# Water Needs of Agricultural Crops in Al-Kafel Area

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## Abstract

The study area (Al-Kifl sub-district) is considered one of the agricultural aspects in Babil Governorate, and its irrigation depends on the Euphrates River and the streams branching from it (Al-Kifl and Bani Hassan) in addition to the prince's schedule that branches off from the Shatt Al-Hilla, as these tables are the main source for meeting the water needs of agricultural crops in The study area, as it is not possible to rely on rain because of its scarcity and seasonality, nor on groundwater because of its salinity. The most important finding of the study is that the Euphrates River and the irrigation streams that feed the study area do not work efficiently in preparing the actually grown crops with the water they need, as it became clear that their rates of consumption are not sufficient to irrigate the crops grown in most months during the year 2018, i.e. in January, February, March, April, May, June, July, August, September, October, November, and December) with a decrease of (2.2, 4,32, 4,72, 35,85, 3,66, 17,78, 6,34, 0.58 and 1.25) $m^3$ / s in each of them, respectively, while its sufficiency is observed during the months (May, September, October) with an increase of (2.72, 10.45 and 14.29) $m^3$ / s, respectively. . The research included the theoretical framework and three sections, as the first topic dealt with the natural factors affecting the water needs of agricultural crops in the Kifl side, while the second study was concerned with studying the nature of the irrigation and agricultural situation in the sub-district, and the third topic was concerned with studying the water needs of agricultural crops in the district and comparing it with the expense tables. The irrigation that it narrates and the water deficit, problems and reasons that called for insufficient irrigation schedules, with some solutions and proposals that would advance the irrigation situation in the district.

**Keywords:** The Area of Kafl, Water Consumption, Net Irrigation Needs, Total Irrigation Needs.

## Introduction

Water resources are among the most important natural resources, as they have a fundamental influence in the formation and formation of most of the components of life, and without them they are absent, as they are the basis of life for all living organisms and the essential factor for every activity, so it is not strange to find that man, since the dawn of creation, resorted to establishing his civilizations around the banks of rivers The constant flow and proximity of water sources, which formed the most important sites in attracting human settlements because they are suitable sites for the practice of its various activities, and since the economic value of water is constantly increasing, it must be rationalized with high efficiency by providing specific and optimal quantities of water as the exploitation of water requires increasing the efficiency of exploitation Reducing waste that depends on an accurate knowledge of the basic water needs of agricultural crops, and this is what research aims. This knowledge is the basis for the success of the agricultural sector, because a decrease in the amount of water during the growth period may cause a decrease in crop production, as well as any increase in irrigation water for a certain extent leads to waste Water increases production costs and affects soil properties and agricultural land drainage.

**Research problem:** The research problem is as follows:

1- What is the effect of natural factors on the water needs of agricultural crops in Al-Kifl area?
2- Do the water shares specified for the Euphrates River and the streams (Al-Kifl, Bani Hassan and Al-Amir) correspond to the water needs of the crops cultivated in Al-Kifl during 2018?

**Research hypothesis:**

To answer the research problem, the study assumed:

1- Natural factors have an effect on the water needs of agricultural crops in the area of Al-Kifl.
2- The water quotas set for the Euphrates River and the streams (Al-Kifl, Bani Hassan and Al-Amir) do not match the water needs of crops grown during 2018.

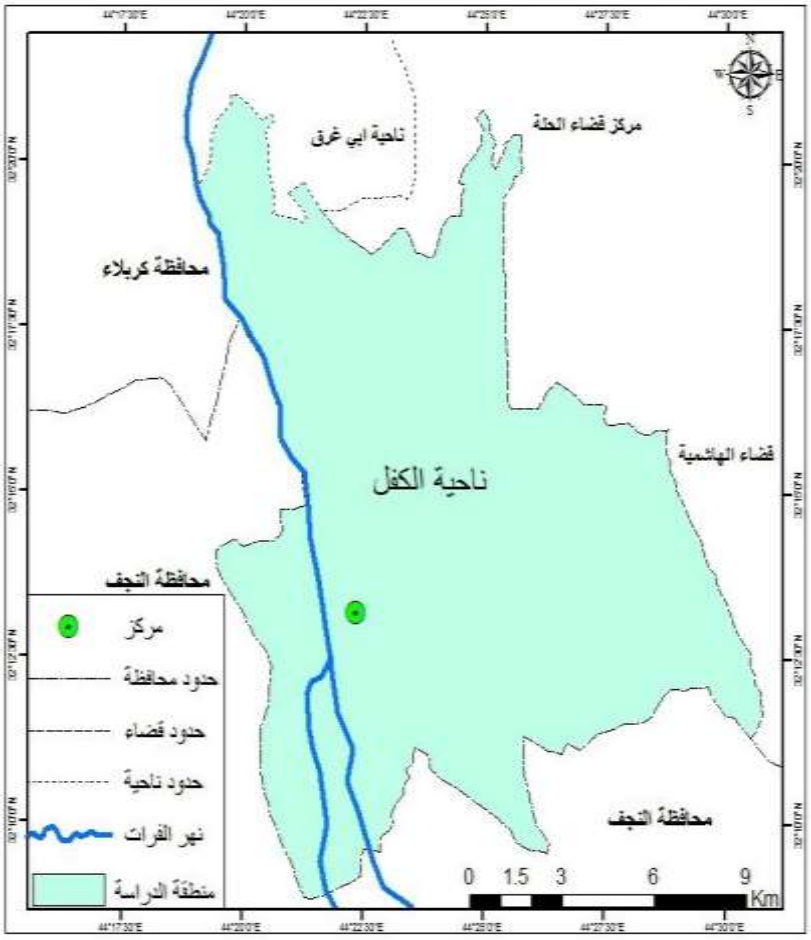
**The research structure:** The research structure included the theoretical framework and three sections. The first topic dealt with the study of the natural factors affecting the water needs of agricultural crops in the area of sponsorship, while the second topic was concerned with studying the irrigation and agricultural situation in the study area, and the third topic discussed the water needs of agricultural crops in an area studying.

The first topic: the natural factors affecting the water needs of agricultural crops in the area of Al-Kifl

First: Location and area: Al-Kifl sub-district is one of the sub-districts of Al-Hilla district in Babel governorate, as it is located between two latitude (35 = 06- 32-38 = 08-

32 degrees) north and two longitudes (16 = 18-44-11 = 34-44 degrees) To the east, it is bordered by Abu Gharq, to the north, the center of the Hilla district to the northeast, Karbala, to the northwest, to the east, the Hashemite district, and Najaf, to the south and southwest. Map (1), as for the area of the study area, it is (526) km2, and it constitutes (59.9%) of the total area of Al Hilla district, which is (878) km2 and about (10.2%) of the total area of Babil Governorate, which is (5119) $km^2$).

Map (1) Al-Kifl district location



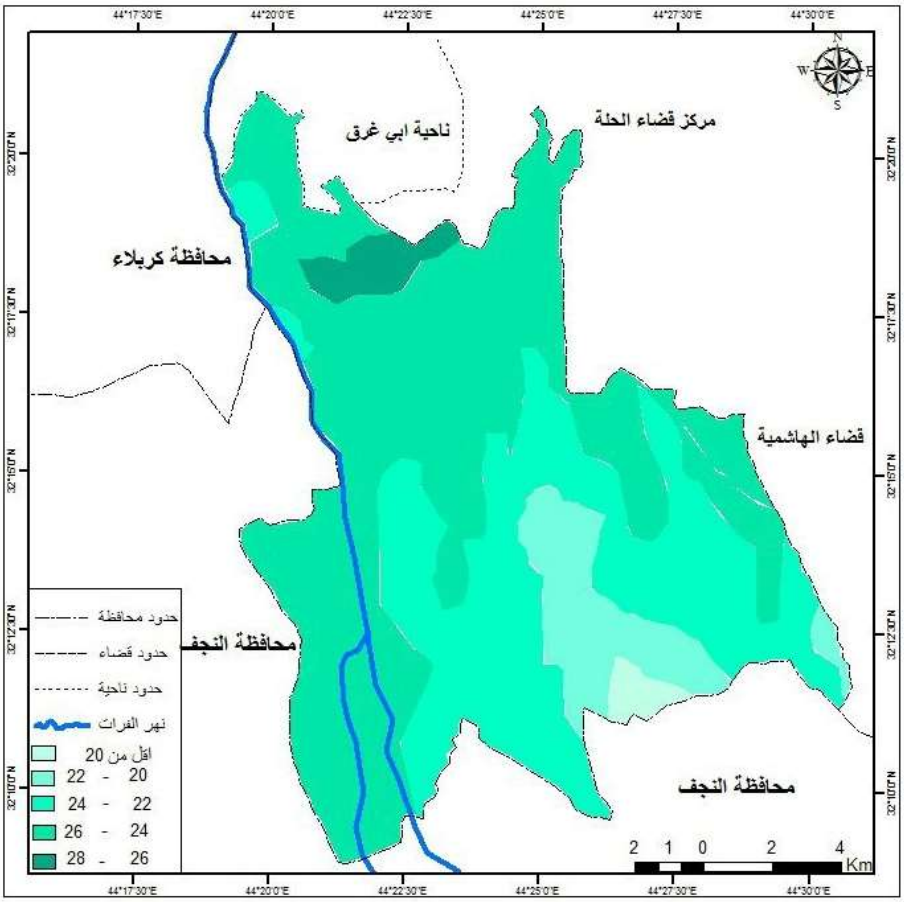

Source: - Republic of Iraq, Ministry of Water Resources, Directorate of Public Survey, Administrative Map of Babil Governorate, Scale 1: 250,000, 2016.

**Second:** The surface: the surface affects directly and indirectly on agricultural production, and the plains are one of the most important sections of the surface suitable for agricultural activity for the ease of conducting agricultural operations. The flatness of the surface also helps establish irrigation and drainage channels (2).

The study area is part of the sedimentary plain, which is the most recent part of the Iraqi surface in its composition, as it is characterized by the flatness of its land and it is clear from the map (2) that the highest levels of the surface in the study area are located in its northern part with a height ranging between (26-28) m, then the levels gradually decrease to Height from (24-26) m and the gradient in surface levels continues until it

reaches less than (20) m in its southeastern sections. This difference in elevation has a clear effect in the direction of the network of rivers and irrigation streams that irrigate the study area from the northwest to the south. The eastern, and the practice of the used irrigation methods and thus the rates of water shares, which greatly affects the values of the water needs of the crops grown in the study area.

Map (2) of the elevations in Al-Kifl sub-district




Source: Republic of Iraq, Ministry of Water Resources, Directorate of Public Survey, Maps Production Department, Map of Babil Governorate, topographic on 1/500000 scale, 1985.

**Third: Climate:** To know the effect of climate on estimating the water needs of crops cultivated in the study area, its components are studied according to the climate data of the neighborhood area for the period (2000-2018), and it is third: (solar radiation, temperature, precipitation, relative humidity, wind, evaporation, Factors: Solar energy is important and affects the water needs of the crop as a basis in the evaporation and transpiration process in addition to the transpiration process not only during lighting the period that is proportional to the amount of transpiration and this mainly depends on the radiant energy (3), and Table No. (1) Looks at The average annual hours of actual brightness in the study area reached during the years (2000-2018) to (8, 4) hours/day, where the highest actual brightness was recorded during July and August (11.4, 11.0)

hours/day Each, while the lowest solar brightness was maintained during December (6,0) hours/day.

Table (1) the monthly and annual averages of the climate elements in the study area for the period (2000-2018).

| Evaporation / mm | Wind speed m / s | Relative humidity%/ | Amount of rain / mm | Temperature / m | Solar radiation hour / day | the month |
|---|---|---|---|---|---|---|
| 3 , 54 | 6 , 1 | 1 , 72 | 9 ,8 1 | 2 , 11 | 1 , 6 | January |
| 1 , 79 | 8 , 1 | 8 , 60 | 4 ,2 1 | 9 , 13 | 1 , 7 | February |
| 9 , 136 | 0 , 2 | 8 , 50 | 9 , 10 | 3 , 19 | 6 , 7 | March |
| 7 , 180 | 2 , 2 | 5.0 4 | 8 , 11 | 2 , 24 | 9 , 7 | April |
| 1 , 255 | 2 , 2 | 9 , 34 | 8 , 3 | 7 , 29 | 1 , 9 | May |
| 0 ,19 3 | 5 , 2 | 9 , 29 | 0 , 0 | 5 , 33 | 6 , 10 | June |
| 4,7 33 | 4 , 2 | 5 , 30 | 0 , 0 | 3 , 35 | 4 , 11 | July |
| 9 , 300 | 7 , 1 | 1 , 32 | 0 , 0 | 7 , 35 | 1.0 1 | August |
| 4,9 23 | 6 , 1 | 1 , 37 | 3 , 0 | 9 , 31 | 9 , 9 | September |
| 5 , 155 | 4 , 1 | 1 , 45 | 5,1 | 3 , 26 | 9 , 7 | October |
| 2 , 79 | 3 , 1 | 9 , 64 | 2,1 2 | 1 , 18 | 9 , 6 | November |
| 5 , 57 | 5 , 1 | 3 , 68 | 20,0 | 9 , 12 | 6,0 | December |
| 3 , 182 | 9 , 1 | 6 , 47 | 7 , 8 | 3 , 24 | 4 , 8 | annual rate |

Source: the Republic of Iraq, Ministry of Transport and Communications, Iraqi Weather Authority, Climate Department, unpublished data, 201 201.

Temperature is a factor affecting the number of water resources, as it largely determines the amount of water flowing in rivers and the flow regime during the year (4). The data table reached above the average annual temperature in the study area (24,3) m, and the highest rates were recorded during the month of August, when it reached (35,7) m, while the lowest level recorded in January (11, 2) is considered rain from The most important aspects of precipitation that affect agricultural production, as it provides the water needed for plant life, as it represents 90% of the growing tissues in the plant, and its importance is measured by its actual value, i.e. the amount of water that the plant can benefit from in completing its life cycle (5). It is clear from the organization itself that the average annual rainfall does not exceed about (8.7) mm, with a height of (1,

22) mm in the third month of October, and then it appears in the third after these months of decline. And it stops during the hot season months (June, July, and August) due to the high temperatures and the high values associated with water residues through evaporation, and thus the increase in water consumption rates that greatly affect the water shares from irrigation schedules in the study area. As for relative humidity, it is one of the climatic factors that affect the growth of agricultural crops, as its decrease in the atmosphere leads to an increase in plant transpiration (6). Moisture harms or delays agricultural crops (7). The data refer to Table No. (1). The annual average relative humidity decreased in the study area (47, 6%), and this rate increases during the season of the cold year as a result of lower temperatures. D- Maternal fall rates fell at their highest rates during the month of December. (72% 1), while the relative humidity decreases during the hot season of the year, with the lowest rates recorded during December. June (29, 9%). With regard to wind, it is one of the climatic elements that affect the life of plants, and its effect varies according to their speed and types if they are very fast in breaking the stems of plants and removing them from their roots and dropping their leaves, flowers and even their fruits, while the fast and dry wind leads to severe evaporation and transpiration, which requires more water to replace lost moisture in plants ([8]). It is clear from the same table that the annual rate of wind speed in the study area reached (1, 9) m / s, and that the wind speed increases during the hot months of the year, to reach the maximum during the month of June (2, 5) m / s, but in The cold season, where November recorded the lowest wind speeds (1, 3) m / s, and evaporation is also one of the climatic factors that affect the water needs of water. Agricultural crops, because they serve to determine the amount of running water in rivers (9), but its effect is related to other factors (solar radiation, temperature, humidity, and winds (10). We can see from the table that the high evaporation rates during the hot season From its year, it reaches its highest levels in July (34.7) 3 mm, and this coincides with high temperatures and low humidity, which requires setting water quotas according to the needs of agricultural crops During the cold season of the year, low rates were recorded in January (54.3) mm.

**Fourth: Soil:** Soil is defined as a natural element in which food is available, and it is the basis of plant life and its continuity (11). Knowledge of its physical and chemical properties is of great importance in irrigation and agricultural production because it facilitates irrigation and improves the efficiency of agricultural irrigation (12) as for the soil in the study area it is divided into the following sections:

1- River streams soil: This soil appears in the study area along the Euphrates River. Map No. (3), which is characterized by good drainage for its height that ranges between (2-3) m above the level of the adjacent ground level (13), as it is characterized by a low internal water level (14), based on these characteristics, it is considered one of the best types of soil suitable for producing various agricultural crops.

**2-** River basins soil: This soil is located in areas far from river courses and irrigation channels. Map (3) is characterized by a decrease in the soil of the

shoulders of the rivers by about (2-3) m, which led to an increase in the groundwater level in it (15).

3- Marshlands and Marshlands: This type of soil is found in the south and some northern and central parts of the study area. Map (3) features the soil as salty soil due to poor drainage and the high water level of the internal manufacturing value of agriculture and clay (17).

Map (3) of the soil types in Al-Kafeel district


Source: Abdul-Ilah Razooqi Karbal, Green Vegetables, and their Future in Hilla, an unpublished master's thesis, College of Arts, University of Baghdad, 1967, p. 58- The second topic: The nature of irrigation and the agricultural situation in the Kifl region

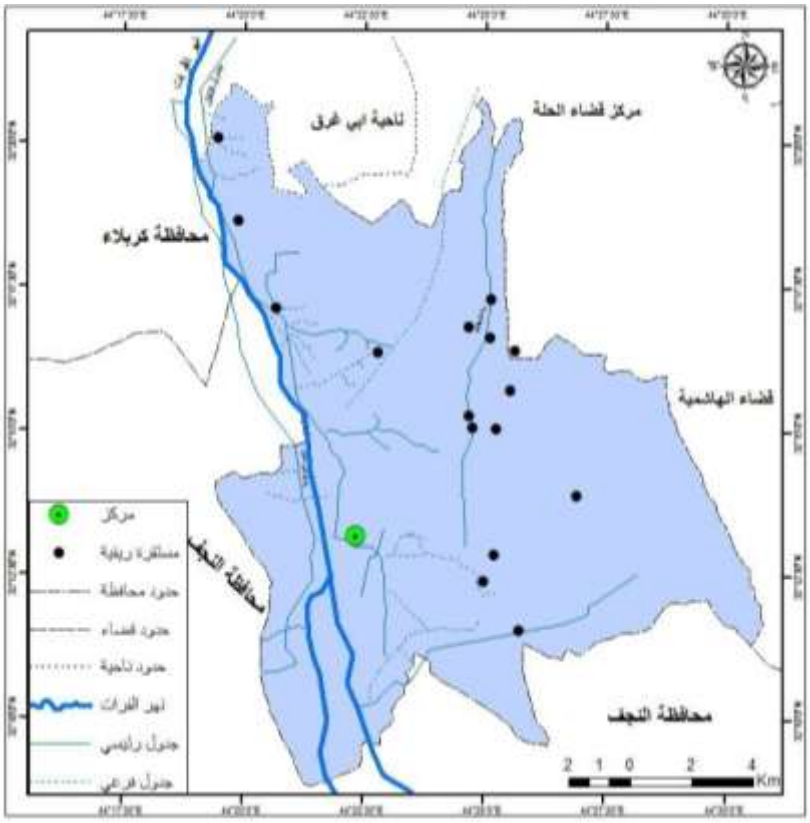
**First:** The nature of Al-Arawi's position on the aspect of sponsorship: the logic of the study of (clusters) Nu al-Ajji Farm in Babel Governorate

1- The Euphrates River: It is one of the water sources in the Al-Kafeel region, as it enters from the northwestern side, and its length reaches the study area (63) km and its course direction from the northwest too. South. Map No. (4) The irrigated area of the Euphrates River reached 8033 dunums (18) in relation to the convergence rates of the Euphrates, as shown in Table No. (2) For desertification rates. From the rural total of the Euphrates River and irrigation channels. The study area, where it was noticed that the data correlation rate of the Euphrates River is the total ratios and the actual

connection of the area to which it arrived, as the annual rate of river drainage reached (2 3, 1 2) m $^3$ / s. During the year 2018, when February recorded the highest rate at (25, 24) m $^3$/ s, while the second month of October recorded the lowest rate, by (2 1, 22) m $^3$/ s.

2- Care schedule: This schedule branches out from the left bank of the Euphrates River at a distance of 120 meters north of India Dam, and it is included in the tables attached to it. Map (4). The sponsor's schedule enters the al-Kafeel area from the northwestern section, and its length inside the area is 32 km, including branch (5) sub tables with a total length of (30) km with a drainage design of (2,496) $m^3$ / s in addition to the number of field outlets (137) is graduated from the timetable, while the area of land that depends on irrigation in the supported schedule is (42.734 dunums). (19).

Map No. (4) The river network and irrigation channels in the Al-Kifl area




Source: The Republic of Iraq, Ministry of Water Resources, Directorate of Water Resources in Babil Governorate, Map of Irrigation and Puncture Projects in Babil Governorate on 1/500000 scale, 2015.

Table (2) the total expenses of the Euphrates River and irrigation schedules in the area of Kifl in 2018.

| Bani Hassan schedule | Sponsorship schedule | Euphrates River | Months |
|---|---|---|---|

| ( m ) Level | ( s / m3 ) Discharge | ( m ) Level | ( s / m3 ) Discharge | ( s / m3 ) Discharge | |
|---|---|---|---|---|---|
| 30,56 | 8 | 31,20 | 10 | 23,84 | January |
| 30,37 | 7 | 31,11 | 9 | 24,25 | February |
| 30,50 | 12 | 26,31 | 14 | 24,24 | March |
| 30,83 | 14 | 31,51 | 19 | 23,97 | April |
| 31.00 | 13 | 23,00 | 9 | 23,05 | May |
| 30,90 | 12 | 31,50 | 10 | 22,81 | June |
| 30,90 | 12 | 31,50 | 10 | 23,56 | July |
| 30,80 | 9 | 31,22 | 9 | 23,63 | August |
| 30,75 | 8 | 31,15 | 8 | 23,28 | September |
| 30,56 | 8 | 31,00 | 8 | 67 , 1 2 | October |
| 30,50 | 8 | 31,00 | 8 | 22 , 1 2 | November |
| 30,50 | 8 | 31,00 | 9 | 93 , 1 2 | December |
| 30,68 | 9,91 | 30,12 | 10,25 | 12 ,23 | Annual Pain del |

Source: Directorate of Water Resources, Babil Governorate, Division of Water Indications, Unpublished Data, 9201.

With regard to the total data rate for the complex disbursement schedule, as shown in Table (2), the annual rate of conjunction with the sponsorship schedule during 2018 was (10, 25) m3/ s and the center (30.12) m. On the backside, where the month of April recorded the highest rate and value (19) m3/ s and (31, 51) m, while the index was only one month (September, October, and November). With a minimum and a rate of (8) m3/ s. As for the actual spending rates as shown in Table No. (3), the annual rate for the sponsorship schedule during the aforementioned year was (5, 08) m3/ s, as of April, the highest rate was recorded At (9,5) m3/ s.

3- Bani Hassan Stream: - This course takes its waters from the right side of the Euphrates River on km (602) km and enters the study area in the western section. Map No. (4) And its length (12) kilometers inside the sponsor side, from which (34) field outlets come out. As for the area that depends on this schedule, it has reached (20303) dunums within the Kafala area (20) in relation to the sanitation rates of Bani Hassan College, as the data refer to Table (2) for the annual rate. Brave Bani Hassan. The agenda during 2018 reached (9.91) m3/ s and (30, 68) m, which is clear from the same timetable. The month of April recorded the highest rate of (1) 4 m3/ s and at (30.83) m, while the lowest rate was recorded in February (7) m3/ s and at (30.37) m.

Table (3) Actual expenditures for irrigation schedules that pass through Al-Kifl for the year 2018

| Prince's ( t / m3 ) schedule | Bani Hassan ( t / m3 ) Schedule | Sponsorship ( s / m3 ) schedule | Months |
|---|---|---|---|
| 4,79 | 1,28 | 5 | January |
| 4,22 | 1,12 | 4,5 | February |
| 5,03 | 1,92 | 7 | March |
| 4,54 | 1,24 | 9,5 | April |
| 3,24 | 2,08 | 4,5 | May |
| 3,24 | 1,92 | 5 | June |
| 3,24 | 1,92 | 5 | July |
| 2,92 | 1,44 | 4,5 | August |
| 2,67 | 1,28 | 4 | September |
| 2,67 | 1,15 | 4 | October |
| 2,50 | 1,10 | 4 | November |
| 2,90 | 1,10 | 4 | December |
| 3,49 | 1,46 | 5,08 | annual rate |

Source: Water Resources Directorate, Babil Governorate, Water Impact Division, unpublished data 9201.

As for the actual rates of expenditures of the Bani Hassan schedule in the study area during the year 2018-2018, as can be seen from Table No. (3) that its annual average was (1,461) m3/ s, as it was the month of May. The highest rate was recorded (2, 08) m3 / s in the month of registration for the months of November and December, the lowest rate was (1, 10) m3/ s for each of them during the year.

4. The Emir's agenda: Ayman Shatt Al-Hilla branches on the (46,600) km and this table entered from the northern side, where it headed south. Map (4) and branches from both sides (17), sub-table (14), a table through which the sponsor passes, with a total length of (54, 27) km, and the land area is estimated at (36286). Acres) and drainage (5,256) m/ s, in relation to the actual rural desertification rates for the Emir's agenda in the study area during 2018, as shown in Table (2), the average age at (49, 3) M 3/ s, where the month of March recorded the highest rate (5), 03) m 3/ second, while the second month of October recorded the lowest rate and (2.50) m 3/ second, we conclude from the above

that there is a noticeable decrease in the expenses rates Water, river network levels and irrigation schedules serving the study area. Therefore, pumps have been relied upon to raise water to agricultural lands.

Figure (1). Pumps installed on the Euphrates River

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Second: The nature of the agricultural situation in terms of sponsorship: - Conditions for ensuring agricultural areas in Babil governorate with a total cultivable area (1 0940 1) dunums (58 82%) of the total size of the hand and (570) 186 acres ([22]) related to crops which are grown there and include: -

**1- Field crops are divided into:**

**A- Land under winter field crops (wheat and barley)**

1- Wheat: The wheat crop is considered one of the most important winter field crops. Table No. (4) Shows that the area cultivated with this crop amounted to (18299) dunums for the period (14-20-20). 2018), and that the area planted with wheat has fluctuated over the years. The above mentioned, where the maximum reached (22825) dunums for the agricultural season 15-20, and the lowest (16551) dunums for the 20-16 season.

Table (4) the areas cultivated with crops (dunums) in the study area for the period (2014- 2018)

| Forage crops | | Vegetable crops | | Leguminous crops | | | Summer field crops | | Winter field crops | | years |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Clover | Jet | Winter | Summer | The cattle | The beans | Beans | the rice | yellow corn | barley | Wheat | |
| 595 | 7184 | 2254 | 3786 | 59 | 981 | 124 | 6614 | 7859 | 7532 | 17093 | 2014 |
| 650 | 3968 | 3191 | 1250 | - | 208 | 700 | 1027 | 848 | 6568 | 22825 | 2015 |
| 677 | 2197 | 1421 | 649 | 60 | 195 | - | 4431 | 10018 | 3233 | 16551 | 2016 |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 808 | 2727 | 2014 | 1301 | 55 | 190 | - | 4004 | 1251 | 3277 | 18015 | 2017 |
| 500 | 2000 | 1914 | 1111 | 25 | 106 | 250 | 4000 | 1151 | 3077 | 17015 | 2018 |
| 646 | 3615 | 2159 | 1619 | 498 | 336 | 358 | 4015 | 4225 | 4082 | 18299 | the average |

Source: Directorate of Agriculture, Babil Governorate, Department of Agricultural Statistics, unpublished data, 2019.

2- Barley crop: As for the winter field crops grown in the study area, it reached the cultivated area at the rate of this crop (4082) without its duration, and that the cultivated area was volatile and reached the maximum (7532). Agricultural season 14 and not less than (3077) Agricultural season 2018 Table (4).

**B- Summer field crops**

1- Yellow corn: Summer cereal crops are considered important for the prevailing cultivation in the study area, as it is clear from the same table that the percentage of cultivated area, which amounted to (4225) dunums for the mentioned period, as the areas planted with maize were fluctuating, where it decreased (848) without the agricultural season 20-15, and in the apartment (10018) without during the season 2016.

2- Crop rice: It is considered one of the most important cereal crops, as wheat comes after the crop in terms of nutritional importance, noting that the aforementioned table shows that the area cultivated with this crop reached (4015) dunums during (4015) dunums. (2014-2018) the cultivated area in 2014 (6614) without which was the highest area planted with this crop during the manhood period, then invested an area (1027) dunums of 5,201 which is the lowest percentage. Of the area planted with this crop during the same period years

**2- Leguminous crops: divided into**

A- Winter legume crops (Beqala'i): One of the crops grown in the study area, where it is clear from the table that the average cultivated area has reached (358) dunums for the mentioned period. The mixed area, as recorded, was the highest cultivated area in Baqalqa (700) dunums, season 15-20, and the lowest cultivated area was (124) dunums, 2014.

**B- Summer leguminous crops: divided into**

1. Cowpea: one of the crops cultivated in the study area, as shown in the table, the percentage of the cultivated area during the mentioned period was (336) dunums mixed, where the area was (981) dunums of 20 14 then. After that, it decreased (106 dunums) in 2018.

2. Livestock: Among the crops cultivated in the study area, as shown in the previous table, the area of cultivated land in the Mak region reached (498) dunums for the period

(2014-2018), and the area is also uneven at its end. To (60) without the 2016 agricultural season, while the lowest cultivated area was (25) without the year 2018.

**3. Vegetable crops are divided into**

A - **Agitator crops t the summer yeh - :**For crops planted in the study area, it appears from Table (4) that the average cultivated area reached (1619) without the mentioned period, the cultivated area was uneven as recorded in the region in which they reached vegetable crops during the year 201 AD The number of (3786) dunums per year 2014, and planted it on an area of (649) without season 20 16.

**B - vegetable crops of the château Yeh - :**Crops cultivated in the study area, and it is clear from the same table that the cultivated area at the rate of these crops reached T. (2159) dunums for the period in question, and the areas differ during the years period, as recorded and the highest cultivated area by the year 201 5 (3191) don, as It is registered in 201 201, a low area, with a total cultivated area of it (1421) dunums.

**4. Forage crops (Jet ,Clover)**

A **- crop Alfalfa:** The crops grown in the study area and notice from the data table that the average cultivated area of the Gajat during the aforementioned years was (3615) dunums and the varying area during the years period reached (7184) dunums from 20 14, which is the highest limit for the area planted with this crop, while The lowest areas where this crop reached during this period were in 2011 8 where it reached (2000) without.

**B - clover - :** Of the crops planted in the study area and the notes of the aforementioned table, the average cultivated area for this crop was (646) dunums during the same period of years, and the area varied over years, with the cultivated area in the year amounted to 14 (595) dunums, then rose to reach (808) Acres in 2017 acres, which is the highest limit reached by the cultivated area, then the area decreased to (500) acres in 8 201, which is the lowest area this crop reached during the same period.

Table (5) shows the cultivated crop areas in terms of the CFL during the year 2018 and which were extracted the needs of her water.

| Area (acres) | Crops |
|---|---|
| 17015 | Wheat |
| 3077 | barley |
| 1151 | yellow corn |
| 4000 | The rice |
| 250 | Do not drop |

| | |
|---|---|
| 106 | The beans |
| 25 | The match |
| 1111 | Summer vegetables |
| 1914 | Winter greens |
| 2000 | Jet |
| 500 | Clover |
| 10830 | Orchards |

Source: Directorate of Agriculture, Babil Governorate, Agricultural Statistics Division, unpublished data 2019.

The third topic: the water needs of agricultural crops in the Alkafil region: estimating the water needs of the different crops is the first and important stage of planning the optimal management of available water (23), and the water needs represent the amount of irrigation water. It is given to this crop during a specific period of time and distributed to a number of irrigation according to the requirements of the need (24). Irrigation water is the main source for meeting the water needs of crops grown in the study area, as it is not possible to rely on rain due to its scarcity and seasonality, nor on groundwater due to its salinity, and for the purpose of determining the water needs of crops in the study area, the following must be determined:

**First: water consumption (consumption):**

Also known as water consumption (evaporation/transpiration) (evaporation), the amount of water stored in the root zone that the plant uses and evaporates from its leaves by the method of transpiration to which the amount of water evaporated from cultivated land adds the same crop in good production conditions (25). The study relied on extracting the water consumption values of the crops cultivated in the study area on the formula (Blani - Cradle) (26):

Cu = KP 4.6 (t +17.8)

Where:

Cu = water consumption during the crop growth period (cm)

K = factor dependent on crop quality. Table (6)

P = percentage of daylight hours per month in relation to their number per year. Table (7)

T = mean monthly temperature in Celsius. Table (8)

Table (6) average (kcal) distributed per month over the growing period of the cultivated crop in the study area

| December | November | October | September | August | July | June | May | April | March | February | January | The crop | No |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8 , 0 | 4 , 0 | - | - | - | - | - | - | 5 , 0 | 0 , 1 | 2 , 1 | 2 , 1 | Wheat | .1 |
| 8 , 0 | 4 , 0 | - | - | - | - | - | - | 3 , 0 | 8 , 0 | 2 , 1 | 2 , 1 | barley | .2 |
| - | 2 , 0 | 0.5 | 8 , 0 | 0 , 1 | 0 , 1 | - | - | - | - | - | - | yellow corn | .3 |
| - | - | - | 5 , 0 | 9 , 0 | 2 , 1 | 1.3 | 3 , 1 | 2 , 1 | 1 , 1 | - | - | the rice | **.4** |
| 87 ,0 | 62 ,0 | 50 ,0 | - | - | - | - | - | 70 ,0 | 90 ,0 | 08 , 1 | 4 , 1 | Beans | .5 |
| - | - | - | - | 54 , 0 | 97 , 0 | 0.85 | 70 , 0 | 58 , 0 | - | - | - | The beans | .6 |
| - | - | - | - | 54 , 0 | 97 , 0 | 0.85 | 70 , 0 | 58 , 0 | - | - | - | The cattle | .7 |
| - | - | - | 7 ,0 | 9 , 0 | 0 , 1 | 9 .0 | 8 , 0 | 8 , 0 | - | - | - | Summer vegetables | .8 |
| 5 , 0 | 5 , 0 | 7 , 0 | - | - | - | - | - | - | 8 , 0 | 6 , 0 | 5 , 0 | Winter vegetables | .9 |
| 14 , 1 | 92 , 0 | 89 , 0 | 88 , 0 | 88 , 0 | 86 , 0 | 88 , 0 | 90 , 0 | 92 , 0 | 94 , 0 | 98 , 0 | 10 , 1 | Jet | .10 |
| 92 , 0 | 64 , 0 | 48 , 0 | | | | | | 89 , 0 | 92 , 0 | 03 , 1 | 16 , 1 | Clover | .11 |
| 5 , 0 | 5 , 0 | 7 , 0 | 7 , 0 | 9 , 0 | 0 , 1 | 9 , 0 | 8 , 0 | 8 , 0 | 8 , 0 | 6 , 0 | 5 , 0 | Orchards | .12 |

**Source:**

1- Nabil Ibrahim Al-Taif, Essam Khudair Al-Hadithi, Basics of Irrigation and Its Applications, Dar Al-Kutub, Directorate of Printing and Publishing, University of Mosul, 1988, p. 224

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Table (7) Average percentage of daytime hours per month relative to their number per year (P) in the study area

| Percentage rate | the month | Percentage rate | the month |
|---|---|---|---|
| 9,77 | July | 7,20 | January |
| 9,28 | August | 6,97 | February |
| 8,34 | September | 8,37 | March |
| 7,93 | October | 8,72 | April |

| | | | |
|---|---|---|---|
| 7,11 | November | 9,63 | May |
| 7,05 | December | 9,60 | June |

Source: Laith Khalil Ismail, Irrigation and Puncture, 2nd edition, Dar Al-Kutub for Printing and Publishing, University of Mosul, 2000, p. 225.

Table (8) monthly averages of temperatures in the study area for 2018

| Monthly rates | the month | Monthly rates | the month |
|---|---|---|---|
| 37,6 | July | 11,4 | January |
| 36,6 | August | 11,8 | February |
| 32,8 | September | 18,5 | March |
| 25,8 | October | 23,8 | April |
| 19,4 | November | 29,8 | May |
| 14,5 | December | 33,3 | June |

Source: the Republic of Iraq, Ministry of Transport and Communications, Iraqi Weather Authority, Climate Department, unpublished data, 2019.

Table No. (9) Shows data on the values of water consumption (evaporation/transpiration) for crops cultivated in the study area during the year 2018. It was also noted from the table that there is a difference in their values of consumption of winter crops for winter crops. The water differs from that grown in the summer as is the case with the rest of the crops grown in the study area on the one hand, and on the other hand, the different need for one crop of water differs according to its different stages. Growth, as it is clear from the same table that the total water consumption of wheat crop reached (575, 51) mm, the maximum water consumption in March (137, 64) mm / month, while the total water consumption of the barley crop is (513, 56) mm in the same year, and its peak consumption was in January (113, 77) mm / month. From this, it is evident that the wheat crop needs more water than the barley crop for many reasons, including that the area planted with the wheat crop is greater than the area planted with the barley crop, as well as for other things related to the characteristics of the same crop, but for summer field crops, it is clear from the previous table that the total consumption. The water from the corn crop (723.94) mm, and the peak water consumption was in July. (243.66) mm / month, while the total water requirement for the rice crop is (15) 09.99) mm and the maximum water consumption in July is (293.57) mm/ month, which means that the rice crop needs more water than yellow. The corn crop is related to several things, including those related to the long period of growth in addition to other matters related to the nature of the crop itself. With regard to crop legumes, as it is clear from the same table that the total water requirements for the Bekaa crop amounted to (717.26) mm and reached the highest water consumption in

January (134.23) mm / month, while the total water requirements for crops reached. (Cowpea and cattle) reached (794.66) mm per year during the year. The highest water consumption was reached in July (2, 43, 66) mm/month, due to the warm and dry weather conditions. Vegetable crops (summer and winter) for vegetable and winter crops, it is clear from the table that the total water consumption reached (430.98) mm, while the summer vegetable crops (J) reached the water they need (10, 80 and 9) mm. As for the fodder crops, they totaled the water consumption of the jet crop is (1801, 86) mm while the total water consumption of the alfalfa crop is (29,722) mm. The water orchards emanating from the table indicated that the total water consumption reached (071511 mm) in 8201, the maximum water consumption in July (2, 43, 66) mm / month, due to the warm and dry weather conditions.

Table (9) Water Consumption (Evaporation/ Transpiration) (mm / month) Crops grown in the study area in 2018.

| Orchards | Forage crops | | Greens | | Legumes | | | Summer field crops | | Winter field crops | | Months |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Clover | Jet | Summer | Winter | The cattle | The epidemic | Beans | the rice | yellow corn | barley | Wheat | |
| 5 , 46 | 110,67 | 105,09 | | 5 , 46 | | | | | | 113,77 | 113,77 | January |
| 00 , 56 | 97,44 | 91,56 | | 00 , 56 | | | | | | 112,28 | 112,28 | February |
| 81 , 108 | 126,79 | 130,51 | | 81 , 108 | | | | 152,21 | | 108,81 | 137,64 | March |
| 9 , 132 | 145,5 | 149.7 | 9 , 132 | | 4 , 95 | 4 , 95 | 134,23 | 199,5 | | 49,8 | 83,1 | April |
| 47 , 166 | | 185,38 | 47 , 166 | | 67 , 141 | 67 , 141 | 100,52 | 271,25 | | - | - | May |
| 2 , 199 | | 194,1 | 2 , 199 | | 00 , 189 | 00 , 189 | 123,38 | 291,00 | | - | - | June |
| 66 , 243 | | 210,49 | 66 , 243 | | 66 , 243 | 66 , 243 | 116,4 | 293,57 | 243,66 | - | - | July |
| 46 , 206 | | 201,19 | 46 , 206 | | 124,93 | 124,93 | 78,12 | 206,46 | 228,16 | - | - | August |
| 131,4 | | 166,8 | 131,4 | | | | 74,4 | 96,00 | 151,8 | - | - | September |
| 81 , 108 | 74,09 | 139,5 | | 81 , 108 | | | 90,21 | | 78,12 | - | - | October |
| 4 , 59 | 74,4 | 111,6 | | 4 , 59 | | | | | 22,2 | 48,3 | 48,3 | November |
| 46 , 51 | 93,31 | 115,94 | | 46 , 51 | | | | | | 80,6 | 80,6 | December |
| 1511,07 | 29 , 722 | 86 , 1801 | 9 , 1080 | 98 , 430 | 66 , 794 | 66 , 794 | 717,26 | 1509,99 | 723,94 | 513,56 | 575,51 | Total |

Source: Dependence on Equation without Ni-Credel and Tables (6), (7), and (8).

**2: Net irrigation needs (m3 / s) for crops grown in the study area in 2018:**

It represents the amount of irrigation water needed for the agricultural crop, that is, the amount of water that must be added and stored in the effective root zone in order for the plant to be able to benefit from it (27). For the study area, the net irrigation needs for the crops planted there were reached through the following relationship: Net irrigation needs = (water consumption (mm / month) x planted area (in dunums) Table

(10) shows the net irrigation. Of the values and the total crops cultivated in the study area during the year 2018, with the total net irrigation needs of the crops, the study area reached (268.34) m3/ s during the year, and the table notes that there is a difference in the month in the values, as recorded by Nilai in the month of April and by (06, 45) m3/ sec. In Lima, the lowest values were recorded in October of (9, 12) m3/ s.

Table (10) the net and total irrigation needs (m3 / s) for crops grown in the study area during the year 2018

| Total irrigation needs (m3 / s) | Net irrigation needs (m3 / s) | the month |
|---|---|---|
| 11 , 37 | 27 , 22 | January |
| 41 , 38 | 05 , 23 | February |
| 91 , 42 | 75 , 25 | March |
| 1 , 75 | 06 , 45 | April |
| 15 , 30 | 09 , 18 | May |
| 63 ,36 | 98 , 21 | June |
| 5 , 51 | 90 , 30 | July |
| 83 , 38 | 30 , 23 | August |
| 78 , 20 | 47 , 12 | September |
| 2 , 15 | 12 , 9 | October |
| 4 , 29 | 64 , 17 | November |
| 18 , 31 | 71 , 18 | December |
| 2 , 47 4 | 34 , 268 | Total |

Source: Based on Tables (5) and (9) 2- Application of Relationship

3: Total irrigation needs (m3 / s) for crops grown in the study area during the year 2018:

Total irrigation needs mean the total amount of water to be added to the field, and it includes the net irrigation needs in addition to field waste, that is, the net irrigation needs after including losses at the field level (28). Total irrigation needs were calculated according to the following relationship:

As follows: IRg = total irrigation needs

In = net irrigation requirement

Ea = field efficiency) 60% is taken for field calculations (29)

Through the application of this, knowledge of the total irrigation needs of the crops grown in the study area was obtained, and Table (10) shows the values of the total irrigation needs of the crops grown in the study area during the year 2018, where the total irrigation needs of the crops of the study area reached (2,447) M3 / s during the year, and it is noticed in the table that there is a monthly discrepancy in the values, as recorded in the month of April with a percentage of (1, 75 m3 / s) in Lima, the lowest level was recorded in the month of October, the first-rate (15, 2) m 3 / s, we conclude through this that there is a variation in the net values of the total and total irrigation needs. The variation in the values is due to several reasons, including the variation in climatic conditions, the diversity of cultivated areas, as well as the variation in the number of water needs of agricultural crops, their different characteristics, and the duration of their growth.

**4: Proficiency rates in the tables of the study area during 2018.**

The adequacy of irrigation was achieved by subtracting the amount of water needed by the crop from the volume of design water (30). Table (11) shows the values of increase and decrease of coupling rates in the tables of the study area about the need for cultivated crops during the year 2018, and the data table notes that The conjugation rates of the tables in the study area are insufficient to irrigate the cultivated crops in most months, as it seems to be insufficient in (January, February, March, April, May June, July, August, September, October, November, and December) with a decrease of (2, 2, 4, 32, 4, 72, 35, 85, 3, 66, 17, 78, 6, 34, 0, 58, 1, 25) (m3 / s in each, respectively, while efficiency is observed during the months) May, September, and October) and increase (2, 72, 10, 45, 29, 14) m 3 / s, respectively.

Table (11): Adequacy of the average expenditures of the study area tables for the crops cultivated therein during the year 2018

| Increment values | Deficiency values | Months |
|---|---|---|
| There is no | 2 , 2 | January |
| There is no | 32 , 4 | February |
| There is no | 72 , 4 | March |
| There is no | 85 , 35 | April |
| 2,72 | There is no | May |
| There is no | 66 , 3 | June |
| There is no | 78 , 17 | July |
| There is no | 34 , 6 | August |

| | | |
|---|---|---|
| 45 , 10 | There is no | September |
| 29 , 14 | There is no | October |
| There is no | 58 , 0 | November |
| There is no | 25 , 1 | December |

Source :Based on tables (3) ,(2) and.(10)

We conclude through so that the irrigation tables that serve the study area do not work efficiently in crop processing actually cultivated with the needed water and due to many reasons , including the relation s climatic conditions of the increasing number of hours of solar brightness and the resulting recording thermal high values and low fall Rains, lack of moisture and high values of surface evaporation of water ,which affects the rates of water quotas through increasing water losses and water needs of agricultural crops, in addition to the methods that farmers use to provide water to agricultural crops , in addition to that the presence of bushes and weeds along the banks of sewers Water and inside the irrigation canals is one of the problems that affect the efficiency of irrigation ,as it leads to impeding the flow of water in these channels . Another reason is the increase in the percentage of water wastes from the irrigation tables and channels in the study area as a result of leakage and leakage of water from them, as there are no lined tables in the study area to ensure that water infiltration , and other issues related to water pumps , which rely on the study area where most of these old and consumer pumps and there is no follow - up To maintain it , and the matter does not depend on the reasons mentioned, there are many factors that must be mentioned are the absence of water guidance in all areas, especially in the field of agriculture and the lack of use of modern irrigation systems and lack of interest in river irrigation ,as well as planning and political factors as Iraq’s geographical location as the downstream country places it in A critical situation that is negatively affected by the procedures of the countries located above the course of the two rivers, as the source countries have a great ability to control Iraq’s water resources with increasing technological capabilities in digging rivers and building dams and reservoirs, all of this affects the amount of water revenue received to Iraq in general and the rates of water quotas for for very a well that feeds the study area in particular.

**Solutions and proposals to raise the irrigation efficiency of the irrigation schedule and channels in the study area:**

1- Following modern methods and methods of irrigation, according to the water needs of agricultural crops, by educating farmers and directing them about their use and urging them to abandon the wrong methods that they adopt in irrigation.
2- Addressing the problem of plants and jungles by uprooting these plants from their roots, and excavators and machines can be used to sweep and disinfect streams, which increases the speed of water movement within the streams.

3- Maintaining irrigation canals from infiltration and leakage through the lining of these main and subsidiary channels that are not lined or partially lined, in order to increase their efficiency and reduce water losses from them.
4- Maintaining and providing fuel for diesel irrigation pumps, in addition to providing the necessary energy for the electric-powered pumps in order to raise the irrigation efficiency of the irrigation schedules serving the study area.
5- Raising the level of awareness by holding educational courses and seminars and intensifying water awareness to educate farmers about the water rationing of agricultural crops and urge them to abandon the wrong methods that they used to use in irrigation and encourage them to use modern methods.
6- Addressing the water policy problem by relying on international charters, norms, and laws that regulate the principles of sharing common water resources between upstream, downstream, and downstream countries in a manner that ensures a fair distribution of water and achieves the interests of all parties together.

**Margins**

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