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An Economic Study of Recycling Agricultural Wastes in Egypt

Haitham Bayoumi Ali Hassan, Mahmoud Riad el Gebaly, Salah Saied Abdul Ghani and Yousef Morsi Mohammed Hussein

Agricultural Department of Economics, National Research Centre, Dokki, Giza, Egypt

ABSTRACT

The increase in the intensive using of production elements and what associates it of horizontal and vertical expansion has been reflected on the increase of the amount of agricultural wastes on farmers and on the accumulation of such wastes annually without treatment. Moreover, the misuse of these agricultural wastes represents a dangerous environmental damage and a waste of an important economic resource. The volume of the agricultural wastes is estimated by about 35 million tons per year, of which, about 23 million tons of vegetarian wastes (utilized by about 7 million tons feed, 4 million tons of organic fertilizer and about 12 million tons are left without avail). In addition to animal wastes which reach to about 12 million tons per year (utilized by about 3 million tons as organic fertilizer and about 9 million tons, per year, are left without avail). This refers to that about 21 million tons of agricultural wastes (plant and animal), per year, are left without avail and lead to the contamination of the agricultural environment. It becomes necessary to activate the attention to recycle the agricultural wastes of crops that constitute a large proportion of wastes. Also, it becomes necessary to activate the most suitable means to convert these wastes into materials with economic value that contribute to increase the productivity of agricultural crops, save energy, improve the environment and increase the self-sufficiency rates. Moreover, it is shown that wastes of maize crop represents about 23.26% and of rice crop represents about 50.9%, While, the, sorghum crop represents about 12.11% and cotton crop reaches to about 13.73% of the total area of plant production at the level of the Republic, during the period (2004-2012),the study reaches to about 41375.33 thousand heml. Maize crop has occupied the first place by 54.64%. While, rice crop has come into the second place by 30.59%, then sorghum by 8.56% and finally, cotton crop by 6.21%. It has been shown that the contribution of the secondary crop in the total value of the crop's revenue has been declined, which indicates the decline of the importance of the agricultural wastes for farmers. Furthermore, it is turned out that the average of the total revenue of maize crop has reached to about 9463.8 thousand pounds of the total revenue , the average of the contribution of the secondary crop has reached to about 472.6 thousand pounds of the total revenue for the same period. Also, it is shown that that the average of the total revenue of rice has reached to about 8875.5 thousand pounds of the total revenue. However, the average of the contribution of the secondary crop has reached to about 268.01 thousand pounds of the total revenue for the same period. Moreover, it is shown that that the average of the total revenue of sorghum has reached to about 1263.77 thousand pounds of the total revenue, however, the average of the contribution of the secondary crop has reached to about 89.56 thousand pounds of the total revenue for the same period.

In addition, it is turned out that the total revenue of cotton is great, It has been reached to about 3002.03 thousand pounds of the total revenue, however, the contribution of the secondary crop has reached to about 63.81 thousand pounds of the total revenue. Furthermore, it is shown that Egypt produces about 22606.5 thousand heml of maize's firewood. Minia Governorate comes into the first place by producing about 3069.3 thousand heml which represent about 13.5% of Egypt production. In addition, it is turned out that maize's firewood is concentrated in Lower Egypt by a total reaches to 11041.9 thousand heml represent about 48.8% of Egypt production. So, focus shall be made into establishing plants for recycling the wastes of maize's firewood on Lower Egypt and its governorates like Sharkia, Behaira, Dakahlia and Menoufia. In addition, it is turned out that Egypt produces about 3541.9 thousand heml of sorghum, Fayoum Governorate comes into the first place by producing about 111.2 thousand heml which represent about 31% of Egypt production, in addition, it is shown that sorghum's firewood is concentrated in Upper Egypt by a total reaches to 2262.9 thousand heml represent about 63.8% of Egypt production, so, focus shall be made into establishing plants for recycling the wastes of sorghum's firewood on Upper Egypt and its governorates like Assiut, Sohag, and Qena. Moreover, it is shown that Egypt produces about 12660 thousand heml of rice crop straw, Dakahlia Governorate comes into the first place by producing about 3910.4 thousand heml which represents about 30.9% of Egypt production, in addition, it is turned out that rice crop straw are concentrated in Lower Egypt by a total reaches to 12611.2 thousand heml represent about 99.7% of Egypt production, so, focus shall be made into establishing plants for recycling the wastes of rice crop straw on Lower Egypt and its governorates like Dakahlia, Kafr Al-Sheik, Behaira, Gharbia and Damietta. Furthermore, it is shown that Egypt produces about 2566.8 thousand heml of cotton crop's firewood. Kafr Al-Sheikh Governorate comes into the first place by producing about 694.8 thousand heml which represents about 27.3% of Egypt production. In addition, it is turned out that cotton crop's firewood are concentrated in Lower Egypt by a total reaches to 2244.9 thousand heml represent about 87.5% of Egypt

Corresponding Author: Haitham Bayoumi Ali Hassan, Agricultural Department of Economics, National Research Centre, Dokki, Giza, Egypt.

production, so, focus shall be made into establishing plants for recycling the wastes of cotton crop's firewood on Lower Egypt and its governorates like Kafr Al-Sheik, Behaira, Dakahlia, Sharkia and Fayoum.

Kew words: Economic study, recycling agricultural wastes, Egypt

Introduction

It is observed that the area of the cultivated land has been increased from 3.5 million feddans to 7.5 million feddans. Also, crop area has increased from 7.72 million feddans to 13.96 million feddans. The total of winter crops is estimated by 6735.6 thousand feddans. However, the total of summer crops is estimated by 6487.7. In addition, the total of Nile crops is estimated by 603.9 thousand feddans. The agricultural sector needs to employ all the resources in order to maximize the return of the agricultural production. But intensifying the use of production elements and what associates it for horizontal and vertical expansion is reflected on increasing the amount of the agricultural wastes for farmers. These wastes accumulate annually without treatment. In addition, the misuse of them represents a dangerous environmental damage and a waste of an important economic resource, so it is necessary to focus on growing the use of these wastes in order to increase its value and increase its contribution in maximizing farmers' profit and the total return of the agricultural production. In addition, reducing the expected environmental risks to which farmers are exposed, and reducing the dangerous pollution of the environment and the waste of its various elements.

The volume of the agricultural wastes is estimated by about 35 million tons per year, of which about 23 million tons of vegetarian wastes (utilized by about 7 million tons feed, 4 million tons of organic fertilizer and about 12 million tons are left without avail), in addition to animal wastes which reach to about 12 million tons per year (utilized by about 3 million tons as organic fertilizer and about 9 million tons, per year, are left without avail). This refers to that about 21 million tons of agricultural wastes, per year, (plant and animal) are left without avail. These wastes lead to the pollution of the agricultural environment, in addition to health damage for citizens and waste of an amount up to about 4.6 billion pounds a year as an average for the period (2004-2012), furthermore, this can be considered as a waste for the natural resources from which benefits can be maximized. These natural resources can be turned into other products with a large economic return in the field of plant, animal and industrial production, which helps in the advancement of the productive farms, especially those that are established on the new lands and desert. These products are represented in the full diets that have a high nutritional value and the organic fertilizers needed to meet the demand for the organic agriculture products. Consequently, all those matters and others justify the importance of reconsidering the areas of usage for wastes in away aims at reaching to the optimum areas of usage which are technically possible and advanced, economically viable and environmentally conservative. But rather it becomes important to reconsider determining the concept of agricultural wastes and to deepen the public awareness of the importance of dealing with them as a main economic resource when using them in an optimum way, economic and developmental returns are achieved. However, when wasting and neglecting them, economic burdens and social and environmental damages are resulted.

Research Problem:

The problem is limited in the fragmentation of the agricultural holdings and the lack of public jars in villages. These things have led to performing the process of threshing on the same cultivated area in farms, thus, there is an urgent need to get rid of the remnants of the process of harvesting and threshing in the shortest possible time in order to prepare the land for the following cultivations. Moreover, the accumulation of the agricultural wastes is increased, and burning may be the possible process to get rid of them as it is the fastest and easiest available mean. But this mean causes a lot of problems, unavailing the agricultural wastes and not making an advantage of them as an economic resources are some of these problems.

In spite of the availability of large amounts of the agricultural wastes, Egypt suffers from a lack in the materials of animal feed, and consequently imports a large proportion of them annually in order to fill the gap of feed, the deficit in feed budget tends to increase year after year. So, it has become necessary to activate the attention to recycle the agricultural wastes of the crops that represent a large proportion of wastes. It is necessary, also, to activate the most suitable means of converting those wastes into materials with an economic value. Such materials can contribute in increasing the productivity of the agricultural crops, saving energy, improving the environment and increasing the self-sufficiency rates.

Aim of Research:

The research aims at identifying the vegetarian agricultural wastes of the vegetarian production, in Egypt, for maize, sorghum, rice and cotton crops. Such crops represent the largest crops from which the most wastes,

that are not taken advantage of, are resulted, moreover, by recycling these wastes, the economic return of farms can be increased and the environment can be protected from pollution. These things can be achieved through identifying the relative importance of the vegetarian wastes of these crops, the economic and productive indicators of major and minor products, the development of area, productivity and the production of those crops, the percentage of the value of contribution of the major and minor crop in the crop's revenue and the geographical distribution of the produced amounts of the agricultural wastes of the crops under study at the provincial level.

The Method of Research and Data Resources:

The research has relayed on following the inductive approach in the economic analysis descriptively and quantitatively, moreover, many analytical tools, mathematical and statistical methods, that achieve the desired objectives of the research, have been used. These analytical tools and the mathematical and statistical methods are such as the general time trend and the simple regression of relations among the changes during the period 2004-2012 to develop the area, production, productivity for the main and the secondary products, and the value of each of them.

The used data has been obtained from the Ministry of Agriculture and Land Reclamation, Economic Affairs Center, the Central Administration of Agricultural Economy, the Public Authority of the Agricultural Budget Fund, the Central Agency of Public Mobilization and Statistics, the Food and Agriculture Organization (FAO), Ministry of Economy and Foreign Trade and Ministry of Industry.

Discussion of Research:

First, the Relative Importance of the Agricultural Wastes of the Crops under Study:

The relative Importance of the Cultivated Area of the Crops under Study: - table No (1) shows that the average of maize crop area reaches to about 673.9 thousand feddans which represent about 23.26% of the total area of vegetarian production at the level of the Republic. However, the average of rice crop area reaches to about 1474.84 thousand feddans which represent about 50.9% of the total area of vegetarian production at the level of the Republic, while the average of sorghum crop area reaches to about 350.9 thousand feddans which represent about 12.11% of the total area of vegetarian production at the level of the Republic. However, the average of cotton crop area reaches to about 397.4 thousand feddans which represent about 13.73% of the total area of vegetarian production at the level of the Republic, as an average during the period (2004-2012).

Table 1: The Relative Importance of the Cultivated Area, per Thousand Feddans, Production and Productivity of the Crops of Maize, Sorghum, Rice and Cotton during the Period (2004-2012)

Years	Yellow and White Maize			Sorghum			Rice			Cotton		
	Area per Thousand Feddans	Productivity per Ardabs	Production per Thousand ardabs	Area per Thousand Feddans	Productivity per ardabs	Production per Thousand ardabs	Area per Thousand Feddans	Productivity per ardabs	Production per Thousand ardabs	Area per Thousand Feddans	Productivity per Qintar	Productivity per Thousand Qintar
2004	1684.9	26.3	44312.8	355.1	17.8	6320.7	1536.6	4.6	6068.4	714.7	7.50	5360.3
2005	16970	26	44145	361.3	17.5	6322.7	1564.7	4.5	7041.2	625.5	7.32	4579.1
2006	1707.9	25.7	43925.7	367.5	17.02	6255.4	1592.80	4.2	6744.2	536.4	7.10	3809.3
2007	1781	22.44	39912.3	347.2	17	5904.5	1672.7	4.1	6868.2	574.6	6.86	3941.48
2008	1860.36	24.21	45043.24	363.68	16.86	6132.14	1769.8	4.09	7240.51	312.7	7.36	2301.47
2009	1821	23.8	42477.78	355.45	16.8	5970.72	1370.16	4.1	5617.65	443.6	7.14	3149.56
2010	1998.2	22.4	4827.7	328.85	15.02	4939.37	1063.1	3.95	4327.1	369.1	6.49	2395.45
2011	1909.6	23.3	44495.18	342.15	15.41	5269.11	1231.63	3.96	4877.25	406.4	6.2	2519.37
2012	2157.7	23.86	51468.15	337.32	15.90	5363.53	1472.13	4.1	5896.5	333.4	5.59	1863.71
Total	11528.1	218.01	269139.7	3158.55	133.41	52478.07	13273.62	37.6	54681.01	3576.6	61.56	29919.74
Average	673.9	24.22	29904.4	350.9	14.8	5830.89	1474.84	4.17	6075.6	397.4	6.84	3324.41
Relative Importance	%23.26			%12.11			%50.90			%13.73		
	Firewood			Firewood			Straw			Firewood		

Source: collected and calculated from data from the Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economy, Economic Affairs Sector, the records of the General Administration of Agricultural Statistics and different numbers.

The average of the total cultivated areas is 2897.04 thousand feddans, the percentage of the crops under study = 100%

The Relative Importance of the Agricultural Wastes of the Crops under Study:

Table No (2) shows the relative importance of the amount of the Vegetarian Wastes of the Crops under Study for 2012. It is turned out that the total amount of wastes reaches to about 41375.33 thousand load. Maize crop has occupied the first place by 54.64%, while rice crop has come in the second place by 30.59%, then sorghum by 8.56% and then cotton crop by 6.21%.

Table 2: the relative importance of the amount of wastes of the crops under study per thousand heml for 2012.

Sequence	Crop	The Amount of Waste (Load)	%
1	Maize	22606156.48	54.64
2	Sorghum	3541912.5	8.56
3	Rice	12660395.4	30.59
4	Cotton	2566872	6.21
	Total Amount	41375336.38	100

Source: collected and calculated from the Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economy, Economic Affairs Sector, the Annual Bulletin of agricultural economy and different numbers.

Second: Productivity and Economic Indicators of the Primary and Secondary Products:

1- The Productivity and Economic Indicators of Maize:

Evolution of Maize Production (the main product):

Equation (1) and table (3) show that the equation of the general time trend of the main production of maize has taken an increasing general trend at a statistically significant annual rate reaches to about 1124 thousand ardabs, at an increasing annual rate reaches to about 11.1% of the average of the main production of maize. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 94% of the changes occurring in production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of Maize's Firewood Production (the secondary product):

Equation (2) and table (3) show that the equation of the general time trend of maize's firewood production has taken an increasing general trend at a statistically significant annual rate reaches to about 41.7 thousand heml, at an increasing annual rate reaches to about 8.4% of the average of the secondary production of maize's firewood. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 94% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of Maize Productivity (the main product):

Equation (3) and table (3) show that the equation of the general time trend of maize acre productivity has taken a decreasing general trend at a statistically significant annual rate reaches to about 0.38 ardabs, at a decreasing annual rate reaches to about 1.6% of the average of maize productivity. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 51% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

The Evolution of the Price of Maize Ardabs (the main product):

Equation (4) and table (3) show that the equation of the general time trend of the price of maize ardabs has taken an increasing general trend at a statistically significant annual rate reaches to about 19.8 pounds, at an increasing annual rate reaches to about 9.01% of the average of the price of maize ardabs. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 96% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

The Evolution of the Price of the Load of Maize's Firewood (the secondary product):

Equation (5) and table (3) show that the equation of the general time trend of the price of the load of maize's firewood has taken an increasing general trend at a statistically significant annual rate reaches to about 1.35 pounds, at an increasing annual rate reaches to about 5.4% of the average of the price of the load of maize's firewood. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 97% of the changes occurring in the price of the load of maize's firewood are attributable to time variable, while the rest of differences in that

production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of Maize Value (the main product):

Equation (6) and table (3) show that the equation of the general time trend of the total value of the main crop of maize has taken an increasing general trend at a statistically significant annual rate reaches to about 1054 million pounds, at an increasing annual rate reaches to about 0.41% of the average of maize value. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 92% of the changes occurring in the value are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of the Total Value of Maize's Firewood (the secondary product):

Equation (7) and table (3) show that the equation of the general time trend of the total value of the secondary crop of maize's firewood has taken an increasing general trend at a statistically significant annual rate reaches to about 39.3 million pounds, at an increasing annual rate reaches to about 8.3% of the average of maize's firewood value. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 93% of the changes occurring in the value are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of the Value of the Revenue of Maize:

Equation (8) and table (3) show that the equation of the general time trend of the total value of the revenue of maize has taken an increasing general trend at a statistically significant annual rate reaches to about 1094 million pounds, at an increasing annual rate reaches to about 11.01% of the average of the revenues of maize. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 93% of the changes occurring in the revenues are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Table 3: Equations of the General Time Trend of the Most Important Productivity and Economic Indicators of Maize Crop during the Period (2004-2012).

Equation No.	Statement	The Equation of the General Time Trend	F	$\acute{R}^2$	% Change Rate
1	The Main Crop's Production	^Y= 3935.1 + 1124.3 Xt (11.6)* *	134.6	0.94	11.1
2	The Secondary Crop's Production	^Y = 267.2+41.75Xt (11.6)* *	135.3	0.94	8.4
3	The Main Crop's Productivity	^Y= 26.15 -0.385Xt (2.7-)*	7.38	0.51	-1.59
4	The Main Crop's Price	^Y = 111.2 + 19.8 (14.7)* *	218	0.96	9.01
5	The Secondary Crop's Price	^Y= 17.4 + 1.357 Xt (16.7)* *	279.5	0.97	5.45
6	The Total Value of the Main Crop	^Y = 4190.1 + 1054.8Xt (9.5)* *	90.9	0.92	0.41
7	The Total Value of the Secondary Crop	^Y = 276.1 + 39.3 Xt (9.5)* *	90.3	0.93	8.3
8	The Total Value of Revenues	^Y = 4466.2 + 1094.1 Xt (9.6)	92.3	0.93	11.01

Source: collected and calculated from the Ministry of Agriculture and Land Reclamation, the Central Administrati0on of Agricultural Economy, Economic Affairs Sector, Indicators of agricultural statistics and different numbers.

As Y^ = the estimated value x= time variable
The figures which are in brackets and under regression equations refer to the calculated values of (t).
(*), (**) refer to the significance of regression coefficient at the level of 0.05, 0.01 respectively.
$\acute{R}^2$= coefficient of determination F= the calculated value of (F).

2- Productivity and Economic Indicators of Rice Crop:

Evolution of Rice Crop Production (the main product):

Equation (1) and table (4) show that the equation of the general time trend of the main production of rice crop has taken an increasing general trend at a statistically significant annual rate reaches to about 663.2 thousand tons, at an increasing annual rate reaches to about 7.05% of the average of the main production of rice crop. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 68% of the changes occurring in production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of Rice Crop Straw Production (the secondary product):

Equation (2) and table (4) show that the equation of the general time trend of rice crop straw production has taken an increasing general trend at a statistically significant annual rate reaches to about 29.6 thousand heml, at an increasing annual rate reaches to about 10.2% of the average of the secondary production of rice crop straw. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 75% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of Rice Straw Productivity (the main product):

Equation (3) and table (4) show that the equation of the general time trend of the productivity of an acre of rice crop has taken a decreasing general trend at a statistically significant annual rate reaches to about 0.068 tons, at a decreasing annual rate reaches to about 1.64% of the average of rice crop productivity. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 69% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

The Evolution of the Price of Rice Crop's Ton (the main product):

Equation (4) and table (4) show that the equation of the general time trend of the price of rice crop's ton has taken an increasing general trend at a statistically significant annual rate reaches to about 144.6 pounds, at an increasing annual rate reaches to about 9.1% of the average of the price of rice crop's ton. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 98% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

The Evolution of the Price of the Load of Rice Crop (the secondary product):

Equation (5) and table (3) show that the equation of the general time trend of the price of the load of rice crop straw has taken an increasing general trend at a statistically significant annual rate reaches to about 2.58 pounds, at an increasing annual rate reaches to about 11.2% of the average of the price of the load of rice crop straw. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 98% of the changes occurring in the price of the heml of rice crop straw are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of the Total Value of Rice Crop (the main product):

Equation (6) and table (4) show that the equation of the general time trend of the total value of rice crop has taken an increasing general trend at a statistically significant annual rate reaches to about 514.8 million pounds, at an increasing annual rate reaches to about 5.8% of the average of rice crop value. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 63% of the changes occurring in the value are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are

reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of the Total Value of Rice Crop Straw (the secondary product):

Equation (7) and table (4) show that the equation of the general time trend of the total value of the secondary crop of rice crop straw has taken an increasing general trend at a statistically significant annual rate reaches to about 23.9 million pounds, at an increasing annual rate reaches to about 8.9% of the average of the value of rice crop straw. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 71% of the changes occurring in the value are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of the Total Value of the Revenue of Rice Crop:

Equation (8) and table (4) show that the equation of the general time trend of the total value of the revenue of rice crop has taken an increasing general trend at a statistically significant annual rate reaches to about 538.7 million pounds, at an increasing annual rate reaches to about 5.8% of the average of the revenues of rice crop. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 63% of the changes occurring in the revenues are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Table 4: Equations of the General Time Trend of the Most Important Productivity and Economic Indicators of Rice Crop during the Period (2004-2012)

Equation No.	Statement	The Equation of the General Time Trend	F	$\acute{R}^2$	% Change Rate
1	The Main Crop's Production	^Y= 5757.2 + 663.2 Xt (4.49)* *	20.2	0.68	7.05
2	The Secondary Crop's Production	^Y = 127.5 +29.6 Xt (5.2)* *	27.5	0.75	10.2
3	The Main Crop's Productivity	^Y= 4.52 -0.068Xt (3.98)* *	15.86	0.69	-1.64
4	The Main Crop's Price	^Y = 779.4+ 144.6Xt (22.1)* *	492.3	0.98	9.18
5	The Secondary Crop's Price	^Y= 8.81 + 2.58 Xt (22.4)* *	504.3	0.98	11.2
6	The Total Value of the Main Crop	^Y = 6301.4 + 514.8 Xt (3.45)* *	11.68	0.63	5.8
7	The Total Value of the Secondary Crop	^Y = 148.2 + 23.96 Xt (4.15)* *	17.2	0.71	8.94
8	The Total Value of Revenues	^Y = 6449.6 + 538.7Xt (3.45) * *	11.9	0.63	5.89

Source: collected and calculated from the Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economy, Economic Affairs Sector, Indicators of agricultural statistics and different numbers.

As Y^ = the estimated value x= time variable
The figures which are in brackets and under regression equations refer to the calculated values of (t).
(*), (**) refer to the significance of regression coefficient at the level of 0.05, 0.01 respectively.
$\acute{R}^2$= coefficient of determination F= the calculated value of (F).

3- Productivity and Economic Indicators of Cotton Crop:

Evolution of Cotton Crop Production (the main product):

Equation (1) and table (5) show that the equation of the general time trend of the main production of cotton crop has taken a decreasing general trend at a statistically non-significant annual rate reaches to about 124.5 thousand qintar, at a decreasing annual rate reaches to about 2.1% of the average of the main production of cotton crop. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 25% of the changes occurring in production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of Cotton Crop's Firewood Production (the secondary product):

Equation (2) and table (5) show that the equation of the general time trend of cotton crop's firewood production has taken a decreasing general trend at a statistically non-significant annual rate reaches to about 0.89 thousand heml, at a decreasing annual rate reaches to about 1.53% of the average of the secondary production of cotton crop's firewood Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 9% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of Cotton Crop Productivity (the main product):

Equation (3) and table (5) show that the equation of the general time trend of the productivity of an acre of cotton crop has taken an increasing general trend at a statistically significant annual rate reaches to about 0.199 qintar, at an increasing annual rate reaches to about 2.9% of the average of cotton crop productivity. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 75% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

The Evolution of the Price of Cotton Crop Qintar (the main product):

Equation (4) and table (5) show that the equation of the general time trend of the price of cotton crop qintar has taken an increasing general trend at a statistically significant annual rate reaches to about 76.3 pounds, at an increasing annual rate reaches to about 7.7% of the average of the price of cotton crop qintar. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 99% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

The Evolution of the Price of the Load of Cotton Crop's Firewood (the secondary product):

Equation (5) and table (3) show that the equation of the general time trend of the price of the load of cotton crop's firewood has taken an increasing general trend at a statistically significant annual rate reaches to about 1.26 pounds, at an increasing annual rate reaches to about 6.7% of the average of the price of the load of cotton crop's firewood. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 99% of the changes occurring in the price of the load of cotton crop's firewood are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of the Value of Cotton Crop (the main product):

Equation (6) and table (5) show that the equation of the general time trend of the total value of the main crop of cotton crop has taken a decreasing general trend at a statistically non-significant annual rate reaches to about 82.4 million pounds, at a decreasing annual rate reaches to about 2.7% of the average of cotton crop value. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 16% of the changes occurring in the value are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of the Total Value of Cotton Crop's Firewood (the secondary product):

Equation (7) and table (5) show that the equation of the general time trend of the total value of the secondary crop of cotton crop's firewood has taken a decreasing general trend at a statistically significant annual rate reaches to about 1.06 million pounds, at a decreasing annual rate reaches to about 1.6% of the average of the value of cotton crop's firewood. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 9% of the changes occurring in the value are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of the Value of the Revenue of Cotton Crop:

Equation (8) and table (5) show that the equation of the general time trend of the total value of the revenue of cotton crop has taken a decreasing general trend at a statistically non-significant annual rate reaches to about 83.5 million pounds, at a decreasing annual rate reaches to about 2.7% of the average of the revenues of cotton crop. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 16% of the changes occurring in the revenues are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Table 5: Equations of the General Time Trend of the Most Important Productivity and Economic Indicators of Cotton Crop during the Period (2004-2012)

Equation No.	Statement	The Equation of the General Time Trend	F	$\acute{R}^2$	% Change Rate
1	The Main Crop's Production	^Y= 3568.5- 124.5 Xt (1.9)	3.96	0.25	2.17
2	The Secondary Crop's Production	^Y = 68.5 -0.89 Xt (-0.91)	0.84	0.09	1.53
3	The Main Crop's Productivity	^Y= 7.84 +0.199Xt (-4.52)* *	20.45	0.75	-2.9
4	The Main Crop's Price	^Y = 559.5 + 76.37Xt (4.66) **	21.7	0.69	7.79
5	The Secondary Crop's Price	^Y= 11.6 + 1.26 Xt (36.3) **	1316	0.99	6.77
6	The Total Value of the Main Crop	^Y 3414.3 - 82.4 Xt (-1.14)	1.3	0.16	-2.7
7	The Total Value of the Secondary Crop	^Y = 69.13 -1.06 Xt (- 0.87)*	0.76	0.09	-1.66
8	The Total Value of Revenues	^Y = 3483.4 – 83.5 Xt (- 1.14)	1.31	0.16	-2.72

Source: collected and calculated from the Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economy, Economic Affairs Sector, Indicators of agricultural statistics and different numbers.

As Y^ = the estimated value x= time variable
The figures which are in brackets and under regression equations refer to the calculated values of (t).
(*), (**) refer to the significance of regression coefficient at the level of 0.05, 0.01 respectively.
$\acute{R}^2$= coefficient of determination F= the calculated value of (F).

4- The Productivity and Economic Indicators of Sorghum:

Evolution of Sorghum Production (the main product):

Equation (1) and table (6) show that the equation of the general time trend of the main production of sorghum has taken an increasing general trend at a statistically significant annual rate reaches to about 95.1 thousand ardabs, at an increasing annual rate reaches to about 7.1% of the average of the main production of sorghum. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 91% of the changes occurring in production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of Sorghum's Firewood Production (the secondary product):

Equation (2) and table (6) show that the equation of the general time trend of sorghum's firewood production has taken an increasing general trend at a statistically significant annual rate reaches to about 3.9 thousand heml, at an increasing annual rate reaches to about 4.2% of the average of the secondary production of sorghum's firewood. Also, the value of the coefficient of determination $\acute{R}^2$ refers to that 95% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of Sorghum Productivity (the main product):

Equation (3) and table (6) show that the equation of the general time trend of sorghum acre productivity has taken a decreasing general trend at a statistically significant annual rate reaches to about 18.09 ardabs, at a

decreasing annual rate reaches to about 1.8% of the average of sorghum productivity. Also, the value of the coefficient of determination Ŕ^2 refers to that 77% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

The Evolution of the Price of Sorghum Ardabs (the main product):

Equation (4) and table (6) show that the equation of the general time trend of the price of sorghum ardabs has taken an increasing general trend at a statistically significant annual rate reaches to about 21.6 pounds, at an increasing annual rate reaches to about 9.29% of the average of the price of sorghum ardabs. Also, the value of the coefficient of determination Ŕ^2 refers to that 96% of the changes occurring in the production are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

The Evolution of the Price of the Load of Sorghum's Firewood (the secondary product):

Equation (5) and table (6) shows that the equation of the general time trend of the price of the load of sorghum's firewood has taken an increasing general trend at a statistically significant annual rate reaches to about 1.25 pounds, at an increasing annual rate reaches to about 5% of the average of the price of the load of sorghum's firewood. Also, the value of the coefficient of determination Ŕ^2 refers to that 98% of the changes occurring in the price of the load of sorghum's firewood are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of Sorghum Value (the main product):

Equation (6) and table (6) shows that the equation of the general time trend of the total value of the main crop of sorghum has taken an increasing general trend at a statistically significant annual rate reaches to about 83.4 million pounds, at an increasing annual rate reaches to about 6.5% of the average of sorghum value. Also, the value of the coefficient of determination Ŕ^2 refers to that 92% of the changes occurring in the value are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of the Total Value of Sorghum's Firewood (the secondary product):

Equation (7) and table (6) show that the equation of the general time trend of the total value of the secondary crop of sorghum's firewood has taken an increasing general trend at a statistically significant annual rate reaches to about 3.62 million pounds, at an increasing annual rate reaches to about 4.04% of the average of sorghum's firewood value. Also, the value of the coefficient of determination Ŕ^2 refers to that 96% of the changes occurring in the value are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Evolution of the Value of the Revenue of Sorghum:

Equation (8) and table (6) show that the equation of the general time trend of the total value of the revenue of sorghum has taken an increasing general trend at a statistically significant annual rate reaches to about 87.01 million pounds, at an increasing annual rate reaches to about 6.4% of the average of the revenues of sorghum. Also, the value of the coefficient of determination Ŕ^2 refers to that 92% of the changes occurring in the revenues are attributable to time variable, while the rest of differences in that production are due to other factors beyond those which are reflected by time variable. It, also, shows the significance of the model statistically, during the period (2004-2012).

Table 6: Equations of the General Time Trend of the Most Important Productivity and Economic Indicators of Sorghum during the Period (2004-2012)

Equation No.	Statement	The Equation of the General Time Trend	F	R^2	% Change Rate
1	The Main Crop's Production	^Y= 803.9 + 95.1 Xt (9.5)* *	90.6	0.91	7.16
2	The Secondary Crop's Production	^Y = 70.36 +3.9 Xt (13.5)* *	182.1	0.95	4.26
3	The Main Crop's Productivity	^Y= 18.09 -0.301Xt (4.79)* *	23.02	0.77	-1.82
4	The Main Crop's Price	^Y = 113.8+ 21.6Xt (15.6) **	243.6	0.96	9.29
5	The Secondary Crop's Price	^Y= 18.25 + 1.25 Xt (29.3) **	858.9	0.98	5
6	The Total Value of the Main Crop	^Y = 846.8 + 83.4 Xt (9.03)* *	81.5	0.92	6.59
7	The Total Value of the Secondary Crop	^Y = 71.43 + 3.62 Xt (12.2)* *	150	0.96	4.04
8	The Total Value of Revenues	^Y = 918.3 + 87.01 Xt (9.2) * *	84.3	0.92	6.43

Source: collected and calculated from the Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economy, Economic Affairs Sector, Indicators of agricultural statistics and different numbers.

As Y^ = the estimated value x= time variable
The figures which are in brackets and under regression equations refer to the calculated values of (t).
(*), (**) refer to the significance of regression coefficient at the level of 0.05, 0.01 respectively.
R^2= coefficient of determination F= the calculated value of (F).
Third: the Contribution of the Main and Secondary Crops' Value in the Revenues of the Crop: -

Table (7) shows the contribution of the main and secondary crops' value in the revenues of the crops of (maize, sorghum, rice and cotton). As it is shown that the contribution of the secondary crop in the total value of the crop's revenues is declined, that indicates the lack of importance of the agricultural wastes for farmers as follows:

Maize:

It is turned out that the contribution of the main crop from the total revenues of maize is, generally, very large. The revenues are ranged between a minimum reached to about 6536.1 thousand pounds in 2004, while the maximum has reached to about 14822 thousand pounds of the total revenues in 2012, at an average reaches to about 9463.8 thousand pounds of the total revenues, as an average for the period (2004-2012).

However, it is shown that the contribution of the secondary crop from the total revenues of maize's firewood is, generally, very small. The revenues are ranged between a minimum reached to about 344.3 thousand pounds in 2004, while the maximum has reached to about 678 thousand pounds of the total revenues in 2012, at an average reaches to about 472.68 thousand pounds of the total revenues, as an average for the period (2004-2012).

Rice:

It is turned out that the contribution of the main crop from the total revenues of rice is, generally, very large. The revenues are ranged between a minimum reached to about 6189.76 thousand pounds in 2004, while the maximum has reached to about 12188 thousand pounds of the total revenues in 2012, at an average reaches to about 8876.51 thousand pounds of the total revenues, as an average for the period (2004-2012).

However, it is shown that the contribution of the secondary crop from the total revenues of rice straw is, generally, very small. The revenues are ranged between a minimum reached to about 171.19 thousand pounds in 2004, while the maximum has reached to about 416 thousand pounds of the total revenues in 2012, at an average reaches to about 268.01 thousand pounds of the total revenues, as an average for the period (2004-2012).

Sorghum:

It is turned out that the contribution of the main crop from the total revenues of sorghum is, generally, very large. The revenues are ranged between a minimum reached to about 976.5 thousand pounds in 2004, while the maximum has reached to about 1700 thousand pounds of the total revenues in 2012, at an average reaches to about 1263.77 thousand pounds of the total revenues, as an average for the period (2004-2012).

However, it is shown that the contribution of the secondary crop from the total revenues of sorghum's firewood is, generally, very small. The revenues are ranged between a minimum reached to about 74.57 thousand pounds in 2004, while the maximum has reached to about 106.2 thousand pounds of the total revenues in 2012, at an average reaches to about 89.56 thousand pounds of the total revenues, as an average for the period (2004-2012).

Cotton:

It is turned out that the contribution of the main crop from the total revenues of cotton is, generally, very large. The revenues are ranged between a minimum reached to about 2180 thousand pounds in 2012, while the maximum has reached to about 3698.6 thousand pounds of the total revenues in 2004, at an average reaches to about 3002.03 thousand pounds of the total revenues, as an average for the period (2004-2012).

However, it is shown that the contribution of the secondary crop from the total revenues of cotton's firewood is, generally, very small. The revenues are ranged between a minimum reached to about 43.5 thousand pounds in 2008, while the maximum has reached to about 75.5 thousand pounds of the total revenues in 2007, at an average reaches to about 63.81 thousand pounds of the total revenues, as an average for the period (2004-2012).

Table 7: The Evolution of Revenue Value of the Crops of Maize, Sorghum, Rice and Cotton during the Period (2004-2012)
Value: in Thousand Pounds.

Years	Summer Maize		Summer Sorghum		Rice		Cotton	
	Main Product	Secondary Product	Main Product	Secondary Product	Main Product	Secondary Product	Main Product	Secondary Product
2004	6536.1	344.3	976.5	74.57	6189.76	171.19	3698.60	71.82
2005	6577.6	373.5	1037.55	79.66	7569.29	187.73	3319.84	67.69
2006	6632.7	357.9	1091.56	84.89	7937.92	204.75	2971.95	62.19
2007	7383.77	429.48	1121.85	83.86	8585.25	258.03	2561.06	75.51
2008	8918.56	467.91	1232.56	87.83	10607.35	333.67	2225.61	43.51
2009	10322.08	477.10	1403.12	95.18	9196.09	293.56	3690.06	66.86
2010	11744.85	565.42	1308.93	93.23	7948.88	245.99	3211.85	59.92
2011	12236.174	560.37	1501.69	100.59	9656.96	300.82	3159.29	67.53
2012	14822.82	678.18	1700.24	106.26	12188.07	416.33	2180.06	59.28
Total	85174.65	4254.16	11373.951	806.07	79879.57	2412.07	27018.32	574.31
Average	9463.85	472.68	1263.77	89.56	8875.51	268.01	3002.03	63.81

Source: collected and calculated from the Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economy, Economic Affairs Sector, the annual bulletin of agricultural economy _ different numbers.

The value of revenue of the main product = area per thousand feddans x amount of production x price

The value of revenue of the secondary product = area per thousand feddans x amount of heml x price

Cotton feddan = 7.73 heml, Rice feddan = 8.57 heml, Maize feddan = 10.48 heml, Sorghum Acre = 10.50 heml

Table 8: The Price of the Ardabs and the Load of the Crops of Maize, Sorghum, Rice and Cotton

Years	Summer Maize		Summer Sorghum		Rice		Cotton	
	The Price of Ardabs	The Price of Load	The Price of Ardabs	The Price of Load	The Price of Ton	The Price of a Straw Load	The Price of Qintar	The Price of Load
2004	147.5	19.5	154.5	20	1020	13	690	13
2005	149	21	164.1	21	1075	14	725	14
2006	151.6	20	174.5	22	1177	15	780	15
2007	185	23	190	23	1250	18	650	17
2008	198	24	201	24	1465	22	806	18
2009	243	25	235	25.5	1637	25	1170	19.5
2010	262	27	265	27	1837	27	1340	21
2011	275	28	285	28	1980	28.5	1254	21.5
2012	288	30	317	30	2067	33	1169	23
Total	1899.1	217.5	1986.1	198.5	13508	195.5	8584	162
Average	211.1	24.16	220.6	22.05	1500.8	21.72	953.77	18

Source: collected and calculated from the Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economy, Economic Affairs Sector, the annual bulletin of agricultural economy and different numbers.

Fourth: the Geographical Distribution of the Amounts Produced from the Agricultural Wastes of the Crops under Study, at the Level of the Republic: -

The geographical distribution of the amounts produced from the agricultural wastes of the crops under study, which are (maize, sorghum, rice and cotton), is being studied at the level of the Republic. In addition, the governorates that produce a large amount of these wastes are being identified in order to make decision makers

able to establish the projects of recycling the agricultural wastes, according to the distribution of the amounts to the governorates in order to be economically feasible.

The Geographical Distribution of the Amount Produced from the Firewood of Maize Crop in the Republic's Governorates:

Table No (9) shows the geographical distribution of maize firewood production at the level of the republic's governorates, and the relative importance of those governorates during 2012, as the data refer to that Egypt produces about 22606.5 thousand heml. Minya governorate is in the first place by a production reaches to about 3069.3 thousand heml represent about 13.5% of Egypt's production. Sharkia governorate is in the second place by a production reaches to about 2645.7 thousand heml represent about 11.7%. Behaira governorate is in the third place by a production reaches to about 2349 thousand heml represent about 10.3% of Egypt's production. Then the governorates of Menoufia, Beni Swef, Assiut, Sohag, Fayoum, Nubaria, Kafr Al-Sheikh, Qalyoubia, Giza and Dakahlia come into the fourth, fifth, sixth, seventh, eighth, ninth and tenth places, respectively, by productions reach to about 2240, 1872, 1669, 1468, 1031, 844, 837, 766, 673 and 606 thousand heml, respectively, represent about 9.9%, 8.3%, 7.4%, 6.5%, 4.6%, 4.2%, 3.7%, 3.4%, 2.9% and 2.7%, respectively, of the total production at the level of Egypt.

It has been turned out, that maize's firewood are concentrated in Lower Egypt by a total 11041.9 thousand heml represent about 48.8% of Egypt's production. Moreover, in Middle Egypt, about 6646.5 thousand heml are produced which represent about 29.4% of Egypt's production, then in Upper Egypt about 3980.9 thousand heml are produced which represent about 17.6% of Egypt's production. So, focus shall be made into establishing plants for recycling the wastes of maize's firewood on Lower Egypt and its governorates like Sharkia, Behaira, Dakahlia and Menoufia. Also, focus shall be made into establishing plants for recycling the wastes of maize's firewood on Middle Egypt in the governorates of Minya and Beni Swef. However, in Upper Egypt, focus shall be on Sohag governorate.

The Geographical Distribution of the Amount Produced from the Firewood of Sorghum Crop in the Republic's Governorates:

Table No (9) shows the geographical distribution of sorghum's firewood production at the level of the republic's governorates, and the relative importance of those governorates during 2012, as the data refer to that Egypt produces about 3541.9 thousand heml. Fayoum governorate is in the first place by a production reaches to about 111.2 thousand heml represent about 31% of Egypt's production. Assiut governorate is in the second place by a production reaches to about 977.5 thousand heml represent about 27.6%. Sohag governorate is in the third place by a production reaches to about 862.3 thousand heml represent about 24.3% of Egypt's production. Then, the governorates of Qena and Minya come into the fourth and fifth places, respectively, by productions reach to about 356.5 and 120.3 thousand heml, respectively, represent about 10.2% and 3.4%, respectively, of the total production at the level of Egypt.

It has been turned out that sorghum's firewood are concentrated in Lower Egypt by a total 226.2 thousand heml represent about 63.8% of Egypt's production. Moreover, in Middle Egypt, about 1276 thousand heml are produced which represent about 36.1% of Egypt's production. So, focus shall be made into establishing plants for recycling the wastes of sorghum's firewood on Upper Egypt and its governorates like Assiut, Sohag and Qena. Also, focus shall be made into establishing plants for recycling the wastes of sorghum's firewood on Middle Egypt in the governorates of Fayoum and Minya.

The Geographical Distribution of the Amount Produced from the Straw of Rice Crop in the Republic's Governorates:

Table No (9) shows the geographical distribution of the straw of rice crop production at the level of the republic's governorates, and the relative importance of those governorates during 2012, as the data refer to that Egypt produces about 12660 thousand heml. Dakahlia governorate is in the first place by a production reaches to about 3910.4 thousand heml represent about 30.9 % of Egypt's production. Kafr Al-Sheikh governorate is in the second place by a production reaches to about 2495.1thousand heml represent about 19.7%. Behaira governorate is in the third place by a production reaches to about 1719 thousand heml represent about 13.5% of Egypt's production. Then the governorates of Gharbia, Damietta, Sharkia, port Said and Qalyoubia come into the fourth, fifth, sixth, seventh, eighth places, respectively, by productions reach to about1264.5, 575.5, 226.1, 171.8 and 132.7 thousand heml, respectively, represent about 9.9%, 4.5%, 1.8%, 1.4% and 1.1%, respectively, of the total production at the level of Egypt.

It has been turned out that the straw of rice crop are concentrated in Upper Egypt by a total 12611.2 thousand heml represent about 99.7% of Egypt's production. So, focus shall be made into establishing plants for

recycling the wastes of rice crop straw on Lower Egypt and its governorates like Dakahlia, Kafr Al-Sheikh, Behaira, Gharbia and Damietta.

The Geographical Distribution of the Amount Produced from the Firewood of Cotton Crop in the Republic's Governorates:

Table No (9) shows the geographical distribution of cotton crop's firewood production at the level of the republic's governorates, and the relative importance of those governorates during 2012, as the data refer to that Egypt produces about 2566.8 thousand heml. Kafr Al-Sheikh governorate is in the first place by a production reaches to about 694.8 thousand heml represent about 27.3% of Egypt's production. Behaira governorate is in the second place by a production reaches to about 649.7 thousand heml represent about 25.3%. Dakahlia governorate is in the third place by a production reaches to about 315.1 thousand heml represent about 13.3% of Egypt's production. Then the governorates of Sharkia, Fayoum, Gharbia, Damietta, Nubaria, Alexandria, and Assiut come into the fourth, fifth, sixth, seventh, eighth, ninth and tenth places, respectively, by productions reach to about 306.4, 156.6, 129.7, 52.7, 51.9, 44.5 and 34.1thousand heml, respectively, represent about 11.9%, 8.5%, 5.1%, 2.2%, 2.1%, 1.7% and 1.3%, respectively, of the total production at the level of Egypt.

Table 9: The Relative Importance of the Geographical Distribution of the Amount Produced from the Wastes of the Crops of Maize, Sorghum, Rice and Cotton at the Level of the Republic in 2012 The Amount per Load = 0.250 ton

Governorates	Maize		Sorghum		Rice		Cotton	
	Total	%	Total	%	Total	%	Total	%
Alexandria	-	-	37322.424	1.65	17595.6	1.38	44552.2	1.73
Behaira	-	-	2349196.8	10.39	1719036.8	13.57	649718.3	25.31
Gharbia	-	-	672229.1	2.97	1264561.2	9.98	129675.7	5.05
Kafr Al-Sheikh	-	-	837414.8	3.70	2495100.8	19.70	694832.6	27.26
Dakahlia	-	-	606477.6	2.68	3910394.2	30.88	3150870.8	13.27
Damietta	-	-	19073.6	0.84	575529.2	4.53	52768.1	2.15
Sharkia	-	-	2645738.8	11.70	226025.2	1.78	306429.2	11.93
Ismailia	-	-	310434.4	1.68	52872.8	0.41	147468.3	0.56
Port Said	-	-	118182.9	0.52	171871	1.35	10564.4	0.03
Suez	-	-	29501.2	0.13				
Menoufia	-	-	2242657.1	9.92	11248.8	0.088	24563	0.09
Qalyoubia	-	-	766559.6	3.39	132775.4	1.04	2256.1	0.08
Cairo	-	-	1236.6	0.54	25.8	0.000		
The Total of Lower Egypt	-	-	11041927.12	48.84	12611263.6	99.71	2244942.7	87.46
Helwan	-	-	-	-	-	-	-	-
6th of October	-	-	-	-	-	-	-	-
Giza	7728	0.02	673465.7	2.97		-	-	-
Beni Swef	36130.5	1.22	1872566.4	8.28	5891	0.04	6865	0.03
Fayoum	1112307	31.40	1031116.7	4.56	6415.6	0.05	156687.3	8.52
Minya	120309	3.39	3069361.4	13.57			11072.6	0.04
The Total of Middle Egypt	1276474.5	36.03	6646510.32	29.41	12306.6	0.09	220620.4	8.59
Assiut	977581.5	27.60	1669107.6	7.38	-	-	34118.7	1.33
Sohag	862291.5	24.34	1468625.2	6.49	-	-	14945.7	0.58
Qena	356590.5	10.26	541669.22	2.39	-	-		
Luxor	7287	0.02	204318.0	0.90	-	-		
Aswan	59136	1.66	97275.3	0.43	-	-		
The Total of Upper Egypt	2262886.5	63.88	3980995.68	17.61	-	-	49064.4	1.91
The Total of Inside the Valley	3539361	99.91	21669433.12	95.86	12623570.2	99.80	2514627.5	97.96
Al-Wadi Al-Gadid Matrouh	2551.5 -	0.09 -	76986.08 13624	0.34 0.06	34434.4 -	0.19 -	246.4 -	0.03 -
Red Sea	-	-	-		-	-	-	-
North Sinai	-	-	1813.04	0.08	-	-	-	-
South Sinai	-	-			-	-	-	-
Nubaria	-	-	844300.24	4.20	2390.8	0.01	51998.1	2.01
The Total of outside the Valley	2551.5	0.09	936723.36	4.14	36825.2	0.20	52244.5	2.04
The Total of the Republic	3541912.5	100	22606156.48	100	12660395.4	100	2566872	100

Source: collected and calculated from the Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economy, Economic Affairs Sector and the annual bulletin of agricultural economy, October – 2013.

It has been turned out that cotton crop's firewood are concentrated in Lower Egypt by a total 2244.9 thousand heml represent about 87.5% of Egypt's production. Moreover, in Middle Egypt, about 220.6 thousand heml are produced which represent about 8.5% of Egypt's production. So, focus shall be made into establishing plants for recycling the wastes of cotton crop's firewood on Lower Egypt and its governorates like Kafr Al-Sheikh, Behaira, Dakahlia, Sharkia and Fayoum. Also, focus shall be made into establishing plants for recycling the wastes of cotton crop's firewood on Middle Egypt in the governorate of Fayoum.

The Advantages Resulting from Recycling the Agricultural Wastes:

The Study Finds that the Most Important Advantages [(1)] of Taking Advantage of the Agricultural Wastes are:

Protecting the environment from the environmental pollution by those agricultural wastes, the possibility of obtaining a complete decomposition organic fertilizer which is useful for the agricultural soil, in large amounts, increasing farms income as a result of taking advantage of the wastes, saving the costs of buying chemical fertilizers, increasing the fertility of the agricultural soil and thus increasing the productivity of area unit as a result of adding the industrial organic fertilizer (compost), the rationalization of consuming and using the chemical fertilizers in production, which have adverse and serious effects on human, animal, plant, soil, irrigation water and ground water as these chemical fertilizers lead to the contamination of irrigation water and ground water. Also, taking advantage of crop residues in producing unconventional feed for livestock by adding ammonia to rice straw and using it as an unconventional feed and also by germinating barley seeds on rice straw in order to get green or dry high nutritional value fodder and taking advantage of the agricultural wastes in producing food for humans such as producing mushrooms through growing it on the agricultural waste. In addition, taking advantage of crop residues is considered a mean to combat pests and harmful insects, by cutting the life cycle of many insects that remain with wastes, as well as the possibility of taking advantage of the agricultural wastes in producing biogas in order to obtain energy and organic fertilizer. Moreover, there is a possibility to compress the agricultural wastes in a narrow space and transport them to plants and others in order to take advantage of them. In addition, there is a possibility to obtain the particleboard wood that is used in furniture industry. It is possible to obtain this kind of wood by chopping cotton firewood and manufacturing them, and thus creating new jobs for young people and contributing to solve the problem of unemployment through the projects based on recycling the agricultural wastes and taking advantage of it, and hence truly contributing in the agricultural development, especially the development of the Egyptian countryside.

(1) Mohamed Al-Sayed Arnaout (Doctor), "Ways to Take an Advantage of the Agricultural wastes"

Summary:

The volume of the agricultural wastes is estimated by about 35 million tons per year, of which about 23 million tons of vegetarian wastes (utilized by about 7 million tons feed, 4 million tons of organic fertilizer and about 12 million tons are left without avail). In addition to animal wastes which reach to about 12 million tons per year (utilized by about 3 million tons as organic fertilizer and about 9 million tons, per year, are left without avail). This refers to that about 21 million tons of agricultural wastes, per year, (plant and animal) are left without avail and lead to the contamination of the agricultural environment. Moreover, it becomes important to reconsider determining the concept of agricultural wastes and to deepen the public awareness of the importance of dealing with them as a main economic resource. When using them in an optimum way, economic and developmental returns are achieved. However, when wasting and neglecting them, economic burdens and social and environmental damages are resulted. So, it has become necessary to activate the attention to recycle the agricultural wastes of the crops that represent a large proportion of wastes. It is necessary, also, to activate the most suitable means of converting those wastes into materials with an economic value. Such materials can contribute in increasing the productivity of the agricultural crops, and in saving energy, improving the environment and increasing the self-sufficiency rates.

Furthermore, it has been shown that the average of maize crop area reaches to about 673.9 thousand feddans which represents about 23.26% of the total area of vegetarian production at the level of the Republic. However, the average of rice crop area reaches to about 1474.84 thousand feddans which represents about 50.9% of the total area of vegetarian production at the level of the Republic, while the average of sorghum crop area reaches to about 350.9 thousand feddans which represents about 12.11% of the total area of vegetarian production at the level of the Republic. However, the average of cotton crop area reaches to about 397.4 thousand feddans which represents about 13.73% of the total area of vegetarian production at the level of the Republic, as an average during the period (2004-2012). Also, it is turned out that the amount of the wastes of the crops under study for 2012 reaches to about 41375.33 thousand load. Maize crop has occupied the first place by 54.64%, while rice crop has come in the second place by 30.59%, then sorghum by 8.56% and then cotton crop by 6.21%.

It has been shown that the contribution of the secondary crop in the total value of the crop's revenue has been declined, which indicates the decline of the importance of the agricultural wastes for farmers.

It is turned out that the contribution of the main crop from the total revenues of maize is, generally, very large, at an average reaches to about 9463.8 thousand pounds of the total revenues. However, the contribution of the secondary crop from the total revenues of maize's firewood is, generally, very small, at an average reaches to about 472.68 thousand pounds of the total revenues, as an average for the period (2004-2012).

Also, it is turned out that the contribution of the main crop from the total revenues of rice is, generally, very large, at an average reaches to about 8875.51 thousand pounds of the total revenues. However, the contribution of the secondary crop from the total revenues of rice straw is, generally, very small, at an average reaches to about 268.01 thousand pounds of the total revenues, as an average for the period (2004-2012).

In addition, it is turned out that the contribution of the main crop from the total revenues of sorghum is, generally, very large, at an average reaches to about 1263.77 thousand pounds of the total revenues. However, the contribution of the secondary crop from the total revenues of sorghum's firewood is, generally, very small, at an average reaches to about 89.56 thousand pounds of the total revenues, as an average for the period (2004-2012).

Moreover, it is turned out that the contribution of the main crop from the total revenues of cotton is, generally, very large, at an average reaches to about 302.03 thousand pounds of the total revenues. However, the contribution of the secondary crop from the total revenues of cotton's firewood is, generally, very small, at an average reaches to about 63.81 thousand pounds of the total revenues, as an average for the period (2004-2012).

Furthermore, it is turned out that Egypt produces about 22606.5 thousand heml of maize's firewood. Minya governorate is in the first place by a production reaches to about 3069.3 thousand heml represent about 13.5% of Egypt's production. Sharkia governorate is in the second place by a production reaches to about 2645.7 thousand heml represent about 11.7%. Behaira governorate is in the third place by a production reaches to about 2349 thousand heml represent about 10.3% of Egypt's production. In addition, it is shown that maize's firewood is concentrated in Lower Egypt by a total 11041.9 thousand heml represent about 48.8% of Egypt's production. Moreover, in Middle Egypt, about 6646.5 thousand heml are produced which represent about 29.4% of Egypt's production, then in Upper Egypt about 3980.9 thousand heml are produced which represent about 17.6% of Egypt's production. So, focus shall be made into establishing plants for recycling the wastes of maize's firewood on Lower Egypt and its governorates like Sharkia, Behaira, Dakahlia and Menoufia. Also, focus shall be made into establishing plants for recycling the wastes of maize's firewood on Middle Egypt in the governorates of Minya and Beni Swef. However, in Upper Egypt, focus shall be on Sohag governorate.

Also, it is turned out that Egypt produces about 3541.9 thousand heml of sorghum. Fayoum governorate is in the first place by a production reaches to about 111.2 thousand heml represent about 31% of Egypt's production. Assiut governorate is in the second place by a production reaches to about 977.5 thousand heml represent about 27.6%. Sohag governorate is in the third place by a production reaches to about 862.3 thousand heml represent about 24.3% of Egypt's production. In addition, It has been turned out that sorghum's firewood are concentrated in Upper Egypt by a total 226.2 thousand heml represent about 63.8% of Egypt's production. Moreover, in Middle Egypt, about 1276 thousand heml are produced which represent about 36.1% of Egypt's production. So, focus shall be made into establishing plants for recycling the wastes of sorghum's firewood on Upper Egypt and its governorates like Assiut, Sohag and Qena. Also, focus shall be made into establishing plants for recycling the wastes of sorghum's firewood on Middle Egypt in the governorates of Fayoum and Minya.

Moreover, Egypt produces about 12660 thousand heml of rice crop straw. Dakahlia governorate is in the first place by a production reaches to about 3910.4 thousand heml represent about 30.9 % of Egypt's production. Kafr Al-Sheikh governorate is in the second place by a production reaches to about 2495.1thousand heml represent about 19.7%. Behaira governorate is in the third place by a production reaches to about 1719 thousand heml represent about 13.5% of Egypt's production.

It has been turned out that the straw of rice crop are concentrated in Lower Egypt by a total 12611.2 thousand heml represent about 99.7% of Egypt's production. So, focus shall be made into establishing plants for recycling the wastes of rice crop straw on Lower Egypt and its governorates like Dakahlia, Kafr Al-Sheikh, Behaira, Gharbia and Damietta.

Furthermore, Egypt produces about 2566.8 thousand heml of cotton crop's firewood. Kafr Al-Sheikh governorate is in the first place by a production reaches to about 694.8 thousand heml represent about 27.3% of Egypt's production. Behaira governorate is in the second place by a production reaches to about 649.7 thousand heml represent about 25.3%. Dakahlia governorate is in the third place by a production reaches to about 315.1 thousand heml represent about 13.3% of Egypt's production. It has been turned out that cotton crop's firewood are concentrated in Lower Egypt by a total 2244.9 thousand heml represent about 87.5% of Egypt's production. Moreover, in Middle Egypt, about 220.6 thousand heml are produced which represent about 8.5% of Egypt's production. So, focus shall be made into establishing plants for recycling the wastes of cotton crop's firewood on Lower Egypt and its governorates like Kafr Al-Sheikh, Behaira, Dakahlia, Sharkia and Fayoum. Also, focus

shall be made into establishing plants for recycling the wastes of cotton crop's firewood on Middle Egypt in the governorate of Fayoum.

The study finds that the most important advantages resulting from recycling the agricultural wastes are protecting the environment from the environmental pollution by those agricultural wastes, the possibility of obtaining a complete decomposition organic fertilizer that is useful for the agricultural soil, in large amounts, saving the costs of buying chemical fertilizers, increasing the fertility of the agricultural soil. Also, taking advantage of crop residues in producing unconventional feed for livestock by adding ammonia to rice straw and using it as an unconventional feed and also by germinating barley seeds on rice straw in order to get green or dry high nutritional value fodder. In addition, there are other advantages resulting from recycling the agricultural wastes such as recycling crop residues as a mean to combat pests and harmful insects, by cutting the life cycle of many insects that remain with wastes, as well as the possibility of taking advantage of the agricultural wastes in producing biogas in order to obtain energy and organic fertilizer. Moreover, there is a possibility to compress the agricultural wastes in a narrow space and transport them to plants and others in order to take advantage of them. In addition, there is a possibility to obtain the particleboard wood that is used in furniture industry. It is possible to obtain this kind of wood by chopping cotton firewood and manufacturing them, and thus creating new jobs for young people and contributing to solve the problem of unemployment through the projects based on recycling the agricultural wastes and taking advantage of them, and hence truly contributing in the agricultural development, especially the development of the Egyptian countryside.

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