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AN ANALYTICAL STUDY FOR EFFECT OF REDUCING WATER VORACIOUS CROP AREAS ON THE CROPPING PATTERN STRUCTURE AND ITS WATER NEEDS

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ABSTRACT

The research aimed to study the effect of reducing water voracious crop areas, such as (rice, sugar cane, bananas, alfalfa) on the available water quantity in the agricultural sector, where the data analysis showed that the most of the voracious crops especially rice and sugar cane are concentrated at the old lands within the valley as it explained in the research later, therefore, the research focused on inventory and analysis of the old land data within the valley to determine the best alternatives of the cropping pattern which achieves the state's goal of saving water and maximizing the return of the water unit, and is compatible with the current local, regional and environmental water conditions and the future developments that may occur in the future, that by using linear programming, through three models that have been formulated: the first is minimizing water requirement, the second model maximizes the net of acre return, while the third model maximizes the return of the water unit, using available data published and unpublished issued by the concerned authorities.

The research focused mainly on the possibility of reducing the water needs of cropping pattern as a main objective, in addition to increasing the self-sufficiency ratios of strategic crops through the first scenario, and increasing the areas of export crops to increase the export proceeds through the second scenario, as far as possible within the available water and land area in the study area, using different statistical models.

The results of the analysis of the statistical models in the first scenario showed that the total quantity of irrigation water available for the cropping pattern of the study crops reached 41.483 billion m3, while 38,604, 38.726, 38.683 billion m3 were used for the statistical models respectively, this indicates that the required water quantities decreased by 2.879, 2.758, 2.800 billion m3, with a change rate of about 6.94, 6.65, 6.75% for the statistical models, respectively. The net return of the water unit for the actual cropping pattern reached about 1.634 LE/m3, while it reached about 1.755, 1.767, 1.765 LE/m3 for the statistical models respectively, which shows the increase in net return of water unit by 0.122, 0.133, 0.131 LE/m3, with a change rate of about 7.46, 8.17, 8.05%, for statistical models respectively.

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

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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 patern structure to be in accordance with the local, regional, environmental situations that may affect current and future water availability.