

## The impact of modern technological innovations on the economic efficiency of crops Wheat and corn in Giza Governorate

Dr. Mervat Rofael Girgis Youssef, Dr. Reda EL-Sayed Mohamed Morsi, Dr. Aml Mohamed Ameen Hasan.

Senior Researcher – Agricultural Research Center – Agricultural Economics Research Institute – Egypt  
Emails: [mervat\\_economic@yahoo.com](mailto:mervat_economic@yahoo.com)1, [redaelsayad802@gmail.com](mailto:redaelsayad802@gmail.com)2, [amlameen167@gmail.com](mailto:amlameen167@gmail.com)3

**Abstract:** The study aimed to examine the development of the area, productivity and production of wheat and corn crops in Egypt during the period 2010 – 2024, the development of national consumption, the food gap and the self-sufficiency rate in Egypt, the development of area, production and productivity in Giza Governorate, and measuring the impact of applying some technological innovations on the productivity per acre of wheat and corn crops. The problem of the study was limited to the inability of local wheat and corn production to meet consumption needs. Despite the increase in per-acre productivity of wheat and corn, the total consumption of these two crops is approximately 21.8 and 15.3 million tons, respectively, of which 9.4 and 7.5 tons from local production and the rest is supplied through imports from abroad, meaning that production covers about 43.1% of wheat and 49.01% of corn, with a deficit of about 57% and 51% for both crops. The study sample was selected based on the relative importance of the area. The cultivated area in Giza Governorate totaled 300,000 feddans, with the total area cultivated with wheat reaching approximately 20,499 feddans. Al-Ayat Center ranked first in wheat production with approximately 6,797 feddans, followed by Atfai Center with an area of 4,220 feddans. As for corn, the Badrshin district ranked first with an area of 12,777 feddans, followed by the Ayat district with 11,255 feddans. One of the most important findings of the research, which examined the impact of modern technological innovations on the productivity per feddan of wheat and corn crops, showed that in the case of wheat crops and when using the recommendations, the average yield per acre of corn increased by about 4.53 ardebs per acre, and in the case of farmers using high-yield varieties, the average yield per acre of corn increased by about 3.88 ardebs per acre. For corn, in the case of farmers using the recommendations, the average yield per acre of corn increased by about 4.53 ardebs per acre. When farmers used high-yield varieties, the average yield per acre of corn increased by about 3.88 ardebs per acre.

[Dr. Mervat Rofael Girgis Youssef, Dr. Reda EL-Sayed Mohamed Morsi, Dr. Aml Mohamed Ameen Hasan. **The impact of modern technological innovations on the economic efficiency of crops Wheat and corn in Giza Governorate.** *Researcher* 2026;18(3):1-12]. ISSN 1553-9865 (print); ISSN 2163-8950 (online). <http://www.sciencepub.net/researcher>. 01. doi:[10.7537/marsrj180326.01](https://doi.org/10.7537/marsrj180326.01)

**Keywords:** impact; modern technological; innovation; economic efficiency; crops; Wheat; corn; Giza Governorate

### 1. Introduction:

Egypt suffers from a shortage in the production of its most important grain crops, wheat and corn. This is due to population growth, declining agricultural productivity, and the lack of some modern agricultural technologies. Adding to the problem is Egypt's water crisis and the continuous shortage of water needed for horizontal expansion of agricultural land to reduce the food gap in wheat and corn. This has led to increased interest in scientific innovations and their wider adoption among farmers to achieve optimal production levels and maximize wheat and corn yields. Agricultural development is a fundamental pillar of economic development, based on increasing production and narrowing the food gap. Wheat and corn hold particular economic importance, both for farmers as essential food crops and at the national level. As strategic crops, wheat and corn are crucial for ensuring food security in the form of grains. Egypt is one of the world's largest importers of wheat and corn due to the inability of domestic production to meet

increasing local demand. Therefore, the government is supporting programs to develop high-yield varieties of wheat and corn, providing improved production inputs such as selected seeds, agricultural machinery, chemical fertilizers, and pesticides, and raising farm-gate prices to encourage farmers to increase cultivated area and adopt high-yield varieties, while also implementing the latest technologies developed by scientific research institutions. productivity My wheat and corn crops.

### Research problem:

The research problem is limited to the inability of local production of wheat and corn to meet consumption needs. Despite the increase in the acre productivity of wheat and corn, the total consumption of the two crops is about 21.8 and 15.3 million tons respectively, of which 9.4 and 7.5 million tons are from local production, and the remainder is provided through imports from abroad. That is, production covers about 43.1% of wheat and 49.01% of corn, with

a deficit of about 57% and 51% for both crops. Therefore, the use of modern technology should be expanded with the application of mechanized farming systems and the use of new, improved, high-yield varieties to work on increasing acre productivity.

**Study objectives:**

- 1- A study of the development of area , productivity, and production of wheat and corn crops in Egypt during the period 2010-2024
- 2- Developments in national consumption , the food gap, and the self-sufficiency rate in Egypt
- 3- Development of area , production and productivity in Giza Governorate
- 4- Measuring the impact of applying certain innovations Technology on acreage productivity For wheat and corn crops,

**2. Methodology:**

The study used the descriptive analysis method. The quantitative aspect is represented by averages, percentages, and general time trend equations in their linear form. The study also estimated the impact of the most important factors affecting the quantity of productivity for wheat and corn crops in Giza Governorate by using the production function in the form of Cobb Douglas ( logarithmic). It also used the non-quantitative model of change (for dummy

variables) to show the impact of these innovations on the feddan productivity of wheat and corn crop farmers.

**Data sources:**

- The study relied on two main sources, which are
- 1- Secondary data from official bodies such as the Ministry of Agriculture and Land Reclamation , Economic Affairs Sector, for a time series during the period 2010-2024, and the Central Agency for Public Mobilization and Statistics
  - 2- Preliminary data for a field study in Giza Governorate for the 2024-2025 agricultural season. Study areas were selected based on area. The cultivated With my harvest wheat and corn

Table (1) shows the study sample for the cultivated areas in Giza Governorate for wheat and corn crops for the year 2024-2025 . The study sample was chosen according to the relative importance of the area. The cultivated With a total of 300 participants, the total cultivated area of wheat reached approximately 20,499 feddans. The Ayatt district ranked first in wheat cultivation with approximately 6,797 feddans , followed by the Atfia district with 4,220 feddans . For maize, the Badrashin district ranked first with an area of 12,777 feddans, followed by the Ayatt district with 11,255 feddans. The study sample was distributed according to the relative importance of the cultivated area , as shown in the table,

**Table (1):** (Geographical distribution of the area of wheat and corn crops in Giza Governorate for the agricultural season 2024-2025.

crop	wheat			maize			
	Center	Area	%	Number of respondents	Area	%	Number of respondents
	Giza	250	1.2	2	2495	6.4	10
	Imbaba	605	2.9	4	1796	4.6	7
	Osim	2507	11.8	18	3272	8.4	13
	Kirdasa	227	1.1	2	795	2.1	3
	Badrashin	578	2.7	4	12777	33.0	49
	Al-Ayyat	6797	32.1	48	11255	29.0	44
	the line	3520	16.6	25	1000	2.6	4
	Atfih	4220	19.9	30	4824	12.4	19
	Bridges	2495	11.8	18	561	1.4	2
	Total	21199	100	150	38775	100	150

**Source:** Giza Directorate of Agriculture, Department of Agricultural Affairs and Statistics 2024-2025 Results and discussion

**First: Development of cultivated area, productivity, and total production of wheat and corn crops during the period 2024-2010**

**1. Wheat crop:**

Table (1) shows the production and economic indicators for wheat during the period (2010-2025). It reveals that the wheat acreage ranged between a minimum and maximum of approximately 3,001,000 feddans in 2010 and 2025, respectively, with an

average acreage of approximately 3,351,000 feddans. The general time trend equation indicates a statistically significant and increasing trend of approximately 33,030 feddans annually, with an annual change rate of approximately 0.99% of the total average acreage during the study period. Similarly, the yield per feddan ranged between a minimum and maximum of approximately 2.1 and 3.1 tons per feddan in 2020 and 2025, respectively, with an average yield of approximately 2.7 tons per feddan. The time trend equation indicates that the increase was

not statistically significant. The total wheat production also ranged between a minimum and maximum. They reached approximately 7487,11185 thousand tons in 2017 and 2024, and the average total production reached approximately 9214 thousand tons. It is clear from the general time trend equation that there is a general increasing trend and statistically significant, reaching approximately 97.08 thousand tons, with an annual change rate of approximately 1.05%, the average of the study period.

**Table (2):** Development of area, productivity, and production of the maize crop in the Republic and Giza Governorate during the period 2010-2025

Years	Republic					Giza			
	Area 1000 acres	Productivity is tons per acre	Total production in tons	Consumption in tons	Self-sufficiency ratio	Area 1000 acres	Productivity is tons per acre	Total production in tons	Relative importance of area
2010	3001	2.6	7803	14673	53.2	38.6	2.5	96.5	1.29
2011	3049	2.6	7927	15215	52.1	41.6	2.6	108.2	1.36
2012	3161	3.4	10747	15790	68.1	44.6	2.8	124.9	1.41
2013	3373	2.9	9782	17210	56.8	46.2	2.9	134.0	1.37
2014	3393	2.8	9500	17560	54.1	46.3	2.6	120.4	1.36
2015	3469	2.9	10060	19560	51.4	46.3	2.7	125.0	1.33
2016	3353	2.9	9724	18220	53.4	31.9	2.9	92.5	0.95
2017	3255	2.3	7487	20000	37.4	41.7	2.6	108.4	1.28
2018	3157	2.4	7577	20240	37.4	34.1	2.7	92.1	1.08
2019	3135	2.5	7838	20420	38.4	42.6	2.8	119.3	1.36
2020	3410	2.1	7161	21290	33.6	45.6	2.9	132.2	1.34
2021	3420	2.7	9234	21414	43.1	38.5	2.8	107.8	1.13
2022	3650	2.9	10585	21538	49.1	41.5	2.8	116.2	1.14
2023	3581	2.7	9669	21662	44.6	38.6	2.7	104.2	1.08
2024	3608	3.1	11185	21786	51.3	34.5	2.6	89.7	0.96
2025	3597	3.1	11151	21910	50.9	33.9	2.8	94.9	0.94
average	3351	2.7	9214	19281	48.4	40.4	2.7	110.4	1.2

Source: Central Agency for Public Mobilization and Statistics, Statistical Yearbook Annual, various issues

The data in the same table indicates that the quantity available for consumption ranged between two minimum and maximum limits, reaching approximately 14,673 and 21,910 thousand tons in 2010 and 2025 respectively. The average quantity available for consumption reached approximately 19,281 thousand tons. The general time trend equation shows a statistically significant and increasing general trend of approximately 499,900 tons, with an annual

change rate of approximately 2.54%, the average for the study period. Meanwhile, the self-sufficiency rate for the wheat crop ranged between two minimum and maximum limits, reaching approximately 33.6% . 68.1% in 2020 and 2012, and the average gap reached about 48.4%. The general time trend equation shows a statistically significant decreasing general trend of about -0.858 and a decreasing annual change rate of about 1.7%, the average of the study period.

**Table (3)** Equation of the general time trend for the development of area, productivity and production of the maize crop in the Republic and Giza Governorate during the period 2010-2025

Variable		constant of the equation	regression coefficient	average	Rate of change annual	R2	Value of T	Value of F
Republic	Area 1000 acres	3069.9	33.03	3351	0.99	0,583	**4.42	**19.5
	Productivity is tons per acre	2.73	0.001	2.7	0.04	0.001	0.04	0.002
	Total production in tons	8389,1	97.08	9214	1.05	0,111	1.32	*1.74
	Consumption in tons	15030,6	499.9	19281	2.59	0,907	**11.7	**137
	Self-sufficiency ratio	55.72	0.858-	48.4	1.77-	0.212	*1.94	*3.77
Giza	Area 1000 acres	44.21	0.448-	40.4	1.11-	0,192	*1.82	*3.31
	Productivity is tons per acre	2.67	0.007	2.7	0.26	0.069	1.02	1,042
	Total production in tons	118.4	0.942-	110.4	0.85-	0.093	1.19	1.43
	Relative importance of area	1.42	0.025-	1,2	0.02 -	0,483	**3,615	**13.06

\*Significant at a 5% significance level \*\* Significant at a 1% significance level

Source: Calculated from the data in Table (2)

The data in the same table indicates the productive and economic indicators for wheat in Giza Governorate during the period (2010-2025). It shows that the cultivated area ranged between a minimum and maximum of approximately 31,900 and 46,300 feddans in 2016 and 2014, respectively, with an average area of approximately 40,400 feddans. The general time trend equation reveals a statistically significant decreasing trend of approximately -0.448 feddans annually, representing a change rate of approximately 1.11% of the total average area during the study period. Similarly, the yield per feddan ranged between a minimum and maximum of approximately 2.5 and 2.9 tons per feddan in 2010 and 2020, respectively, with an average yield of approximately 2.7 tons per feddan. The time trend equation indicates that the increase was not statistically significant. Meanwhile, the total wheat production in Giza Governorate ranged between two limits. The lowest and highest figures reached approximately 89,700 and 134,000 tons in 2013 and 2024, respectively. The average total production was approximately 110,400 tons. The general time trend equation shows a statistically insignificant decreasing trend. The relative importance of the area also varied. The percentage of wheat cultivated in Giza Governorate, relative to the Republic, is between a minimum and a maximum limit of approximately

0.94%. 1.41% in 2025 and 2012, and the average was about 1.2%. The general time trend equation shows a statistically significant decreasing general trend of about -0.025 and a decreasing annual change rate of about 0.02% of the average of the study period.

## 2. Corn crop

Table (2) shows the production and economic indicators for maize during the period (2010-2025). It reveals that the maize acreage ranged between a minimum and maximum of approximately 2,001 and 2,340,000 feddans in 2010 and 2018, respectively, with an average acreage of approximately 2,162,000 feddans. The general time trend equation shows a statistically significant increasing trend of approximately 9,890,000 feddans annually, representing a change rate of approximately 0.457% of the total average acreage during the study period. The yield per feddan also ranged between a minimum and maximum of approximately 3.12 and 3.35 tons per feddan in 2015 and 2011, respectively, with an average yield of approximately 3.3 tons per feddan. The time trend equation does not show a statistically significant increase. The total maize production ranged between a minimum and maximum of approximately 5896, 7659 thousand tons in 2011, 2017. The average total production reached about 7029 thousand tons. The general time trend equation shows a statistically significant and increasing general

trend of about 27.78 thousand tons, with an annual change rate of about 0.395%, the average of the study period.

As shown in the data of the same table, the quantity available for consumption of the corn crop ranged between two minimum and maximum limits, reaching about 12,036 and 18,196 thousand tons in 2011 and 2020 respectively. The average available for consumption reached about 13,957 thousand tons. The general time trend equation shows a general increasing trend that is not statistically significant. The self-sufficiency ratio for the corn crop ranged between two minimum and maximum limits, reaching about 43.3%. The gap was 53.5% in 2012 and 2021, and the average gap was about 52.6%. The general time trend equation shows an increasing general trend, which has not been proven statistically significant.

Data on the same production and economic indicators for maize in Giza Governorate during the period (2010-2025) shows that the cultivated area of maize in Giza Governorate ranged between a minimum and maximum of approximately 28,600 and 50,000 feddans in 2010 and 2021, respectively, with an average area of approximately 39,500 feddans. The general time trend equation reveals a statistically significant and increasing trend of approximately 1,070 feddans annually, with an annual growth rate of approximately 2.72% of the total average area during

the study period. Similarly, the yield per feddan ranged between a minimum and maximum of approximately 3.2 and 3.7 tons per feddan in 2010 and 2019, respectively, with an average yield of approximately 3.5 tons per feddan . The time trend equation clearly indicates that the yield per feddan of maize in Giza Governorate has followed an upward trend. The regression coefficient was statistically significant , reaching approximately 0.016, and the annual rate of change was approximately 0.37% of the mean for the study period. Total maize production in Giza Governorate ranged between a minimum and maximum of approximately 91,500 and 176,800 tons in 2001 and 2020, respectively, with an average total production of approximately 138,600 tons. The general time trend equation clearly shows a statistically significant increasing trend, with a regression coefficient of 3,940 tons and an annual rate of change of 2.8% over the study period . The relative importance of the area also varied. The percentage of corn crops cultivated in Giza Governorate, relative to the Republic, is between a minimum and a maximum limit of about 1.4%. 2.28% in 2010 and 2020, and the average was about 1.8%. It is clear from the equation of the general time trend that it took a general increasing trend and statistically significant, reaching about 0.033, with an increasing annual change rate of about 1.83%, the average of the study period.

**Table (4)** Development of area, productivity, and production of the maize crop in the Republic and Giza Governorate during the period 2010-2025

years	Republic					Giza			
	Area 1000 acres	Productivity is tons per acre	Total production in tons	Consumption in tons	Self-sufficiency ratio	Area 1000 acres	Productivity is tons per acre	Total production in tons	Relative importance of area
2010	2001	3.14	6283	12754	49.3	28.6	3.2	91.5	1.43
2011	1760	3.35	5896	12036	49.0	31.2	3.5	109.2	1.77
2012	2161	3.34	7218	13489	53.5	33.5	3.4	113.9	1.55
2013	2145	3.32	7121	13492	52.8	32.6	3.6	117.4	1.52
2014	2194	3.32	7284	14595	49.9	34.6	3.4	117.6	1.58
2015	2262	3.12	7057	14958	47.2	40.3	3.51	141.5	1.78
2016	2213	3.24	7170	15681	45.7	35.9	3.46	124.2	1.62
2017	2300	3.33	7659	16693	45.9	38.63	3.5	135.2	1.68
2018	2340	3.18	7441	16482	45.1	37.8	3.3	124.7	1.62
2019	2156	3.2	6899	17945	38.4	47.7	3.7	176.5	2.21
2020	2158	3.3	7121	18196	39.1	49.1	3.6	176.8	2.28
2021	2251	3.32	7473	17274	43.3	50	3.4	170.0	2.22
2022	2061	3.22	6636	14787	44.9	45.2	3.7	167.2	2.19
2023	2157	3.12	6730	14244	47.2	44.3	3.7	163.9	2.05
2024	2236	3.22	7200	15346	46.9	41	3.46	141.9	1.83
2025	2197	3.31	7272	15340	47.4	40.8	3.6	146.9	1.86
average	2162	3.3	7029	13957	52.6	39.5	3.5	138.6	1.8

Source: Central Agency for Public Mobilization and Statistics, Statistical Yearbook Annual, various issues

**Table (5)** Equation of the general time trend for the development of area, productivity and production of the maize crop in the Republic and Giza Governorate during the period 2010-2025

variable		constant of the equation	regression coefficient	average	Rate of change annual	R2	Value of T	Value of F
Republic	Area 1000 acres	207,29	9.89	2162	0,457	0,144	1.59	*2.52
	Productivity is tons per acre	3.26	0.001-	3.3	0.030-	0.007	0.318	0,101
	Total production in tons	6778.7	27.78	7029	0.395	0.102	1.30	*1.7
	Consumption in tons	13258.7	0,589	13957	0.004	0.023	0,589	0,346
	Self-sufficiency ratio	51.74	0.096	52.6	0,183	0.001	0.142	0,020
Giza	Area 1000 acres	31.4	1.07	39.5	2.71	0,509	**3.94	**15.5
	Productivity is tons per acre	3.38	0.013	3.5	0,371	0,221	*2.06	**4.24
	Total production in tons	106.2	3.94	138.6	2,843	0,509	**3.94	***15.56
	Relative importance of area	1,524	0.033	1.8	1,833	0,376	**3.01	**9.05

Significant at a 5% significance level \*\* Significant at a 1% significance level

Source: Calculated from the data in Table (4)

**Secondly: The most important factors affecting acreage productivity For the corn and maize crops in the study sample in Giza Governorate**

**1- Wheat production function for a sample of farmers in Giza Governorate,**

The results in Table (6) show that the estimated function is significant at the 1% level, according to the F-value of approximately 44.19 and the coefficient of determination of 0.724. This indicates that the independent changes in the function explain 72% of the variations in wheat production. The calculated t-value shows the significant positive effect at the 1% level for farmyard manure , nitrogen fertilizer , phosphate fertilizer, potassium fertilizer , and human labor. However, the seed quantity did not prove significant. As shown in the same table, the production elasticities of the wheat production inputs are positive, meaning that the quantity of wheat production responds directly to the quantities of the inputs used. The highest elasticity is for farmyard manure, where a 1% increase in this input results in an increase in production of approximately 0.403%. For the remaining production inputs— nitrogen fertilizer , phosphate fertilizer , potassium fertilizer, and human labor—a 1% increase in each results in an increase in productivity of approximately 0.284%, 0.239%, 0.207%, 0.319% respectively. The overall elasticity of production factors in the estimated function was estimated at about 1.54, which reflects the nature of

the return on increasing capacity , i.e., increasing the quantities of each of the production factors used in the function by 1% leads in total to an increase in wheat crop productivity of about 1.54%.

**2- Maize production function for a sample of farmers in Giza Governorate,**

The results in Table (6) show that the estimated function is significant at the 1% level, according to the F-value, which is approximately 3 , and the coefficient of determination, which is 0.724. This indicates that the independent changes in the function explain 72% of the 1.14 changes in maize production. The calculated t-value shows the significant positive effect at the 1% level for farmyard manure, nitrogen fertilizer , phosphate fertilizer , labor, and seeds . However, the amount of potassium fertilizer was not significant. As shown in the same table, the production elasticities of the maize production inputs are positive, meaning that the quantity of maize production responds directly to the quantities of the inputs used. The highest elasticity is for farmyard manure, where a 1% increase in this input results in an increase in production of approximately 0.354%. For the remaining production inputs— nitrogen fertilizer , phosphate fertilizer , labor, and seeds—a 1% increase in each results in an increase in productivity of approximately 0.34%, 0.184%, 0.349%, 0.191% respectively . The overall elasticity of production factors in the estimated function was

estimated at about 1.44, which reflects the nature of the return on increasing capacity , i.e., increasing the quantities of each of the production factors used in the

function by 1% leads in total to an increase in the productivity of the corn crop by about 1.44%.

**Table ( 6):** The most important factors affecting the productivity of maize and corn crops in the study sample in Giza Governorate 2024-2025

Variables	Indicators	corn crop			corn crop	
		Unity	Flexibility	Value of T	Flexibility	Value of T
organic fertilizer	m <sup>3</sup>	0,403	**4,726	0,354	**3.52	
Nitrogen fertilizer	kg	0,284	**2,702	0.34	**3.58	
phosphate fertilizer	kg	0.239	**2.80	0,184	*1.70	
Potassium fertilizer	kg	0,207	**2.75	0.029	0,308	
Human work	day	0.319	**4.55	0,349	**4.07	
seeds	kg	0.091	0,978	0,191	**2.59	
constant of the equation	liter	0.92-	5.39-	0.81-	3.79-	
R <sup>2</sup>	-	0.74	-	-	0,668	
R-2	-	0,724	-	-	0,646	
F	-	**44.19	-	-	**31.14	

Source: Field study sample data

**Third: The impact of technological innovations on the productivity of wheat and corn crops in the study sample in Giza Governorate**

Unmeasured pseudo-variables on the productivity of the studied crops in the study sample in Giza Governorate was estimated. This reflects the impact of modern technological innovations adopted by farmers through decisions made during the production process, or in other words, it reflects the farmer's management style in His farm, and then the efficiency of managing the productive resources of the crops under study , and the results of the impact of these variables on the productivity of the acre per unit area were estimated using the simple regression method.

**Analysis of Variance Model :Covariance analysis**

The covariance model<sup>(1)</sup> is commonly used to measure the effect of qualitative variables , which Its units cannot be measured quantitatively, such as agricultural practices like farming methods, irrigation systems, varieties, production areas, and farm capacities, at production levels or production cost levels. The covariance model used in this study takes the following mathematical form:

$$Y = a + \sum_i B_i$$

**Whereas:**

**Y**: The dependent variable, measured quantitatively.

**A**: represents the average value of the dependent variable when the arbitrary value is zero.

**B<sub>i</sub>**: The independent variable, which represents the qualitative variable whose effect on the dependent variable is to be determined, and takes the arbitrary value. Zero or One,

**Fourth: The impact of some farming practices on the productivity of the wheat crop in the study sample in Giza Governorate:**

**1. Using the recommendation:**

The farmers in the study sample differed in their methods of using extension recommendations; the farmers who did not use the recommendations method were given arbitration value. Zero, and farmers who use valuable arbitration recommendations One, and it was shown from Table (7) that the average productivity of the wheat crop for farmers who did not use the recommendations was estimated at about 13.3 ardebs per feddan, and in the case of farmers using the recommendations, the average productivity of the wheat crop per feddan increased by about 4.53 ardebs per feddan, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

**2. Seed varieties Recommended:**

The study sample revealed that some farmers use unreliable seed sources, while others use high-yield varieties. Farmers who did not use high-yield seeds were given a zero rating , while those using high-yield varieties received a rating of zero . One, and it was shown from Table (7) that the average productivity of the wheat crop for farmers who did not use high- yielding varieties was estimated at about 14.23 ardebs per feddan, and in the case of farmers using high-yielding varieties , the average productivity of the wheat crop per feddan increased by about 3.88 ardebs per feddan, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

### 3. Planting dates:

The study sample showed that some farmers have different planting dates. Egyptian In it, he gave arbitration value to farmers who did not adhere to the planting dates. Zero, and the farmers who adhered to the planting schedules The Egyptian has the arbitration value One, and it was shown from Table (5) that the average productivity of the wheat crop for the first group of farmers was estimated at about 13.9 ardebs per feddan, The second group had an average yield per acre of wheat crop that increased by about 3.33 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

### 4. The method of cultivation using laser deep plowing:

The study sample revealed that some farmers did not use the deep plowing system, as indicated by the arbitration value. Zero, and farmers who committed to using deep plowing as one of the modern technological innovations, the arbitration value One, and it was shown from Table (7) that the average productivity of the wheat crop for the first group of farmers was estimated at about 15.72 ardebs per feddan, The second group had an average yield per acre of wheat crop that increased by about 2.34 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

### 5. Fertilization rates:

The study sample revealed that some farmers did not adhere to fertilization rates, and they were given the arbitration value. Zero, and farmers who adhered to the recommended fertilization rates, the arbitration value One, and it was shown from Table (5) that the average productivity of the wheat crop for the first group of farmers was estimated at about 14.05 ardebs per feddan, The second group had an average yield per acre of wheat crop that increased by about 3.44 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

### 6. Water source:

The study sample showed that some farmers irrigate using mixed water, and they were given the arbitration value. Zero, and farmers who use fresh water have the arbitration value. One, and it was shown from Table (7) that the average productivity of

the wheat crop for the first group of farmers was estimated at about 16.14 ardebs per feddan, The second group had an average yield per acre of wheat crop that increased by about 1.01 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 5%.

### 7. Number of irrigation times:

The study sample showed that some farmers have a difference in the number of irrigation times. Recommended In it, where he gave them the arbitration value Zero, and farmers who adhere to the number of irrigations of value arbitration One, and it was shown from Table (7) that the average productivity of the wheat crop for the first group of farmers was estimated at about 13.77 ardebs per feddan, The second group had an average yield per acre of wheat crop that increased by about 4.17 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

### 8. Irrigation schedule:

The study sample revealed a difference in irrigation schedules among the sampled crops, as they were given the arbitration value. Zero, and farmers who adhere to irrigation schedules are valuable arbitration One, and it was shown from Table (7) that the average productivity of the wheat crop for the first group of farmers was estimated at about 14.47 ardebs per feddan, The second group had an average yield per acre of wheat crop that increased by about 3.27 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

### 9. Irrigation method:

The study sample revealed that some farmers do not adhere to the methods The recommended modern irrigation methods were given arbitration value. Zero, and farmers who adhere to a recommended irrigation method are valuable arbitration One, and it was shown from Table (7) that the average productivity of the wheat crop for the first group of farmers was estimated at about 14.17 ardebs per feddan, The second group had an average yield per acre of wheat crop that increased by about 3.52 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

**Table (7):** The impact of technological innovations on wheat crop productivity in the study sample in Giza Governorate 2025-2024 Unit/acre

Technological innovations	B <sub>0</sub>	b <sub>1</sub>	R <sup>2</sup>	R <sup>-2</sup>	F
Using the recommendation takes the number (1), and not using it takes the number (0).	13.3 **47.3	4.53 **11.6	0,581	0,576	**135.6
Seed classification: Use recommended new varieties that take the number (1), and do not use new varieties and stick to traditional varieties that take the number (000).	14,23 **45.5	3.88 **10.05	0,508	0.503	**101.05
Planting dates: Adherence to recommended planting dates (1), non-adherence to recommended planting dates (0).	13.9 **26.5	3.33 **5.71	0,249	0,242	**32.56
Farming method: Use of deep plowing or laser leveling and modern farming machinery (1), non-compliance with that technological recommendation (0).	15.72 **42.94	2.34 **3.59	0,160	0,147	**12.91
Fertilizer application rate: Adherence to recommended fertilization rates (1), non-compliance with those rates (0).	14.05 **32.96	3.44 **6.90	0.327	0,320	**47.67
Irrigation water source: fresh water (1), mixture, drainage or other (0,).	16,14 **46.3	1.01 *1.88	0.035	0.025	**3.56
Number of irrigations: Adherence to the recommended number of irrigations (1), non-compliance with that recommendation (0).	13.77 **43.15	4,177 **10.71	0.539	0.535	**114.7
Irrigation schedules: Adherence to the recommended irrigation schedules (1), non-compliance with that recommendation (0).	14.47 **39.7	3.27 **7.21	0,347	0,340	**51.96
Irrigation method: Follow the recommended method (modern irrigation) (1), do not follow it (traditional irrigation) (0).	14,17 **37.65	3.52 **7.73	0,379	0.372	**59.75
Harvesting or gathering method: Mechanical harvesting or gathering (1), Manual harvesting or gathering (0).	14.64 **34.46	2.79 **5.45	0,233	0.225	**29.77

\*Significant at the 5% level \*\* Significant at the 1% level

Source: Calculated from field study data using a computer.

#### 10. harvesting method:

The study sample revealed that some farmers do not adhere to the recommended modern harvesting methods, and they were given arbitration value. Zero, and farmers who adhere to the recommended harvesting method are of high value. arbitration One, and it was shown from Table (7) that the average productivity of the wheat crop for the first group of farmers was estimated at about 14.64 ardebs per feddan, The second group had an average yield per acre of wheat crop that increased by about 2.79 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

#### Fifth: The effect of some farming practices on the productivity of the corn crop in the study sample in Giza Governorate:

##### 1. Using the recommendation:

The farmers in the study sample differed in their methods of using extension recommendations; the farmers who did not use the recommendations method were given arbitration value. Zero, and farmers who use valuable arbitration recommendations One, and it was shown from Table (8) that the average productivity of the corn crop for farmers who did not use the recommendations was estimated at about 17.66 ardebs per feddan, and in the case of farmers using the recommendations, the average productivity per feddan of the corn crop increased by about 5.71 ardebs per feddan, and the statistical significance of the increase and the

estimated relationship were proven at a significance level of 1%.

## **2. Seed varieties Recommended:**

The study sample showed that some farmers had an unreliable seed source, while others used seeds of high-yielding varieties. Farmers who did not use high-yielding seeds were given a zero arbitration value, and farmers who used high-yielding varieties were given a one arbitration value. Table (8) showed that the average yield of the corn crop for farmers who did not use the varieties was estimated at about 18.52 ardebs per feddan, and in the case of farmers using high-yielding varieties, the average yield of the corn crop per feddan increased by about 4.72 ardebs per feddan. The statistical significance of the increase was proven, and the estimated relationship was established at a significance level of 1%.

## **3. Planting dates:**

The study sample showed that some farmers have different planting dates. Egyptian In it, he gave arbitration value to farmers who did not adhere to the planting dates. Zero, and the farmers who adhered to the planting schedules The Egyptian has the arbitration value One, and it was shown from Table (8) that the average productivity of the corn crop for the first group of farmers was estimated at about 17.5 ardebs per feddan, The second group had an average yield per acre of corn crop that increased by about 3.65 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

## **4. The method of cultivation using laser deep plowing:**

The study sample revealed that some farmers did not use the deep plowing system, as indicated by the arbitration value. Zero, and farmers who committed to using deep plowing as one of the modern technological innovations, the arbitration value One, and it was shown from Table (8) that the average productivity of the corn crop for the first group of farmers was estimated at about 20.75 ardebs per feddan, The second group had an average yield per acre of corn crop that increased by about 2.07 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

## **5. Fertilization rates:**

The study sample revealed that some farmers did not adhere to fertilization rates, and they were given the arbitration value. Zero, and farmers who adhered to the recommended fertilization rates, the arbitration value One, and it was shown from Table (8) that the average productivity of the corn crop for the first group of farmers was estimated at about 18.20 ardebs per feddan, The second group had an average

yield per acre of corn crop that increased by about 4.18 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

## **6. Water source:**

The study sample showed that some farmers irrigate using mixed water, and they were given the arbitration value. Zero, and farmers who use fresh water have the arbitration value. One, and it was shown from Table (8) that the average productivity of the corn crop for the first group of farmers was estimated at about 20.71 ardebs per feddan, The second group had an average yield per acre of corn crop that increased by about 2,057 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

## **7. Number of irrigation times:**

The study sample showed that some farmers have a difference in the number of irrigation times. Recommended In it, where he gave them the arbitration value Zero, and farmers who adhere to the number of irrigations of value arbitration One, and it was shown from Table (8) that the average productivity of the corn crop for the first group of farmers was estimated at about 17.92 ardebs per feddan, The second group had an average yield per acre of corn crop that increased by about 5.41 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

## **8. Irrigation schedule:**

The study sample revealed a difference in irrigation schedules among the sampled crops, as they were given the arbitration value. Zero, and farmers who adhere to irrigation schedules are valuable arbitration One, and it was shown from Table (8) that the average productivity of the corn crop for the first group of farmers was estimated at about 14.47 ardebs per feddan, The second group had an average yield per acre of corn crop that increased by about 3.27 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

## **9. Irrigation method:**

The study sample revealed that some farmers do not adhere to the methods The recommended modern irrigation methods were given arbitration value. Zero, and farmers who adhere to a recommended irrigation method are valuable arbitration One, and it was shown from Table (8) that the average productivity of the corn crop for the first group of farmers was estimated at about 18.81 ardebs per feddan, The second group had an average yield per acre of corn crop that increased by about 4.27 ardebs

per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

**10. Harvesting method:**

The study sample revealed that some farmers do not adhere to the recommended modern harvesting methods, and they were given arbitration value. Zero, and farmers who adhere to the recommended harvesting method are of high value. arbitration One,

and it was shown from Table (8) that the average productivity of the corn crop for the first group of farmers was estimated at about 17.98 ardebs per feddan, The second group had an average yield per acre of corn crop that increased by about 4.74 ardebs per acre, and the statistical significance of the increase and the estimated relationship were proven at a significance level of 1%.

**Table (8): The impact of technological innovations on the productivity of the corn crop in the study sample in Giza Governorate ,2025-2024Unit/Acre**

Technological innovations	B0	b1	R2	R-2	F
Using the recommendation takes the number (1), and not using it takes the number (0).	17.66 **44.32	5.71 **11.8	0.587	0.583	**139.4
Seed classification: Use recommended new varieties that take the number (1), and do not use new varieties and stick to traditional varieties that take the number (0).	18.52 **41.8	4.72 **8.54	0.427	0.421	**73.02
Planting dates: Adherence to recommended planting dates (1), non-adherence to recommended planting dates (0).	17.50 **26.87	3.65 **4.38	0.164	0.155	**19,22
Farming method: Use of deep plowing or laser leveling and modern farming machinery (1), non-compliance with that technological recommendation (0).	20.75 **48.67	2.07 **3.02	0.084	0.075	**9.01
Fertilizer application rate: Adherence to recommended fertilization rates (1), non-compliance with those rates (0).	18,20 **26.47	4.18 **5.44	0.232	0.224	**29.62
Water source: fresh water (1), mixture, drainage or other (0).	20.71 **47.37	2,057 **3.01	0.085	0.075	**9.05
Number of irrigations: Adherence to the recommended number of irrigations (1), non-compliance with that recommendation (0).	17.92 **43.12	5.41 **10.66	0.537	0.532	**113.7
Irrigation schedules: Adherence to the recommended irrigation schedules (1), non-compliance with that recommendation (0).	18.81 **39.85	4.27 **7.23	0.348	0.342	**52.37
Irrigation method: Follow the recommended method (modern irrigation) (1), do not follow it (traditional irrigation) (0).	18.72 **36.44	4.14 **6.63	0.310	0.303	**44.12
Harvesting or gathering method: Mechanical harvesting or gathering (1), Manual harvesting or gathering (0).	17.98 **31.79	4.74 **7.27	0.350	0.344	**52.85

\*Significant at the 5% level \*\* Significant at the 1% level

Source: Calculated from field study data using a computer.

**References**

- Othman, Samir (Dr.) An Analytical Study of Some Extension Methods Used and the Influencing Variables in an Arab Region, Second Conference on Economics and Development in Egypt and the Arab Countries – Faculty of Agriculture – Mansoura University 1989
- Abu Anin, Intisar Zakaria, 2005. Estimating the Economic Return on Irrigation Water for Some Crops. Master's Thesis, Department of Agricultural Economics , Faculty of Agriculture , Ain Shams University.
- Magdy Al-Shurbaji (Doctor :( Econometrics : Theory and Application –Department of Foreign Trade – Faculty of Commerce and Business Administration – Helwan University – First Edition 1994,
- Amira Ahmed Al-Shater, 2004, Developing Methods for Estimating Agricultural Production Costs : A Case Study on Wheat in Egypt, Master's Thesis , Faculty of Agriculture, University of Cairo, pp. 173-174
- Amira Ahmed Mohamed Elshater, Faten Mohamed ElhadyZeidan, 2015, An Economic Study of the Production Costs of Summer Wheat and Sorghum in Egypt, Egyptian Journal of Economics Agricultural , Volume 25, Issue 2, pp. 495-496

6. Khalil Al-Sa'aydeh 2022, Production and consumption of wheat and barley in Jordan in relation to population growth: A study in human geography, An-Najah University Journal for Human Sciences Research (Jordan, Volume 36, Issue 8, pp. 1588-1593.
7. Samia Abdel Fattah et al., 2009, " Statistical Analysis of Wheat and Cotton Production Costs in Egypt," 34th International Conference Statistics , Computer Science and its Applications, p. 256
8. Karim Abdel Hamid et al. , 2008, An Economic Study of Grain Crops in Egypt, Egyptian Journal of Agricultural Economics , Volume 18, Issue 4, p. 142
9. Muhammad, Ihab ( Doctors) The impact of using modern agricultural technology on the economic efficiency of wheat production in Sharqia Governorate
10. 10-Journal of Agricultural Economics & Rural Development; Suez Canal University, 2023