SUMMARY

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The agricultural sector occupies a prominent position in the Egyptian national economy. Such a position is based Firstly on the fact that the sector is largely responsible for the supply of most of the food needs and directs some surplus to export channels, Secondly The Egyptian exports of agricultural products are the principal source of foreign currencies needed for economic and social development. Moreover, agriculture is a main supplier of raw materials requested by major industries. As a matter of fact, agriculture acts as a wide market for the industrial products.

Due to the proportional increase of the demands on agricultural goods and the limited agricultural economic resources, the development of the agricultural sector should be speeded up. Therefore, the development of agricultural sector needs urgent perfect use of the existing agricultural resources with the usage of all modern scientific agricultural methods to increase the production in quantity and quality.

The problem investigated in this study dealt with the phenomena of decreased per feddan production averages of some grain crops in ARE and in Sharkia Governorate on one hand and the rapid increase of population. on the other hand, The consequence, therefore is the disability of Egyptian agriculture to fulfill one of its national goals to provide food security, i.e. sufficient needs of food to the growing population . In other words ‹ It means the insurance of every member of the society to reach his food needs decided by daily nutritional requirements of the individual and insuring the minimum limit of these needs with

respect to the quantity & quality especially for those of low-bracket income.

Owing to the great importance of cereals, being the main source of food for the majority of people in Egypt, the government has been giving lots of attention to raise their productivity to face the increase of the national needs via following the agricultural vertical expansion in which new suitable technologies are used i.e. agricultural mechanization, improved Crop varieties, fertilizers, pests control and other production types which increase productivity.

The objective of the study is to measure the economic impact of the applications of mechanical technology and methods to upgrade the production of important grain crops, such as wheat and rice in Sharkia Governorate. Several sub-objectives are also of concern, these dealt with the status quo of cereals positions under recent conditions, modern agricultural mechanization effects on making technical changes and to determine the most effective methods for grain crops production.

To fulfill these objectives, the approach of the study depends on the inductive method from the descriptive aspect and on the deductive method in the quantative aspect in economical analysis. Many analytical, statistical, mathematical and measurement methods were used, such as percentages, general vector timing equations and analysis of variance. And to estimate the functional relation between quantative variables in the linear form, correlation, simple and multiple regressions were used. Also, to differentiate between mechanization usages in the sampled villages, dummy variables were used.

This study depended on secondary data whether published or not. Because of the shortage of the secondary data, the study, also depended on primary data, that is sector statistical data collected from the field of the study through questionnaire and interviews with the sampled persons in the Sharkia Governorate during the agricultural season 2004/2005.

The study includes four main chapters, in addition to the introduction and summary in both English and Arabic with a list of the Arabic and English references.

First Chapter deals with reviewing agricultural mechanization .A comprehensive literature review was carried out to extract the main conclusion and recommendation from previous studies, in order to help in widening the theoretical and applied aspects of the research.

Second Chapter In this chapter we discussed the effect of Agricultural Mechanization in Grain Crops Production the grain crops through two parts, the first part deals with the recent position of the agricultural mechanization in Egyptian agriculture through studying the recent position for the numbers of agricultural tractors, irrigation machines and combiners in the whole republic through the time period (1990-2005), such that the number of tractors increased from 79.73 thousand tractor on 1990 to be 97.6 thousand tractor on 2005 i.e. increasing by 17.87 thousand tractor which represent around 22.41% since 1990. So, it is clear that the number of tractors took a general statistically incrementing direction through (1990-2005) such that the annual increase is around 0.751 thousand tractor which is approximately 0.85% of the average which is 88.44 thousand tractor through the study period.

As for the irrigation machines it increased from about 350.87 thousand machines in 1990 to 683.78 thousand machines in 2005 i.e. increased 332.91 thousand machines which represent 94.88% in 1990. So it was clear that it took a general incrementing direction statistically through (1990-2005) such that the annual increase is around 0.3 thousand machine which is approximately 0.06% of the average which is equal to 520.62 thousand machine through the period under study.

While the number of combiner machines increased from about 32.81 thousand machines in 1990 to 49.03 thousand machines in 2005 i.e. increased 16.22 thousand machines which represents 49.44% in 1990. So it is clear that it took a general incrementing direction statistically through (1990-2005) such that the annual increase is around 0.06 thousand machine which is approximately 0.15% of the average which is equal to 40.24 thousand machine through the period under study.

Also, the forms of changes of the mechanical technology over the republic and the Sharkia Governorate were studied. Such that the crops area in feddan over the republic reached 13814461 feddan in 1995, and increased in 2005 to reach 14551230 feddan with incrementing percentage of 5.33%. In Sharkia Governorate, it reached 1347755 feddan in 1995, while increased to reach 1465276 feddan in 2005 with incrementing percentage 8.72% which needs increasing the number of the machine units to cover the whole increased area.

Also the functional relations between the important agricultural machines and the variables based on agriculture were

measured. That was done by studying the effect of the number of tractors, irrigation machines and combiners over the agricultural area and crops area, the value of the plant production and the net plant income through (1990-2004). Also the evolution (improvement) of the share of the tractors, irrigation machines and combiners from the agricultural and crops area through the same period under study, also estimation of the request functions of the tractors and agricultural machines over the whole republic over the same period of time mentioned before.

While the second part focused on studying the quantitative analysis of grain crops economics in Sharkia governorate through calculation of the percentage of the cultivated area and productivity and production over the Sharkia governorate, where the average cultivated areas through the period 1990-2005 reached around 265.41 thousands of feddans which represent about 11.91% of the average wheat cultivated area over all the ARE which is 2227.7 thousands of feddans for the same period .

The average rice cultivated area in Sharkia Governorate reached 229.69 thousands feddans representing 16.62% of the average rice cultivated area over all the ARE which is 1381.82 thousand feddan through the same period of time, while the average production per feddan of wheat reached about 16.93 ardab over Sharkia Governorate with percentage of 105.16% of average republic feddan production level which is 16.1 ardab within the period (1990-2005).

The average production per feddan of summer rice in Sharkia governorate is about 3.56 ton representing 98.34% of the

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average production per feddan of rice over the republic which is 3.62 ton for the same period.

The relative importance of the overall production average of the wheat crops in Sharkia governorate was about 12.52% from the overall production average of the republic which reached about 36239.8 thousand ardab within the period (1990-2005), while the overall production average of the summer rice in Sharkia governorate reached 830.34 thousand ton representing 16.47% of the overall summer rice production average of the republic which equaled 5042.1 thousand ton within the same period of time

By calculating general time trends for the cultivated area development of wheat within the period (1990-2005), it is clear that the annual average of wheat cultivated area over the republic tended to decrease by 12.17 thousand feddan / year, which equal to 0.55% of the average wheat crops cultivated area in the republic which equals to 2227.7 thousands feddan for the same period.

While in Sharkia, the average wheat cultivated area increased by 6.89 thousand of feddan / year, i.e. 2.6% of the average wheat cultivated area in the governorate which equal to 256.41 thousand feddan. While the average rice cultivated area increased with 3.38%, 1.95% in the governorate and the republic, respectively in the period (1990-2005).

By calculating general time trends for the feddan production average development of wheat crops within (1990-2005), it appeared that the production average increased by 0.283 ardab / feddan in Sharkia governorate and by about 0.261 ardab / feddan in the whole republic.

By calculating general time trends for the development of feddan production average of summer rice within the period (1990-2005), it is clear that the average feddan production is increasing by 0.08 ton in Sharkia and 0.78 over the republic within the study period. Similarly, by calculating general time trends for the development of production average per feddan of wheat crops within the period (1990-2005), it is clear that the average feddan production is increasing by 194.34 ardab in Sharkia and 465.85 ardab over the republic within the study period.

By calculating general time trends for the overall production average of summer crops, it is detected that it is increasing year after year within the study period by about 45.57 ton in Sharkia and by about 201.28 ton for the whole republic.

By studying the development of grain crops production cost relative to agricultural operations service within two periods (1990-1995) and (2000-2005) where the first period represents the beginning of the total economic liberalization of Egyptian agriculture, while the period (2000-2005) is after the total economic liberalization of Egyptian agriculture. It is detected that wheat production cost increased over the republic compared to Sharkia governorate by 2.23% in the period (1990-1995), while wheat production of Sharkia increased over the republic by 14.66% within (2000-2005).

By comparing the summer rice production cost in Sharkia with the whole republic, it appeared that the production cost in Sharkia is greater than that over the republic by 1.91% for the period (1990-1995), while for (2000-2005), the cost in Sharkia governorate increased than that over the republic by 11.39%.

Third Chapter it concerns the measurement of the efficiency of using working power resources for the sample under study and it includes two main sections. The first is specified for choosing the study sample which represents the whole community of Sharkia, this aspect includes sampling technique, sample stages and to determine sampled centers, villages and farmers. The other aspect is interested in describing main properties of the chosen sample which includes mechanization degree in agricultural operations of some economical variables related to crop production study's in sample.

The second part concerns with estimation of functional relation between labor inputs and the quantity of the production of the two crops in the sample by using simple and multiple regression both in linear and double log relationship. This chapter also included a comparative analysis of the efficiency of human labor and mechanical work in relation to the yields of the studied crops in sampled villages.

In Sadieen, Azezia, Abasa and Asadeia, it was found that the human labor is the major method which the agricultural operations depends on for our studied crops. The yield of the studied crops was increased by increasing the human labor. The increment of yield in Sadieen, Azezia, Abasa and Asadeia reached 1.03, 0.99, 1.01 and 0.94 ardab of wheat and 1.07, 1, 1.01 and 0.97 ton of summer rice, respectively.

Regarding mechanical work, in the same villages it was found that the use of mechanical work by one unit, the yield of the crops increased also, the estimated increases were 0.96, 0.89, 0.89

and 0.97 ardab for wheat and 0.99, 0.89, 0.97 and 0.93 ton for summer rice.

Considering the relationship between the animal work and the production of the studied crops, it was found that all the regression coefficients were significant. In Sadieen, Azezia, Abasa and Asadeia villages in that order, it was found that the use of animal work by one unit, the yield of the crops increased also, the estimated increases were 0.67, 0.64, 0.89 and 0.91 ardab in wheat and 1.01, 0.94, 0.88 and 0.81 ton in summer rice, respectively.

This revealed that the effectiveness of animal work was less important, so, animals should be excluded from agricultural work and be kept for milking and meat production.

Comparing the value of marginal productivity and the cost in both human labor and mechanical productivity in sampled villages, it was found that in wheat, the values of marginal productivity of human labor amounted to 125.81, 124.9, 132.4 and 95.26 L.E for Sadieen, Azezia, Abasa and Asadeia, respectively. Whereas the cost of using human labor were 13.88, 13.25, 12.5 and 13.69 L.E. for the same villages, respectively. This indicates that the values of marginal productivity were greater than the costs of human labor. This means that the use of human labor could be increased until achieving the optimum production level of that factor.

For the mechanical work, in wheat, the values of marginal productivity were estimated by 149.5, 146.4, 129.8 and 188.5 L.E. for Sadieen, Azezia, Abasa and Asadeia, respectively, whereas the costs of using the mechanical work were 19.45, 22.74, 20.54 and 21.19 L.E. for the same villages, respectively. It indicates that the

value of marginal productivity was greater than the cost; this means more efficiency of mechanical work.

In summer rice, the values of marginal productivity for the human labor were estimated by 146.78, 91.43, 106.29 and 86.07 L.E. for Sadieen, Azezia, Abasa and Asadeia, respectively, whereas the cost of using the human labor were 17.68, 18.34, 17.65 and 19.37 L.E. for the same villages, respectively. This means that the values of marginal productivity were greater than the costs, which also means that there is an ability to increase its usage to reach the ideal production level with respect to the human labor.

For the mechanical work, in the summer rice, the values of marginal productivity were estimated by 183.48, 150.76, 153.83 and 203.91 L.E. for Sadieen, Azezia, Abasa and Asadeia villages, respectively. Whereas the costs were 29.95, 31.58, 34.61 and 38.36 L.E. for the same villages, respectively. Comparing the value of marginal productivity, it was greater than the costs in all crops, which means that there is a possibility to use more units of mechanical work to achieve the optimum production level.

Fourth Chapter was specified for the economic study for the modern mechanical work usage in grain crops production in the study samples through two sections. The first section was for detecting the effect of using agricultural mechanization over the economic changes to produce grain crops in the study samples, and that was done through financial standards like feddan productivity cost, total feddan revenue, ratio between total revenue and total cost, the feddan net revenue and the invested pound profit for both ordinary agricultural mechanization and modern agricultural mechanization for the studied sampled crops.

It was detected that by using modern agricultural mechanization in wheat such as leveling by laser, agriculture mechanization using "planter", harvesting using "combine" which caused increase in the total feddan revenue by 5.98%, 6.61%, 6.67% and 17.7% in Sadieen, Azezia, Abasa and Asadeia, respectively more than that of using ordinary agricultural mechanization in which plowing earth, irrigation using machines and threshing machines are used. But for summer rice, the modern agricultural mechanization in rice plantation in form of leveling using laser, mechanical plantation by transplanters and harvesting using "combine" caused increasing the total feddan revenue by 12%, 6.02%, 6.4% and 6.6% in the sampled villages, respectively over that of ordinary mechanization usage.

Also, it was detected that the usage of modern agricultural mechanization caused increasing in invested pound profit for the studied crops. For wheat crops, the usage of modern agricultural mechanization caused increasing in invested pound profit by about 7.89%, 5.62%, 7.15% and 27% in the sampled villages respectively, more than that of using ordinary agricultural mechanization. For summer rice crops, the usage of modern agricultural mechanization caused increasing in invested pound profit by about 17.98%, 3.03% and 5.89% in Sadieen, Azezia and Asadeia villages respectively, more than the case of using ordinary agricultural mechanization. But for Abasa, the use of modern agricultural mechanization caused a decreasing in invested pound profit by about 27% and that may be caused because of not using the proper modern agricultural machines which caused the increase of the total feddan costs.

The second section discussed the efficiency of using modern agricultural mechanization in productivity of the sampled crops under study through two criteria, the first was the effect of using modern agricultural mechanization on the surface of productivity functions for the sample crops, such that the results of statistical estimation showed that the modern agricultural mechanization caused the move of the surface of the productivity function by 4.48, 3.39, 2.25 and 4.14 ardab for the sample villages respectively. And it also moved the surface of the productivity function by 6.19, 6.42, 3.46 and 3.67 ton.

While the second part of section two discussed the effect of the modern agricultural mechanization on the farm revenue capacity for the grain crops under study and the production function (cobb-douglas) in its dual logarithmic form using the dummy variable to show the effect of using the modern agricultural mechanization on the production of the crops under study. For wheat, an increase in its productivity capacity was detected from the statistical estimation of its production function in case of using the modern agricultural mechanization in the sampled villages. The productivity function database pointed out that there is capacity abundance increase of about 1.06 for the total sample i.e. the increase of the explained variables by 100% caused an increase in ardab production by 106% . But in case of the productivity function when the modern agricultural mechanization, was not used the decrementing capacity abundance region reached 0.995 i.e. the increase of the explained variables by 100% caused an increase in ardab production by 99.5%.

For the summer rice crops, from the statistical estimation of its production function an increase was detected in its productivity capacity in case of using the modern agricultural mechanization in the sampled villages. The productivity function database pointed out that there is capacity abundance increase by about 1.07 for the total sample i.e. the increase of the explained variables by 100% caused an increase in ton production by 107% . But in case of the productivity function which doesn't use the modern agricultural mechanization, the decrementing capacity abundance region reached 0.999 i.e. the increase of the explained variables by 100% caused an increase in ton production by 99.9%.

On the light of the various aspects presented in the study, by determining the place of the agricultural mechanization upgrading the productivity on one hand, and the most efficient form of mechanization on the other hand, it becomes necessary to put forward a number of recommendations, aiming at improving the efficiency of operational and productive and economic returns. These recommendations are listed below:

1- Machineries should be provided in proper time and increase its operating efficiency. The machines urgently needed by the farmers should be provided, which have a clear effect on the quantity and quality of the production such that following the modern agricultural machines system in producing wheat and rice which cause the increase of the production and decrease the production costs e.g. planters, laser machines, and combiners.

2- The central bank for credit and development should carry out a merit study of loans to buy agricultural machineries and equipments. This should include the availability of tractors with

compatible accessories and matching the agricultural machinery units available to farmers with their holdings. The rates interest on loans should be unified for all agricultural machineries. These rates should be revised in order to decrease them, particularly for machines of limited operating hours per year.

3- To generalize the leveling system using laser to decrease the high productivity seeds quantity which have high price, to\limit the high production costs also to stop the collapse of the Egyptian lands on one side and as an effective factor in increasing the vertical expansion from another side.

4- To increase the importance of the maintenance of the cultivating machinery and to increase the number of trainees to limit the human labor which cause a reverse effect in some villages under study and converting to positive elements in the society and to manufacture the spare parts locally.

5- The necessity for working against the fragmentation of land holdings via projects like the establishing collective entities units which guarantee the achievement of economical capacities for the machinery work used in the production of wheat and rice in some of the villages under study, and limiting the reverse effect and convert it to a positive effect such that the small areas are not suitable with the size of the machine used, and import new agricultural machines for small agricultural lands, then, to helps in minimizing the costs of the farming processes and maximizing the profits.

ECONOMICS OF AGRICULTURAL MECHANIZATION IN GRAIN CROPS PRODUCTION IN SHARKIA GOVERNORATE

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THESIS

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