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Full length article

Technical and economic evaluation of the experiments of the salt-tolerant wheat crop, (Ismailia (1) Al-Fattah Al-Aleem) planted in the regions of the Republic for the 2023-2024 season

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ABSTRACT

Wheat is considered a strategic crop in Egypt, as the area planted with wheat in the 2023/2024 agricultural season reached about 3.2 million acres, with a production of about 9.5 million tons, as the self-sufficiency rate of wheat is estimated at about 50% in 2022. The sustainable agricultural strategy in Egypt 2030 aims to increase the self-sufficiency rate of wheat to about 70% in 2030, through horizontal expansion in old lands and vertical expansion by increasing productivity from land units and irrigation water by expanding the cultivation of high-yielding, resistant and tolerant varieties to all environmental pressures. Economic evaluation of wheat crop (Ismailia (1) Al-Fattah Al-Aleem strain) tolerant to salinity, heat and drought, which was tested under different levels of water and soil salinity, where its cultivation was tested in different regions and by multiple scientific bodies (Ministry of Agriculture and Land Reclamation - Ministry of Water Resources and Irrigation - Faculties of Agriculture in Egyptian universities at the Ministry of Higher Education and Scientific Research), and the results showed the feasibility of cultivating this strain in lands with relatively high salinity that use water with relatively high salinity, which will be positively reflected in increasing farmers' income, increasing total wheat production, raising the self-sufficiency rate and reducing the import bill from abroad on the other hand.

1. Introduction

Egypt is currently facing a set of water-related challenges, as the increasing population growth and the high standard of living are among the main challenges that lead to increasing the water needs of all sectors that use water, and population growth is one of the main reasons for the widening of the food gap between production and consumption, which requires increasing the agricultural area to reduce this food gap, which leads to an increase in agricultural water needs and an increase in water needs for the drinking water and industry sectors.

Egypt is considered one of the largest countries in the world importing wheat due to the lack of water resources on the one hand and the lack of arable land and the limited area allocated for wheat cultivation on the other hand, so we had to contribute in this area to achieve self-sufficiency of this important strategic crop by developing new breeds of wheat with a superior ability to withstand the harsh conditions of salinity, drought and heat for cultivation in desert lands with the aim of horizontal expansion. The new wheat strains are characterized by tolerance to salinity and drought as It achieves an economic crop, which confirms and enhances the possibility of using it in horizontal expansion projects and increasing the agricultural area, in

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addition to the possibility of planting other crops after wheat that serve the environment and society alike, such as other summer crops and fodder for the development of livestock and poultry and the establishment of agricultural facilities, and this comes from the state's keenness to adopt balanced strategies in the field of irrigation to achieve compatibility between the available water resources and the corresponding different needs, whether in the field of agriculture or other domestic, industrial and navigational uses. Through integrated land, water and environmental management. As an arid country dependent on the Nile River, which provides 95% of its water resources, Egypt suffers from water stress due to lack of resources, increasing population and increased demand for water from the Nile Basin countries. The uncertain effects of climate change on the flow of the Nile add another challenge to water management in Egypt. Besides, the expected high temperature will increase domestic demand for water, especially in the agricultural sector. In the past, Egypt's water resources were sufficient to meet demand current and emerging on water by various sectors.

Egypt gradually moved from a state of water abundance to a state of water scarcity. However, agriculture remains the backbone of the Egyptian economy and the largest consumer of fresh water as it consumes more than 80% of Egypt's water resources. Egypt has plans to use its limited water resources efficiently and overcome the gap between supply and demand. In the ancient lands of the Nile Valley and the Delta, most farmers still use rudimentary methods of irrigation, fertilization, and weed and pest control practices. It is usually done Manual fertilizer use with low efficiency, leading to high costs and environmental problems such as waterlogging and soil salinization. Soil and water salinity is one of the most severe factors limiting sustainable agricultural production not only in Egypt but also in the world. Salinization is increasingly affecting agricultural land in Egypt and the world, causing significant loss of production and soil degradation; therefore, understanding how to improve crop productivity in saline environments is critical to achieving the difficult goal of securing national food security and the future of future life.

El-Tahouri et al. (2016) conducted a field experiment at the Soil and Water Research Section, Nuclear Research Center, Atomic Energy Commission. Using soil sawdust and drip irrigation systems are strategies to save irrigation water. This track was implemented during the 2014-2015 winter season in Egypt to assess the effects of soil coverage and the

Drip irrigation to combat salinity and at the same time improve yield and water use efficiency by cultivated wheat Misr 2 variety in sandy soils. Water salinity treatments, i.e. freshwater (F 0.5 ds m^{-1}), S_1 6 dSm-1 and S_2 8 dS m-1) were applied under cover (rice straw). The results showed that wheat productivity was about 6.75 and 6.25 Ardab/Fed., under saline water 6 d/m and 8 decrements/m respectively. While the productivity under the same degree of salinity of irrigation water under rice straw coverage was about 7.1 and 8.2 Ardab/Fed., under saline water 6 ds/m and 8 ds/m respectively.

Alaa et al. (2021) conducted a study to estimate the effect of saline water and magnetically treated salt water on the physiological and crop characteristics of 32 bread wheat genotypes and to determine changes in soil properties. These genotypes were cultured in a potted experiment under greenhouse conditions during the winter planting seasons 2018-2017 and 2019-2018 at the farm of the Faculty of Agriculture, El Kawthar, Sohag University, Sohag, Egypt, and five irrigation treatments were applied, namely1. Tap water (Control) 2. Salinity level (2500 ppm) 3. Salinity level (5000 ppm) 4. Magnetically treated salt water (2500 ppm) 5. Magnetically treated salt water (5000 ppm). The results showed an increase in plant height to 66.6, 10.13%, 39.4 and 27.4% for the number of spikes/plants, 18.5 and 18.8% for spike length, 13.5 and 57.10% for biological crop/plant, and 89.6 and 94.7% for grain/plant crop under magnetically treated salt water respectively compared to 2500 and 5000 ppm of salt water. But in fact, more studies are needed on the effects of magnetic water on the growth, productivity and quality of various other crops.

The study by Ahmed et al. (2021) aimed to assess salinity tolerance among 159 genetic traits of elite spring wheat and compare them with 16 Egyptian tests. Thus, genotypes were evaluated under salinity conditions in El-Arish, Egypt (EC 10 Ds/m). The field experiment was developed in the design of the alpha network. Data were collected per thousand grains, highest plant survival rate, plant height, number of seeds/spikes, number of spikes/plants, seeds/spike, spike length and spike weight in the field. Interestingly, it was noted that the elite models of wheat 30351 and 30383 have Maximum values for the weight of one thousand grains in comparison with other wheat genotypes under study. The results of this study indicate that the Egyptian varieties, sids1, sids12, sids13 and Gemmiza12, had a maximum value of seeds/spike, spike length and spike weight respectively.

The main objective of this study was to investigate Evaluation of the effects of saline irrigation water with different levels of salinity on the new strain of salt-tolerant wheat under different environmental conditions.

1. Determine the level of salinity that will affect the yield and the highest yield level under these conditions.

2. Identify the best agricultural practices for the new strain of salt-tolerant wheat to bridge the food gap and to achieve self-sufficiency in wheat by exploiting marginal and untapped resources of saline lands and saline and semi-saline water in Egypt.

3. Study the environmental effects of the successive use of saline and semi-saline irrigation water on the new strain of salt-tolerant wheat and soil.

2. Materials and methods

▪ Plant material

Plant material has conducted preliminary experiments on salt-tolerant wheat strain (Ismailia (1) Al-Fattah Al-Aleem) were used in this study were obtained by Water Management Research in cooperation with Prof. Dr. Abdel Rahim at Wadi Al-Natroun Research Station, as well as the Institute's participation in the evaluation of this variety through the joint committee between the Ministry of Agriculture and the Ministry of Irrigation to conduct preliminary experiments in different regions of the Republic.

▪ Experimental Locations and Treatments

To achieve a package of objectives, many experiments have been conducted in research stations to assess economic and environmental impacts under different levels of salinity. The following is a brief scientific and historical overview of the experiences of the salt, heat and drought tolerant wheat strain/variety the future of Egypt (Ismailia (1) Al-Fattah Al-Aleem). Where the strain was cultivated the future of Egypt (Ismailia (1) Al-Fattah Al-Aleem) in some locations, headed by the Farm of the Faculty of Agriculture in Ismailia, and the Farm east of the lakes in Sinai Faculty of Agriculture Suez Canal University, Faculty of Agriculture King Salman University (Ras Sidr) in partnership with the Desert Research Center and productive fields of some farmers in the agricultural areas of Qantara East with an area of 5.5 feds, the Farm of the Faculty of Agriculture, Al-Azhar University, the Directorate of Beheira Agriculture in Nubaria, and the Faculty of Agriculture of Al-Arish. Currently, the cultivation of the rest of the selected sites has been completed successively with good follow-up of planting timings, fertilizer treatments, water rations and estimation of salinity levels in the cultivation area.

The experiment was conducted in randomized complete block design with three replications following the procedures of Gomez and Gomez (1984). In each plot having net plot size of 15 m^2, the 33 rows were maintained at recommended row to row distance of 15 cm (Khoso, 1990). Recommended land preparation operations were performed for equal distribution of irrigation and fertilizers. Sowing was done with a single coulter hand drill. First irrigation was applied 20 after days sowing.

▪ All P, K and half N.

They were applied during final land preparation at the time of sowing. The second half of N was split applied at 2^{nd}, 3^{rd} and 4^{th} irrigations in equal amount. Weed management practices were done manually for reducing weed-crop competition.

▪ Observation and Sampling.

The obtained values of nutrient concentration were multiplied with total dry matter of plant for NPK uptake: At harvest, 25 plants were randomly selected from each treatment for measuring different plant traits.

▪ Salinity Evaluation

The strain was compared at six salinity levels of irrigation water using NaCl, after germination five plants were retained in each pot and the pots were subjected to salinity treatments. 1500, 2000, 3000, 3040, 6000, 7554ppm, according to the region of planting. Agronomical traits six agronomical traits were recorded as an average for each pot.

3. Results and discussions

▪ The results of the crop in research stations and the most important results of the evaluation of the bread wheat (Ismailia (1) Al-Fattah Al-Aleem)

Table 1 shows the effect of seed quantity, planting date, soil type, irrigation method, soil salinity and irrigation water, and planting area on the crop productivity of the salt-tolerant strain (Ismailia (1) Al-Fattah Al-Aleem) when grown in different areas.

The results showed that Beheira Governorate (Nubaria) recorded the highest productivity per acre in Ardab, as it recorded 25.9 Ardab per Fed, despite the salinity of the irrigation water used being 2000 ppm using the drip irrigation method via groundwater, as well as planting on limestone lands on December 5. It was followed by agriculture in the Sharkia Governorate, Ouled Saqr, when planting on October 25, despite the salinity of the irrigation water used at 3040 ppm when using the flood irrigation method on loamy land, where a crop of 22 Ardab per acre was recorded, and the salinity rate was 3040 ppm. The results showed that Giza Governorate recorded the highest productivity per acre in Ardab, as it recorded 21 Ardab per acre, despite the salinity of the irrigation water used at 1500 ppm using the drip irrigation method via groundwater, as well as when planting in sandy land on December 15, with an amount of seeds of 40 kg/Feds.

Table 1

Study areas and evaluation of the results of the cultivation experiment of the wheat (Ismailia (1) Al-Fattah Al-Aleem) strain.

Governorate	Cultivation area	Entity	Irrigation water source	Salinity of irrigation water (ppm)	Irrigation method	Productivity (Ardab/Fed.)	Soil type	Planting date	Seed rate kg/Fed
Beheira	Nubaria	Directorate of Agriculture in Nubaria	Ground water	2000	Drip	25.9	Calcareous	05-Dec	60
Alexandria	Mariout	National Water Research Center	Drain	3000	submerge	15	Calcareous	03-Dec	70
Luxor	Esna	Ministry of Irrigation	Ground water	7554	submerge	15.5	Sandy	-	70
Ismailia	East Elbohirat	Suez Canal University	Drain	6000	submerge	19.7	Sandy	10-Nov	60
ElSharkia	Sufia, Awlad Saqr	Faculty of Agriculture, Suez Canal University-	Drain	3040	submerge	22	Clay	25-Oct	60
Giza	Nakla Region Faculty of Agriculture, Al-Azhar University	Farms Production Field	Ground water	1500	Drip	21+10 Haystack	Sandy	15-Dec	40
South Sinai	Faculty of Agriculture, Al-Azhar University	Farms Production Field	Ground water	3000	submerge	19.8+7 Haystack	Sandy	01-Dec	40
Cairo	Al-Azhar Faculty of Agriculture	Al-Azhar University	fertilization	2000	submerge	18+8 Haystack	Sandy	25-Oct	30
Cairo	Al-Azhar Faculty of Agriculture	Al-Azhar University	Fertilizing 4 times	2000	submerge	19.8+8 Haystack	Sandy	25-Oct	30

The results of this strain did not differ when planted in Ismaila Governorate, even though the salinity level reached 6000 ppm and the drip irrigation was in sandy lands, where the strain recorded 19.7 Ardab per Fed., when planted on November 10, with a seed quantity of 60 kg/Fed., while when planted in Luxor (Ithna), despite the salinity of the irrigation water used at 7554 ppm when using the flood irrigation method on sandy land, where a crop of 15.5 Ardab per Fed., was recorded when planted with 70 kg/Feds.

- **Yield productivity**

The results in Table 2 showed that yield productivity of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in the Nubaria region (under the conditions of a drip irrigation system with a water salinity degree of 2000pmm) for the season 2022-2024 is estimated at about 25.9 Ardab/Fed., an increase of about 1.4 Ardab/Fed., by 5.7% from the average productivity of the Fed. Planted wheat in the Nubaria region, which amounted to about 24.5 Ardab/Fed.

- **Productivity of irrigation water unit**

The water resource is the most important agricultural productivity element in Egypt due to its scarcity, as Egypt is located below the water poverty line, so identifying the productivity of the water unit has become one of the most important economic indicators to ensure the achievement of production efficiency, which means producing the largest amount of the crop with the least amount of water or producing the same amount of crop with less water. It is clear that the productivity of the irrigation water unit (1000 m^3) for the wheat crop strain (Ismailia (1) Al-Fattah Al-Aleem) cultivated In the Nubaria region it surpasses its counterpart in the fields compared to the Nubaria region, where it produced 15.9 Ardab/1000 cubic meters, while the comparative fields produced 15.10 Ardab/1000m^3, an increase of 0.86 Ardab/1000m^3 equivalent to 5.7%.

- **Total Revenue**

The total revenue per Fed., planted with wheat crop (Ismailia (1) Al-Fattah Al-Aleem) cultivated in the Nubaria region for the 2022-2024 season was about 41250 Pounds/Fed., an increase of 2100 Pounds/Fed., by 5.4% over the average total revenue per Fed., of wheat in the Nubaria region.

- **Total variable and total costs**

The costs are one of the economic variables that must be taken into account when making decisions related to the adoption of modern technologies, and the total variable costs of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Nubaria region season 2022-2024 amounted to about 13,440 Pounds/Fed., and the total costs amounted to about 19,440 Pounds/Fed.,

- **Net Fed. Return**

The net return per Fed., is one of the most important economic indicators that farmers respond to when adopting new technologies, the net yield per Fed., for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in the Nubaria region season 2022-2024 is estimated at about 21810 Pounds/Fed., an increase of 2100 Pounds/Fed., an increase of 10.7% over the general average of the net yield of wheat crop in the fields compared to the Nubaria region Which amounted to 19710 Pounds/Fed.

- **Mark up**

The mark up expresses the return above variable costs, and the value of this indicator amounted to about 27810 Pounds/Fed., for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem strain cultivated in the Nubaria region) season 2022-2024, surpassing its counterpart in the comparative fields, which amounted to about 25710 Pounds/Fed., an increase of 2100 Pounds/Fed., equivalent to about 8.2%.

- **Ratio of return to costs**

The ratio of return to costs is one of the most important economic indicators indicating the priorities and preference of alternative choices within the framework of technical and economic efficiency, and it also represents the profitability of the invested pound. It is noticeable that the ratio of return to costs for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in the Nubaria region exceeds the 2023-2024 season, as it reached about 2.12, an increase of about 5.4% over the comparative fields.

- **Yield productivity**

The results in Table 3 showed that yield productivity of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Marriott area (under the conditions of a developed surface irrigation system with a water salinity of 3000pmm) for the season 2022-2024 AD is estimated at about 15 Ardab/Fed., an increase of about 3 Ardab/Fed., by 25% over the average productivity of the Fed. planted wheat in the Marriott area, which amounted to about 12 Ardab/Fed.

- **Productivity of irrigation water unit**

It is clear that the productivity of the irrigation water unit (1000 m^3 for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in the Marriott area is superior to its counterparts in the comparative fields, where it produced 10 Ardab/1000m^3 while the comparative fields produced 8 Ardab/1000m^3 with an increase of 2 Ardab/1000m^3 equivalent to 25%.

Table 2

Economic indicators of salt-tolerant wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in Nubaria region (under drip irrigation system conditions with water salinity 2000pmm) for the season 2023-2024.

Indicator	Unit	Ismailia (1) Al-Fattah Al-Aleem dynasty	Nubarian Intermediate	Change	
				unit	%
Average yield per Fed., (grains)	Ardab/Fed.	25.9	24.5	1.40	5.7 %
Average price planted	EGP/Ardab	1500	1500	0	0
Value of the main output	EGP/Fed.	38850	36750	2100	5.70 %
Average production per Fed	Lamp/Fed.	12	12	0	0
Average price planted	EGP/Lamp.	200	200	0	0
By-product value	EGP/Fed.	2400	2400	0	0
Total value of the main and secondary product (Revenue)	EGP/Fed.	41250	39150	2100	5.40 %
Total variable costs	EGP/Fed.	13440	13440	0	0
Total costs	EGP/Fed.	19440	19440	0	0
Net yield per Fed.	EGP/Fed.	21810	19710	2100	10.70 %
Mark up	EGP/Fed.	27810	25710	2100	8.20 %
Ratio of return to total costs	EGP/Fed.	2.12	2.01	0.11	5.40 %
Water needed	1000 m^3/Fed.	1.622	1.622	0	0
Productivity of the irrigation water unit	Ardab/1000m^3	15.97	15.10	0.86	5.71 %

Source: Compiled from: Arab African Council for Agriculture and Partnership for Development and the Economic Affairs Sector at the Ministry of Agriculture and Land Reclamation.

Table 3

Economic indicators of salt-tolerant wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in Marriott area (under the conditions of an upgraded surface irrigation system with a water salinity of 3000pmm) for the season 2023-2024.

indicator	Unit	Ismailia (1) Al-Fattah Al-Aleem dynasty	Marriott area average	Variance	
				value	%
Average yield per Fed., (grains)	Ardab/Fed.	15	12	3	25.00 %
Average farm price	EGP/Ardab	1500	1500	0	0
Value of the main output	EGP/Fed.	22500	18000	4500	25.00 %
Average production per Fed.,	Lump/Fed.	8	3	0	0
Average farm price	EGP/Download	200	200	0	0
By-product value	EGP/Fed.	1600	600	0	0
Total value of the main and secondary product (revenue)	EGP/Fed.	24100	18600	5500	29.57 %
Total variable costs	EGP/Fed.	13440	13440	0	0
Total costs	EGP/Fed.	19440	18240	1200	0.065789
Net Fed. yield	EGP/Fed.	4660	360	4300	1194.44 %
Mark up	EGP/Fed.	10660	5160	5500	106.59 %
Ratio of return to total costs	EGP/Fed.	1.24	1.02	0.22	21.57 %
Water needed	1000 m^3/Fed.	1.5	1.5	0	0
Productivity of the irrigation water unit	Ardab/1000m^3	10	8	2	25.00 %

Source: Compiled from: Arab African Council for Agriculture and Partnership for Development and the Economic Affairs Sector at the Ministry of Agriculture and Land Reclamation.

▪ **Productivity of irrigation water unit**

It is clear that the productivity of the irrigation water unit (1000 m^3 for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in the Marriott area is superior to its counterparts in the comparative fields, where it produced 10 Ardab/1000m^3 while the comparative fields produced 8 Ardab/1000m^3 with an increase of 2 Ardab/1000m^3 equivalent to 25%.

▪ **Total Revenue**

The total revenue per Fed., planted with wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in the Mariout area for the 2022-2024 season amounted to about 24,100 Pounds/Fed., an increase of 5,500 Pounds/Fed., by 29.6% over the average total revenue per Fed., of wheat in the comparative fields.

▪ **Total variable and total costs**

The total variable costs of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Marriott area for the 2022-2024 season amounted to about 13,440 Pounds/Fed., and the total costs amounted to about 19,440 Pounds/Fed.

▪ **Net Fed. Return**

The net yield per Fed., for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem strain grown in the Marriott area) season 2022-2024 is estimated at about 4660 Pounds/Fed., an increase of 4300 Pounds/Fed., an increase of 1194% over the general average net yield of wheat crops in the fields compared to the Mariout area, which amounted to 360 Pounds/Fed.

▪ **Mark up**

Where the value of the Markup was about 10660 Pounds/Fed., for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Marriott area for the 2022-2024 season, outperforming its counterpart in the comparative fields, which amounted to about 5160 Pounds/Fed., an increase of 5500 Pounds/Fed., equivalent to about 106.6%.

▪ **Ratio of return to costs**

It is noticeable that the ratio of return to costs for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Marriott region exceeds the 2023-2024 season, reaching about 1.24, an increase of about 21.6% over the comparative fields.

▪ **Yield productivity**

The results in Table 4 showed that yield productivity of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the East Lakes area in Ismailia (under the conditions of an immersion irrigation system with a water salinity of 6000pmm) for the season 2022-2024 is estimated at about 19.7 Ardab/Fed., an increase of about 2.4 Ardab/Fed., by 13.9% over the average productivity of the Fed., planted wheat in the comparative fields, which amounted to about 17.3 Ardab/Fed.

▪ **Productivity of irrigation water unit**

It is clear that the productivity of the irrigation water unit (1000 m^3) for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the East Lakes region in Ismailia is superior to its counterpart in the fields compared to the East Lakes region in Ismailia, where it produced 9.45 Ardab/1000m^3 while the comparative fields produced 8.3 Ardab/1000m^3 with an increase of 1.15 Ardab/1000m^3 equivalent to 13.9%.

▪ **Total Revenue**

Where the total revenue per Fed., planted with wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in the East Lakes area in Ismailia for the 2022-2024 season reached about 31750 Pounds/Fed., an increase of 3800 Pounds/Fed., by 26.2% over the average total revenue per Fed., of wheat in the comparative fields.

▪ **Total variable and total costs**

The total variable costs of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the East Lakes area in Ismailia for the 2022-2024 season amounted to about 13,440 Pounds/Fed., and the total costs amounted to about 19,440 Pounds/Fed.

▪ **Net Fed. Return**

The net yield per Fed., of wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the East Lakes area in Ismailia for the 2022-2024 season is estimated at about 12310 Pounds/Fed., an increase of 3800 Pounds/Fed., an increase of 44.7% over the general average net yield of wheat crop in the fields compared to the East Lakes area in Ismailia, which amounted to 8510 Pounds/Fed.

▪ **Mark up**

Where the value of this indicator amounted to about 18310 Pounds/Fed., for the wheat crop of the (Ismailia (1) Al-Fattah Al-Aleem strain grown in the East Lakes region in Ismailia) season 2022-2024 AD, outperforming its counterpart in the comparative fields, which amounted to about 14510 Pounds/Fed., an increase of 3800 Pounds/Fed., equivalent to about 26.2%.

▪ **Ratio of return to costs**

It is noticeable that the ratio of return to costs for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the East Lakes area in Ismailia exceeds the 2022-2024 season, as it reached about 1.63, an increase of about 13.6% over the comparative fields.

Table 4

Economic indicators of wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in the East Lakes area in Ismailia (under flood irrigation system conditions with water salinity 6000 pmm) for the season 2023-2024.

indicator	Unit	Ismailia (1) Al-Fattah Al-Aleem dynasty	Average East Elbohirat area in Ismailia	Variance	
				value	%
Average yield per Fed., (grains)	Ardab/Fed.	19.7	17.3	2.4	13.87%
Average farm price	EGP/Ardab	1500	1500	0	0
Value of the main output	EGP/Fed.	29550	25950	3600	13.87%
Average production per Fed.,	Lump/Fed.	11	10	0	0
Average farm price	EGP/Download	200	200	0	0
By-product value	EGP/Fed.	2200	2000	0	0
Total value of the main and secondary product (revenue)	EGP/Fed.	31750	27950	3800	13.60%
Total variable costs	EGP/Fed.	13440	13440	0	0
Total costs	EGP/Fed.	19440	19440	0	0
Net Fed. yield	EGP/Fed.	12310	8510	3800	44.65%
Mark up	EGP/Fed.	18310	14510	3800	26.19%
Ratio of return to total costs	EGP/Fed.	1.63	1.44	0.2	1360%
Water needed	1000 m^3/Fed.	2.085	2.085	0	0
Productivity of the irrigation water unit	Ardab/1000m^3	9.45	8.3	1.15	13.87%

Source: Compiled from: Arab African Council for Agriculture and Partnership for Development and the Economic Affairs Sector of the Ministry of Agriculture and Land Reclamation.

- **Average Fed. Productivity**

The results in Table 5 showed that yield productivity of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Ras Sidr area in South Sinai (under the conditions of an immersion irrigation system with a water salinity of 3000pmm) is estimated at about 19.8 Ardab/Fed., an increase of about 10.25 Ardab/Fed., by 107.3% over the average productivity of wheat grown per Fed., in Ras Sidr area in South Sinai, which amounted to about 9.55 Ardab/Fed.

- **Productivity of irrigation water unit**

It is clear that the productivity of the irrigation water unit (1000 m^3) for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Ras Sidr area in South Sinai is superior to its counterpart in the comparative fields, where it produced 9.5 Ardab/1000m^3 while the comparative fields produced 4.58 Ardab/1000m^3 with an increase of 4.92 Ardab/1000m^3 equivalent to 107.3%.

- **Total Revenue**

Where the total revenue per Fed., planted with wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Ras Sidr area in South Sinai for the 2022-2024 season reached about 31,500 Pounds/Fed., an increase of 15,375 Pounds/Fed., by 95.4% over the average total revenue per Fed., of wheat in the comparative fields.

- **Total variable and total costs**

The total variable costs of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Ras Sidr area in South Sinai for the 2022-2024 season amounted to about 13,440 Pounds/Fed., and the total costs amounted to about 19,440 Pounds/Fed.

- **Net Fed. Return**

The net yield per Fed., of wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in the Ras Sidr area of South Sinai for the 2022-2024 season is estimated at about 12060 Pounds/Fed., while the wheat crop in the comparative fields achieved a loss of 3315 Pounds/Fed.

- **Mark up**

The value of this indicator amounted to about 18060 Pounds/Fed., for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Ras Sidr area in South Sinai for the 2022-2024 season, surpassing its counterpart in the comparative fields, which amounted to about 15375 Pounds/Fed., an increase of 2685 Pounds/Fed., equivalent to about 572.6%.

Table 5

Economic indicators of salt-tolerant wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in Ras Sidr area in South Sinai under flood irrigation system with water salinity 3000pmm for the season 2022-2024.

Indicators	Unit	Ismailia (1) Al-Fattah Al-Aleem dynasty	South Sinai Average	Variance	
				value	%
Average yield per Fed., (grains)	Ardab/Fed.	19.8	9.55	10.25	107.33%
Average farm price	EGP/Ardab	1500	1500	0	0
Value of the main output	EGP/Fed.	29700	14325	15375	107.33%
Average production per Fed.,	Lump/Fed.	9	9	0	0
Average farm price	EGP/Download	200	200	0	0
By-product value	EGP/Fed.	1800	1800	0	0
Total value of the main and secondary product (revenue)	EGP/Fed.	31500	16125	15375	95.35%
Total variable costs	EGP/Fed.	13440	13440	0	0
Total costs	EGP/Fed.	19440	19440	0	0
Net Fed. yield	EGP/Fed.	12060	3315	15375	463.80%
Mark up	EGP/Fed.	18060	2685	15375	572.63%
Ratio of return to total costs	EGP/Fed.	1.62	0.83	0.79	95.35%
Water needed	1000 m^3/Fed.	2.085	2.085	0	0
Productivity of the irrigation water unit	Ardab/1000m^3	9.5	4.58	4.92	107.33%

Source: Compiled from: Arab African Council for Agriculture and Partnership for Development and the Economic Affairs Sector of the Ministry of Agriculture and Land Reclamation.

- **Ratio of return to costs**

It is noticeable that the ratio of return to costs for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Ras Sidr area in South Sinai exceeds the 2022-2024 season, reaching about 1.62, an increase of about 95.4% over the comparative fields.

- **Yield productivity**

The results in Table 6 showed that yield productivity per Fed., of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Nakla area of Giza Governorate (under the conditions of a drip irrigation system with a water salinity of 1500pmm) estimated at about 21 Ardab/Fed., an increase of about 11 Ardab/Fed., by 110% over the average productivity of the Fed. planted wheat in the Nakla area of Giza Governorate, which amounted to about 10 Ardab/Fed.

- **Productivity of irrigation water unit**

It is clear that the productivity of the irrigation water unit (1000 m^3) for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem strain cultivated in the Nakla area of Giza Governorate) is superior to its counterpart in the fields compared to the Nakla area in Giza Governorate, where it produced 12.41 Ardab/1000m^3 while the comparative fields produced 5.91 Ardab/1000m^3 with an increase of 6.5 Ardab/1000m^3 equivalent to 110%.

- **Total Revenue**

The total revenue per Fed., planted with wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain planted in the Nakla area of Giza Governorate for the 2022-2024 season reached about 33,500 Pounds/Fed., an increase of 17,500 Pounds/Fed., by 109.4% over the average total revenue per Fed., of wheat in the Nakla area in Giza Governorate.

- **Total variable and total costs**

The total variable costs of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Nakla area of Giza Governorate for the 2022-2024 season amounted to about 6538 Pounds/Fed., and the total costs amounted to about 10538 Pounds/Fed.

- **Net Fed. Return**

The net yield per Fed., for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Nakla area of Giza Governorate for the 2022-2024 season is estimated at about 22,962 Pounds/Fed., an increase of

17,500 Pounds/Fed., an increase of 320.4% over the general average net yield of wheat crop in the fields compared to the Nakla area in Giza Governorate, which amounted to 5,462 Pounds/Fed.

- **Mark up**

The value of this indicator amounted to about 26962 Pounds/Fed., for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in the Nakla area of Giza Governorate for the 2022-2024 season, surpassing its counterpart in the comparative fields , which amounted to about 9462 Pounds/Fed., an increase of 17500 Pounds/Fed., equivalent to about 185%.

- **Ratio of return to costs**

It is noticeable that the ratio of return to costs for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Nakla area of Giza Governorate exceeds the 2022-2024 season, reaching about 3.18, an increase of about 109.4% over the comparative fields.

Table 6

Economic indicators of salt-tolerant wheat crop **(**Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in Nakla area, Giza Governorate under drip irrigation system conditions with water salinity of 1500pmm).

Indicators	Unit	Ismailia (1) Al-Fattah Al-Aleem dynasty	Giza Governorate average	Variance	
				value	%
Average yield per Fed., (grains)	Ardab/Fed.	21	10	11	110.00%
Average farm price	EGP/Ardab	1500	1500	0	0
Value of the main output	EGP/Fed.	31500	15000	16500	110.00%
Average production per Fed.,	Lump/Fed.	10	5	0	0
Average farm price	EGP/Download	200	200	0	0
By-product value	EGP/Fed.	2000	1000	0	0
Total value of the main and secondary product (revenue)	EGP/Fed.	33500	16000	17500	109.38%
Total variable costs	EGP/Fed.	6538	6538	0	0
Total costs	EGP/Fed.	10538	10538	0	0
Net Fed. yield	EGP/Fed.	22962	5462	17500	320.40%
Mark up	EGP/Fed.	26962	9462	17500	184.95%
Ratio of return to total costs	EGP/Fed.	3.18	1.52	1.66	109.38%
Water needed	1000 m^3/Fed.	1.692	1.692	0	0
Productivity of the irrigation water unit	Ardab/1000m^3	12.41	5.91	6.5	110.00%

Source: Compiled from: Arab African Council for Agriculture and Partnership for Development and the Economic Affairs Sector of the Ministry of Agriculture and Land Reclamation.

- **Average Fed. Productivity**

The results in Table 7 showed that the productivity per Fed., of salt-resistant wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Esna area in Luxor (under the conditions of an immersion irrigation system with a water salinity of 7554pmm) is estimated at about 15.5 Ardab/Fed., an increase of about 2.5 Ardab/Fed., by 19.2% over the average productivity of the Fed. planted wheat in the Esna area in Luxor, which amounted to about 13 Ardab/Fed.

- **Productivity of irrigation water unit**

It is clear that the productivity of the irrigation water unit (1000 m^3) for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem strain cultivated in the Esna area in Luxor) is superior to its counterpart in the fields compared to the Esna area in Luxor, where it produced 5.44 Ardab/1000m^3, while the comparative fields produced 4.56 Ardab/1000m^3, an increase of 0.88 Ardab/1000m^3 equivalent to 19.2%.

- **Total Revenue**

The total revenue per Fed., planted with wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain planted in the Esna area in Luxor for the 2022-2024 season was about 25250 Pounds/Fed., an increase of 4750 Pounds/Fed., by 23.2% over the average total revenue per Fed., of wheat in the comparison fields.

Table 7

Economic indicators of salt-tolerant wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in Esna area in Luxor under flood irrigation system with salinity of 7554 PPM.

Indicators	Unit	Ismailia (1) Al-Fattah Al-Aleem dynasty	Average Luxor	Variance	
				value	%
Average yield per Fed., (grains)	Ardab/Fed.	15.5	13	2.5	19.23%
Average farm price	EGP/Ardab	1500	1500	0	0
Value of the main output	EGP/Fed.	23250	19500	3750	19.23%
Average roduction per Fed.,	Lump/Fed.	10	5	0	0
Average farm price	EGP/Download	200	200	0	0
By-product value	EGP/Fed.	2000	1000	0	0
Total value of the main and secondary product (revenue)	EGP/Fed.	25250	20500	4750	23.17%
Total variable costs	EGP/Fed.	13440	13440	0	0
Total costs	EGP/Fed.	19440	19440	0	0
Net Fed. yield	EGP/Fed.	5810	1060	4750	448.11%
Mark up	EGP/Fed.	11810	7060	4750	67.28%
Ratio of return to total costs	EGP/Fed.	1.3	1.05	0.24	23.17%
Water needed	1000 m^3/Fed.	2.85	2.85	0	0
Productivity of the irrigation water unit	Ardab/1000m^3	5.44	4.56	0.88	19.23%

Source: Compiled and calculated from: Arab African Council for Agriculture and Partnership for Development and Economic Affairs Sector of the Ministry of Agriculture and Land Reclamation.

- **Total variable and total costs**

The total variable costs of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Esna area in Luxor for the 2022-2024 season amounted to about 13,440 Pounds/Fed., and the total costs amounted to about 19,440 Pounds/Fed.

- **Net Fed. Return**

The net yield per Fed., of wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Esna area in Luxor for the 2022-2024 season is estimated at about 5810 Pounds/Fed., an increase of 1060 Pounds/Fed., an increase of 448.1% over the general average net yield of wheat crop in the comparative fields, which amounted to 4750 Pounds/Fed.

- **Mark up**

The value of this indicator was about 11810 Pounds/Fed., for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem strain grown in the Esna area in Luxor) for the 2022-2024 season, surpassing its counterpart in the comparative fields, which amounted to about 7060 Pounds/Fed., an increase of 4750 Pounds/Fed., equivalent to about 67.3%.

- **Ratio of return to costs**

It is noticeable that the ratio of return to costs of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Esna area in Luxor exceeds the 2022-2024 season, as it reached about 1.3, an increase of about 23.2% over the comparative fields.

- **Yield productivity**

The results in Table 8 showed that the productivity per Fed., of wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Sufiya area of Sharkia Governorate (under the conditions of an immersion irrigation system with a water salinity of 2000pmm) is estimated at about 22 Ardab/Fed., an increase of about 3.3 Ardab/Fed. by 17.7% over the average productivity of wheat cultivated Fed. in Sharkia Governorate, which amounted to about 18.7 Ardab/Fed.

- **Productivity of irrigation water unit**

It is clear that the productivity of the irrigation water unit (1000 m^3) for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem strain grown in the Sufiya Awlad Saqr area in Sharkia Governorate) is superior to its counterpart in the comparative fields, where it produced 10.55 Ardab/1000m^3 while the comparative fields produced

8.97 Ardab/1000m³ with an increase of 1.58 Ardab/1000m³ equivalent to 17.7%.

- **Total Revenue**

Where the total revenue per Fed., planted with wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in Sufism, Awlad Saqr in Sharkia Governorate season 2022-2024 AD amounted to about 35,000 Pounds/Fed., an increase of 5950 Pounds/Fed., by 20.5% from the average total revenue per Fed., of wheat in the Sufi area of Awlad Saqr in Sharkia Governorate

- **Total variable and total costs**

The total variable costs of the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Sufi Awlad Saqr area in Sharkia Governorate for the 2022-2024 season amounted to about 13,440 Pounds/Fed., and the total costs amounted to about 19,440 Pounds/Fed.

- **Net Fed. Return**

The net yield per Fed., of wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Sufiya Awlad Saqr area in Sharkia Governorate for the 2022-2024 season is estimated at about 15560 Pounds/Fed., an increase of 5950 Pounds/Fed., an increase of 61.9% over the general average net yield of wheat crop in the fields compared to the Sufiya Awlad Saqr area in Sharkia Governorate, which amounted to 9610 Pounds/Fed.

- **Mark up.**

The value of this indicator was about 21,560 Pounds/Fed., for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Sufi Awlad Saqr area in Sharkia Governorate for the 2022-2024 season, surpassing its counterpart in the comparative fields, which amounted to about 15610 Pounds/Fed., an increase of 5950 Pounds/Fed., equivalent to about 38.1%.

- **Ratio of return to costs**

It is noticeable that the ratio of return to costs for the wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain grown in the Sufi Awlad Saqr area in Sharkia Governorate exceeds the 2022-2024 season, as it reached about 1.8, an increase of about 20.5% over the comparative fields.

Table 8

Economic indicators of salt-tolerant wheat crop (Ismailia (1) Al-Fattah Al-Aleem) strain cultivated in Al-Sufiya area in Sharkia Governorate under flood irrigation system conditions with water salinity 2000ppm**.**

Indicators	Unit	Ismailia (1) Al-Fattah Al-Aleem dynasty	Average Sharkia Governorate	Variance	
				value	%
Average yield per Fed., (grains)	Ardab/Fed.	22	18.7	3.3	17.65%
Average farm price	EGP/Ardab	1500	1500	0	0
Value of the main output	EGP/Fed.	33000	28050	4950	17.65%
Average production per Fed.,	Lump/Fed.	10	5	0	0
Average farm price	EGP/Download	200	200	0	0
By-product value	EGP/Fed.	2000	1000	0	0
Total value of the main and secondary product (revenue)	EGP/Fed.	35000	29050	5950	20.48%
Total variable costs	EGP/Fed.	13440	13440	0	0
Total costs	EGP/Fed.	19440	19440	0	0
Net Fed. yield	EGP/Fed.	15560	9610	5950	61.91%
Mark up	EGP/Fed.	21560	15610	5950	38.12%
Ratio of return to total costs	EGP/Fed.	1.8	1.49	0.31	20.48%
Water needed	1000 m³/Fed.	2.085	2.085	0	1
Productivity of the irrigation water unit	Ardab/1000m³	10.55	8.97	1.58	17.65%

Source: Compiled from: Arab African Council for Agriculture and Partnership for Development and the Economic Affairs Sector of the Ministry of Agriculture and Land Reclamation.

4. Conclusions

First: Cultivating this type of strategic crops that tolerate salt, heat and drought will enhance the capabilities of the national economy by reducing imports from abroad, which ensures maintaining the level of the balance of payments in favor of export instead of import. It will reduce the pressure on the national currency.

Second: Ensuring an appropriate degree of reducing the food gap, which will bring us closer to achieving a nominal goal, which is self-sufficiency in cereals, especially the wheat crop.

Third: Increasing the efficiency of Egypt's exploitation of its resources from desert lands and marginal waters.

Fourth: With the development of experience and maximizing its positive effects, opportunities will be available to reconsider the crop composition by providing the opportunity for export crops, which helps to achieve annual exports to $ 100 billion annually.

Recommendations

After confirming the results obtained by the Council through experiments carried out in ministries, universities, concerned bodies and institutions and scientific research centers, the increase in the percentage of protein in the salt-tolerant strain of Egypt Ismailia Future (1) reached 16 compared to other varieties (Misr 1 and Misr 2) as well as the sedimentation test (SDS), which results:

1. The new strains are characterized by a high ability to tolerate salinity and drought and achieve an economic crop of cereals in some areas.
2. The possibility of horizontal expansion and increase the agricultural area of the wheat crop.
3. The possibility of growing other crops after wheat that serve the environment and society, such as summer fodder and other summer crops such as corn, rice, soybeans, etc.
4. Developing livestock and poultry on feed resulting from wheat, thus benefiting the country and society, prevailing security and peace, and achieving prosperity for all.
5. The possibility of generalizing the cultivation of the new strain in the future of Egypt Ismailia (1) in saline lands or areas prone to heat and drought.
6. The possibility of increasing the agricultural area outside the yards to be irrigated with Nile water.

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التقييم الفني والاقتصادي لتجارب محصول القمح المتحمل للملوحة (الإسماعيلية (١) الفتاح العليم) المزروع بمناطق الجمهورية لموسم ٢٠٢٣ - ٢٠٢٤

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الملخص العربي

يعتبر القمح محصولا استراتيجيا في مصر، حيث بلغت المساحة المزروعة بالقمح في الموسم الزراعي ٢٠٢٣/٢٠٢٤ نحو ٣,٢ مليون فدان بإنتاج نحو ٩,٥ مليون طن، حيث تقدر نسبة الاكتفاء الذاتي من القمح بنحو ٥٠٪ عام ٢٠٢٢. وتهدف الاستراتيجية الزراعية المستدامة في مصر ٢٠٣٠ إلى زيادة نسبة الاكتفاء الذاتي من القمح إلى نحو ٧٠٪ عام ٢٠٣٠، من خلال التوسع الأفقي في الأراضي القديمة والتوسع الرأسي بزيادة الإنتاجية من الوحدات الأرضية ومياه الري بالتوسع في زراعة الأصناف عالية الإنتاجية والمقاومة

والمتحملة لكافة الضغوط البيئية. التقييم الاقتصادي لمحصول القمح (سلالة الإسماعيلية (١) الفتاح العليم) المتحمل للملوحة والحرارة والجفاف والذي تم اختباره تحت مستويات مختلفة من ملوحة المياه والتربة حيث تم اختبار زراعته في مناطق مختلفة ومن قبل هيئات علمية متعددة (وزارة الزراعة واستصلاح الأراضي – وزارة الموارد المائية والري – كليات الزراعة بالجامعات المصرية بوزارة التعليم العالي والبحث العلمي) وأظهرت النتائج جدوى زراعة هذه السلالة في الأراضي ذات الملوحة العالية نسبياً والتي تستخدم مياه ذات ملوحة عالية نسبياً مما سينعكس إيجاباً في زيادة دخل المزارعين وزيادة الإنتاج الكلي من القمح ورفع نسبة الاكتفاء الذاتي وخفض فاتورة الاستيراد من الخارج من ناحية أخرى.