An Economic Study of Irrigation Systems for the most Important Crops in New Lands in Beni Suef Governorate

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Summary
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The agricultural sector is one of the most important economic sectors in Egypt as a source of raw materials for industry, as well as a source of food and clothing for the majority of the population. Water considered the most important limitation of horizontal and vertical agricultural development determinants, and despite the limited and the stability of the water resources in Egypt, but the efficiency low due to high water losses.

The problem of the study is the lack of supply of regular water resources in return for the increased demand, where demand for water is increasing due to the growing number of the population as well as the growing demand for food. The mentioned statement demonstrates the growing water gap in Egypt and, accordingly, Egypt's entry into the circle of water poverty, where the average per capita reached about ٠٣٦ m³/year. The low efficiency of the use of agricultural water resources, low yield from the water used in agriculture compared to other uses of water resources in general and particularly in Beni Suef is another side of the problem.

This study aims to determine the most appropriate irrigation systems that achieve higher economic efficiency in the production of the most important crops in Beni Suef. A set of objectives investigated to determine the study's aim. Objectives are as follow; investigate the the development of using irrigation machinery in Egypt and in Beni Suef, compare the efficiency of irrigation systems used in the irrigation of the most important agricultural crops in Beni Suef, estimates the production and cost functions, determines the potential for horizontal expansion in Beni Suef according to water resources available and under use of modern irrigation systems, and identify the most important problems facing farmers with regard to modern irrigation systems.

The study relies on using descriptive and quantitative economic analysis methods in order to estimate the efficiency of using water resources under various efficiency indicators for profitability of the most irrigation systems. The economic important agricultural crops under various irrigation systems are used. The sources of data varies from secondary published and unpublished data collected from different related sources to primary data collected from the sample farmers using tailored questionnaire.

The study includes four main chapters in addition to the introduction, Arabic summary, English summary, and references.

The first chapter includes two sections; the first section is the theoretical background of the study and the second section is the review of literature. The second chapter highlights the current situation of irrigation machinery in Egypt and in Beni Suef. The third chapter provides estimates of economic efficiency of the most important agricultural crops under different irrigation systems in new lands in Beni Suef. The last chapter provides estimates for the production and cost functions and the economic impact of irrigation systems.

A random sample of ٥٧١ farmers from three villages in the new lands in Beni Suef has been selected. Tomatoes, onions, peppers and wheat are the four crops selected for investigation.

The main findings are summarized as following:
The number of fixed and Conveyor irrigation machines in Egypt was as low as ٩٫٩٦٤ thousand machines in ٧٩٩١ and reached its peak in ٣١٠٢ with ٦٫٠٨٨ thousand irrigation machine. As for Beni Suef; the number of machines was as low as ٥٫٧١ thousands machines in ٧٩٩١ and reached its peak in ٣١٠٢ with ٧٫٦٧ thousand machines with ٪٧٧ increase.

Changes in productivity, amount of irrigation water, cultivated area, and the production & economic efficiency of the unit of irrigation water are reported as follow. As for tomatoes, productivity has increased by ٣٫٩ tons in case of drip irrigation which represent an increase of ٧٨٣٪ compared to productivity in flood irrigation. As for onion, productivity has increased by ٤٫٩ tons in case of drip irrigation. As for pepper, productivity has increased by ٩٫٥ tons in case of drip irrigation which represent an increase of ٨١٥٪ compared to productivity in flood irrigation. As for wheat, productivity has increased by ٩٢٠ and ٨٠٧ bushels in case of drip irrigation and sprinkle irrigation respectively, which represent an increase of ٨٥٠٪ and ٨٠٪ compared to productivity in flood irrigation.

The drip irrigation system in tomatoes is proved to reduce water consumption per feddan of tomato of about ٥٣٤ cubic meters compared to flood irrigation. Change flood irrigation system into dripping system may save about ١١٤٩ million cubic meters for Beni Suef and about ١٤٩١ million cubic meters for Egypt. The preserved amount of water can be used to expand the area cultivated with tomatoes by about ٢٠٤ and ٠٥٩ thousand feddans for Beni Suef and Egypt respectively considering that the water requirements per feddan of tomatoes is ٠٨٣٢ cubic meters.

The drip irrigation system in onion is proved to reduce water consumption per feddan of tomato of about ٠٥٤ cubic meters compared to flood irrigation. Change flood irrigation system into dripping system may save about ٣٣ million cubic meters for Beni Suef and about ٢٢٠ million cubic meters for Egypt. The preserved amount of water can be used to expand the area cultivated with onion by about ٢٨٤ and ٠٥١ thousand feddans for Beni Suef and Egypt respectively considering that the water requirements per feddan of onions is ٠٥٦١ cubic meters.

The drip irrigation system in pepper is proved to reduce water consumption per feddan of tomato of about ٢٤٥ cubic meters compared to flood irrigation. Change flood irrigation system into dripping system may save about ٥٩١ million cubic meters for Beni Suef and about ٥٢٩ million cubic meters for Egypt. The preserved amount of water can be used to expand the area cultivated with onion by about ٢٧٠ and ٥١ thousand feddans for Beni Suef and Egypt respectively considering that the water requirements per feddan of peppers is ٠٠٧٢ cubic meters.

As for wheat, the drip irrigation system in wheat is proved to reduce water consumption per feddan of tomato of about ٠٧٤ cubic meters compared to flood irrigation. Change flood irrigation system into dripping system may save about ٤٤٤ million cubic meters for Beni Suef and about ٣٢٩ million cubic meters for Egypt. The preserved amount of water can be used to expand the area cultivated with onion by about ٥٠٧ and ٦٦١ thousand feddans for Beni Suef and Egypt respectively considering that the water requirements per feddan of tomatoes is ٠٦٧١ cubic meters.

The sprinkle irrigation system in wheat is proved to reduce water consumption per feddan of tomato of about ٠٥٢ cubic meters compared to flood irrigation. Change flood irrigation system into dripping system may save about ٤٤٤ million cubic meters for Beni Suef and about ٣٢٩ million cubic meters for Egypt. The preserved amount of water can be used to expand the area cultivated with onion by about ٥٠٧ and ٦٦١ thousand feddans for Beni Suef and Egypt respectively considering that the water requirements per feddan of tomatoes is ٠٦٧١ cubic meters.
flood irrigation system into dripping system may save about ٤٢٤ million cubic meters for Beni Suef and about ٥٥١ million cubic meters for Egypt. The preserved amount of water can be used to expand the area cultivated with onion by about ١٢٤ and ١٢٤ thousand feddans for Beni Suef and Egypt respectively considering that the water requirements per feddan of tomatoes is ١٧٣ cubic meters. As for the impact of replacing regular flood irrigation system with drip irrigation system, economic indicators show an expected increase in the net return of all investigated crops. Net return of tomatoes is expected to increase by ١٧٣ and ٢٤٢٤,٩ million pounds at Beni Suef and Egypt levels. Net return of onion is expected to increase by ٢٥٠٨,٥ and ٧٧٠٣,٤ million pounds at Beni Suef and Egypt levels. Net return of pepper is expected to increase by ٢٣٦,٥ and ٥٣٩,٥ million pounds at Beni Suef and Egypt levels. Net return of wheat is expected to increase by ٤٤٢٣ and ٦٣٢,١ million pounds at Beni Suef and Egypt levels. As for the impact of replacing regular flood irrigation system with sprinkle irrigation system in wheat, net return of wheat is expected to increase by ٨٤٨,٨ and ٦٣٢,١ million pounds at Beni Suef and Egypt levels.

The study Recommendations:

١. Expand the use of modern irrigation systems in the new lands for various agricultural crops as it may increase the area cultivated of investigated crops.

٢. Provide irrigation kits with reasonable prices to farmers through agricultural associations to encourage farmers to switch from flood irrigation to modern irrigation, especially in the new land dedicated to graduates.

٣. Provide loans to invest in modern irrigation systems.