small and medium agricultural units with an area of (5, 10, 15, 20, 30) dunums led to the creation of small agricultural investment units that cannot use the agricultural cycle and modern mechanization in them.
- Preparing a comprehensive program for the development of service sectors and the development of infrastructure and production structures in the field of agricultural services in terms of production, consumption, and export, to enable these services to stand on their feet and occupy an appropriate position in the local market in preparation for competition in foreign markets.
- Paying attention to important environmental problems, by establishing projects to combat desertification resulting from the significant increase in the areas of sand dunes in central and southern Iraq. Ending the salinity problem that threatens most of the soils in the central and southern regions through land reform.

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- Exploiting large areas of land in Iraq for agriculture through joint investment, whether Iraqi companies with other Arab or international companies, provided that the state has contributions in this process and therefore the process is positive and not monopolized.
- Developing the infrastructure in the countryside, including roads, transportation, electricity, organizing irrigation and drainage canals, and delivering potable water, and this requires a large financial coverage.
- The need to cooperate with international institutions concerned with food security such as the Food and Agriculture Organization of the United Nations, the Agricultural Development Fund and the Arab Organization for Agricultural Development, and to benefit from their capabilities and expertise in conducting studies on assessing the conditions of Iraqi food security and future forecasts to meet the increased demand for strategic crops due to the continuing gap between production and consumption.
- The underdevelopment of the agricultural sector hinders the process of development in other sectors. Therefore, the development of this sector must occupy a privileged position in the developmental directions in the medium and long term, especially after the population increase and the increase in demand for food.

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APPENDIX



1.The economic factors affecting the values of the agricultural domestic product in the first stage of the standard analysis

The year s	Agricultural output values (Million dollars)	Agricultural Investment (Million Dollars)	Agricultural labor force (Thousand people)	Inflation rate in Iraq (%)	Agricultural loans (Million dollars)	Cultivated land area (Million dunum)	Exchange rate
	Y_1	X_1	X_2	X_3	X_4	X_5	X_6
1990	1127.92	12.4	1046.8	0,51	1.18	8.3	4
1991	662.91	15.2	1415.1	0,18	1.77	10.2	10
1992	1089.18	5.5	1348.8	0,83	1.68	15.1	21
1993	673.84	1.5	1210.9	0,20	1.97	13.9	74
1994	728.22	2.5	1273.3	0,49	3.27	13.4	458
1995	823.34	0.4	1341.4	0,35	7.74	13.5	1674
1996	1033.32	0.3	1303.1	0,15	7.8	13	1170
1997	867.69	0.2	1209.3	0,23	8.65	13.4	1471
1998	1153.32	0.2	1010.8	0,14	8.12	14.6	1620
1999	1258.93	3.9	943.3	0,12	8.36	14.2	1972
2000	971.74	0.5	973.3	0,49	9.54	9.2	1930
2001	1484.45	3.5	983.6	0,16	8.49	10.4	1929
2002	1794.92	2.5	1107.2	0,19	14.53	14.3	1957
2003	1999.95	1.1	1515.9	0,32	14.39	8.1	1936
2004	2542.17	1	1060.7	0,26	48.17	13.1	1453
2005	3440.32	3.3	1535.2	0,36	67.61	14.7	1472
2006	3775.58	2.4	2110.4	0,53	155.77	14.1	1393
2007	4379.37	3.3	1180.2	0,30	252.1	14.3	1216
2008	4785.62	4.4	1863	0,27	325.79	15.7	1180
2009	6769.09	4.3	1888.6	0,69	141.53	10.5	1185
2010	7150.63	8.1	1937.9	0,24	210.24	12.1	1185
2011	8477.19	5	1996.5	0,56	455.91	13	1218
2012	8990.95	7.8	1845.7	0,61	449.71	12.7	1222
2013	11188.56	5.7	1857.8	0,19	276.34	14	1222
2014	11259.54	8	2002.2	0,22	184.83	15.7	1205
2015	6990.95	5.8	2027	0,20	67.67	10	1216
2016	6626.1	5.9	1883.1	0,20	76.03	10.3	1182
2017	6268.22	7.8	1984.7	0,20	65.02	13.7	1184
2018	6462.88	9	1998.5	0,20	62.89	16.4	1182
2019	6333.99	11.8	2024.6	0,21	68.49	18.9	1183
2020	6894.48	12.4	2114.2	0,22	74.16	22.7	1192

2.The effect of agricultural output values on agricultural export values in the second stage of the standard analysis

The years	Agricultural export values	Agricultural output values
	Y ₂	X
1990	98.6	3.01
1991	119.2	3.35
1992	112.4	2.71
1993	116.8	3.28
1994	122.4	3
1995	119.1	3.13
1996	119.3	3.36
1997	118.9	3.27
1998	119.8	3.38
1999	118.05	3.4
2000	121.6	2.98
2001	114.5	3.34
2002	141.03	3.3
2003	111.03	3.13
2004	141.3	3.21
2005	384.4	3.13
2006	141.5	2.96
2007	115.6	3.19
2008	141.7	3.22
2009	145.8	2.82
2010	111.03	3.26
2011	112.5	2.95
2012	113.24	2.92
2013	111.3	3.31
2014	113.5	3.22
2015	123.3	3.3
2016	141.1	3.3
2017	1132	3.3
2018	1105.5	3.31
2019	1138.4	3.3
2020	1218.6	3.3

3.The effect of agricultural output values on agricultural import values in the third stage of the standard analysis

The years	Agricultural import values	Agricultural output values
	Y_3	X
1990	1,851.59	3.01
1991	169.2	3.35
1992	196.65	2.71
1993	941.24	3.28
1994	585.3	3
1995	638.45	3.13
1996	445.57	3.36
1997	278.99	3.27
1998	97.19	3.38
1999	161.41	3.4
2000	187.94	2.98
2001	241.87	3.34
2002	1,645.73	3.3
2003	1,587.66	3.13
2004	2,274.16	3.21
2005	3,042.01	3.13
2006	3,085.29	2.96
2007	2,951.29	3.19
2008	5,305.44	3.22
2009	4,396.18	2.82
2010	1,930.51	3.26
2011	10,553.25	2.95
2012	4,447.63	2.92
2013	2,762.15	3.31
2014	2,185.34	3.22
2015	2,907.03	3.3
2016	1,924.73	3.3
2017	3,659.95	3.3
2018	2,830.57	3.31
2019	2,989.67	3.3
2020	3,118.42	3.3

4.The effect of agricultural output values on the values of total foreign trade in the fourth stage of the standard analysis

The years	Total foreign trade values	Agricultural output values
	Y_4	X
1990	1950.19	3.01
1991	288.4	3.35
1992	282.05	2.71
1993	1058.04	3.28
1994	707.7	3
1995	757.55	3.13
1996	564.87	3.36
1997	397.89	3.27
1998	216.99	3.38
1999	279.46	3.4
2000	309.54	2.98
2001	356.37	3.34
2002	1786.76	3.3
2003	1698.69	3.13
2004	2415.46	3.21
2005	3426.41	3.13
2006	3226.79	2.96
2007	3066.89	3.19
2008	5447.14	3.22
2009	4541.98	2.82
2010	2041.54	3.26
2011	10665.75	2.95
2012	4560.87	2.92
2013	2873.45	3.31
2014	2298.84	3.22
2015	3030.33	3.3
2016	2065.83	3.3
2017	4791.95	3.3
2018	3936.07	3.31
2019	4128.07	3.3
2020	4337.02	3.3