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# An Analytical Study for the Agricultural Manpower in Egypt

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**Abstract:** This work aims to study different economic variables which affect the agriculture labor and to detect the most important ones affecting the agricultural wages and the agricultural net income in Egypt by using general equilibrium model. The importance of increasing the agriculture crop area, was shown from model analysis. It was obvious that increasing the total agricultural investments by million pounds increases the agricultural labor demand by 0.0656 thousand laborers at the same year. And increasing the agricultural labor productivity by one pound increases the agricultural labor demand by 0.2559 thousand laborers, the total net agricultural income by 0.035 million pound and agricultural wages by 0.4506 pound at the same year. It was noticed also that increasing number of agricultural machines by one thousand machine decreases the agriculture labor demand by 130.466 thousand laborers and agriculture wages by 741.559 million pounds at the same year. Thus, increasing the agriculture crop area, agriculture total investments and agriculture labor productivity are important to solve the agriculture unemployment and increasing the agriculture labor demand.

**Key words:** Agriculture, manpower, Egypt, income, wages

## INTRODUCTION

Manpower element is considered one of the most important resources used for upgrading the national production and economic development. Therefore, achieving production efficiency depends on the efficiency of using production elements which the manpower element is considered the most important one. Regarding the agricultural sector's great share in the national production economic growth, as it is the aggregate manpower. Then, it is essential to achieve the considered one of the most important development sectors as it absorbs one-third of maximum production efficiency of using the available agricultural resources, particularly, the agricultural manpower (Fadl Allh, 2003).

With respect to the agricultural manpower ratio to the national manpower, it is observed that, it decreased during the period (2000-2002) to reach 28.3% compared to the period (1982-1984) which represented by 37.8% (Anonymous). Regarding agricultural unemployment, it is seen that, its percentage decreased compared to the total unemployment percentage during the last three years (2000-2002) to reach 6.6% compared to the period (1982-1984) which was represented by 15.5% (FAO, 2003). It is clear that, big portion of the manpower in the Egyptian market get low incomes and wages because of the lag of demand growth for manpower factor compared to the fast growth of manpower supply. This fact is referred to the high increase of new born ratio during the last two decades. Hence, the economic return of the labor factor is considered very low. Accordingly, the economic system faces real problem which is how to increase the labor demand with an adequate support for solving such problem. The one and only way to increase the labor demand comes from the rural and agriculture growth (Millor and Randy, 2002).

In spite of the state's efforts to create real employment opportunities to limit the structural disequilibrium in the labor market quantitively and qualitatively in the economic sectors in general and in the agriculture sector in particular, yet, there are many problems hinder the economic development process, such as the decreased ratio of the agriculture sector production progress. Therefore, the study problem is concerned with the issue of the inadequate total agriculture sector returns with its importance in the national economy as a leading economic sector. Accordingly, it caused downsizing the net agriculture income, which reflected negative effects on the aggregate agriculture wages, consequently, the Egyptian agricultural laborer average wage. Also, it was observed that, there was a decline of the agricultural labor demand because of the weakness of the increasing percentages of the crop-cultivated area, compared to the population increase. Investment weak ratio shared in highlighting such problem and accordingly, the agricultural unemployment was affected.

The study aims to investigate the economic variables affecting the agricultural manpower supply and its demand and the agricultural unemployment. Also, it is concerned with determining the most important variable

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affecting agricultural wages and net agricultural income. The study also suggests some means to increase the demand of agricultural manpower and the Egyptian agricultural net income under the general equilibrium model.

Recently, many studies have been done on agricultural labor in Egypt. Some of them noticed that the agricultural manpower demand was affected by the national agricultural production (Khalifa and Abdel Meseeh, 2003). They assured the substitution relation between technology and the demand for manpower for the work favour. They also suggested investing on heavy labor projects to overcome unemployment problem. While other works on unemployment suggested small scale industries (El-Sayed, 2003) or small craft projects as an effective way to increase rural family income as it may create real work opportunities to overcome the unemployment problem (Fadl-Alla, 2003).

Other studies have been done on agricultural wages. They showed that the real challenge facing the decision maker, was achieving suitable formula to connect wages and productivity in order to have real criterion for pricing real average (Othman, 2003). He suggested means of work performance, laborer productivity, labor training programs and labor intensive project investment to obtain suitable wages.

## MATERIALS AND METHODS

The study used secondary data issued from the concerned authorities of economic statistics of agricultural manpower in Egypt represented by the Central Agricultural Economy Administration at the Ministry of Agriculture, The Central Body of General Mobilization and Statistics and FAO.

An analysis of the development of economic variables affecting the agricultural manpower during the period (1982-2002) has been done via the statistic evaluation of trend equations of these variables.

A Standard Analytical Model for Agricultural labor in Egypt is also used in this study. This model is consisted of four structural equations describing the Egyptian Agricultural labor behavior. These equations are:

**The first equation: Agricultural net income equation:** The positive effect of the agricultural crop area, size of agricultural labor and agricultural laborer productivity on agricultural net income is theoretically expected, as increasing either of them will increase the agricultural net income. However, the value of agricultural net income is inversely affected by the agricultural labor wage, where increasing the agricultural labor wage lead to increase costs and thus decreasing the agricultural net income at the same year.

**The second equation: Agricultural labor supply equation:** Theoretically, it is expected that increasing agricultural labor force in working age (15-60 years old) and increasing the agricultural labor wage lead to increase Agricultural labor supply. However, increasing labor wage at non-agriculture sectors leads to decrease agricultural labor supply.

**The third equation: Agricultural labor demand equation:** Expectedly, increasing the agricultural crop area and agricultural investment values, mean agricultural labor wage and agricultural labor productivity lead to increase agricultural labor demand. It is also expected that the increase of using agricultural machines in different agricultural process leads to decrease the demand on Agricultural labor.

**The fourth equation: Agricultural wages equation:** Expectedly, increasing agricultural crop area, agricultural labor productivity and agricultural net income value lead to increase agricultural wages. However using agricultural machines leads to decrease agricultural wages for the decrease of agricultural labor demand.

As the equations in this model are identified, thus the model is estimated by the least square method by two steps 2 SLS where it is the most suitable method that describing efficient results. Time chains for variables in the period 1982-2002 were used for estimation.

**Model composition**

The first equation: Agricultural net income equation:

$$NAI_t = B_1 + B_2 A_t + B_3 AL_t + B_4 LP_t + B_5 AINP_t - B_6 W_t$$

The second equation: Agricultural labor supply equation:

$$SAL_t = B_7 + B_8 RP_t + B_9 W_t - B_{10} NW_t$$

The third equation: Agricultural labor demand equation:

$$DAL_t = B_{11} + B_{12} A_t + B_{13} inv_t + B_{14} W_t + B_{15} LP_t - B_{16} M_t$$

The fourth equation: Agricultural wages equation:

$$TAW_t = B_{17} + B_{18} A_t + B_{19} AL_t + B_{20} LP_t + B_{21} AINP_t - B_{22} M_t$$

**Model variables**

**Endogenous variables**

$NAI_t$= Egyptian Agricultural net income by million pounds at year t.

$SAL_t$= Agricultural labor supply by thousand laborer at year t.

$DAL_t$= Size of Agricultural labor demand by thousand laborer at year t.
$TAW_t$=Agricultural wages labor demand by million pounds at year t.

**Exogenous variables**
$A_t$= Agricultural crop area net income by thousand feddan at year t.
$AL_t$= Size of the used Agricultural labor by thousand laborer at year t.
$AINP_t$=Value of the used Agricultural production requirements by million pounds at year t.
$LP_t$= Agricultural labor productivity by pounds at year t.
$W_t$= Agricultural labor Wage by pounds at year t.
$inv_t$= the total Agricultural investments by million pounds at year t.
$NW_t$= labor Wage in sectors other than Agricultural by pounds at year t.
$M_t$= number of agricultural machines in agricultural sector by thousands machines at year t.
$RP_t$= Rural labor force (15-60 years old) by thousand individual at year t.

## RESULTS

**The agricultural manpower economic variables development during the period (1982-2002)**

**Number of agricultural laborer development:** It was shown from Table 1 that the agricultural labor (by thousand laborer) takes an increasing trend during the study period with annual growth rate reaching up ca. 1.1% of the average number of agricultural labor (4.615 thousand laborer) and the deterministic coefficient was 0.98, which reflected the percentage 98% of agricultural labor changes correlated with time. It was shown also that statistical significance was assured during the period of study.

**Agricultural manpower wage development:** Table 1 illustrated that, agricultural wages estimated by Egyptian currency adopted increasing trend during the study period with annual rate 7.64% of the average which stood for 3.88 milliard L.E. The deterministic coefficient was 0.95 which reflected that 95% of agricultural manpower wage changes were correlated with time. Statistical significance was assured during the study period.

**Agriculture laborer wage development:** Table 1 revealed that, the agriculture laborer wage adopted increasing trend during the study period with annual rate 6.6% of the average, which represented 819.2 L.E. The deterministic coefficient was 0.95, which meant 95% of agriculture laborer wage changes were linearly correlated with time. Statistical significance was assured.

**Agriculture investments development:** Regarding agricultural investments, it is clear that, it adopted increasing trend during the study period with statistical significant rate, it was 13.7% of the average which represented 4.22 milliard L.E. The deterministic coefficient during the study period was 0.85, which reflected that 85% of the occurred changes in agricultural investments were linearly correlated with time.

**Agriculture laborer productivity development:** As for agricultural laborer productivity, it adopted increasing trend with statistical significant annual rate 9.96% of the average of 6.066 thousand L.E. during the study period. Whereas, the deterministic coefficient reached 0.98, which meant that 98% of the occurred changes in the agricultural laborer productivity were linearly correlated with time.

**Crop area development:** The crop area adopted increasing trend with statistical significant annual rate 1.48% of the average 12.56 million feddan during the study period. While, the deterministic coefficient was 0.93, i.e., 93% of crop area changes were linearly correlated with time.

**Agriculture net income development:** Table 1 stated that, the agricultural net income (estimated with million L.E.) took a decreasing trend during the study period with an annual decreasing rate 0.86% of the average of 42580.7 million L.E. during the study period.

**Agriculture production requirement value development:** Table 1 indicated that the agriculture production requirement value (million L.E.) adopted an increasing trend during the study period with an annual increasing rate statistically significant, it was 10.3% of the average of 10191.2 million L.E. The deterministic coefficient was around 0.92 that represented 92% of the agriculture production requirement value were linearly correlated with time during the study period. The statistical significant was assured.

**Agriculture machine counts development:** Table 1 showed that the agriculture machine counts adopted increasing trend during the study period with annual rate 17.3% of the average of 27008.4 thousand machine. The deterministic coefficient was around 0.58, that meant 58% of agriculture machine counts development were correlated linearly with time. The statistical significant was assured.

Table 1: The trend of some agricultural labor variables in Egypt for the period (1982-2002)

| The variable | The equation | Change ratio % | Average | $R^2$ | T | F |
|---|---|---|---|---|---|---|
| Number of agricultural laborer in Egypt (Thousand laborer in the Year $_t$) | $Y_t = 4.61571 + 0.05377\ X_{1t}$ | 1.1 | 4.615 | 0.98 | 31 | 962 |
| Agricultural manpower wages in Egypt (L.E. in the Year $_t$) | $Y_t = 624143 + 0.2966377\ X_{1t}$ | 7.64 | 3.88 | 0.95 | 18.8 | 354 |
| Average agricultural laborer wages (L.E. in the Year $_t$) | $Y_t = 221.6141 + 54.32858\ X_{1t}$ | 6.6 | 819.2 | 0.95 | 20.4 | 416.77 |
| Agricultural investments size in Egypt (Milliard L.E per Year $_t$) | $Y_t = - 2.14057 + 0.577974\ X_{1t}$ | 13.7 | 4.22 | 0.85 | 10.4 | 108 |
| Agricultural laborer productivity in Egypt (Thousand L.E per Year $_t$) | $Y_t = - 0.58095 + 0.604286\ X_{1t}$ | 10 | 6.1 | 0.98 | 31 | 961.8 |
| Crop area in Egypt (Million feddan in the Year $_t$) | $Y_t = 10.51031 + 0.186396\ X_{1t}$ | 1.5 | 12.56 | 0.93 | 15.6 | 243 |
| Net agricultural income in Egypt (Million L.E. in the Year $_t$) | $Y_t = 46610.1 - 366.312\ X_{1t}$ | 0.86 | 42580.7 | 0.01 | - 0.4 | 0.2 |
| The agricultural production requirements value (Million L.E. in the Year $_t$) | $Y_t = -1330.85 + 1047.388\ X_{1t}$ | 10.28 | 10191.2 | 0.92 | 14.44 | 208 |
| Machine counts in Egypt (Thousand machine in the Year $_t$) | $Y_t = -24291.5 + 4663.29\ X_{1t}$ | 17.27 | 27008.4 | 0.58 | 5.142 | 26.44 |
| Labor force in rural Egypt (Thousand individual in the Year $_t$) | $Y_t = 54492.657 + 318.174\ X_{1t}$ | 3.54 | 8992.6 | 0.99 | 47.64 | 2269.5 |
| Annual laborer wage in non-agriculture sectors in Egypt (L.E. In the Year $_t$) | $Y_t = 1674.638 + 180.613\ X_{1t}$ | 4.93 | 3661.4 | 0.98 | 28.43 | 808.2 |
| Agricultural manpower demand In Egypt (Million working day per man in the Year $_t$) | $Y_t = 1208.46 + 9.403896\ X_{1t}$ | 0.72 | 1311.9 | 0.88 | 11.6 | 133.9 |
| Agricultural manpower supply in Egypt (Million laborer in the Year $_t$) | $Y_t = 4.168262 + 0.52214\ X_{1t}$ | 1.1 | 4.76 | 0.90 | 13.3 | 175.5 |
| Agricultural unemployment size in Egypt (Million unemployed laborer in the Year $_t$) | $Y_t = 0.097157 + 0.00444\ X_{1t}$ | 3.04 | 0.146 | 0.98 | 27.2 | 738.2 |

Source: Calculated and evaluated from data in Appendix 1, Note: $Y_t$ is the evaluated value of a variable during the study period in the Year$_t$ t: represent years 1,2,……, 21, $X_1$= time factor in Year $_t$

**Rural manpower development:** Regarding rural manpower (thousand individuals), it is clear that, it took an increasing trend during the study period with statistical significant rate. Its annual growth rate was 3.54% of the average of 8992.6 thousand individual. The deterministic coefficient was 0.99, which meant that 99% of the occurred changes in rural manpower was linearly correlated with time.

**The annual wage development in non-agriculture sectors:** As for the annual wage development in non-agriculture sectors (L.E.), it adopted an increasing trend will statistical significant rate. This rate reached 5% of the average of 3661.4 L.E. during the study period. The deterministic coefficient was 0.98; i.e., 98% of changes of agricultural laborer productivity was linearly correlated with time.

**Agricultural labor demand development:** The agricultural labor demand (million working day/man) took an increasing trend with statistical significant rate. Its annual rate was 0.72% of the average 1311.9 million working day/man during the study period. The deterministic coefficient was 0.88 i.e., 88% of changes of agricultural labor demand was linearly correlated with time.

**Agricultural manpower supply:** Table 1 showed that, the agricultural manpower supply (million laborers) adopted increasing trend during the studied period with annual growth rate 1.1% of the average of 4.76 million laborers during the studied period. The deterministic coefficient was 0.9, this result assured that 90% of the agricultural manpower supply changes were correlated with time. The statistical significant was assured during the studied period.

**The agriculture unemployment size development:** Table 1 indicated that, the agriculture unemployment size (million unemployed laborer) adopted increasing general trend during the study period with annual growth rate 3% of the average of 0.146 million laborer, the annual growth rate was statistically significant. The deterministic coefficient was 0.98; this result assured that 98% of the agriculture unemployment size changes were correlated to time. The statistical significant was assured during the study period.

**Result explanation of the standard analytical model:** Significance of the model at 0.01 level was obvious from results (Table 2), as F = 152.541 at the first equation, F = 28.763 at the second equation, F = 66.242 at the

Table 2: Results

$NAI_t = 2900.75 + 1.1368\ A_t + 0.2749\ AL_t + 0.03511\ LP_t + 0.1464\ AINP_t - 0.5085\ W_t$, $R^2 = 0.83677$, $F = 152.541$ $DW = 1.323825$

$SAL_t = 2488.233 + 0.8565\ RP_t + 0.1865\ W_t - 0.2096\ NW_t$, $R^2 = 0.848776$, $F = 28.763$, $DW = 1.641299$

$DAL_t = 1825.748 + 3.05954\ A_t + 0.06560\ inv_t + 1.1088\ W_t + 0.25598\ LP_t - 130.4665\ M_t$, $R^2 = 0.789389$, $F = 66.242$, $DW = 0.807339$

$TAW_t = 3078.288 + 96.6824\ A_t + 3.43379\ AL_t + 0.4506\ LP_t + 0.21144\ AINP_t - 741.559\ M_t$, $R^2 = 0.7577373$, $F = 90.707$, $DW = 1.257044$

Source: Calculated from data in Appendix 1

third equation and F = 90.707 at the fourth equation. Also, the value of Durbin-Watson State shows the absence of chain correlation which effect on the estimation efficiency in the model (Table 2).

**The first equation: Agricultural net income:** The value of $r^{-2} = 0.837$ shows that the variation in the independent variables in the equation explain 83.7% of the variations in the Agricultural net income. And the signs of the estimated coefficients agree with economic logic, as the positive sign was found with variables; agricultural crop area by thousand feddan, size of the used Agricultural labor by thousand laborers, agricultural labor productivity by pounds and value of the used agricultural production requirements by million pounds. This means that increasing the agricultural crop area by one thousand feddan leads to increase the agricultural net income by about 1.1368 million pounds at the same year. Also, increasing of the size of the used agricultural labor by one thousand laborers leads to an increase in the agricultural net income by about 0.275 million pounds at the same year. And increasing the agricultural laborer productivity by one pound, leads to an increase in the agricultural net income by about 0.035 million pounds at the same year. Also, increasing the value of agricultural production requirements by one million pounds, leads to an increase in the agricultural net income by about 0.147 million pounds at the same year.

However, the negative sign was shown with the agricultural labor wage variable by pound, as an increase in agricultural labor wage by one pound leads to a decrease in the agricultural net income by 0.508 million pounds at the same year.

**The second equation: Agricultural labor supply:** The value of $r^{-2} = 0.849$ shows that the variation in the independent variables in the equation explain 84.9% of the variations in the agricultural labor supply. And the signs of the estimated coefficients agree with economic logic, as the positive sign was found with rural labor force (15-60 years old) by thousand individual and the agricultural labor wage by pound. This means that if the size of rural labor force (from 15-60 years old) increases by one thousand laborers, the agricultural labor supply will be increased by 0.8565 thousand laborers in the same year. And the increase of agricultural labor wage by one pound leads to an increase in agricultural labor supply by 0.1865 thousand laborers at the same year.

However, the negative sign was shown with labor wage in sectors other than agricultural by pound, as increasing labor wage in either of these sectors by one pound leads to a decrease in agricultural labor supply by 0.2096 thousand laborers at the same year.

**The third equation: Agricultural labor demand:** The value of $r^{-2} = 0.849$ shows that the variation in the independent variables in the equation explain 78.9% of the variations in the agricultural labor demand. And the signs of the estimated coefficients agree with economic logic, as the positive sign was found with variables; agricultural crop area by thousand fed, the total agricultural investments by million pounds, agricultural labor wage by pounds, agricultural labor productivity by pounds. This means that, increasing the agricultural crop area by one thousand feddan leads to an increase in agricultural labor demand by 3.05954 thousand laborers at the same year. Also, increasing the total agricultural investments by one million pounds leads to an increase in agricultural labor demand by 0.0656 thousand laborers at the same year. And increasing the agricultural labor wage by one pound increases the agricultural labor demand by 1.1088 thousand laborers at the same year. Also, an increase in the agricultural labor productivity by one pound increases the agricultural labor demand by 0.25598 thousand laborers at the same year.

However, the negative sign was shown with number of agricultural machines in agricultural sector, as increasing the number of agricultural machines in agricultural sector by one thousand machines decreases the agricultural labor supply by 0.25598 thousand laborers at the same year.

**The fourth equation: Agricultural wages:** The value of $r^{-2} = 0.758$ shows that the variation in the independent variables in the equation explain 75.8% of the variations in the agricultural wages. And the signs of the estimated coefficients agree with economic logic, as the positive sign was found with variables; agricultural crop area by thousand feddan, size of the used agricultural labor by thousand laborer, agricultural labor productivity by pounds and the value of the used agricultural production requirements by million pounds. This means

that, increasing the agricultural crop area by one thousand feddan increases the Agricultural wages by 96.6824 million pounds at the same year. Also, increasing the size of the used agricultural labor by one thousand laborers leads to an increase in agricultural wages by 3.43379 million pounds at the same year. And increasing the agricultural labor productivity by one pound increases the agricultural wages by 0.4506 million pounds at the same year. Also, an increase in the value of the used agricultural production requirements by one million pounds increases the agricultural wages by 0.21144 million pounds at the same year.

However, the negative sign was shown with number of agricultural machines in agricultural sector, as increasing the number of agricultural machines in agricultural sector by one thousand machine decreases the agricultural wages by 741.559 million pounds at the same year.

The importance of increasing the agricultural crop area was shown from the model results. Its increasing by 1000 fedan increases the agricultural net income by 1.14 million pounds, the agricultural labor demand by 3.1 thousand laborers and the agricultural wages by 96.7 million pounds at the same year.

It was shown also that increasing the total agricultural investments by million pounds increases the agricultural labor demand by 0.0656 thousand laborers at the same year. And increasing the agricultural laborer productivity by one pound leads to increase the agricultural laborer demand by 0.2559 thousand laborer and to the increase of the agricultural net income by 0.035 million pounds and the increase of agricultural wages by 0.4506 pounds at the same year.

It was noticed also that increasing the agricultural production requirements value by one million pounds leads to increase the agricultural net income by 0.147 million pounds and the increase of agricultural wages by 0.21144 million pounds at the same year.

Also, increasing the agricultural machine counts in the agricultural sector by 1000 machines leads to decrease the agricultural labor demand by 130.466 thousand laborers and decrease the agricultural wages by 741.559 million pounds at the same year.

## DISCUSSION

The relationship between the agricultural wages, agricultural labor productivity and the agricultural net income in Egypt will be firstly discussed, in the following paragraphs, declaring the agreement of the present study results with those reported in the other recent studies in Egypt. Then the discussion of the agricultural investments and agricultural unemployment size will come later.

Studying the agricultural wages via the fourth equation of the studied standard model of agricultural labor showed that increasing the agricultural labor productivity by one pound increases the agricultural wages by 0.4506 million pounds at the same year. The result which coincides with that declared by Othman (2003) who explained the problem of low agricultural wages and suggested means of work performance, laborer productivity, labor training programs to get suitable wages. He also, clarified that the real challenge which face policy makers was to put good formula which connecting between wages from one side and productivity from another for putting real criterion for pricing real average. His study, using dummy variables regression, showed that agricultural laborer productivity had an increasing trend by 104.64 pounds, with annual rate 5.15% of the average of agricultural laborer productivity (2032.39 pounds) while the average annual of the agricultural laborer wage increased by 3.37%, through the study period (1987-2001), from the previous average annual wage of the agricultural laborer in Egypt (418.5 pounds).

However, the present study, using the statistic evaluation of trend equations of the agricultural laborer productivity development, showed that it adopted an increasing trend with statistical significant annual rate 9.96% of the average of 6.066 thousand L.E. during the study period (1982-2002). But for the agricultural manpower wage development, it had an increasing trend through the study period with annual significant rate 7.64% of the average, which stood for 3.88 milliard L.E. While, there was an increasing trend for the agricultural laborer wage development with an annual rate 6.6% of the average, which represented 819.2 L.E. Also, studying the agricultural net income in the first equation of the studied standard model of agricultural labor in Egypt showed that increasing the agricultural laborer productivity by one pound led to increase the agricultural net income by about 0.035 million pounds at the same year. While the study via statistic evaluation of trend equations showed that it took a decreasing trend with an annual decreasing rate 0.86% of the average of 42580.7 million L.E. during the study period (1982-2002). The analysis of the development of variables affecting agricultural labor productivity and agricultural wages via the statistic evaluation of trend equations of these variables during the period showed an increasing trend of all variables, during the study period, except the agricultural net income development which took a decreasing trend.

On the other hand, the agriculture investments and the agricultural unemployment size developments in Egypt were studied. They adopted increasing trends during the study period with statistical significant rate. For the agriculture investments, it was 13.7% of the average which represented 4.22 milliard L.E. But it was with annual growth rate 3% of the average of 0.146 million unemployed for the agricultural unemployment size.

The present study declared the importance of increasing rates of agricultural investments to overcome the agricultural unemployment problem, the result which agreed with that recommended by Khalifa and Abdel Meseeh (2003), who demanded investing on heavy labor projects to overcome unemployment problem. They showed that the evaluation of the investment function in the previous year explained about 88.1% from changes occurred in agricultural investments and that increasing the national agricultural product by one milliard pounds led to increase 0.042 milliard pounds in investments. While, El-Sayed (2003), recommended small-scale industries and noticed that they represented 93% from total investments of the private sector and shared 80% from the total added value. Also, small craft projects (Fadl-Alla, 2003) was recommended to overcome this problem. He showed that the unemployment size in graduates in Egypt was 5.23 million unemployed in 1996-1997.

Thus, increasing the agricultural crop area, the agricultural total investments and agricultural labor productivity must be taken into consideration when making policies to solve the agricultural unemployment and increase the agricultural labor demand. Also, it is essential to increase the agricultural net income which in turn increase the agricultural wages and this will be done by increasing the agricultural crop area, labor productivity and the production requirement values.

Appendix 1

| Year | Net Income | National labor | National unemployment | Agric. unemployment | Agric. labor wages | Agric. labor demand | Agric. labor supply year | Requirement value |
|---|---|---|---|---|---|---|---|---|
| 1982 | 70661 | 10.8 | 0.606 | 0.111 | 1.74 | 4167 | 4.251 | 2980 |
| 1983 | 74435 | 11.07 | 0.813 | 0.114 | 1.83 | 4257 | 4.304 | 3875 |
| 1984 | 89542 | 11.37 | 0.756 | 0.112 | 1.91 | 4321 | 4.342 | 3641 |
| 1985 | 93871 | 11.67 | 0.802 | 0.115 | 2 | 4489 | 4.395 | 3814 |
| 1986 | 10539 | 12 | 0.862 | 0.118 | 2.09 | 4514 | 4.448 | 3925 |
| 1987 | 11431 | 12.33 | 0.941 | 0.122 | 2.2 | 4589 | 4.502 | 4041 |
| 1988 | 12855 | 12.69 | 0.2 | 0.126 | 2.3 | 4614 | 4.556 | 3986 |
| 1989 | 15983 | 13.03 | 1.12 | 0.129 | 2.46 | 4660 | 4.599 | 4540 |
| 1990 | 19111 | 13.38 | 1.29 | 0.132 | 2.87 | 4721 | 4.642 | 5735 |
| 1991 | 20473 | 13.74 | 1.397 | 0.136 | 3.1 | 4750 | 4.686 | 7177 |
| 1992 | 23009 | 14.01 | 1.416 | 0.141 | 3.36 | 4764 | 4.721 | 7953 |
| 1993 | 27348 | 14.44 | 1.801 | 0.145 | 3.67 | 4775 | 4.765 | 9162 |
| 1994 | 34650 | 14.88 | 1.865 | 0.151 | 4.04 | 4785 | 4.811 | 11041 |
| 1995 | 38345 | 15.34 | 1.978 | 0.156 | 4.51 | 4810 | 4.846 | 13802 |
| 1996 | 41889 | 15.83 | 2.078 | 0.166 | 5.06 | 4828 | 4.915 | 14191 |
| 1997 | 47088 | 16.34 | 2.124 | 0.17 | 5.46 | 4842 | 4.99 | 14183 |
| 1998 | 47961 | 16.87 | 2.254 | 0.173 | 5.87 | 4860 | 5.073 | 15679 |
| 1999 | 50457 | 17.42 | 2.441 | 0.178 | 6.3 | 4882 | 5.168 | 18430 |
| 2000 | 50695 | 17.98 | 2.644 | 0.184 | 6.48 | 4892 | 5.254 | 20969 |
| 2001 | 53363 | 17.95 | 2.863 | 0.19 | 6.86 | 4917 | 5.31 | 21119 |
| 2002 | 60488 | 18.49 | 3.1 | 0.197 | 7.46 | 4946 | 5.417 | 23772 |

Appendix 1: Continue

| Year | Machine counts | Rural labor force | Annual labor wage | Crop area | Agric. laborer productivity | Agric. investments | Agric-laborer wage | Agric. laborer |
|---|---|---|---|---|---|---|---|---|
| 1982 | 4657 | 5427 | 1905 | 11.174 | 1.22 | 0.39 | 420.47 | 4.14 |
| 1983 | 4775 | 5895 | 1974 | 11.2 | 1.37 | 0.53 | 436.93 | 4.19 |
| 1984 | 4851 | 6218 | 2015 | 11.037 | 1.51 | 0.61 | 450.46 | 4.23 |
| 1985 | 5166 | 6752 | 2175 | 11.188 | 1.79 | 0.86 | 466.36 | 4.28 |
| 1986 | 5226 | 7039 | 2250 | 11.155 | 2.34 | 0.74 | 483.6 | 4.33 |
| 1987 | 5450 | 7625 | 2806 | 11.173 | 2.54 | 1.48 | 501.48 | 4.38 |
| 1988 | 5591 | 8027 | 2975 | 11.35 | 3.25 | 2.09 | 518.63 | 4.43 |
| 1989 | 6133 | 8311 | 3128 | 11.544 | 3.97 | 1.72 | 549.77 | 4.47 |
| 1990 | 6371 | 8593 | 3599 | 12.2 | 4.23 | 2.01 | 636.38 | 4.51 |
| 1991 | 6455 | 8812 | 3761 | 12.424 | 4.76 | 2.41 | 681.46 | 4.55 |
| 1992 | 7079 | 9084 | 3973 | 12.49 | 5.34 | 2.3 | 733.94 | 4.58 |
| 1993 | 7451 | 9387 | 3995 | 12.781 | 5.95 | 2.72 | 793.12 | 4.62 |
| 1994 | 7638 | 9710 | 4164 | 13.003 | 6.88 | 3.4 | 866.44 | 4.66 |
| 1995 | 7995 | 9945 | 4260 | 13.815 | 7.88 | 3.74 | 959.94 | 4.69 |
| 1996 | 8252 | 10223 | 4347 | 13.71 | 8.92 | 4.81 | 1065.3 | 4.75 |

Appendix 1: Continue

| Year | Machine counts | Rural labor force | Annual labor wage | Crop area | Agric. laborer productivity | Agric. investments | Agric-laborer wage | Agric. laborer |
|---|---|---|---|---|---|---|---|---|
| 1997 | 8483 | 10635 | 4588 | 13.829 | 9.52 | 6.84 | 1132.55 | 4.82 |
| 1998 | 87712 | 10896 | 4606 | 13.859 | 10.07 | 8.23 | 1196.74 | 4.9 |
| 1999 | 90284 | 11157 | 4887 | 13.939 | 10.63 | 9.89 | 1263.65 | 4.99 |
| 2000 | 93315 | 11416 | 4964 | 13.808 | 11.22 | 11.61 | 1278.12 | 5.07 |
| 2001 | 95760 | 11707 | 5152 | 14.03 | 11.91 | 11.07 | 1339.99 | 5.12 |
| 2002 | 98532 | 11985 | 5365 | 14.065 | 12.09 | 11.11 | 1428.47 | 5.22 |

Source: 1-Agricultural ministry, Economic sector, Central administration of agriculture economic, Agriculture economic publication, 2- The Central system of general mobilization and statistic, Annual statistical book, 3- Food and Agricultural Organization (FAO). Trade yearbook

Appendix 2

| Year | Population | Rate of unemployment | Total laborer wages | National laborer wage | Total local production | Total agricultural production | National investments | National laborer production | National laborer costs | Agricultural laborer costs | Cultivated area |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1982 | 44.67 | 10 | 10.51 | 973.39 | 25.41 | 5.07 | 8.29 | 2.35 | 0.97 | 0.42 | 5.85 |
| 1983 | 45.92 | 11.2 | 11.84 | 1069.73 | 30.08 | 5.72 | 9.15 | 2.72 | 1.07 | 0.44 | 5.848 |
| 1984 | 47.5 | 12.47 | 13.34 | 1173.95 | 35.64 | 6.38 | 10.63 | 3.14 | 1.17 | 0.45 | 5.992 |
| 1985 | 47.88 | 10.27 | 14.69 | 1258.76 | 41.43 | 7.67 | 13.01 | 3.55 | 1.26 | 0.47 | 5.987 |
| 1986 | 48.25 | 6.93 | 16.19 | 1349.09 | 49.34 | 10.11 | 14.59 | 4.11 | 1.35 | 0.48 | 6.001 |
| 1987 | 49.83 | 13.82 | 19.38 | 1571.21 | 58.63 | 11.12 | 21.8 | 4.75 | 1.57 | 0.5 | 6.071 |
| 1988 | 51.35 | 13.1 | 22.07 | 1739.67 | 73.17 | 14.4 | 24.15 | 5.77 | 1.74 | 0.52 | 6.183 |
| 1989 | 52.89 | 10.87 | 25.58 | 1962.75 | 91.54 | 17.74 | 26.18 | 7.02 | 1.96 | 0.55 | 6.27 |
| 1990 | 54.44 | 9.38 | 29.71 | 2220.8 | 110.01 | 19.11 | 25.48 | 8.22 | 2.22 | 0.64 | 6.918 |
| 1991 | 55.89 | 9.24 | 33.96 | 2471.53 | 131.06 | 21.68 | 27.5 | 9.54 | 2.47 | 0.68 | 7.023 |
| 1992 | 56.43 | 10.02 | 38.58 | 2753.83 | 145.16 | 24.43 | 31.64 | 10.43 | 2.75 | 0.73 | 7.12 |
| 1993 | 57.56 | 9.85 | 44.55 | 3085.87 | 162.97 | 27.5 | 33.45 | 11.29 | 3.09 | 0.79 | 7.179 |
| 1994 | 58.98 | 9.56 | 51.9 | 3488.16 | 191.01 | 32.05 | 39.41 | 12.84 | 3.49 | 0.87 | 7.413 |
| 1995 | 60.24 | 9.36 | 60.04 | 3914.1 | 214.19 | 36.97 | 44.11 | 13.96 | 3.91 | 0.96 | 7.813 |
| 1996 | 59.31 | 8.83 | 69.89 | 4416.64 | 239.5 | 42.33 | 55.28 | 15.13 | 4.42 | 1.07 | 7.564 |
| 1997 | 60.71 | 8.32 | 77 | 4711.43 | 262.22 | 45.88 | 62.01 | 16.04 | 4.71 | 1.13 | 7.564 |
| 1998 | 61.99 | 7.84 | 85.31 | 5055.63 | 283 | 49.36 | 68.59 | 16.77 | 5.06 | 1.2 | 7.761 |
| 1999 | 63.25 | 7.43 | 95.62 | 5489.56 | 318.43 | 53.02 | 73.11 | 18.28 | 5.49 | 1.26 | 7.895 |
| 2000 | 64.58 | 7.59 | 102.68 | 5709.78 | 345.8 | 56.86 | 80.5 | 19.23 | 5.71 | 1.28 | 7.995 |
| 2001 | 65.83 | 9.02 | 110.25 | 6141.87 | 363.18 | 60.96 | 85.5 | 20.23 | 6.14 | 1.34 | 7.095 |
| 2002 | 67.3 | 8.74 | 118.92 | 6432.38 | 379.8 | 63.1 | 88.2 | 20.54 | 6.43 | 1.43 | 7.123 |

Source: 1-Agricultural ministry, Economic sector, Central administration of agriculture economic, Agriculture economic publication, 2- The central system of general mobilization and statistic, Annual statistical book, 3- Food and Agricultural Organization (FAO). Trade yearbook

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