Agroecological and biological assessment of crop systems in Zubair, Iraq

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Abstract. This study presents a biological and agroecological analysis of the agricultural systems in Zubair, Iraq, focusing on the interaction between environmental factors and crop productivity. The research examines the influence of soil properties, climatic conditions, and water resources on the physiological performance and yield characteristics of major cultivated species. Emphasis is placed on the biological diversity of crop varieties, plant adaptation mechanisms to arid conditions, and the sustainability of current agroecosystems. The study also evaluates the role of agricultural mechanization and irrigation technologies in maintaining soil microbiological activity and plant health. Results highlight a limited crop diversity and reduced biological resilience in local agroecosystems, suggesting the need for integrative biological and ecological approaches to improve agricultural productivity and environmental stability in the Zubair region.

1 Introduction

The agricultural sector is one of the most prominent economic sectors that form the economic structure of countries, because of its great importance in promoting growth and development in all countries of the world, both developing and developed, because of the great role it plays in supporting the economies of these countries, because it is an essential source in providing the food necessary to meet the needs of the population, as well as being an important financial resource, so the agricultural sector occupies a prominent place among the main productive sectors in the development of the national economy, so the research aims to study the reality of the structure of agricultural investment in the Zubair region to increase demand, especially vegetable crops, for increasing the population, accompanied by improving their living standards. And their awareness of the nutritional and economic importance of agricultural crops.

Research problem:

1 - Is there a discrepancy in terms of the area of agricultural crops in the province of Zubair?

2 - What is the reality of agricultural production of agricultural crops in the Zubair region?

Research hypothesis:

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1-the difference in the cultivation of agricultural crops between the administrative units in the region.

2-the diversity of cultivation of agricultural crops in the province of Zubair.

Research objective:

The study aimed to study the reality of agricultural production in the Zubair region and to find out the difference in the size of cultivated areas between administrative units.

Research methodology:

The research was based on the analytical and quantitative method used to analyze the data on agricultural production and reach more accurate and better results.

Study limits:

The study area is determined by Zubair district, which is located in the southwestern part of Basra governorate , and is one of its ten districts, which is characterized by its important geographical and astronomical location, as it is located between two viewing circles ("50 "35 295-"40 "41 305) North, and longitude ("20 "13 485-"30 "7 475) to the East, it is administratively bordered on the north by the Deir, Madinah and Dhi Qar districts , on the East by Abu al-khasib and Al-Faw districts, on the Northeast by Basra district, on the South by the state of Kuwait, and on the West by Safwan district and Muthanna governorate, see Figure (1). As for the area of Zubair district amounted to (2746) km2, equivalent to(14.4%) of the area of Basra governorate of (19070) km2, the judiciary consists administratively of two administrative units, namely (Zubair Center, Umm Qasr district), which includes a total of (36) districts, with (27) districts of the Judicial Center occupied by (1134) km2 constituting a percentage of (41.3%) of the total judicial area, and (9) districts in Umm Qasr district with an area of (1612) km2 (58.7%) of the judicial area. As shown in Table (1) and Figure (2).

2 Materials and methods

Agricultural investment occupies a prominent place in the economies of countries, whether developed or developing, as agriculture is one of the vital effective sectors because of its great importance in growth and development, it constitutes a basic source of food, and also plays an important role in rural development and the exploitation of available natural resources, and agricultural investment is defined as the process of integrating the available factors of production in agriculture (land, labour, capital) in order to produce agricultural materials that meet the needs of consumers and achieve the best possible results [1, 2], so plant and animal production and investment are vital to ensure that increasing human needs are met, which makes it the subject of great attention at the same time Crop production is the main source of human food, as well as providing the industry with the necessary raw materials, because it represents a wide market for agricultural products, and providing job opportunities for many rural residents, which contributes to achieving economic savings, so these activities are one of the basic inputs in the agricultural process

By looking at Table (1), Figure (1) and Figure (3,4), it shows that the total total area in the Zubair region amounted to (1098400) dunums, of which (3890120) dunums of arable land constituted a percentage of (7.9%) of the total area of the judiciary for the agricultural season (2023-2024), while the area of cultivated land actually amounted to (39424) without accounting for (5.5%) of the total arable land, due to these low percentages due to the weakness of the economic resources of this sector in the region and the high salinity of water and soil, in addition to the urban sprawl towards agricultural lands and stripping them of Agriculture, most farmers in the study area have fragmented the land Agricultural land is sorted into plots not exceeding (200) m and sold for the purpose of housing.

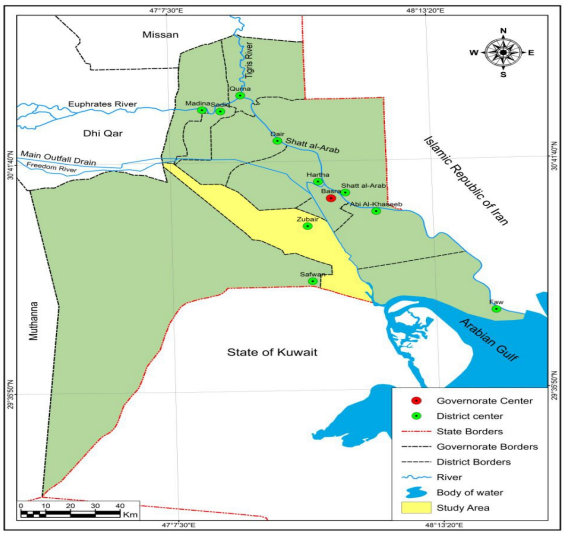

Fig. 1. The location of Zubair province of Basra for the year 2024,Source-Ministry of Water Resources, Directorate, General Authority for Survey, map production department, Basra administrative map, scale 1: 500000, Baghdad, 2007

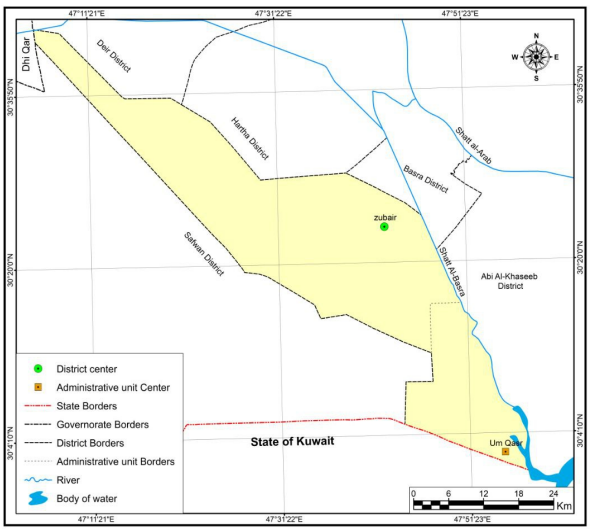

Fig. 2. Administrative units in the Zubair region for the year 2024, Source-Ministry of Water Resources, Directorate, General Authority for Survey, map production department, Basra administrative map, scale 1: 500000, Baghdad, 2007

This area was distributed to the administrative units in the region, and the Zubair district center ranked first in terms of arable area and the area actually cultivated with an arable area of (3838912) dunums, constituting (98.7%) of the total rate of arable area in the region, while the area actually cultivated in it reached (36604) dunums (92.8%) of the total area actually cultivated in the region, followed by Umm Qasr district in second place with an arable area of (51208) without accounting for (1.3%) of the total arable area in the Zubair region, and with an actually cultivated area of (2820) without equivalent to (7.2%) of the total area It is

actually cultivated in the province ,to identify the areas actually cultivated in the study area, it is necessary to review the natural and human components of it , no crop can be grown without the necessary ingredients for its success, so these ingredients will be addressed as follows:

2.1 Natural ingredients

Natural ingredients play a vital and influential role in the development of agricultural activity, which is the basic element in human life, because it is primarily responsible for providing food, these ingredients determine the possibility of growing a particular agricultural crop in one area compared to other crops, and despite the great progress achieved by man, he still faces challenges before natural forces in directing production according to his wishes, but in a limited way, for example, the surface is one of the most important natural ingredients that directly affect agricultural production, the flatter the surface, the more suitable for agricultural activity [3], the surface affects the type of soil in terms of its composition.

Table 1. The total area suitable for agriculture and cultivated according to the administrative units in the Zubair region of the agricultural season (2023-2024)

%	The area cultivated / acres	%	Arable area/acres	%	Total area/acres	Administrative unit
92.8	36604	98.7	3838912	41.3	453600	M.S . Judicial Center
7.2	2820	1.3	51208	58.7	644800	N . Or a palace
100	39424	100	3890120	100	1098400	Total territory

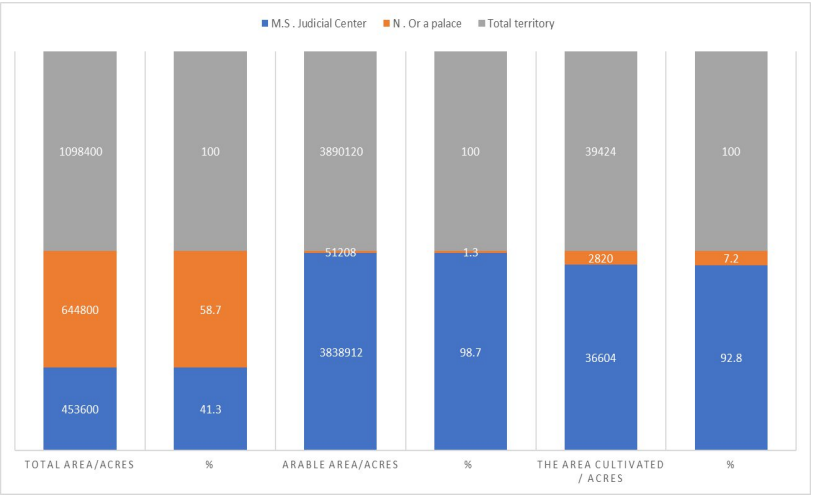

Fig.3. The relative distribution of the total arable and cultivated area according to the administrative units in the Zubair region for the agricultural season (2023-2024).

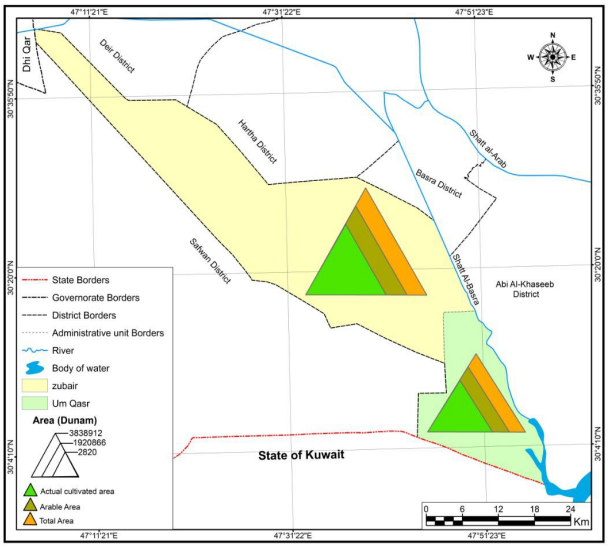

Fig. 4. Geographical distribution of arable and cultivated areas by administrative units in the Zubair region for the agricultural season (2023-2024)

The flatter the surface and its slope is simple, the easier it is to drain water, and reduce the problem of salinity [4], in addition, the surface affects the external appearance of the land at various stages of the agricultural process, starting from tillage, sowing and fertilization, up to the process of irrigation and crop harvesting, the nature of the surface and its shape determines the type and agricultural machinery and equipment used, as for the climate, its impact on agricultural production comes through its elements represented by the amount of solar radiation and heat humidity, rain and wind, these elements play a crucial role in determining the type of agricultural crops and affect farming systems It also determines the type of crop prevailing in one region without another, as well as its significant impact on the composition of soils, their different types and the degree of fertility .As for the rains in the province of Zubair, as we explained in the first chapter and Table (3), its annual total reached (97.5) mm, agriculture in the region does not depend on it because of its lack and annual fluctuation, but its importance is determined in reducing the amount of irrigation, and its fall during the winter season contributes to increasing the amount of groundwater in the area on which the region is completely dependent in agriculture because of the lack of a surface water resource, so agriculture depends entirely on groundwater extracted from wells as the main source of irrigation water in the region. As for the soil, it is one of the most important basic natural factors that affect the use of agricultural land, because it represents the main source that supplies humans, animals and plants with the food they need, so the soil is one of the ecological factors necessary for life on the Earth, for this reason it is a vital source for agriculture, and also plays a major role in the productivity of any human activity, it determines the geographical distribution of agricultural crop patterns as we find that there is a clear relationship between the type of soil and the diversity of agricultural land uses and its spatial variation in the region .

2.2 Human factors

The human components are one of the main pillars that determine the pattern of agricultural production in both (plant - animal) in a particular region, because these components are characterized by the speed of change and overlap between them more clearly than natural

factors, because the development of the agricultural sector of any country in the world depends on the human factor, and the extent of its possession of:

2.3 Agricultural manpower

The population of the region is divided into (urban – rural) and the rural population is the main source of manpower in the agricultural sector, and it should be noted that the cultivated crops differ in their need for manpower, some of them need many working hands, such as growing horticultural crops represented by vegetables and palm trees for their need of high experience and constant care, while there are fewer in field crops such as wheat and barley. It is noted from Table (2) and Figure (5) that the total agricultural labor force in the region amounted to (1350) farmers by (1659) farms in the center of Zubair district accounted for (90.6%) of the total farmers in the region, and (173) farms by (9.4%) farms in Umm Qasr district, the reason for this decrease is due to the orientation of farmers in the region to engage in other economic activities, as a result of a decrease in the financial return from agriculture, the competition of imported agricultural products characterized by low prices compared to domestic products, as well as weak government support for this sector contributed to the reluctance Many people stopped working in agriculture and resorted to looking for other job opportunities because of the high wages in them, which was clearly reflected in the agricultural sector in Zubair province .

2.4 Methods of irrigation

The irrigation process means supplying the soil with water in order to provide the moisture necessary for plants to grow well, for the purpose of obtaining a high yield per unit area planted, and this process is practiced in areas where the amount of rainfall is not sufficient to meet the water needs of plants, as well as in dry or semi-dry areas where agriculture is possible only by relying on irrigation water [5], it is also intended to deliver water in the right quantity, time and place to increase crops with the moisture necessary for their growth, protect them from dry periods, temper the surrounding atmosphere and soil, wash and reduce the salinity of the soil in the root zone, which facilitates the movement of food from the soil to the plant reduces stiffness Soil and facilitate land care processes [6].

Table 2. Agricultural manpower by administrative units in Zubair province for the year 2024.

%	Agricultural labour force	Administrative unit
90.6	1659	M.S . Judicial Center
9.4	173	N . Or a palace
100	1832	Total territory

Agricultural lands in the province of Zubair depend entirely and directly on groundwater in the process of irrigating orchards and agricultural lands, and this is done by pumps and machines that are used to raise water from wells to agricultural lands, as water is withdrawn from these wells by pumps powered by diesel, electricity and solar energy. Table (3) and Figure (6) show that the number of water pumps in the Zubair region amounted to (3525) pumps, of which (3229) in the Zubair district center accounted for (91.6%) of the total pumps in the region, and(296) pumps in one direction or another (8.4 %) of the total pumps in the Zubair region, dividing these pumps into several types there are (1500) electric pumps, (2020) diesel pumps, and (5) solar pumps, and the reason for the variation in the number of pumps in the region is due to the variation in the area of agricultural land and the different purchasing power of farmers .

Fig.5. The relative distribution of agricultural labour by administrative units in the Zubair region for the year 2024.

These pumps are placed near the edge of the well after the construction of a basin next to it , and the water drawn from the Wells is collected in these basins, which ranged in height from(1.5-2) m^2, and then this water is distributed to the main channel associated with it, and then to the secondary channels inside the farm through a network of plastic pipes that vary in length depending on the area of the farm, so this method is the prevailing in the study area to irrigate various agricultural lands, and water is delivered from the main channel to the agricultural lands by the following methods:

2.5 Drip irrigation method

The drip irrigation method is one of the modern methods compared to other traditional methods. Irrigation water is delivered through pipes equipped with many drippers that meet the needs of aquatic plants. this method is characterized by providing water continuously and directly to the root zone, which maintains a good moisture level without the plant being exposed to water pressures that negatively affect its productivity, unlike other methods that rely on water supply in batches and at intervals [7].

Table 3. Numerical and relative distribution of agricultural machinery by administrative units in Zubair region for the year 2024

%	**Sprinkler irrigation**	**%**	**Drip irrigation systems**	**%**	**Pumps**	**Administrative units**
100	153	85.9	1804	91.6	3229	**Zubair district center**
	0	14.1	296	8.4	296	**Side or palace**
100	153	100	2100	100	3525	**Total**

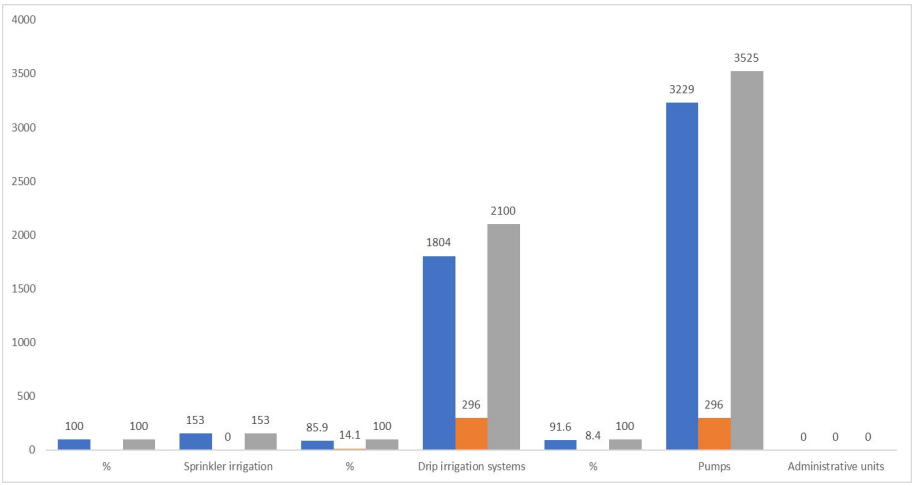

Fig.6. The relative distribution of agricultural machinery by administrative units in the Zubair region for the year 2024.

Water is pumped into a network of pipes until it reaches the nozzle of the sprinkler, and this method has some advantages, including the possibility of using it in flat lands, areas with different slopes and even mountainous areas, and also contributes to shortening some agricultural processes such as fertilization and pest control, by adding these substances directly to the irrigation water before entering the pipe network, which saves time, effort and labor and makes it suitable for cultivation in greenhouses, and this method can also be used in cases of water scarcity and in general, this system achieves high efficiency in the use of irrigation water, however, the disadvantages of this method are the accumulation of salts at the top of the morose as a result of For the movement of soil salts and water. According to Table (3) and Figure (6), drip irrigation systems in the region amounted to (2100) drip systems distributed between the Zubair district center with a number of (1804) drip systems representing (85.9%) of the total irrigation systems in the region, and Umm Qasr district with a number of (296) systems with (14.1%) of the total irrigation systems in the Zubair region, and this method is used in the Zubair region to irrigate vegetable crops, palm trees and buckthorn.

2.6 Spraying method

Spray irrigation is known as a method used to pump water through a network of pipes of different diameters, these pipes end with fixed or rotary openings from which water comes out in the form of a rain-like spray as a result of its exit from narrow openings under a certain pressure, which helps to reach the soil in the root zone to its field capacity while reducing water losses, this method is modern and widespread thanks to its high efficiency, uniform distribution of moisture on the soil surface and inside, and provides the necessary materials for its installation, so this method facilitates water rationing used in irrigation while ensuring water access to the roots of plants, especially since the soil of the region is Sandy and with a rough texture does not help It is characterized by economic costs compared to surface irrigation and does not need workers to maintain irrigation channels, however there are some factors that limit its use such as high system costs, the need for a fixed water source, as well as its unsuitability in case of increased wind speed. This method is used on a small scale in the region, specifically in the Zubair district center with (153) irrigation organizations,

including (150) fixed irrigation systems and (3) pivot irrigation systems used to irrigate wheat and barley crops.

2.7 Agricultural peasant associations

These are agricultural economic, social and cultural institutions that seek to provide all the necessary means for the exploitation of agricultural lands and related economic and social activities aimed at improving and developing agricultural production in rural areas, and this is done through the modernization of agricultural production methods. And raise the standard of living of its members, by providing a range of services to its members, including (seeds, fertilizers, pesticides, agricultural machinery and machinery, cash loans to farmers, marketing operations), so these institutions are one of the basic elements in agricultural policy that play a key role in enhancing production through the services they provide to their members, and also work to link farmers with other institutions related to agricultural activity such as the Irrigation Division, the Agricultural Bank, the Directorate of Agriculture, and the Directorate of water resources, so these institutions are the objectives of agricultural development, as well as its role in supporting the activity Agriculture by providing chemical fertilizers and improved seeds at prices lower than their prices in the markets .
Table (4) shows that the number of cooperative peasant associations in the Zubair region reached (5) associations covering all the region, of which (4) are located in the Zubair district center, which is an association (Zubair, lahis, Najmi, Khor Zubair), and one association for Umm Qasr is the Umm Qasr peasant association, with a total of (4840) members, (4450) members for the Judicial Center, and (400) members for Umm Qasr

Table 4. Peasant associations by administrative units in the Zubair region for the agricultural season (2023-2024)

Om Qasir		**Zubair district center**		**Administrative units Name of the association**
Number of members	%	**Number of members**		
Zubair	---	2900	65.2	**Zubair**
Lahis	---	800	18	**Lahis**
Asterism	---	500	11.2	**Asterism**
Khor Al-Zubair	---	250	5.6	**Khor Al-Zubair**
Or a palace	100	---	65.2	**Or a palace**
Total	100	4450	18	**Total**

Agricultural mechanization is defined as the investment of mechanical and electrical capabilities (horsepower) to carry out agricultural operations in order to achieve the highest level of profits with the least possible human or animal effort to obtain abundant production at low costs [8], and agricultural mechanization is one of the main factors contributing to the development of Agriculture, the increase in land productivity depends on the continuous progress in the mechanisms of agricultural operations, and among the reasons that led to the spread of agricultural mechanization in Iraq is the expansion of agricultural areas and the migration of farmers from rural to cities, it is considered one of the modern means of transferring agriculture from the traditional stage to the modern stage in the exploitation of agricultural land The economic goals of using machines are to increase production, reduce costs , improve the quality of production, as well as saving the effort and time spent by the farmer in completing agricultural work [9], the development of any agricultural country is measured by the percentage of introduction of mechanization in it and also expresses the development of any agricultural process in the production of a particular crop based on the

extent of the use of mechanization in its production, and thus the concept of agricultural mechanization reflects the level of economic development that the country is living, in developing countries agricultural mechanization is limited to power units such as tractors In developed countries, its concept goes beyond force units to include all the machinery and equipment necessary to carry out agricultural operations that have proven their effectiveness [10-11]. It is clear from Table (5) and Figure (7) that the Zubair region uses types of machines in agricultural production, including tractors that are used in the operations of plowing, smoothing, adjusting, sowing, transporting agricultural production requirements and marketing agricultural crops to markets and shopping centers, and are considered one of the most agricultural machines used in the judiciary, totaling (113) pullers distributed to administrative units in the region by (96) pullers in the Zubair district center, representing a percentage of (85.9%), and in Umm Qasr district it reached. 14.1%) of the total withdrawals in the region, harvesters are also used in the region and their use in the Judicial Center is limited to (2) harvesters (100%) are used These machines are used in harvesting field crops such as wheat and barley, as they save a lot of time and reduce the costs of harvesting and transportation operations, and they also reduce crop losses compared to traditional harvesting methods, they are mainly used in large holdings and are not used for small agricultural holdings in the Judicial Center, in addition, there are Sowers that are used to scatter seeds of grain crops such as wheat and barley on the soil surface, there were only (2) seeds equivalent to (100%) of the total seeds of the region simple and small agricultural machines for conducting agricultural operations.

Table 5. Numerical and relative distribution of agricultural machinery by administrative units in Zubair region for the year 2024

%	Seedsdraw	%	Harvesters	%	Pullers	Administrative units
100	2	100	2	85.9	96	**Zubair district center**
--	--	--	--	14.1	17	**Side or palace**
100	2	100	2	100	113	**Total**

Fig.7. The relative distribution of agricultural machinery by administrative units in the Zubair region for the year 2024.

2.8 Transport and agricultural marketing

Transportation means economic activity that deals with the movement of people and goods from one place to another, exceeding the spatial and temporal distance to create, increase or develop benefits. it serves as the backbone of economic activity, as it helps to transfer surpluses of crops and goods from their production sites to consumption markets to protect them from damage. Therefore, the development of the transport road network significantly contributes to agricultural development aimed at increasing agricultural output, as transportation provides inputs to the agricultural process from fertilizers, seeds and agricultural machinery, as well as marketing agricultural crops, and transportation contributes to the reorganization of Agricultural Relations and the increase of Agricultural resources used in the countryside in a way that helps to increase production and reduce its cost. As for marketing, it means the set of activities, efforts or services related to the delivery of agricultural and animal products or the transfer of ownership from the producer to the consumer. All activities and processes related to the flow of goods and services from the farm to consumers, because the final product cannot be achieved unless it can be marketed, so Agricultural Marketing is defined as a set of activities related to the transfer of agricultural goods from the producer to the final consumer. It plays a vital role in the quality of agricultural production and its geographical distribution, as vegetable and fruit crops are affected more than field crops, so these crops are grown near markets or are connected to them through good and flexible roads, which facilitates their transportation within a short period of time, because they are subject to damage and lack of modern and appropriate means of transportation, and to achieve any progress in production, it is necessary to develop appropriate marketing plans in line with the productive capacities of the agricultural sector, this has prompted a change in the goal of agricultural production from self-sufficiency and meeting local needs to contribute to meeting the needs of agricultural products, especially vegetables, to meet the needs of markets, especially the development of marketing operations It is closely related to the economic and social development in the study area, the larger the population, the wider the markets for agricultural commodities, and this contributes to the transition of Agriculture from the stage of self-sufficiency of farmers to the expansion of production economically, with the aim of achieving monetary income. In the province of Zubair, agricultural crops (tomatoes, watermelon, okra, eggplant, cucumber, water cucumbers, onions and garlic) are marketed through direct sale from farms to the owners of the main Allawi in the judicial and governorate center, as well as marketing centers located within residential neighborhoods, due to the availability of transportation routes and means of transportation that facilitate traffic, which contributed to enhancing the process of direct sale. As for dates, they are marketed in two directions, the first is internal within the borders of the region, and the second is the marketing of farmers for their production to Alawi and central markets outside the borders of the region, such as Alwa Hamdan and the Publican market, because these markets provide more profits for farmers compared to internal marketing, and crops are sold in the study area on external roads, especially if the farms are located near these roads, the owner of the farm displays them on the roads and sells them directly.

2.9 Analysis of the structure of the agro-vegetable sector in the province of Zubair

Agricultural investment in the Zubair region is characterized by its diversity, it is not limited to growing only one crop, and thanks to this diversity in agricultural crops and investing them in various ways, it is necessary to clarify the agricultural investment systems by

studying the areas planted with crops in the region for the agricultural season (2023-2024), and will be addressed as follows:

2.10 Cereal crops

Grain crops are of great relative importance both in terms of the components of the crop structure and in terms of the individual's diet, and their importance comes through increasing demand for them compared to the volume of production, due to the influence of several factors, most notably high population growth, increasing national income and redistribution, as well as their use as food for humans, and a large part of these crops are also allocated for non-food purposes, as they are used as animal feed, whether mainly through their products or secondarily through their stems and residues of harvesting and milling grain operations, so grain crops are considered commodities the strategy in the field of food security, as the majority of the population relies on it as a daily food It is a raw material that enters into various industries. According to the data of Table (6) and Figure (8), the total area planted with grain crops in the Zubair region amounted to (16052) dunums for the agricultural season (2023-2024) accounted for (40.6%) of the total area invested in agriculture in the Zubair region, and at the level of administrative units in the region.

Table 6. Numerical and relative distribution of areas planted with grain crops by administrative units in the Zubair region for the agricultural season (2023-2024)

%		%	Barley	%	Wheat	Name of the crop
93.8	**15025**	66.7	500	95.1	14525	**Administrative units**
6.2	**1000**	33.3	250	4.9	750	**Om Qasir**
100	**16025**	100	750	100	15275	**Zubair district center**
%		95.3		4.7		**total**

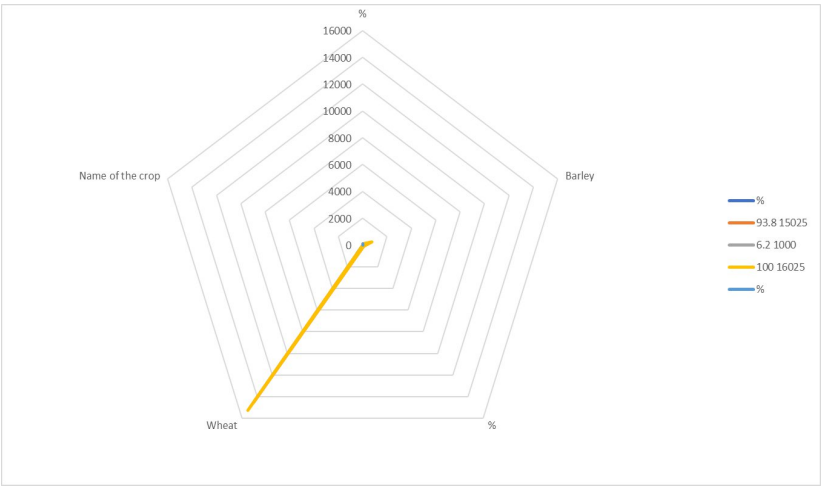

Fig.8. The relative distribution of the areas planted with grain crops by agricultural units in the Zubair region for the agricultural season (2023-2024).

The Zubair district center topped the highest areas planted with grain crops, amounting to (15025), accounting for (93.8%) of the total area planted with grain crops in the region, while Umm Qasr district came in second place with (1000), equivalent to (6.2%) of the total areas planted in the Zubair region. Grain crops in the Zubair region were represented by winter grain crops only, namely (wheat, barley) and will be discussed as follows:

2.11 Wheat

Wheat is one of the most important and widespread main food crops; more than a third of the world's population currently relies on it, because it is the main source of the bread industry and also enters into many food industries such as pies, cakes and biscuits, and its consumption is associated with a high standard of living and occupies a prominent place in the list of basic food crops that contribute to the food security of the population, and its nutritional importance comes from the fact that its grains contain (70%) of sugars, (11.5%) of protein, (2%) of fat, (2%) from fiber, wheat residues from hay and Bran are also used as animal feed due to their high content of nutrients .

It is clear from the extrapolation of the data of Table (6) and Figure (8) that the wheat crop exports the grain crops invested in the Zubair region with an area of (15,275) dunums of the total areas planted with grain crops in the region, this is due to the high financial return achieved by the wheat crop compared to other grain crops, as well as the increase in demand for it, which these areas are widely distributed at the level of administrative units in the Zubair region, as the Zubair district center ranked first in the area planted with the crop amounted to (14425) without equivalent to (95.1%) of the total This is due to the large size of agricultural holdings in the Zubair district center, the population concentration there, and the use of modern agricultural machinery compared to Umm Qasr, and then came in second place in Umm Qasr with an area of (750) dunums, which accounted for (4.9%) of the total areas planted with wheat crop in Zubair province.

2.12 Barley

Barley is one of the agricultural crops known to man since ancient times, it belongs to the najili family, and is used as food for the inhabitants of the desert in some areas, as well as being a basic material in animal feed, whether as green feed or after drying to become concentrated feed, and is characterized by its ability to mature quickly [12], its grains contain between (11-12%) of proteins, (6%) of starches and sugars, (4-5%) of fatty substances, and (2-3%) fiber, protein and starch are the most important of these components, barley is also a drought-resistant crop, which makes it suitable for cultivation in dry areas where salts are concentrated in the lower layers of Soil, while it thrives in mixed or clay soils.

By looking at Table (6) and Figure (8), it is noted that the total area invested in the cultivation of barley crop amounted to (750) dunums equivalent to (4.7%) of the total area invested in the cultivation of the crop in the region, and the Zubair district center received the highest cultivated areas by (500) dunums representing (66.7%) of the total areas planted with barley crop in the region, and the lowest was from Umm Qasr district with an area of (250) dunums by (33.3 the reason for the low percentage of the area of this crop in the Zubair region, especially in Umm Qasr district, is due to the small size of agricultural holdings where barley is grown, and the intense competition from the wheat crop, because most of the farmers of the region prefer to grow wheat crop for its high material yield, as well as the competition directed by the barley crop from other crops such as horticultural crops, especially vegetables that need small areas .

Horticulture crops are one of the vital agricultural crops that are of great interest by many farmers, because of the high economic yield they provide compared to other crops, as well

as they form an important part of human food and some fruit trees and their products are considered a raw material for many industries such as the manufacture of medicines, cosmetics, perfumes, oils, dyes and others, so they will be addressed as follows:

2.13 Palm trees

The palm is one of the most important fruit trees known to man since ancient times, in addition, dates are one of the most important basic nutrients for humans, and it is also an important source of hard currency through its export. The palm produces many by-products that carry great economic and social importance. the trunks are used as supports for roofs, while Palm skins are used in the manufacture of cages and others. date cores are also used as livestock feed. It is clear from Table (7) and Figure (8) that the total area invested in the cultivation of palm trees in the region amounted to (3729) dunums equivalent to (9.5%) of the total areas invested in agriculture in the region, and its geographical distribution varies between administrative units in the province of Zubair, Zubair district center ranked first in the areas invested in palm trees, reaching (3229) dunums (86.6%) of the total areas invested in palm trees in the then Umm Qasr district came in second place with an area of (500) without accounting for (13.4%) of the total areas invested in palm trees in Zubair province.

Table 7. Cultivated areas of palm trees and buckthorn Sidr and their preparation according to the administrative units in the Zubair region for the agricultural season (2023-2024)

%	Preparation of buckthorn trees	%	Preparation of Palm (Palm)	%	Area of palm trees (acres)	Administrative units
87.3	12250	85.6	130805	86.6	3229	**Zubair district center**
12.7	1790	14.4	22000	13.4	500	**Side om Qasir**
100	14040	100	152805	100	3729	**Total**

As for the number of palm trees, the total number of palm trees in the region is (152,805), and these numbers were distributed among administrative units, and the Zubair district center received the highest number (130,805) palms, representing (85.6%), followed by the second place in Umm Qasr district with (22,000) palms, representing (14.4%) of the total number of Palms in the region. See Figure (6). As for the varieties of dates, Zubair province has several varieties of dates, including (Halawi, Sayer, Barhi, khadrawi, Breem, Kantar, diri, khastawi, Zuhdi, jajab, Shukr, dikl, Maktoum, tabrizel, shweti).

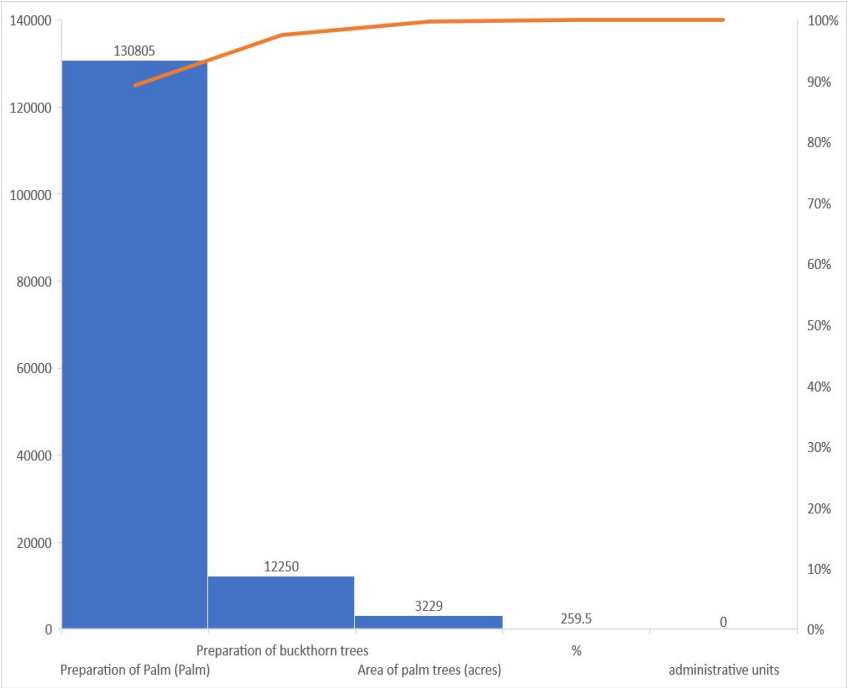

Fig.9. The relative distribution of the numbers of palm and buckthorn Sidr planting by administrative units in the Zubair region for the agricultural season (2023-2024).

2.14 Fruit trees

The fruit trees in the Zubair region included only buckthorn trees planted among palm trees by (14040) Sidra, and the center of the Zubair district acquired the highest number of Sidr Al-Nabq trees by (12250) Sidra accounted for (87.3%) of the total Sidr Al-Nabq trees in the district, followed by Umm Qasr district with the lowest number of (1790) Sidra by (12.7%) of the total Sidr Al-Nabq trees in the region.

Vegetables come in second place after cereals in terms of nutritional importance, because they contain a high percentage of essential nutrients such as carbohydrates, vitamins, vitamins and minerals that humans need, so the cultivation of these crops receives special attention due to the high demand for them and their high value, and their cultivation is characterized by rapid growth, which has increased the interest of farmers in them, because they contribute to meeting demand in a short time, and they also achieve a yield that exceeds many other crops, due to the urgent need for them. It can be seen from Table (8) that the total areas invested in the cultivation of vegetable crops in the Zubair region for the agricultural season (2023-2024), reaching (19670) dunums, equivalent to (49.9%) of the total cultivated areas in the region, i.e. almost half of the areas invested in agriculture to increase the demand for them by the population and increase their economic material return, of which (13222) without winter vegetables occupied (67.2%) of the total area invested in vegetable crops in the Zubair region, and(6448) summer vegetables, equivalent to (32.8%) of the total areas invested in the cultivation of vegetable crops in the region will be addressed as follows:

2.15 Winter vegetable crops

The crops that were grown during this season in the province of Zubair included both (tomatoes, onions, garlic), which are of great importance in the economy of the region to increase the demand for them by the governorate market on the one hand, as well as the economic yield on the other hand, which made farmers in the province expand in the cultivation of these crops. Table (8) show that the total areas invested in growing winter vegetable crops amounted to (13222) without varying their geographical distribution at the level of administrative units administrative units in the region, the Zubair district center topped the highest areas planted with winter vegetables amounted to (12550) without accounting for (94.9%) of the total areas planted with winter vegetables in the study area, then Umm Qasr district came in second place with (672) without equivalent to (5.1%) of the total areas planted with winter vegetables in the region, the tomato crop accounted for the majority of the cultivated areas by (95.6%) in the Judicial Center and (74.4%) in Umm Qasr district

Table 8. The area planted with winter and summer vegetables (dunums) according to administrative units in the Zubair region for agricultural seasons (2023-2024)

%	Total territory	%	Side om Qasir	%	Zubair district center	Type of crop	Season
94.5 3.3 2.2	12500	74.4	500	95.6	12000	**Tomato**	**Winter vegetables**
	435	12.6	85	2.8	350	**Onions**	
	287	12.9	87	1.6	200	**Garlic**	
100		13222	100	672	100	12550	Total
3.5 17.3 12.6 29.4 33.4 3.9	228	19.8	128	1.7	100	**Bamia**	**Summer vegetables**
	1113	17.4	113	17.2	1000	**Qathaa cucumber**	
	810	17.0	110	12.1	700	**Water cucumbers**	
	1895	14.7	95	31.0	1800	**Watermelon**	
	2152	23.5	152	34.5	2000	**Promotion**	
	250	7.7	50	3.4	200	**Eggplant**	
100		6448	100	648	100	total	

2.16 Summer vegetable crops

Such crops include (okra, water cucumber, cowslip cucumber, melon, Ruki, eggplant).
The total area invested in summer vegetable crops in the region amounted to (6448) dunums, and these areas were distributed to administrative units in the Zubair region, and the Zubair district center received the highest areas planted with summer vegetables amounted to (5800) dunums, which represents (90%) of the total areas planted with summer vegetables in the region, while Umm Qasr district ranked second with (648) dunums by (10%) of the total areas planted with summer vegetables in Zubair province (Table (8)).

3 Results and conclusion

1-the suitability of natural factors for the cultivation of all crops, so the exploitation of arable land should be expanded by planting it with different types of crops, which contributes to meeting the needs of the market for various agricultural products, and then reduces the dependence of the region on imported products from other provinces.
2-the lack of manpower in the agricultural sector in the region, the reason for this decline is due to the tendency of farmers in the region to engage in other economic activities, as a result

of the low financial return from agriculture, and the competition of imported agricultural products characterized by low prices compared to local products.
3-agricultural mechanization in the Zubair region is not sufficiently available because its numbers are substandard, which leads to a low quality of agricultural production, due to the high prices of machinery and machines working in agricultural production.
4-the weakness of government support for this sector contributed to the reluctance of many to work in agriculture and resort to looking for other job opportunities due to high wages, which clearly reflected on the agricultural sector in the province of Zubair.
5-the areas already cultivated in the province of Zubair rely on irrigation by means of spray and drip irrigation technology only.
6-the study showed the small area actually cultivated compared to the arable areas, it amounted to (1.01%) of the total arable land, and the study also showed the lack of diversity of agricultural crops in the Zubair region and its dependence on certain crops, including grain crops by (40.6%) of the total cultivated areas in the region, palm trees and buckthorn by (9.5%), vegetables by (49.9%), the Zubair district center topped the largest cultivated areas followed by Umm Qasr district second

Recommendations:

1-investing the available natural and human resources in the region in order to strengthen the agricultural sector and preserve the agricultural potential.

2-strengthening government support by providing farmers with agricultural production requirements, including chemical fertilizers, pesticides and improved seeds.

3-encouraging and motivating farmers to apply agricultural cycles appropriate to the prevailing soil quality, to preserve its fertility.

4-providing improved seeds of high quality to farmers by the Ministry of Agriculture at affordable prices, with the aim of increasing agricultural production.

5-importing various agricultural machines and renting them to farmers at affordable prices, to facilitate the introduction of modern technology in agricultural operations in the region concerned.

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