

## **The (spatial and economic) feasibility of fish farms in Anbar Governorate / a study in economic geography**

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### **Abstract:**

This research aims to estimate the spatial and economic feasibility of fish farms in Anbar Governorate in Iraq. The research is dealt with from the perspective of economic geography, where the spatial and economic factors affecting the development of the fish farming sector in the region are analyzed. The availability of water resources, suitable land and available infrastructure is assessed, in addition to analyzing the costs of establishing and operating farms and their expected economic benefits. The research methodology includes a field study of fish farms in the governorate, where their economic performance is analyzed and their impact on the technological balance of payments is evaluated. The comparative study will be used to compare the performance of fish farms in the region with other types of farming, and will also rely on economic analysis to assess the financial returns and economic benefits of investing in fish farms. It is expected that the results of this research will contribute to understanding the importance of developing the fish farming sector in Anbar Governorate and identifying opportunities and challenges related to this sector. The research will also provide guidance and recommendations to those concerned with the development of this sector, and contribute to enhancing the economic and environmental sustainability of fish farms in the region.

The research showed that the revenues of the ponds in the study area were highest in Karma, followed by Al-Qaim, then Saqlawiya, Fallujah and Al-Khalidiyah (483,840 - 20,232 - 11,520 - 10,800 - 8,460) million Iraqi dinars, and the production costs were the highest in Al-Karmah is followed by Al-Qaim, Saqlawiya, Fallujah, and Al-Khalidiya, respectively (- 4,884 - 11,943.6 - 2,086.8 - - 2,664- 2,841.6) million Iraqi dinars, so profits were higher in each of Al-Karmah And Saqlawiya, Fallujah and Al-Khalidiya, respectively (- 15,348 - 36,440.8 - 6,373.6 - 8,136 - 8,678.4) million Iraqi dinars, and this indicates that the basins are economically feasible as they are profitable Throughout the breeding season as a

result of the appropriate climatic conditions and the absence of diseases in addition to the technical expertise of fish breeders in the study area.

## **1- the introduction**

Fish farms are considered one of the important and pivotal agricultural activities in developing the agricultural sector and achieving environmental sustainability in Anbar Governorate. This study aims to assess the spatial and economic feasibility of establishing fish farms in the governorate from a geo-economic perspective. Geographical economic analysis is an important tool for understanding the relationship between place and economy, and thus helps in making effective decisions in directing investments and identifying suitable locations for fish farms.

The researcher aims to shed light on the importance of this research and its objectives, in addition to reviewing the methodology used and clarifying the expected benefits of the study. The study will be based on a comprehensive analysis of the spatial and economic factors affecting the establishment and operation of fish farms, including the appropriate location, infrastructure, expected costs and revenues, and the economic impacts on the local community.

This research provides an overview of the importance of the study and an introduction to the main concepts that will be explored in future research. The coming chapters will provide a comprehensive analysis of the spatial and economic factors affecting the feasibility of fish farms in Anbar Governorate, and the results of the study and its recommendations regarding investment in this important sector will be presented.

### **1-1- Research problem**

Anbar province suffers from challenges and problems that negatively affect the development of the agricultural sector and the local economy in general. Among the most prominent of these problems are the lack of fresh water resources, the high costs of establishing and operating traditional farms, the deterioration of water quality and its pollution, in addition to the lack of investments directed towards the agricultural sector and the provision of job opportunities for the local community. All these challenges affect the feasibility and financial sustainability of fish farm projects in the province.

Therefore, the research problem in this study is to determine the feasibility of establishing fish farms in Anbar Province, from a spatial and economic point of view, and the extent to which this sector can contribute to the development of the province and improve the technological balance of payments. This requires a comprehensive analysis of influencing factors and a careful assessment of the costs and benefits associated with operating fish farms and the economic and social impacts of this sector in the governorate.

By defining and understanding the research problem, the study will be able to provide a comprehensive analysis of the effects of technological knowledge on the dynamics of the technological balance of payments in Anbar Governorate, and thus provide valuable references and recommendations to help make informed decisions and enhance the fish farming sector in the province.

## **1-2- research importance**

The importance of this research comes from the need to achieve sustainable development in Anbar Governorate, and to promote economic and environmental sustainability in the agricultural sector. Fish farms contribute as one of the sustainable and innovative options in the development of aquaculture, as they are considered a sustainable source of food, income and employment. In view of the strategic geographical location of Anbar Governorate and the availability of large water resources such as the Euphrates River, the establishment of fish farms is a strategic step to enhance the local economy and provide job opportunities for the local community. It also contributes to improving the technological balance of payments and reducing dependence on fish imports.

Providing an accurate analysis of the feasibility of fish farms in Anbar Province can contribute to identifying sustainable investments and directing public policies to promote this sector. The research can also contribute to highlighting the benefits of hydroponics and the technology used in it, and raising awareness of the importance of sustainable agricultural practices. In addition, the research is considered a valuable scientific contribution in the field of economic geography, as it contributes to understanding the spatial and economic interactions of fish farms in Anbar Governorate and their impact on the environment and sustainable development.

### **1-3- Search target**

This research aims to achieve several main goals:

Estimating the spatial feasibility of fish farms in Anbar Governorate, through the analysis of the geographical, environmental and economic data of the region. The available water resources, land availability, environmental sustainability and economic cost of establishing and operating fish farms are evaluated.

Estimating the economic feasibility of fish farms in Anbar Governorate, through analyzing the financial costs and benefits associated with establishing and operating farms. This includes estimating costs for the required infrastructure, equipment and technology, as well as estimating expected revenues from fish sales and other economic benefits related to the sector.

Analyzing the impact of fish farms on the technological balance of payments in Anbar Governorate, by analyzing the economic impact of local production and reducing dependence on fish imports. The impact of this sector on foreign trade and the trade balance of the province is analyzed.

Analyze the impact of fish farms on environmental sustainability in Anbar Governorate, by assessing their impact on water resources, biodiversity and ecological balance in the region. Sustainable agricultural practices are analyzed and recommendations are made for environmental conservation and sustainable development of the fish farming sector.

By exploring these objectives, the research aims to provide valuable and accurate information related to an important part of the fish wealth and also important in studying the geography of the period at the level of the governorates of Arabia and Iraq.

### **1-4- research assumes**

This study assumes that the development of fish farms in Anbar province will have a positive impact on the spatial and economic aspects. It also assumes that the availability of water resources, suitable land and adequate infrastructure will contribute to the success of this sector and increase economic returns. The study also assumes that fish farm investments will contribute to improving the technological balance of payments and

promoting economic development in the region. These hypotheses are analyzed according to the available data and information and the economic and geographical analyzes required in the research

## **1-5- Research Methodology**

This study will use an integrated methodology that includes the following steps: Data collection: The necessary data will be collected from various sources, including previous studies, available reports, and official sources. It will include geographical, economic and environmental data related to Anbar Governorate and the fish farming sector. Data analysis: The data collected will be analyzed using appropriate analytical tools. Geo-economic techniques will be used to analyze the spatial and economic factors affecting the viability of fish farms. Economic analysis will also be used to estimate the financial costs and benefits related to the sector. Then the case study: An applied study will be conducted on the companies registered in the Iraq Stock Exchange operating in the fish farming sector in Anbar Governorate. The financial and operating data of these companies will be collected and analyzed to assess the feasibility and impact of cloud accounting on their performance and budgets.

## **2-search area**

The research area revolves around Al-Anbar Governorate in Iraq, which is considered one of the areas of great interest in the field of fish farming. Anbar Province has rich water resources and a suitable environment for the development of the fish farming sector. The spatial and economic feasibility of fish farms in this region will be analyzed, based on local geographical and economic factors.

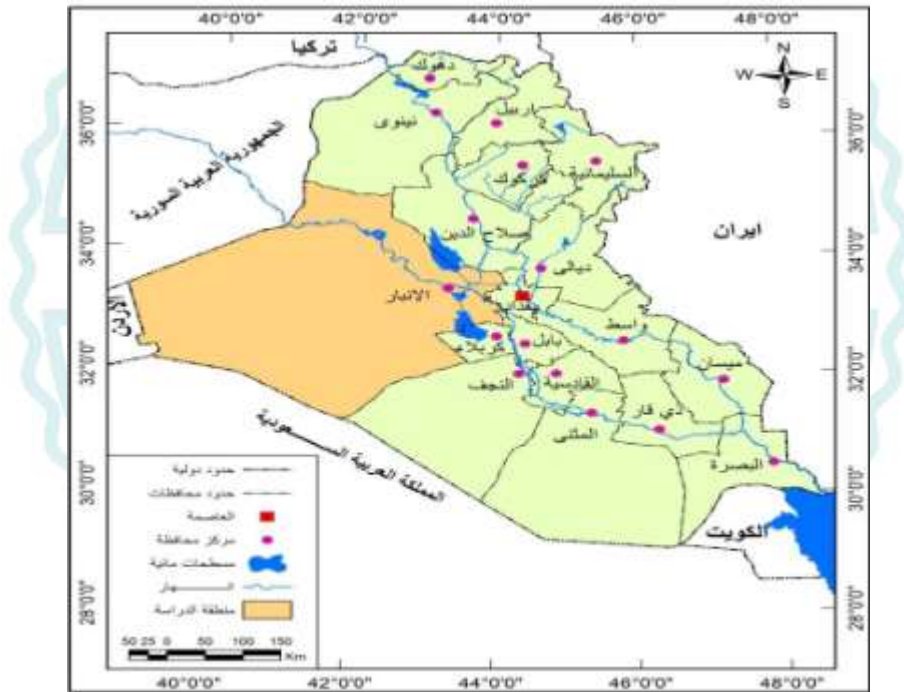
Specifically, the focus will be on the economic and spatial environment of fish farms in Anbar Governorate, including spatial analysis of available water resources, economic analysis of costs and benefits of establishing and operating farms, and analysis of the impact on the balance of payments of technology in the region. Existing fish farms in the region will be studied and their economic performance and impact on environmental sustainability will be analyzed.

This region provides an appropriate context for the feasibility study and economic analysis of fish farms, and provides an opportunity to identify potential improvements and development of the sector in this important region of Iraq.

### search limits

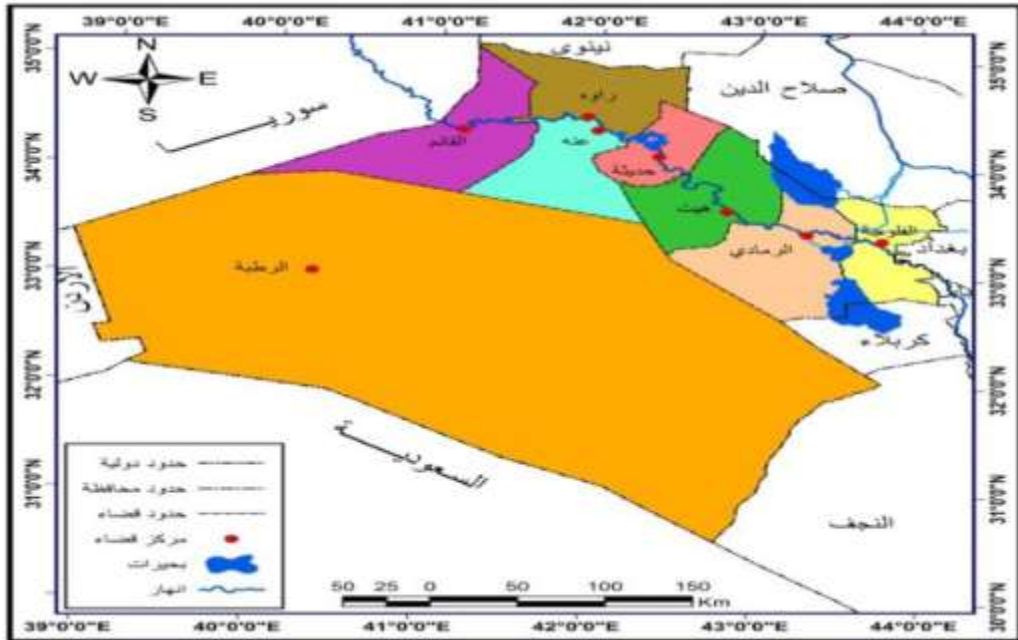
The borders of the region (the research borders) are represented by the administrative borders of Anbar Governorate, as shown in Map No. (1) and its administrative units included in the study, as shown in Map No. (2)

Map (1) the location of the Anbar Governorate of Iraq



Source: Ministry of Irrigation, General Commission for Survey, Administrative Map of Iraq; scale 1: 1,000,000; for the year 2022

Map (2) the administrative units in Anbar Governorate



Source: Ministry of Irrigation, General Commission for Survey, Anbar administrative map, scale 1:1,000,000 for the year 2000.

### 3- Practical study

#### 3-1-Earthen ponds

It is a body of water designed in such a way that the water contained within it can be completely drained easily, while the basins that cannot control the water drainage completely cannot control its production. Breeding fish in earthen ponds is one of the methods of fish farming, which is characterized by low production costs due to the fact that fish obtain their nutritional needs or the bulk of them from the nutrients available in the water of the earthen pond, which can be developed through natural or chemical fertilization of these ponds.

The method of raising fish in earthen ponds in large areas of land and providing the necessary water for it is characterized by a simple management method that does not require much experience from the producer in exchange for low production costs

represented mainly by saving feeding costs, which represent the largest part of operating costs. It becomes economically unfeasible, especially with the high value of land suitable for fish farming and the rationalization of water consumption (2) This method is based on the freedom of the breeder to choose the site and determine the area within the controls decided by the official inspection committee from the Directorate of Agriculture, which is one of the requirements for granting the government license.

The method of transporting young fish to the pond at the beginning is by special cars after the pond is wrapped with nylon and quantities of clean water are placed to ensure that the fish do not die during the transportation distance to the pond, or the fingerlings are transported in nylon bags after a third of the bag is filled with water and oxygen is pumped into it in the form of bubbles; And the location of the basin must be close to the Euphrates River, as water is indispensable to sustain the life of fish, and the basin water is constantly increased when it decreases due to the evaporation factor and the earth's absorption of it. Earthen ponds are one of the old traditional methods that were and still are used in breeding operations, but they are useless due to the problems facing the breeder in the event of their use, including (providing an appropriate water share; maintaining ponds, unforeseen deaths from diseases, thefts, birds, and other obstacles) on the one hand. And it is not economically feasible due to the high operating costs on the other hand, as the productivity of one dunam of ponds is estimated to be about one ton of fish during one breeding season if the environmental conditions are ideal, and this is difficult to obtain. 8) months compared to other breeding methods.

As for the distribution of earthen ponds in Anbar Governorate, Table (1), Map (3) and Figure (1) illustrate this. losses in each basin (5%); As for the production of each tank during (6) months, it is (3.75) tons, and the weight of the fish during (6-8) months is (2.5) kg; As for the source of obtaining fingerlings, it is from a family source, which is the Radwaniya hatchery. As for the water area of the second field, it is (50) dunums and consists of (56) ponds. The capacity of each pond in the two fields is (7,500) units of fingerlings. As for the price of fingerlings upon purchase, it will be (2800) Iraqi dinars, and the cost of establishing the basin from purchasing water pumps and equipment for the basin amounts to (160,000,000) twenty million Iraqi dinars, while the cost of electricity amounts to (2.000.000) thousand Iraqi dinars per month, and the wages of the car



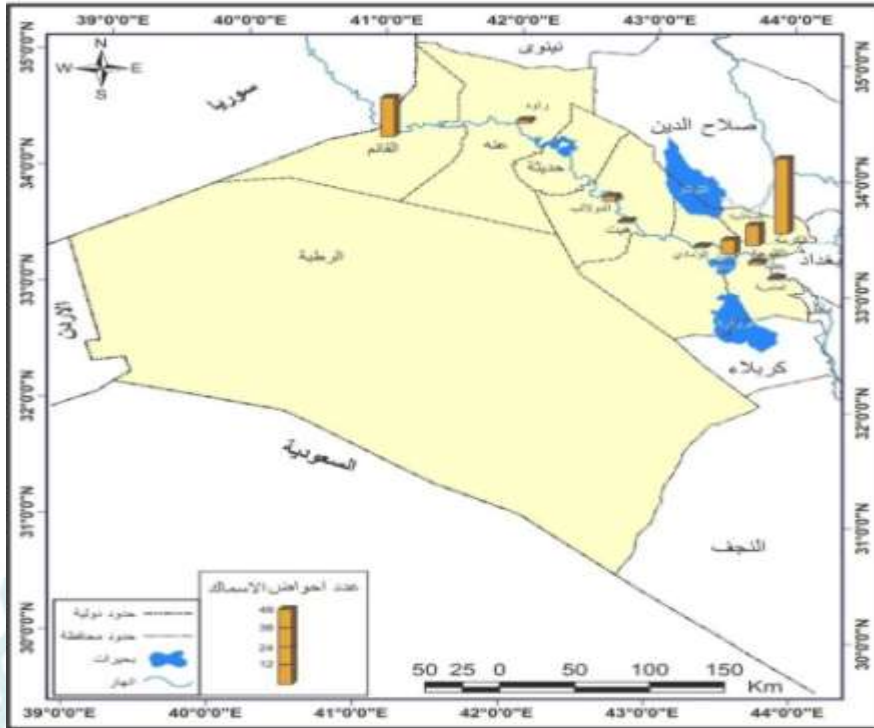
designated for transporting fingerlings amount to (800,000) Iraqi dinars for every (900) kilograms of fish. The selling price is (48,000) Iraqi dinars per kilogram.

Table (1) Geographical distribution of fish farming ponds and their production in Anbar Governorate for the year (2022)

Administrative unit	The number of basins	The ratio%	Water area / dunum	production quantity thousand / ton
Fallujah	96	١١	480	1800
grapevine	384	٤٢	2152	8069.6
Saqlawiyah	104	١٢	512	1920
Amriya	8	٠	60	0.16
Khalidiya	72	٧	376	1409.84
Gray	8	٠	60	0.16
cupboard	24	٣	136	509.84
Hit	8	١	60	0.16
Modern	16	-	60	0.16
about him	8	-	60	0.16
saw it	16	٢	60	1800
existing	200	٢٢	880	3300
humid	8	-	60	0.16
the total	920	%١٠٠	4776	18810.4

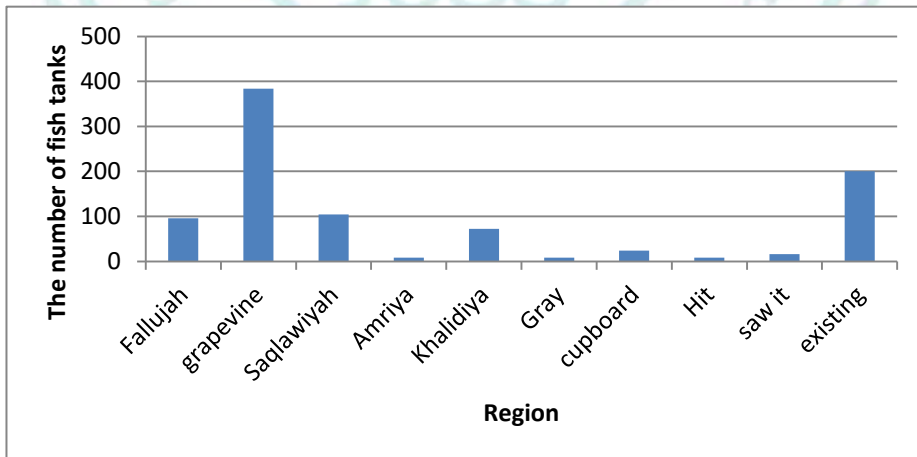
Source: Ministry of Agriculture; Anbar Governorate Agriculture Directorate; Livestock Division, Fisheries Division, unpublished data 2013.

Map (3): The number of earthen ponds in the study area for the year (2013)



Source: Based on Table (1)

Figure (1) Number of earthen ponds in the study area for the year (2022)



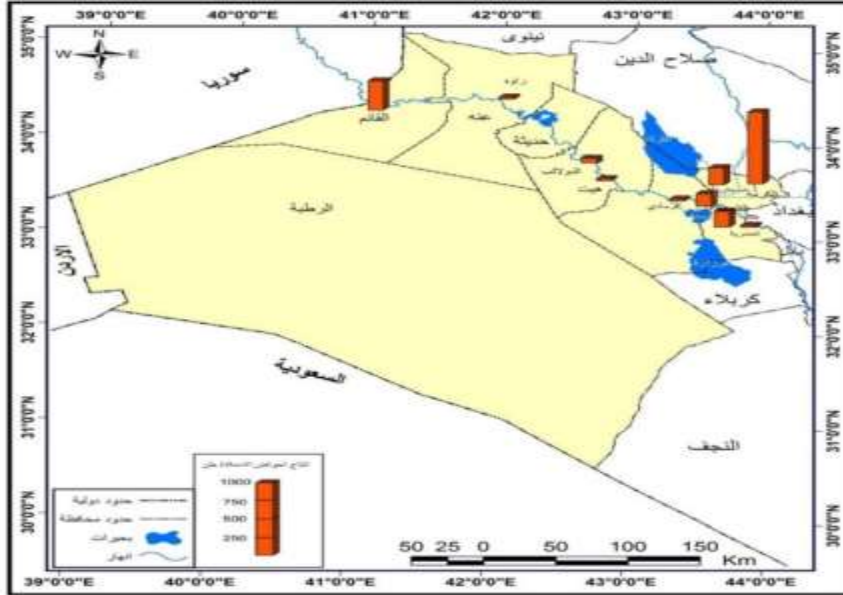
Source: Based on Table (1)

Map (3) and Figure (1) show that the number of earthen ponds in the Karma region is more than the rest of the other administrative units, as a result of the age of this activity and the accumulation of technical expertise. Then it was followed by Al-Qaim in the number of earthen basins, then Saqlawiya and Al-Khalidiya.

There are several problems that pond breeders face, including the lack of fodder and the lack or scarcity of electricity. The owners of these ponds prefer to fill them with water at night (5); As for the non-licensed ponds in Fallujah, their number is (320) ponds, and it is not possible to obtain information about them because their owners evade fearing the taxes imposed on them. As for Al-Khalidiya, the number of licensed ponds in them reached (9) ponds, the area of one of which is (7) dunums, and the area of two of them (10) dunums for each basin, and the area of the other basins is (3-5) dunums; As for the absorptive capacity, it ranges from (1000 - 1500) fingerlings per dunum. As for the ponds that are not legally approved, they number (56) ponds and their area ranges from (1-4) dunums per pond. As for the weight of the fish when sold, it amounts to (2.5) kilograms. (6); As for Karma, the number of ponds in it is (32) basins, and this indicates that there is no administrative unit in Anbar Province that matches Karma in this agricultural activity as a result of the age of this activity in it, the accumulation of technical expertise and the guarantee of profit. As for Al-Qaim, the number of approved ponds is 200, but they are not working due to the security and economic conditions that the country is going through, with the exception of only two ponds that are still operating until now. As for the unauthorized basins, there are (112) basins that have been filled in by their owners by order of the state (7); As for Haditha, there is no earthen basin in it, as it was all done by the state and its owners were referred to the law (595) because it is not officially authorized; As for Heet, most of the unauthorized earthen ponds have been filled in due to their water consumption and overrun of the water quota; As for the bypass ponds, there are (1) basins located on a high place and beekeepers use them for the purpose of raising water from low areas to high places. Its production is used for the purpose of meeting the needs of family consumption only, and the capacity of one dunum is (1000) fish; As for the weight of the fish during (6) months, it ranges from (2 - 2.5) kilograms; Fingerlings are obtained from the Essaouira hatchery in the form of worms, larvae, or two-day-olds, at a price of (2800) Iraqi dinars for one fingerling; It is noted that the amount of production throughout the study area is low compared to the number of

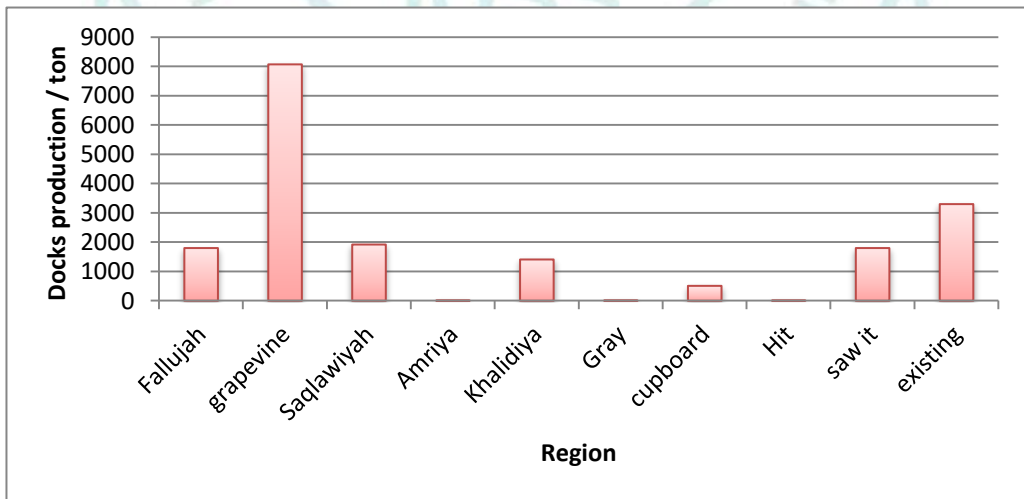
earthen ponds (46); Map (4) and Figure (2) show the amount of production in the study area.

Map (4) the production of earthen ponds in the study area for the year (2013)



Based on the table (1)

Figure (2) Earthen pond production / ton for the year (2013)



Source: Based on Table (1)

Map (4) and Figure (2) show that the production of ponds in Karma is higher than the rest of the production of fish ponds in other administrative units, followed by Al-Qaim, then Fallujah and Saqlawiyah, respectively.

### 3-2- floating cages

Rearing fingerlings means up to the weight of marketing in a closed space from all sides, and the space allows the movement of water to and from the cages. And more than one type of fish can be raised in it, as it produces (50) times more than the same water area of earthen ponds with no need for much labor, as well as for the ease of collecting and marketing fish, which generates a large profit, and also for the ease of daily observation, care, feeding and protection of fish from theft and from Natural enemies (birds, frogs, predators), and it is also a means of breeding fish in water bodies that are difficult to catch due to the nature of their lands, ease of fishing, examination, control, and easy modification and expansion. On the ground, as the sizes of cages start from (1 - 5000) m<sup>3</sup>.

There are conditions for choosing the appropriate location for the floating cages, which guarantee the success of the project and its operation at the lowest costs, which are:

The first condition: the temperature that depends on the air temperature and salinity is not important for fresh water, and making sure of the industrial waste that is thrown into the running water at the site even if the distances are far from the site of the fish projects. Oxygen and some toxic compounds are one of the reasons for the failure of the project, such as the growth of algae, which directly affects the rate of oxygen and the speed of water exchange or water currents in the site.

The second condition: it is full of depth, as the fish must be far from the bottom of the water body at a safe distance of (0.5 - 1) m, and the preferred depth of the water body is between (4 - 6) m, and the cages must be protected and in locations not affected by waves or winds .

The third condition: It is represented in obtaining approvals within the legal conditions for installing cages in water bodies and ease of access to the site for the purpose of management, monitoring and proximity to markets, in order to deliver the product to the markets or the requirements of the project.

Cages can be placed in any water body, whether it is a stream, river, lake, or canal. Despite the difference in the nature and quality of its water, the water specifications that are considered more suitable for this purpose are that its temperature is from (20-24) m<sup>5</sup>; And the percentage of dissolved oxygen in it (10-6) parts per million; The pH number is from (7-8), and the ammonia concentration is less than (0.4) ppm; It shall be free of any kind of pollution, and the depth shall not be less than (1.5) m; And to be renewable and current speed from (5 - 10) m / sec.

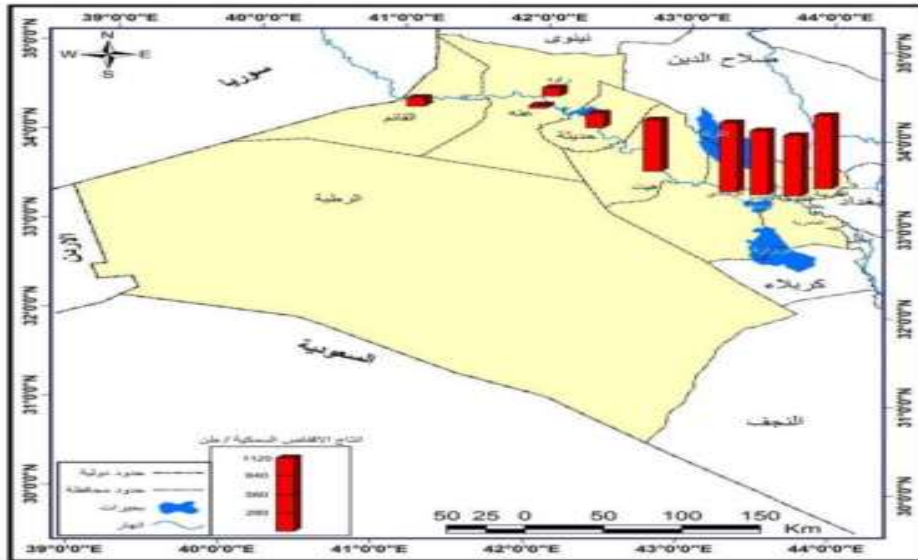
As for the distribution of cages within the borders of the study area, Table (2) and Map (5) show that the number of cages within the borders of the study area is (6.400) cages, and this number is still small compared to the availability of natural geographic characteristics represented by the Euphrates River and the streams attached to it; As well as the availability of manpower and the presence of many people with financial ability within the population of the governorate. In terms of comparison of the administrative units, the number of cages and the level of their production, it will be little compared to the level of need of the population and the successive increase in it, as the general rate of production per cage is (7.6) tons per year.

Table (2): Geographical distribution of licensed fish farming cages and their production in the study area during the year (2013)

Administrative unit	number of cages	water area	Production quantity / ton	The ratio	Carrying capacity / fish
Fallujah	1080	25920	7401.6	17	1944
grapevine	1.28	30720	8960	21	2304
Khalidiya	1120	26880	7782.4	18	2016
Gray	1216	29184	8464	20	2188.8
Hit	960	23040	6282.4	15	1728
Modern	280	6720	1744	4	504
about him	80	1920	329.6	1	144
saw it	160	3840	1004	2	288
existing	224	5376	1040	1	403.2
humid	-	-	-	-	-
the total	6400	١٥٣٦٠٠	٤٣٠٠٨	100%	11520



Map (6) Production of fish cages in the study area for the year (2013)



Source: Based on Table (2)

### 3-3- economic costs

It is the sum of the value of what is paid for all resource services used in the production process (11). Fish is one of the most important cheap sources of protein that must be invested and increased in production to reduce the demand for other animal products, as it provides (24%) of animal protein, while other types of meat provide (40%). It is also one of the important development fields due to the fact that it constitutes an important economic source that contributed to raising the value of the domestic product and developing the food industry, as well as the contribution of fish wealth to enhancing the country's food security, despite the availability of great potentials for water resources in Iraq and the appropriate environmental conditions for fish farming and breeding. However, the fish wealth suffers from a clear decline in production compared to the increase in demand for it, and one of the main reasons for this decline is the high production costs, which indicates a decline in the efficiency of the use of economic resources, so it is necessary to study production costs in order to reach the optimal size of fish farms in the study area . From the analysis of table (3) it is clear that the total cost of



producing one dunum amounted to (44,400,000) million Iraqi dinars within the limits of the study area.

Table (3) The total costs per dunum for the fish farming project in the study area for the year (2013)

cost items	quantity or number	cost value	The ratio %
Feeds	4 tons	6600000	15
fingerlings	1500	4200000	10
salt	-	160000	0
worker or guard within one month	1	4000000	9
Transport	one ton	800000	2
fuel	one barrel	1280000	3
other costs		960000	2
Land rent	per acre	8000000	18
pit pits	per acre	8000000	18
Gate installation	-	2400000	5
water pump	1	8000000	18
the total	-	4.440.000	100%

Source: Based on the questionnaire in the study area.

Table (4), map (7) and figure (3) show that the revenues of the basins in the study area were highest in Al-Karmah, followed by Al-Qaim, then Saqlawiya, Fallujah and Al-Khalidiyah (-48,384-8,460- 11, 520- 10, 800 -20.232), respectively.

Table (4) Costs and revenues of fish farming ponds in various regions of Anbar Governorate (million dinars)

Administrative unit	production / tons	actual revenue	production costs	profit
Fallujah	1800	10800	2664	8136
grapevine	8064	48384	11943.6	36440.4
Saqlawiyah	1920	11520	2841.6	8678.4
Amriya	225.04	1350	333	1017
Khalidiya	1410	8460	2086.8	6373.2
Gray	225.04	1350	333	1017
cupboard	510	3060	754.8	2305.2
Hit	225.04	1350	333	1017
Rawa	225.04	1350	333	1017
existing	3372	20232	4884	15348
the total	17976	107856	26506.8	81349.2

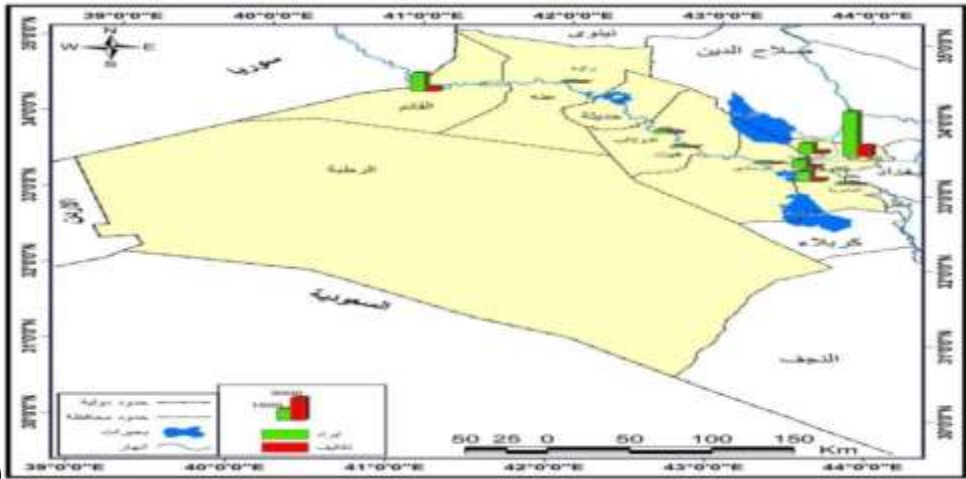
Source: Based on Table (1)

The average cost of a fish tank per acre was (44,400,000) Iraqi dinars.

$$\text{Revenue} = \text{Price} * \text{Quantity} \quad (12)$$

$$\text{Profit} = \text{Revenue} - \text{Costs}.$$

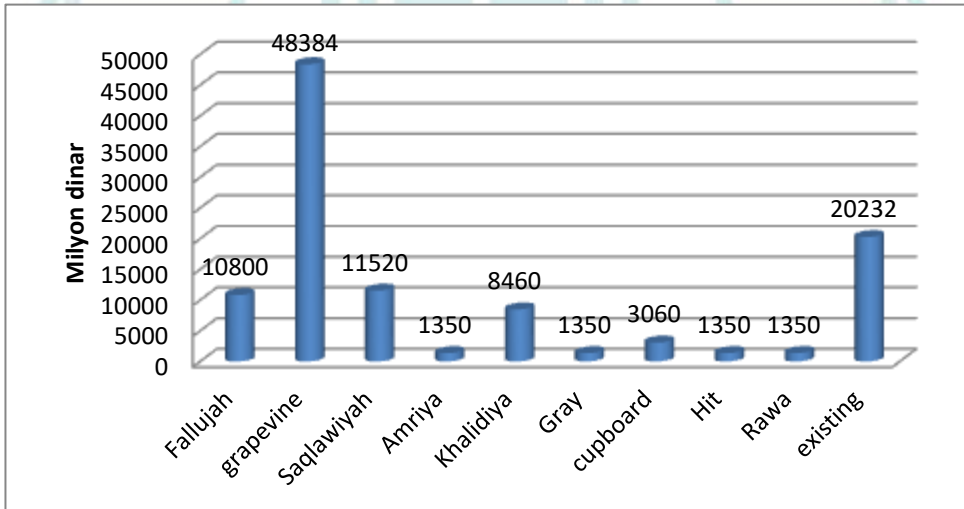
Map (7) Costs and revenues of fish farming ponds in Anbar Governorate for the year



(2013)

Source: Based on Table (4)

Figure (3) Distribution of fish pond revenues in Anbar Governorate (million dinars)

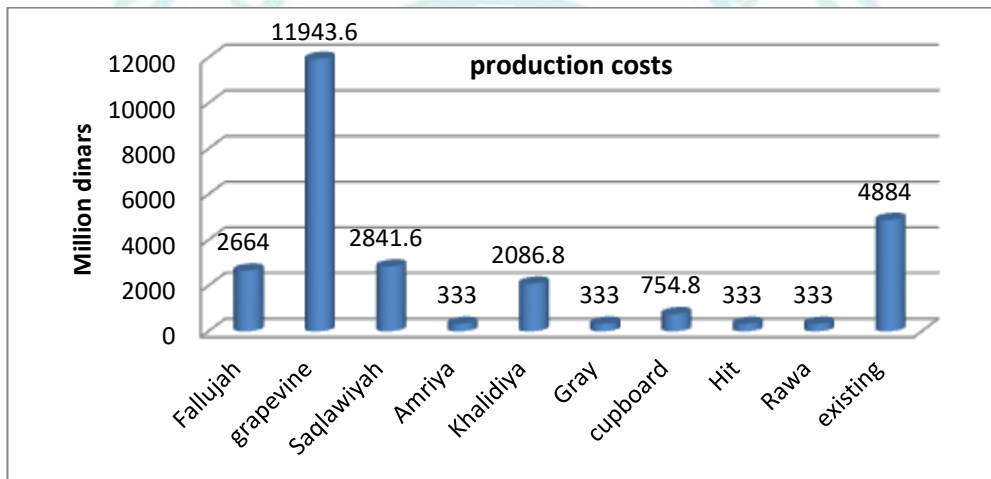


Source: Based on Table (4)

From Figure (3), we find that the highest revenues were achieved in Karma, and exceeded (6) billion Iraqi dinars; Then it was followed by Al-Qaim, and the volume of revenues amounted to (20.232) billion Iraqi dinars, while we find that the lowest revenues were found in Rawa, Heet, and Al-Amriya, which amounted to (1,350.4) million Iraqi dinars.

Figure (4) shows production costs in each of Al-Karmah, followed by Al-Qaim, Saqlawiya, Fallujah, and Al-Khalidiyah, respectively (2,086.8 – 2,664 -2,841.6 -4,884 – 11,934.6) million Iraqi dinars. Therefore, profits were higher in each of Al-Karmah, Saqlawiyah, Fallujah, and Al-Khalidiyah, respectively (6,373.6 -8,136 – 8,678.4 -15,348 -36,440.8) as a result of the appropriate climatic conditions and technical expertise, as shown in Figure (5). This indicates that the ponds are economically feasible as they are profitable throughout the breeding season as a result of the appropriate climatic conditions and the absence of diseases in addition to the technical expertise of fish breeders in the area. the study.

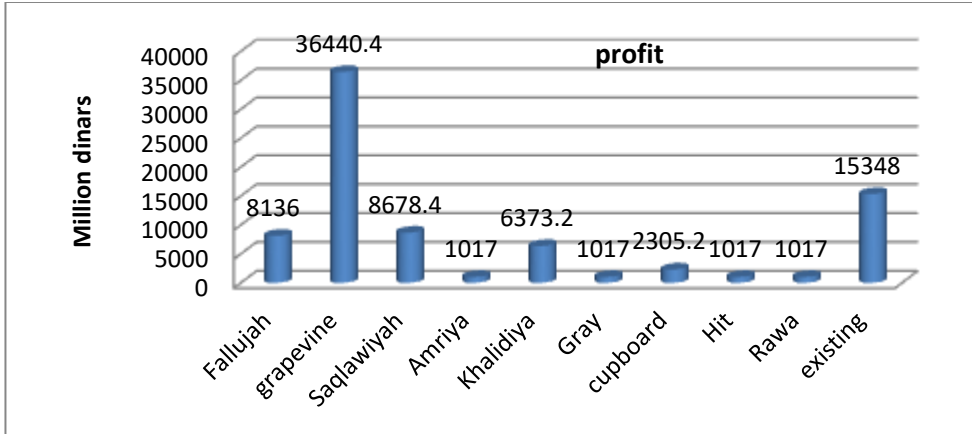
Figure (4) Distribution of fish pond production costs in Anbar Governorate (million dinars)



Source: Based on Table (4)

From Figure (4), we find that the highest costs were achieved in Karma, and exceeded (11.963) billion Iraqi dinars; Then it was followed by Al-Qaim, and the volume of costs amounted to (4.880) million dinars, while we find that the lowest costs were achieved in Rawa. gray heat; Al-Amriyah amounted to (333.8) million Iraqi dinars.

Figure (5) Distribution of profits from fish farming ponds in various regions of Anbar Governorate (million dinars)



Source: Based on Table (4)

From Figure (5), we find that the highest profits were achieved in Karma, which exceeded (36.٤٤) billion Iraqi dinars, then Al-Qaim, where the volume of profits amounted to (15.344) billion Iraqi dinars; While we find that the lowest profits were achieved in Rawa, Heet, Al-Ramadi and Al-Amriya, amounting to (1,016.8) million Iraqi dinars.

Table (5) the cost of establishing a cage with an area of (4 x 3 x 2) m<sup>3</sup>

Cost item for the cage	quantity or number	the cost
Feed (pelt)	115.2	5200
Kvyat	14400	21.600.000
Medicines or antibiotics	-	2000
The worker's wages for a month	8	4000
Transport	-	800
The cost of establishing the cage, equipment and nets	8	48.000.000
other costs	-	2000
the total	-	83.600.000

Source: field study

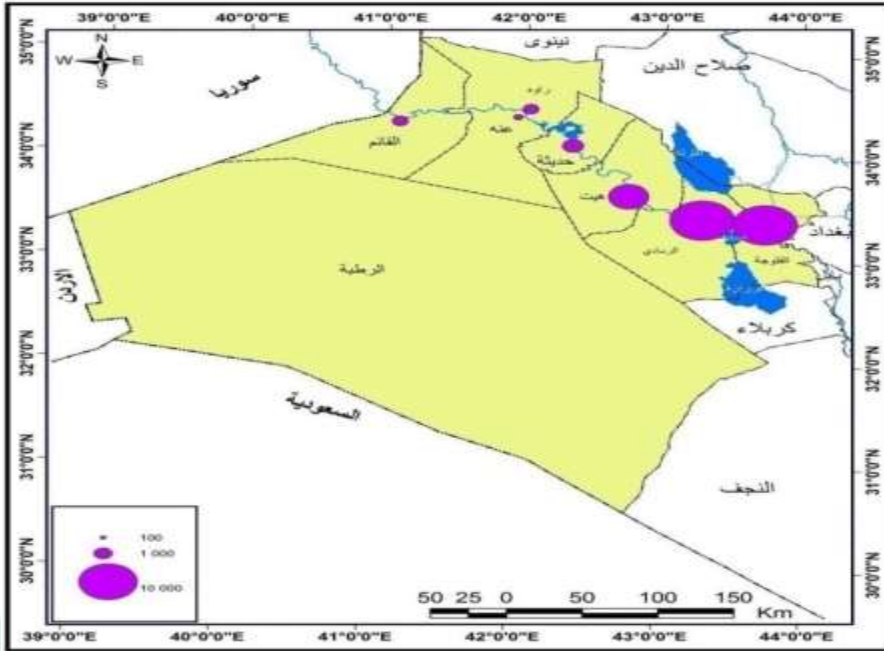
As for the costs of producing fish cages in the study area, Table (5) shows that the total costs of a cage with an area of (24) m<sup>3</sup> is (83,600,000) million Iraqi dinars. Table (6), Map (8) and Figure (6) show cage revenues within the area. the study; The revenues of the vine cages, Ramadi, Khalidiya, Fallujah, Hit, Anah, Haditha, Al-Qaim and Rawa amounted to (6.240 – 10.464 – 1,977.6- 37,694.4 - 44,409.6- 46,694.4 - 50,784 - 53,760 -) 6,024 million dinars, respectively.

Table (6) Costs and revenues of fish cages in various regions of Anbar Governorate (million dinars)

Region	output	Revenues	costs	profit
Fallujah	7401.6	44409.6	11288	33120
grapevine	8960	53760	13376	40384
Khalidiya	7782.4	46694.4	11704	34992
Gray	8464	50784	12704	38080
Hit	6282.4	37694.4	10032	27664
Modern	1744	10464	2926.4	7538.4
about him	329.6	1977.6	836	1141.6
saw it	1004	6024	1672	4352
existing	1040	6240	2340.8	3899.2
humid	0	0	0	0
the total	43008	258048	66880	191168

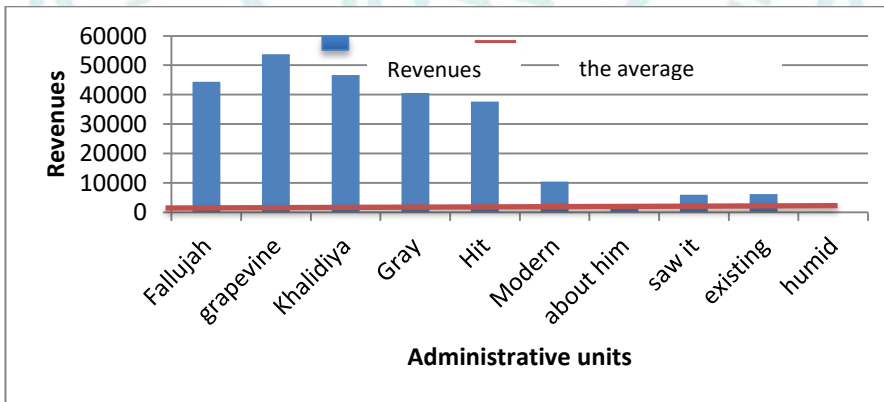
Source: Based on Table (2).

Map (8) Distribution of cage revenues in Anbar Governorate for the year (2013)



Source: Based on Table (6).

Figure (6) Revenues from cages in Anbar Province for the year (2013)



Source: Based on Table (6)

The average cost of a fish cage was (83,600,000) Iraqi dinars

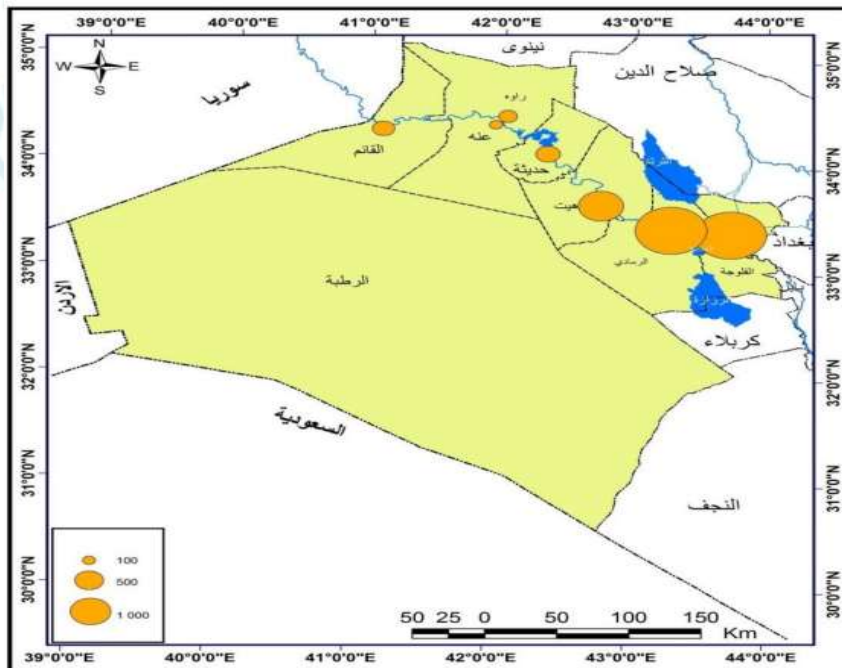
$$\text{Revenue} = \text{Price} * \text{Quantity}$$

$$\text{Profit} = \text{Revenue} - \text{Costs}$$

From Figure (6), we find that the highest revenues were achieved in Karma, amounting to (53,760) million Iraqi dinars; Then it was followed by Ramadi, with revenues amounting to (50,784) million Iraqi dinars. While the lowest revenues were recorded in Anah, amounting to (1,977.6) million Iraqi dinars.

While map (9) and figure (7) show production costs in floating cages within the borders of the study area, as the highest costs were recorded in Karma, Ramadi, Khalidiya, Fallujah, Hit, Haditha, Al-Qaim and Rawa (13,376 -12,704 -11,704 -11,288 -10,032 – 2,926.4 - 2,340.8 -1,672) million dinars respectively.

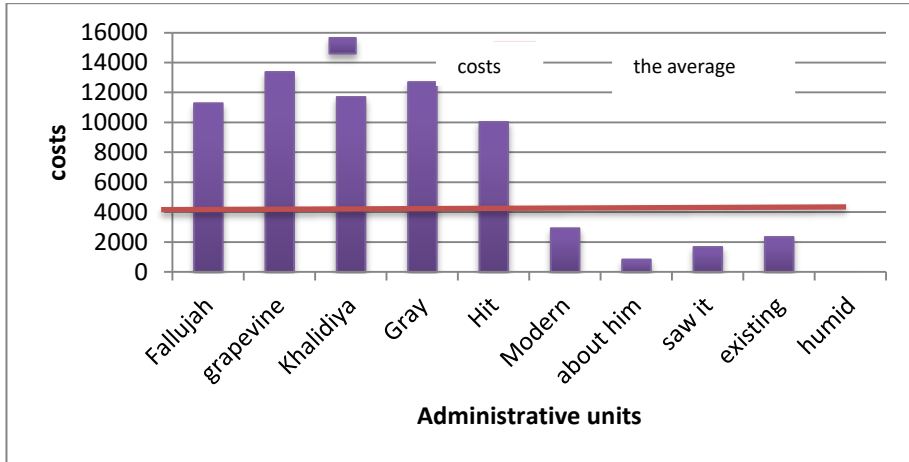
Map (9) Distribution of costs of floating cages in Anbar Governorate for the year (2013)



Source: Based on Table (6)



Figure (7) Costs of cages in Anbar Province for the year (2013)

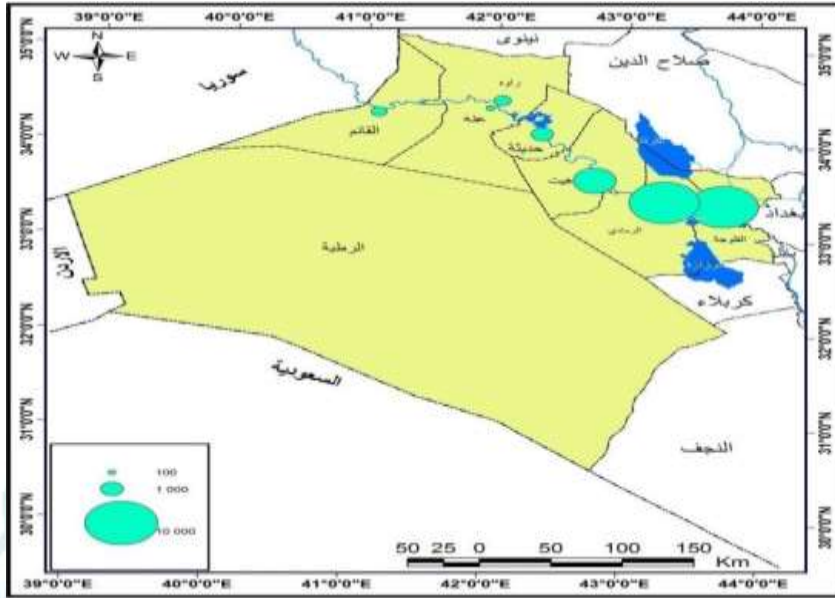


Source: Based on Table (6)

From Figure (7), we find that the highest costs were recorded in Karma and amounted to (13.376) million Iraqi dinars, then followed by Ramadi, where the volume of costs amounted to (12.704) million Iraqi dinars, while we find the lowest costs were recorded in Anah and amounted to (836) million Iraqi dinars.

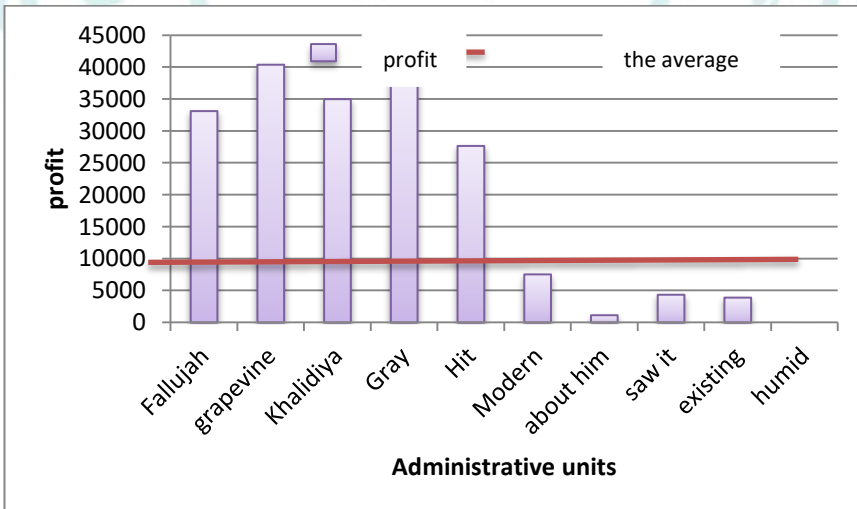
As for profits, they were higher in Al-Karmah, Al-Khalidiya, Fallujah, Hit, Haditha, Al-Qaim and Rawa, as they amounted to (40,386 - 38,080 -34,992 -33,120 - 27,664 - 7,538.4 - 3,899.2 - 4,352) million Iraqi dinars, respectively, as shown in Map (10) and Figure (8). For the rest of the floating cages within the borders of the study area, their revenues were high and their costs were lower. Therefore, these projects were profitable, but they needed support from the state. Therefore, it is necessary to raise the productivity of cages and ponds within the borders of the study area and in all administrative units, through holding seminars in order to guide educators on breeding methods. Modern fish and how to follow the optimal methods to raise efficiency by increasing the size of the water area to reach the optimal areas through the merger or participation between farmers.

Map (10) Distribution of profits from floating cages in Anbar Province for the year (2013)



Source: Based on Table (6)

Figure (8) Profits from floating cages in Anbar Province for the year (2013)



Source: Based on Table (6)

From Figure (8), we find that the highest profits were achieved in Karma, which amounted to (40,384) million Iraqi dinars, followed by Ramadi, as the volume of profits in it amounted to (38,080) million Iraqi dinars. While we find the lowest profits recorded in Anah amounting to (1,141.6) million Iraqi dinars.

## conclusions

The revenues of the ponds in the study area were higher in each of Al-Karmah, followed by Al-Qaim, then Saqlawiya, Fallujah and Al-Khalidiya (8,460 – 10,800 – 11,520 – 20,232 – 483,840) respectively, and therefore the profit in them is higher as a result of the appropriate climatic conditions and technical expertise.

Earthen ponds are feasible from an economic point of view, as they are profitable throughout the breeding season as a result of the appropriate climatic conditions and their absence from diseases, in addition to the technical expertise of fish breeders, as is the case in Al-Karmah, as their profits amounted to (36,440.4) million Iraqi dinars.

The floating cages projects had high revenues and lower costs within the study area. But it needs support from the state as well as the establishment of extension seminars in order to guide farmers on modern methods of fish farming.

## Recommendations

Holding seminars in order to guide farmers on modern methods of fish farming and how to follow the best methods to increase its efficiency by increasing the size of the water area in order to reach the optimal areas.

Establishing stations to collect seed from its natural sources, which supply fish farms with fish seed; Receipt of fingerlings and handcuffs from the official government agencies, in order to ensure their safety from diseases, as well as providing them at a subsidized price.

Paying attention to building floating cages that do not affect the water share because they are less expensive and easier to build than earthen ponds.

Formation of a fish extension agency that includes trained human cadres that provide fish breeders with the necessary directions and information in the field of aquaculture and to be a link between farmers and fish research centers.

Encouraging farmers to increase the volume of production and the water area in order to achieve economic revenues whenever it approaches the optimal size.

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