



STATISTICAL ESTIMATION OF PRODUCTION FUNCTIONS AND AGRICULTURAL COSTS AND MEASURES OF PRODUCTIVITY EFFICIENCY OF WATER USERS' ASSOCIATIONS OF DIFFERENT IRRIGATION SYSTEMS IN AL-BEHEIRA GOVERNORATE

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ABSTRACT

Egypt suffers from future risks due to lack of water especially in the downstream countries, Egypt and Sudan, which depend on the Nile water almost entirely and the upstream countries are moving to raise problems with Egypt and erect dams and pressure on Egypt to achieve the greatest economic benefit possible to prevent Egypt from horizontal agricultural expansion.

Egypt is the largest and most dependent country on Nile water, with almost no rainfall. Groundwater is not renewable. Thus, the Nile water accounts for about 97% of Egypt's water resources and the share of the Egyptians is 55.5 billion m³, this quantity of water is insufficient to the needs of the population, and in order to maintain Egypt's per capita water, it needs about 80 billion m³, which means a deficit of 25 billion m³ and stability of Egypt's share of the Nile water under current local, regional and global conditions, and development of the appropriate strategy to alleviate the conflict with the basin countries Nile River so the study aimed to compare production efficiency and the

economics of the irrigation systems used in the province of the lake through the study of water user associations in agriculture under the different irrigation patterns within water users association and outside association to rationalize the use of water and raising awareness to increase productivity.

The results of the estimation indicated that the economic efficiency indicators of the maize and potato crop farmers in the sample of the field study show the preference of the use of the production function in the logarithmic formula to the different variables affecting the productivity of the crops according to the irrigation systems within the water user associations

The results showed that the total production elasticity of maize crop was about 0.720, 0.530, 0.348 for sprinkler & drop, developed irrigation, and padded flooding systems, while the value of (R^2) was about 0.63, 0.60, 0.76 for irrigation systems respectively,

The results showed that the total productivity of the potato crop was 1.127, 1.16, 1.318, for sprinkler & drop, developed irrigation, and padded flooding systems respectively, while the value of (R^2) was about 0.76, 0.62, 0.70 for irrigation systems respectively.

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The relationship between the total costs and quantity produced of maize, which showed that the quadratic formula is the best formulas for the data, and the equations show that there is a statistically significant positive relationship between the total costs and production of maize in Behera Governorate.

In the estimation of the optimal production volume, which reduces the costs is estimated at about 18.7, 22.1, 23.9 ardab/feddan, for sprinkler & drop, developed irrigation, and padded flooding systems respectively.

In the estimation of the production volume which maximizes profit, the results showed that this volume was not reached, 29.1, 36.1, 31.9 ardab/feddan, for sprinkler & drop, developed irrigation, and padded flooding systems respectively.

Calculating cost elasticity, it reached about 1.19, 0.804, 0.719, for sprinkler & drop, developed irrigation, and padded flooding systems respectively.

In order to determine the optimal production volume of the potato crop, which reduces the costs, so make average cost equal marginal costs, estimated at 12.539, 11.377, 11.064 tons/fed, for sprinkler & drop, developed irrigation, and padded flooding systems respectively.

The size of production of potato that maximizes profit was about 42,500, 33,350, 25,600 tons/fed, for sprinkler & drop, developed irrigation, and padded flooding systems respectively.

Calculating the cost elasticity of the potato, it turned out that it was about 0.93, 0.804, 0.719 for sprinkler & drop, developed irrigation, and padded flooding systems respectively.

Production efficiency measures are (7), the study of the efficiency of production of maize crop for members of water associations in the sample of the study in Behera Governorate. It was found that the members of the water users association of developed irrigation for in the feddan productivity of maize was exceeded, which was estimated at 23.01 ardab/feddan, while it reached about 19.05, 22.1 ardab/feddan for sprinkler & drop, and flooding systems respectively.

Increase the total revenues of the members of water user associations to developed irrigation system for the maize crop, estimated at 8744.7 pounds/feddan while it reached about 7239, 8402.2 pounds/fed for members of the water associations that use sprinkler & drop, and flooding systems respectively.

Increase in return of maize crop for members of water associations users of developed irrigation system, which amounted to about 3529.3 pounds while estimated at about 2204.8, 3270.1 pounds for members of water use associations for sprinkler & drop, and flooding systems respectively.

Increase in the profitability of the pound for water use associations of developed irrigation system, which amounted to about 0.677 pounds, the ratio of the total return on the costs of the members of water use associations to flooding irrigation and developed irrigation, estimated at 2.03, 2.07 while estimated at 1.71 sprinkler irrigation, members of water user associations of the developed irrigation system was exceeded, where the return of cubic meter of water reached about 3.53 pounds, and the productivity of the cubic meter of water for the members of the water user associations showed that the irrigation system of sprinkling and drip was about 5.6 for maize crop.

The members of water use associations of for sprinkler & drop irrigation in the potato productivity was exceeded, estimated at 11.250 tons/fed, increase the total income of The members of water use associations of irrigation sprinkling and drip of potato crop, estimated at about 33750 pounds/ fed, shows the increase yield of potato crop members of links irrigation sprinkler system, where reached about 11300 pound.

Increase in the profitability of the pound for the members of sprinkler irrigation system, it was about LE 0.5. The members of the water users association of the sprinkler and drip irrigation system, was exceeded, where the return of the use of cubic meters of water was about 18.9 pounds.

Showing the return of the use of cubic meters of water for the members of water users association for sprinkling irrigation system, which amounted to about 5.6,

The cultivation of maize, and potatoes in the water users' associations was exceeded compared to the different irrigation system in all the centers in the study sample.

The second scenario aims beside minimizing the water needs of cropping pattern, increasing export crop areas such as onions, peanuts, potatoes, tomatoes and other vegetables as much as possible, assuming situation stability of foreign trade. The results of the analysis of the statistical models in the second scenario showed that the total quantity of irrigation water available for the cropping pattern was about 41.483 billion m³, while 38,471, 38.912, 38.803 billion m³ were used for the statistical models respectively, indicating

that the required water quantities decreased by 3.013, 2.572, 2.681 billion m³, with a change rate of about 7.26, 6.20, 6.46%, for statistical models, respectively. The net return of the water unit for the actual cropping pattern was about 1.634 LE/m³, while it reached about 1.773, 1.830, 1.833 LE/m³ for the statistical models respectively, which shows the increase in the net return of water unit by 0.139, 0.197, 0.199 LE/m³, with a change rate of about 8.53, 12.04, 12.21%, for statistical models respectively.

Crop rotations can be applied to the new lands using water savings including (wheat and maize), with an area ranging from 2048 to 2399 thousand feddans, and including (wheat and summer and nili vegetables), with an area ranging from 2941 to 3444 thousand acres, also including (maize, winter and nili vegetables), with an area ranging from 3432 to 4021 thousand feddans.

With regard to the impact of reducing the area of water crops to water gap which reached about 20.9 billion m³, it decreased by about 2.879, 2.758, 2.800 billion m³, which make water gap

decreased to about 18.02, 18.14, 18.10 billion m³, with change rate of about 3.77, 3.61, 3.66%, for statistical models respectively, while the results of the second scenario show decreased of about 3.013, 2.572, 2.681 billion m³, which make water gap decreased to about 17.89, 18.33, 18.22 billion m³, with change rate of about 3.94, 3.37 and 3.51% for statistical models respectively.

The research recommends the following points:

1. Reduce the areas of rice, sugar cane and alfalfa to save a quantity of water ranging between 2.572 - 3.013 billion m³ of land within the valley.
2. Using of water savings resulting from reducing the areas of water crops to expand the cultivation of new land with strategic and monetary crops.
3. Sugar beet area can be expanded at least to the extent that it covers the shortage of sugar production caused by reducing the sugar cane area, then taking into account and study the effects resulting from that.
4. Modification of cropping pattern structure to be in accordance with the local, regional, environmental situations that may affect current and future water availability.