The Impact of Climate Change (some Element) on Field Crops in Baghdad Province

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Abstract

The study aimed to analyze the impact of climate change, which included elements {actual brightness, degrees of normal temperature and the maximum and minimum, wind speed, relative humidity, rainfall, evaporation} in the change of field crops and its implications in the province of Misaan, and the impact of those changes in the area and the yields and production of selected agricultural crops They {wheat, barley, rice, maize } has been relying in this study on the data of Two weather stations are (Misaan ,AL hay) for the period (1960-2014), it has been the general trend and the rate of change coefficient the annual rate of change during the duration of the study for an average of different climatic elements, showing the direction of the solar brightness in all stations downward direction different temperatures upward ranged Other elements between the rise and fall according to the stations on the impact of this rise and fall with the climate elements on an area and yields and production of field crops, which include each of wheat, barley, rice, maize**.**

Keywords: Crops, Baghdad, Misaan, Weather, Temperature.

Study Problem:

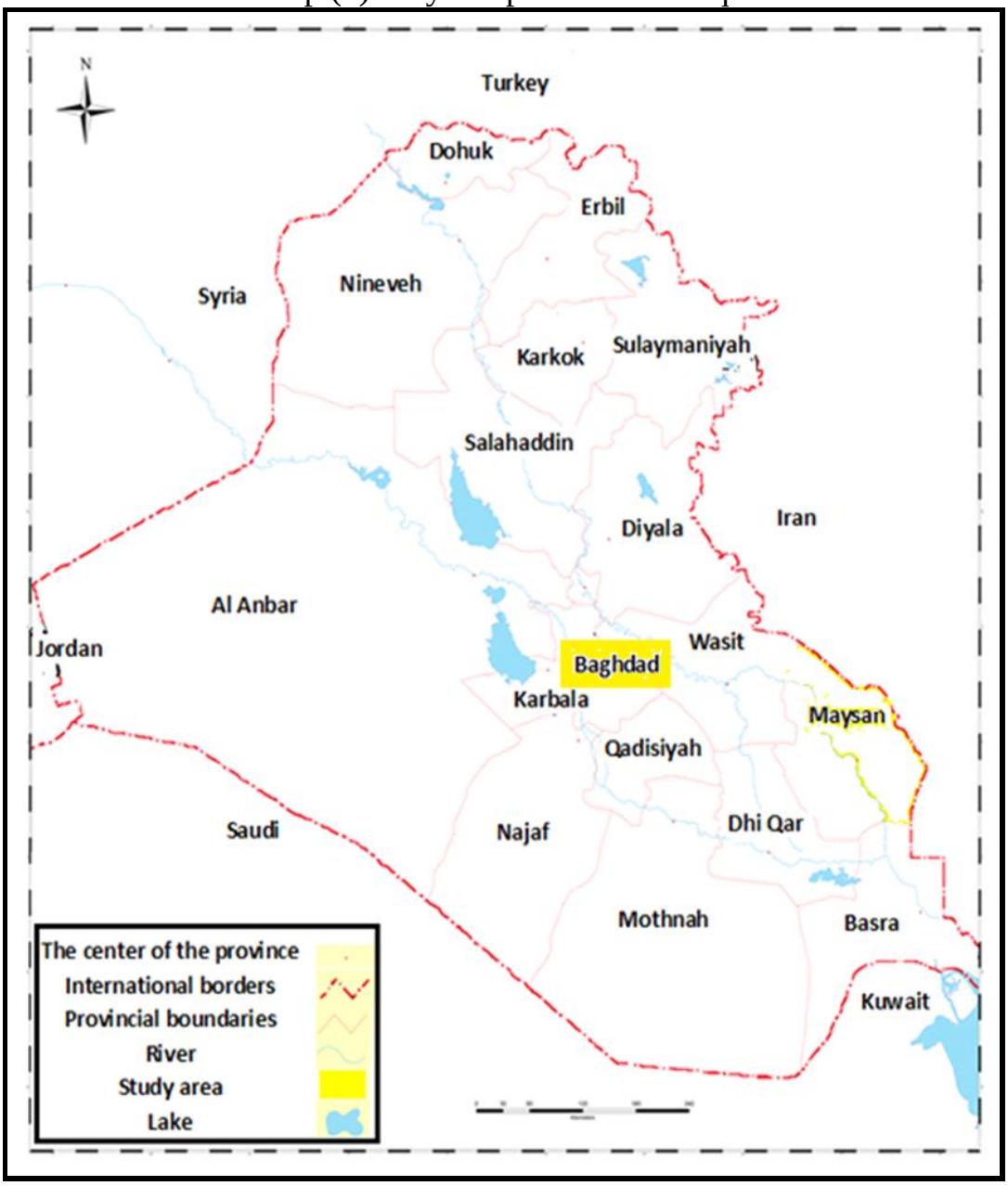
Does climate change affect the area, yield and production of selected agricultural crops (wheat, barley, rice, maize) in Maysan province?

Study hypothesis:

Climate change and global warming have a significant impact on the area, yield and production of selected agricultural crops. Spatial, temporal and qualitative boundaries:

The study area was represented by the administrative boundaries of Maysan Governorate. Wasit governorate is bordered by the north-west with a length of 38 km, see map (1), and the governorate of Basra is bordered in the south with a length of 24.5 km. See the Pictures (1) and (2) and (3) and(4) and (5) and (6).

Map (1) Maysan province of Iraq



Source: Researcher based on the General Authority for Survey, Iraq Administrative Map 2007, scale 1/100000.

The west is 225 km long, while Iran is 261 km to the east [(*1)], As for the astronomical location of the study area, it is located between two latitudes (49, 14, 31, 51, 49, 32, north) and longitude (32, 28, 46, 42, 51, 47, east).

The temporal boundaries are represented by climatic elements data for the period 1960 - 2014 divided into six smaller climatic cycles. Climate is one of the natural phenomena subject to change on various short and long time scales as well as local, regional and global spatial scales. Throughout history, information from millions of years ago

(*1) Information on the length of the boundaries was collected in the General Directorate of Survey by a computer, using a program (Arc Gis – Arc info).

obtained by studying the layers of land, glaciers, polar ice sheets, tree rings, and the remains of plants and animals from some epochs is taken as evidence of climate change [2] , The research revolves around climate change, and studies show that the change in the climate of the globe is caused by a major factor is the human factor, and natural factors did not play any role in making these changes [3] , There is very high confidence that the net release of human activities since 1970 is a cause of warming, and it is very likely that most of the observed increase in average temperatures since the mid-20th century is due to greenhouse gas concentrations [4] .

Statistical methods are one of the most important methods used to highlight climate change, so we will rely on the use of the general trend and rate of change in order to clarify the changes in climate elements , in the study area (Trend Detection) The overall trend of annual time series averages (for climate elements) was calculated, and the trend coefficient was expressed as a percentage of all variables in climate elements. As well as for annual rates of change **(**Annuals Change) According to the following equation [5] :

$C = (bi / y) * 100$

(C = annual rate of change, bi = trend coefficient, Y = arithmetic mean)

$\frac{\overline{X}_2 - \overline{X}_1}{T_2 - T_1}$

bi = can be extracted from the following equation [6] (bi) [*7]

First: the change and the general trend of the annual rate in the elements of the climate of the province of Baghdad

1: Change and overall trend of the annual average rate of hours of actual solar brightness:

It is clear from Table (1) and Figure (1) that the actual solar brightness has taken a decreasing trend during the study in all stations,

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([2])) J.C .van Dam , Impacts of Climate Change and Climate Variability On Hydrological Regimes , Cambridge University Press , UK , 2003 , P 1 .

([3])Salar Ali Al-Dazni, Abdul Razzaq Khyoon Al-Muhaimeed, Climate Change Indicators in Iraq and its Impact on the Yield of Wheat, Barley and Cotton Crops, Journal of the Iraqi Geographical Society, Vol. 1, No. 62,2010, p. 51.

(4) IPCC, "Synthesis Report, 2007, p. 5.

(5) Mohammed Sadaqa Abu Zaid, Current Changes in Annual Rains in Southern Taif Province, Saudi Arabia, Journal of Meteorology, Environment and Arid Land Agriculture, King Abdulaziz University, Vol. 21, No. 2, 2010, p.

(6)Nader Mohammed Syam, An Analytical Statistical Study of Rain Trends in Some Locations in Syria, Damascus Journal, Vol. 14, No. 2, 1994, p.

(7)The rate of change for the duration of the study was extracted by multiplying the annual rate of change in the number of years, So The trend coefficient was extracted by EXCEL, and the time series can be divided in half and subtracting the second medium - the first medium, and the second time - the first time (years).

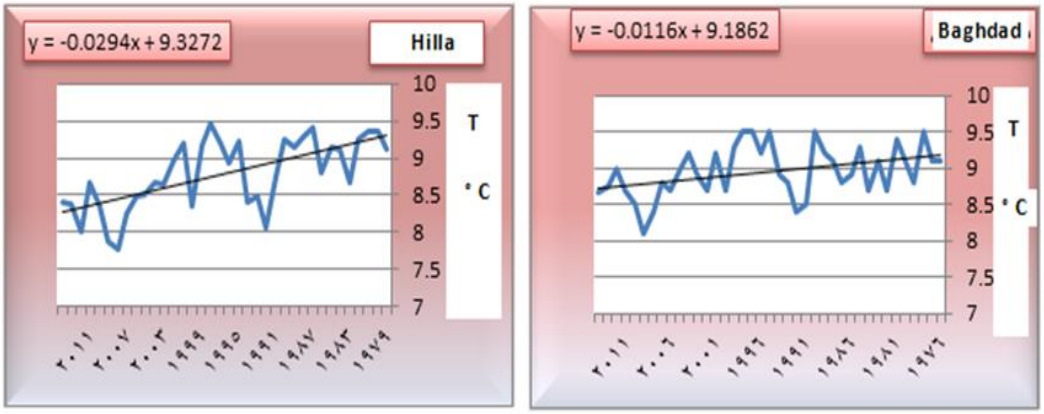
and that the general trend coefficient for the average hours of actual solar brightness (hour / day) tends to decrease in all stations with negative and annual rate of change. (-0.243, -0,119%) for stations (architecture, neighborhood) respectively and at a rate of change during the study period (-11.1, -4.2%) for stations (architecture, neighborhood) respectively, and recorded the highest amount of decreasing in brightness hours Al-Amarah plant (-11.1%) while the lowest decrease in the neighborhood (-4.2%). We note the decrease of the actual solar brightness in the studied stations and this indicates a decrease in the actual solar brightness. The effect of atmospheric pollutants (aerosol Aersol) that is emitted into the atmosphere due to different human activities and the impact of the blackout phenomenon on the natural vegetation of it or agricultural through its impact on the process of photosynthesis in the plant and thus reduced production as well Woody to decrease the amount of evaporation from water and land surfaces and also cause a decrease in the amount of rain falling as they affect the change recipes Cloud [8].

Table (1) Rate of change (%), annual rate of change and general trend of actual solar brightness hours (hours / day)

T	Name of station	Arithmetic mean	The number of years	Direction coefficient	Annual rate of change	Rate of Change (%)
1	Baghdad	9	45	0.025	0.243	11.1
2	Alhai	9	39	0.009	0.119	4.2

Source: The work of the researcher based on the General Authority for Meteorology and Seismic Monitoring, Department of Climate, Baghdad, 2014, (unpublished data).

Figure (1) Change and general trend of the average number of hours of actual solar brightness (hour / day) of study stations



Source: based on Table (1)

(8)Field crop cultivation is placed on the site : http: // www. /reefnet.gov .sy / reef index .php, option.

2- The general change and trend of the average annual average normal temperature (° C):

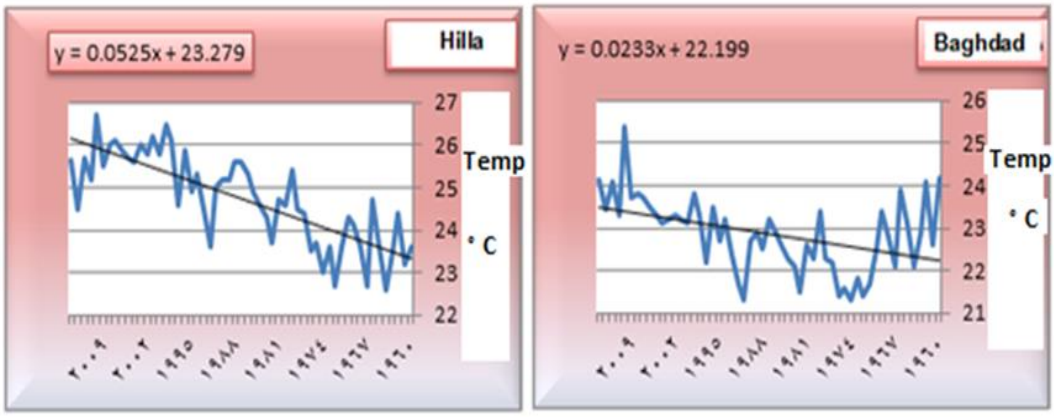
It can be seen from Table (2) and Fig. (2) that the general trend coefficient for the average normal temperature (m) tends to rise by a positive amount in the study stations and at an annual rate of change of (0.11, 0.198%) for Baghdad and Hilla stations respectively, and at a rate of change for a period of The study (%) of (5,3, 11,3) for the same stations respectively, and the highest amount of change in height was recorded in (Hilla) station by (11.3%), while the lowest amount of change was recorded in (Baghdad) station by (5, 3%), that this increase in the average temperature is due to global warming and this is what was stated in the International (Ipcc) reports on climate change for the year 2001, meaning that the study area has been affected by global warming as a result of the high percentage of greenhouse gases in the atmosphere, especially (CO2) .

Table (2) The rate of change (%), the annual rate of change, and the general trend of the average normal temperature (° C).

T	Name of station	Arithmetic mean	The number of years	Direction coefficient	Annual rate of change	Rate of Change (%)
1	Baghdad	23	55	0.021	0.11	5.3
2	Alhai	25	55	0.052	0.198	11.3

Source: The work of the researcher based on the General Authority for Meteorology and Seismic Monitoring, Department of Climate, Baghdad, 2014, (unpublished data).

Fig (2) The change and general trend of the annual average of the average normal temperature (° C) for the study stations.



Source: based on Table (2).

3: The general change and trend of the average annual average maximum temperature (° C):

It can be seen from Table (3) and Figure (3) that the general trend coefficient for the average maximum temperature tends to rise by a positive amount in all stations, with an annual rate of change of (0.07,

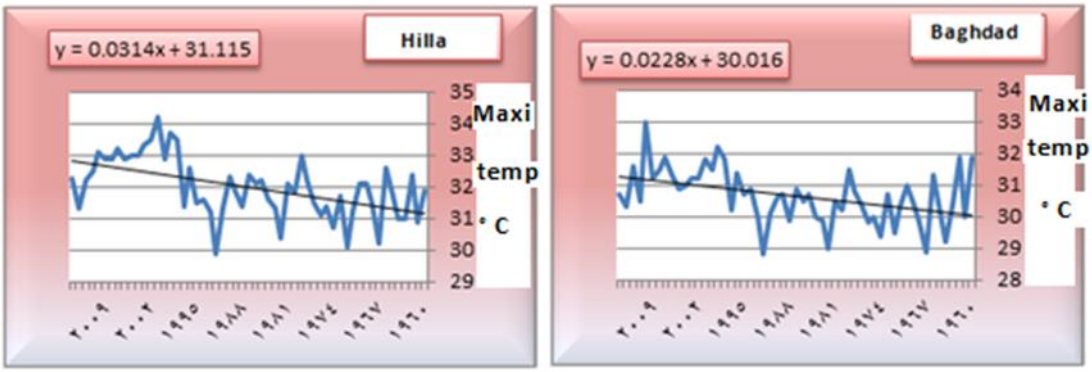
0.096, 0.1183, 0.129%) and a rate of change of (%) of (3,9, 5,1) for study stations (Baghdad and Hilla) respectively. The highest amount of change was recorded in the rise in (Hilla) station by (5.1%), while the lowest amount of change was recorded in (Baghdad) station by (3.9%). This increase in maximum temperatures is due to global warming. We conclude from this that the rate Maximum temperatures have increased in the study area. As for the relationship between the phenomenon of solar dimming and global warming, it is assumed that the temperatures tend to decrease due to the phenomenon of solar blackout, but the main reason for raising the temperatures is global warming. The researchers indicated that the cooling resulting from the phenomenon of blackout The solar system is less than the heating caused by the phenomenon of global warming, for this reason, the global temperature tends to rise, i.e. increase.

Table (3) Rate of change (%), annual rate of change, and general trend of average maximum temperature (° C).

T	Name of station	Arithmetic mean	The number of years	Direction coefficient	Annual rate of change	Rate of Change (%)
1	Baghdad	30	55	0.024	0.069	3.9
2	Alhai	31	55	0.035	0.097	5.1

Source: The work of the researcher based on the General Authority for Meteorology and Seismic Monitoring, Department of Climate, Baghdad, 2014, (unpublished data).

Figure (3) The general change and trend of the average maximum temperature (° C) for the study stations.



Source: based on Table (3)

4: The general change and trend of the average annual mean of the minimum temperature (° C):

It can be seen from Table (4) and Figure (4) that the trend coefficient for the average minimum temperature (M o) tends to rise by a positive amount in all stations (Baghdad, Hilla) with an annual rate of change of (0.233, 0.282%) and a rate of change of (%) of (8, 12,9) for study stations (Baghdad and Hilla) respectively, and the

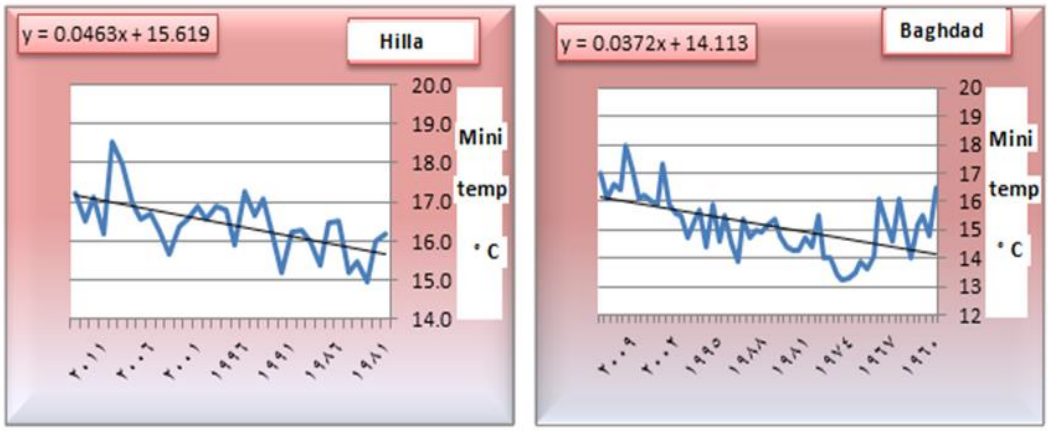
highest amount of change in height was recorded in (Baghdad) station by (12.9%), while the lowest amount of change was recorded in (Hilla) station by (8,8). %) And we conclude that the trend coefficient for the average minimum temperature (M o) tends to rise by a positive amount higher than the normal and maximum temperatures.

Table (4) The rate of change (%), the annual rate of change, and the general trend of the average minimum temperature (° C)

T	Name of station	Arithmetic mean	The number of years	Direction coefficient	Annual rate of change	Rate of Change (%)
1	Baghdad	16	55	0.036	0.233	12.9
2	Alhai	18	34	0.047	0.282	8.8

Source: The work of the researcher based on the General Authority for Meteorology and Seismic Monitoring, Department of Climate, Baghdad, 2014, (unpublished data).

Fig (4) The general change and trend of the mean temperature minimum (° C)



Source: based on Table (4).

5: The change and general trend of the average annual average wind speed (m / s)

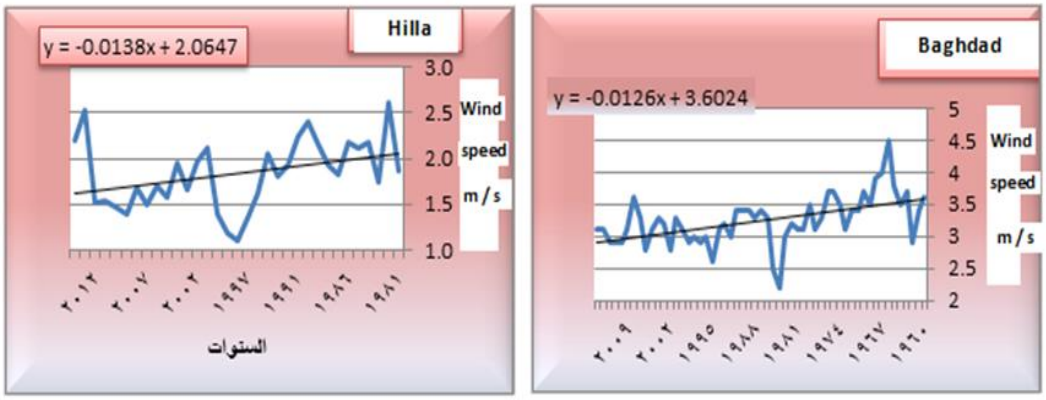
It can be seen from Table (5) and Figure (5) that the direction coefficient for the average wind speed (m / s) tends to decrease by a negative amount in the stations (Baghdad and Hilla) with an annual rate of change of (-0,362, -0,731) and a rate of change (%) of (-22,1, -25,8) for the study stations (Baghdad and Hilla) respectively, and the highest trend coefficient of decline was recorded in (Hilla) station by (-0,014%) while the lowest amount of change was recorded in (Baghdad) station by (- 0.011%).

Table (5) The rate of change (%), the annual rate of change, and the general trend of the rate of wind speed (m / s)

T	Name of station	Arithmetic mean	The number of years	Direction coefficient	Annual rate of change	Rate of Change (%)
1	Baghdad	3.4	55	0.011	0.362	22.1
2	Alhai	1.6	34	0.014	0.731	25.8

Source: The work of the researcher based on the General Authority for Meteorology and Seismic Monitoring, Department of Climate, Baghdad, 2014, (unpublished data).

Figure (5) The change and general direction of the average wind speed (m / s)



Source: based on Table (5).

Second: The effect of climate change on the area and average production and productivity of field crops

The effect of climatic changes on the area, yield and productivity of field crops in Baghdad, which includes both grain crops. Herbal plant species that are grown for their starchy grains and are used in human and animal food such as wheat, barley, rice and yellow corn. Yellow, the second classification is according to the growing season. Grains are classified into winter crops that are grown in the fall and grow in the winter, such as wheat and barley, and summer crops need high temperatures, i.e. higher than the previous ones. They are grown in the spring and grow in the summer, like yellow corn. The second type One of the field crops is the fibrous crops that are grown in order to obtain their fiber, and I will deal with the cotton crop [(9)]. The other part of the field crops is the oil crops that are grown for the purpose of

[9] Ahmed Ghazi Muften, Ali Kazem Alwaeli, Nameer Nazir, THE EFFECT OF CHANGE RATES AND THE GENERAL TREND OF THE ANNUAL AND MONTHLY RATE İN THE SELECTED CLİMATE ELEMENTS (TEMPERATURE AND WİND SPEED) ON THE REALİTY OF DESERTİFİCATİON İN IRAQ, Royte Educational & Social Science Journal, Vo.7, Issue.8, 2020.p.9.

obtaining the seeds from which the oil is extracted. Oil is used in the industry for various purposes, including making soap, dyes, and engine oil as it is used For medicinal purposes and pest control, the oil of these crops is edible, and among these crops is sesame, and for the purpose of knowing the effect of the change On these crops, the percentage of change in area and average yield and productivity of the crop during the period (1960-2014) was extracted and matched to the climatic period. We find that there are crops that witnessed a positive compound growth rate and another that witnessed a negative compound growth rate, as shown in Table (6) of the following:

1- Crops that witnessed a negative percentage change to the total cultivated area during the period (1960-2014), which is a crop (wheat, barley, and rice), as the percentage of change was (- 41, -78, -52 %), respectively, crops that witnessed a positive change rate for the total in the cultivated area, which is a crop (yellow corn, cotton, sesame), as the percentage of change reached (14, 81, 494 %), respectively.
2- All crops witnessed a positive change in the average yield of a dunum of the total cultivated area, thus achieving a positive compound growth rate, except for the rice crop, which achieved a negative change rate, as the percentage change was (73, 1.3, -27, 38, 22, 49 %), respectively.
3- Crops that witnessed a negative change in production during the period (1960-2014), which is the crop (barley, rice), as the percentage of change reached (- 80, -43 %) respectively, and crops that witnessed a positive change in the total area of cultivated area, which is a crop (wheat, corn Yellow, cotton, and sesame) as the percentage of change reached (15, 876, 72, 412 %), respectively.

That the amount of change during the period of growth of the wheat crop tends towards a negative change in the study area, that the negative and positive changes of the climatic elements will have an effect on the expansion and diminution of the area cultivated for the wheat crop, the yield and the production, despite the variation in the amount of the wheat crop area, and with reference to Table (1) The actual hours of brightness were diminishing, as was the wind speed in Table (5) during the growing season. As for the temperature, especially the maximum, its direction was towards an increase in Table (3). The skin and the vessels of the transporter, when the temperature decreases, causes an increase in the viscosity of the protoplasm, and the opposite occurs at higher temperatures, as the viscosity of the protoplasm decreases. At very high temperatures, the protoplasm coagulates and the cells die.

Table (6) The percentage of change (%) in the annual rate of area (dunums), yield (kg / dunum) and production (tons) of grain yields governorate Baghdad

The name of the crop	Area (Dunums)	Average yield (kg / dunum)	Production (tons)
Wheat	– 41	73	15
barley	– 78	1.3	- 80
the rice	– 52	– 27	– 43
yellow corn	14	38	876
Cotton	81	22	72
Sesame	494	49	412

Source: From the researcher's work based on data, Ministry of Agriculture, Agricultural Statistics Department, unpublished data.

In addition to the natural factor, there are some human factors that affected the cultivated area during the period (1980-1990). The reason is due to the Iran-Iraq war that forced many farmers to leave farming and become preoccupied with war and this contributed to the deterioration of agricultural lands, and on the contrary, the area of land increased during (1992-2000) and due to the conditions of the siege that prompted the state to follow the state's policy that encourages farmers to plant strategic crops, the most important of which is the wheat crop, as it is the main food for the population. The expansion of the cultivated area and the increase in the amount of production does not necessarily mean an increase in the average yield because the climatic conditions have a direct effect on the crop. By means of increasing the cultivated area itself, increasing the cultivated area does not necessarily mean increasing the amount of production, it means the expansion of irrigation agriculture and the increase in pressure on surface water resources, means the expansion of irrigation agriculture and the increase of pressure on surface water resources.

The rice crop has witnessed a negative change in the area, yield and productivity of the crop, but its cultivation has disappeared in recent years, due to the effect of the crop by changes in the direction of negative or positive climatic elements [(10)]. The solar radiation has tended towards negative change in most of the months of the growth season in the study area represented in Table (1) Light is considered one of the main factors affecting rice production, and the appropriate limit for rice is between 9-12.5 hours. As for the maximum temperature, a positive change was recorded in the study area during

[10] Raya A Al-Kayal, Ali A Alwaeli, Kadhem A Alasadi, The Use of Solar Cells in Energy Saving and its Impact on the Architectural Configuration of the City of Baghdad, International Journal of Recent Engineering Research and Development, Vo.4, Issue.7, 2019.p.48.

the months that represent the period of growth of the rice crop, Tables (4,3,2). The stigmas wither and the plant becomes impotent to pollination, especially if it is accompanied by dry and hot winds and insufficient water, and the plant stops growing at a temperature of 45 ° C and more, and this is what happens in June, July and August when temperatures rise. As for the maize crop, it achieved a positive change in the area, production and yield of the yellow maize crop, and by reference to the climatic factors, we find that the climatic changes represented by the decrease in the number of hours of actual brightness and the increase in the minimum and maximum temperatures had a positive effect on the yellow maize crop because it is a hot plant crop that requires temperatures It is high, which has a role in the speed of plant growth, and thus the incidence of disease decreases, and this is reflected in the increase in production and this average yield on one side and on the other hand, corn plant is considered one of the short day plants (8- 9) hours. The trend in the number of hours of actual brightness was negative, in addition to other human factors represented by the use of modern methods in agriculture, such as selecting good varieties, using modern irrigation methods and controlling pests, and the yellow corn crop is increasing its production capacity and adapting to different climatic conditions, while the cotton and sesame crops achieved an average Positive compound growth in both area cultivated and average yield and production for the period (1960-2014).

Conclusions:

1- The study demonstrated that there are changes in the path of the climatic elements in the Baghdad station and the selected stations, which lasted for a period of time (1960 - 2014). They can be considered a clear indicator of the occurrence of climate change if this trend continues in the future.

2- The presence of a declining trend for the actual solar brightness by (-11,1, -4,2%) in the stations Baghdad and Hilla, respectively.

3- The presence of a trend towards an increase in the normal air temperature in the Hilla station and the selected stations, by (-5,3, -11,3) in the Baghdad and neighborhood stations respectively, as well as the existence of a trend towards an increase in the maximum temperature in the study stations and the rate of change reached (- 3,9 - 5,1) respectively, as well as the existence of a rise towards the lower temperature in Baghdad station and the control station, and the rate of change reached (-12,9, 8,8-) Baghdad and Hilla stations respectively.

4- There was a trend towards a decrease in the average wind speed in the study stations (Baghdad and Al-Hillah), and the rate of change was (-22.1, -25.8), respectively.

5- A negative change rate reached (-41%) in the areas cultivated for the wheat crop, while yield and production recorded a positive change rate of (73% and 15%) respectively.
6- The rate of change of area, yield and production of the rice crop tended to decline, reaching (- 52%, - 27%, - 43%) respectively.
7- The rate of change of area, yield and production of (yellow corn, cotton, sesame) crops tended towards an increase, as the change per crop in cultivated areas reached (14, 81, 494%), respectively, while the percentage change in crop yields reached (38, 22, 49%) respectively, while the percentage change in production amounted to (876, 72, 412%), respectively.

References:

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