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ENABLERS TO INCREASE SELF-SUFFICIENCY RATE OF MAIZE CROP

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Abstract:

The demand for corn increases for its multiple uses, both in human nutrition, or as an essential component in the diets of livestock and poultry and the problem of maize lies in the failure of domestic production to cover the need of the total consumption, which leads to importing it from abroad and this represents a burden on the balance of payments, especially under the economic conditions Egypt experiences lately. It is shown from the redistribution of varieties summer and Nile white maize in the old lands the increase in the produced quantity by about 1.06 million ardebs and about 0.94 million ardebs representing about 2.98% and 19.1% respectively of the current total produced amount of summer and Nile white maize crop. The increase in the produced quantity of summer and Nile white maize in the new lands is about 0.98 and 0.04 million ardebs representing about 36.84% and 12.90%, respectively. It is shown from the redistribution of summer and Nile yellow maize varieties in the old lands has led to increase the produced quantity of maize by about 1.05% and 0.04% million ardebs representing about 20.23% and 4.08%, respectively. The increase in the produced quantity of summer and Nile yellow maize cultivated in the new lands is about 0.11 and 0.037 million ardebs representing about 8.4% and 14.4% of the current total production of 2012. Consequently, the total production of white maize on the level of the republic increases by about 4.16 million ardebs, representing about 9.56%. The increase in the produced amount of yellow maize is about 1.14 million ardebs representing about 14.78%. The increase in total production for each of the white and yellow maize is about 5.3 million ardebs representing about 10.34% of the total produced quantity on the level of the republic in the current situation.

KEY WORDS:

Maize varieties, maize economic indicators, self-sufficiency.

INTRODUCTION

Maize is considered one of the major cereal crops in Egypt for to its importance in human, animal and poultry nutrition where it enters in the industry of dry feed by 70%, and in the baking industry by 20%, and also enters in some industries such as extraction of glucose, fructose and oil. The new reclaimed and newly cultivated lands are an important part in the state's plan for the horizontal expansion and large areas of these lands can be cultivated with maize by following suitable fertilization and irrigation systems, and the success of this leads to increase in production of maize and decrease in the quantities imported from abroad, which are used as feed.

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Research Problem: The demand for corn increases for its multiple uses, both in human nutrition, or as an essential component in the diets of livestock and poultry and the problem of maize lies in the failure of domestic production to cover the need of the total consumption, which leads to importing it from abroad and this represents a burden on the balance of payments, especially under the economic conditions Egypt experiences lately.

Research Objective: Studying maize crop in terms of production, total consumption, size of the gap, the farm price and imports of maize in Egypt and studying the different varieties of the cultivated crop in the governorates of the Republic and the re-distribution of varieties to the governorates, which give the greater productivity.

RESEARCH METHOD & DATA SOURCES

The study relied on the descriptive and quantitative statistical method in achieving its objectives and depended on the published and unpublished data by the Ministry of Agriculture and Land Reclamation and the Central Agency for Public Mobilization and Statistics.

RESULTS AND DISCUSSION

Economic Indicators of Maize Crop during the period (1995-2011):

Studying Table (1) shows that the cultivated area with maize is fluctuated during the study period where it was approximately 2.877 million feddan in 2004, as a maximum, and about 1.822 million feddan in 2006, as a minimum, and also production is wobbling between the increase and decrease during the study period as it amounted to about 5.178 million tons as a minimum in 1995, and about 7.183 million tons in 2010 as a maximum. For productivity, it is increasing in general, it was about 2.49 tons/feddan in 1995 and increased gradually until it reached about 3.52 tons/feddan in 2006.

Table 1: Area, production, productivity, available for consumption and the gap for the maize crop during the period (1995 - 2011).

Years	Area in million feddan	Production in million tons	Productivity ton/feddan	Farm Price pound/ton	Net Yield Pound/feddan	available for Consumption in million tons	Gap Size in million tons	Imports	
								Amount in million tons	Value in Million dollars
1995	2.079	5.178	2.49	514.30	1280.58	8.259	2.558	2.4	349
1996	2.086	5.825	2.79	537.10	1498.22	7.651	2.298	2.5	435
1997	1.938	5.806	3.00	550.14	1463.37	8.460	2.635	3.1	385
1998	2.022	6.149	3.04	579.14	1847.46	9.129	3.035	3.0	379
1999	1.845	5.878	3.18	605.00	1718.20	11.066	4.729	3.6	644
2000	1.948	6.257	3.21	607.86	1793.19	11.085	4.941	4.7	542
2001	1.987	6.557	3.30	612.86	1807.94	11.259	4.784	4.8	553
2002	1.833	5.980	3.26	629.39	1856.41	11.526	4.684	4.7	592
2003	1.877	6.235	3.30	692.86	2085.51	10.457	4.026	4.8	529
2004	2.877	6.236	2.32	1035.71	3117.49	8.907	3.377	4.8	365
2005	2.067	7.085	3.43	1035.71	3666.46	11.862	5.134	6.4	696
2006	1.822	6.374	3.52	1078.57	3882.85	11.482	3.784	5.2	545
2007	2.096	6.243	3.02	2292.00	3051.00	11.392	4.483	4.5	940
2008	1.860	6.306	3.39	1414.00	1753.00	12.000	4.134	4.0	1037
2009	1.978	6.645	3.36	1379.00	1611.00	11.967	4.478	4.2	1105
2010	2.343	7.183	2.885	1871.43	2430.00	12.509	3.698	4.8	1223
2011	2.115	6.876	3.063	1928.57	2500.00	12.645	5.454	6.8	2105

Source: Ministry of Agriculture and Land Reclamation - Economic Affairs Sector, Annual Bulletin of the food balance of Arab Republic of Egypt - various issues. * Website of the United Nations International Food and Agriculture Organization (FAO).

For the price of farm, it is noted that it is in a steady increase during the study period as it was about 514.3 pounds/ton in 1995 and continued to increase until it reached about 2292 pounds/ton in 2007, then it was about 1929 pounds/ton in 2011. The same is applied to net yield as it amounted to about 1280.58 pounds/feddan in 1995, increased until it reached about 3882.85 pounds/feddan in 2006 and then declined in recent years, reaching about 2,500 pounds/feddan in 2011.

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It is clear from the same table that the available for consumption reached about 7,651 million tons in 1996, as a minimum, and it increased till it reached about 12,645 million tons in 2011, as the size of the gap was about 2,298 million tons in 1996, as a minimum, and reached its maximum in 2011 by about 5,454 million tons, so to cover that gap is to import from abroad and the quantity of imports amounted to about 2,425 million tons, with a value of about 349 million dollars in 1995 and it has been increasing until it reached about 6.8 million tons, with a value of about 2105 million dollars in 2011.

Hybrid Maize:

Farmers in most industrialized countries, which cultivate maize, cultivate varieties of hybrid maize, and this maize is produced through a process of breeding, characterized by the strength of growth of hybrid maize, and hybrid maize is produced through a process of hybridization. In this process, breeders of plant elected of varieties maize that have desirable traits to pass it for future generations. For example, one of maize varieties, El Manghoza, can resist diseases better than another variety, but the other variety can produce larger size than the first variety. Plant breeders are doing internal breeding (self-vaccination) of plants each elected variety for several generations until they get genetically pure strains. After that these two strains, which have an internal breeding to get the single-mating hybrid seeds are hybridized and when these seeds grow, they produce strong identical plants and contain genetic traits of the two strains. When farmers cultivate individual hybrid crops to get seeds to be cultivated in another season, the resulting plants have different qualities and low crop. As a result, the maize farmers must buy new hybrid seeds for cultivating maize crop each year.

Maize Varieties (1):

Individual Hybrid:

White: Individual Hybrid 9-10-103-122-123-124-125-126-128-129.
Yellow: Individual Hybrid 155-162-163-164-166-167-168-169-173.

These varieties are resistant to diseases of late wilting, smut and downy mildew and enjoy high quality in the governorates of Upper and Lower Egypt, new lands and El Nubaria, Toshka, Shark El Owinat and other areas with an average productivity of about 30-35 ardebs / acre.

Triple Hybrid:

White: Triple Hybrid 310-311-314-321-324-325-326-327-329.
Yellow: Triple Hybrid 351-352.

These varieties have the strength of growth and increase in the size of the leaf system, which make them suitable for the manufacture of silage after harvest and their cultivation is preferred in the governorates of Upper and Lower Egypt, new lands and El Nubaria, Toshka, Shark El Owinat and other areas which are resistant to wilting and downy mildew diseases, with an average productivity of about 27-30 ardebs/feddan.

Cultivation of Maize in Egypt:

The growing season in Egypt is divided into two agriculture seasons which are the summer agriculture and the Nile agriculture. Summer Agriculture: In this agriculture, the maize crop is cultivated in April, May and June and it has been cultivated in small areas before the completion of construction of the High Dam for the non-availability of water required for agriculture, but this changed after the construction of the High Dam and the cultivated areas of maize became mainly in summer agriculture.

Nile Agriculture:

These plants are cultivated in agriculture in July and the first half of August and the cultivated areas in Nile agriculture are decreasing from year to year after the construction of the High Dam. It is preferred to cultivate late mature varieties in summer agriculture, where the environmental conditions throughout the growing season are suitable for the production of the crop. Early mature varieties are cultivated, especially in the late appointments of Nile Agriculture due to the unavailability of appropriate

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environmental conditions for growth for conditions of late maturity.

First: Redistribution of white and yellow maize varieties on the governorates the Republic:

Studying the maize varieties cultivated in 2011, it is found that quality varies according to the cultivated region. Some varieties give larger production in Lower Egypt than Upper Egypt. It is seen from the Tables (2) and (3) that varieties of white and yellow, summer and Nile, maize in the old and new lands which give larger productivity for each governorate of the Republic.

Table 2: The distribution of white summer and Nile maize varieties recommended by the highest productivity in the governorates of the republic in 2011.

Area	Governorates	Old Lands		New Lands	
		Summer	Nile	Summer	Nile
Lower Egypt	Alexandria	Triple Hybrid 310	Triple Hybrid 310	Individual Hybrid 10	Triple Hybrid 310
	Beheira	Individual Hybrid 10	Individual Hybrid 10	Individual Hybrid 2030	-----
	Gharbeya	Triple Hybrid 310	Triple Hybrid 321	-----	-----
	Kafr El Sheikh	Triple Hybrid 323	Individual Hybrid 10	-----	-----
	Dakahleya	Individual Hybrid 8 K / 8/20	Individual Hybrid 2031	Individual Hybrid 2030	-----
	Sharkeya	Individual Hybrid 13	Individual Hybrid 10	-----	Triple Hybrid 325
	Ismailia	Individual Hybrid 2031	Triple Hybrid 310	Triple Hybrid 310	-----
	Suez	Triple Hybrid 310	Individual Hybrid 10	Individual Hybrid 2031	Triple Hybrid 325
	Port Said	-----	-----	Individual Hybrid 10	Individual Hybrid 10
	Monofeya	Triple Hybrid 323	-----	Local	-----
	Kaliobeya	Individual Hybrid 10	-----	-----	-----
Cairo and Helwan	Triple Hybrid 310	Individual Hybrid 10	Triple Hybrid 310	-----	
Middle Egypt	October 6 and Giza	Triple Hybrid 8 K / 8/30	Individual Hybrid 10	Triple Hybrid 321	Individual Hybrid 10
	BeniSuef	Individual Hybrid 2031	Triple Hybrid 311	Individual Hybrid 2030	-----
	Fayoum	National Individual Hybrid 4	Triple Hybrid 310	-----	-----
	Minya	National Individual Hybrid 4	-----	Triple Hybrid 314	-----
Upper Egypt	Assiut	Individual Hybrid 2030	-----	Individual Hybrid 10	-----
	Sohag	Individual Hybrid 8 K / 8/30	Triple Hybrid 310	Triple Hybrid 310	-----
	Qena	Individual Hybrid 2030	Bashaier 13	Individual Hybrid 2030	Bashaier Local
Outside Valley	New Valley	-----	Triple Hybrid 310	Individual Hybrid 10	Triple Hybrid 310
	El Nubaria	-----	-----	Individual Hybrid 10	-----
	North Sinai	-----	Triple Hybrid 310	-----	Triple Hybrid 310

Source: Collected and counted from data of the Central Administration of Agricultural Economics - The Ministry of Agriculture and Land Reclamation.

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Table 3: The distribution of varieties of summer and Nile yellow maize recommended by the highest productivity in the governorates of the republic in 2011.

Area	Governorates	Old Lands		New Lands		
		Summer	Nile		Summer	Nile
Lower Egypt	Alexandria	Individual Hybrid 3062	Individual 3062	Hybrid 162	Triple Hybrid 352	Individual Hybrid 110
	Beheira	Individual Hybrid 3062	Individual 162	Hybrid 3062	Triple Hybrid 352	-----
	Gharbeya	Triple Hybrid 352	Individual 3062	Hybrid 352	-----	-----
	Kafr El Sheikh	Triple Hybrid 352	Triple Hybrid 352	-----	-----	-----
	Dakahleya	Individual Hybrid 3084	Individual Hybrid 3084	Hybrid 3084	Triple Hybrid 352	-----
	Sharkeya	Triple Hybrid 352	Individual Hybrid 3084	Hybrid 3084	Triple Hybrid 352	-----
	Ismailia	Individual Hybrid 3084	-----	-----	Individual Hybrid 3062	-----
	Suez	Yellow Gold	-----	-----	-----	-----
	Port Said	-----	Yellow gold	-----	-----	-----
	Damietta	Triple Hybrid 351	-----	-----	-----	-----
	Monofeya	Triple Hybrid 352	-----	-----	-----	-----
	Kaliobeya	Yellow gold	Individual 30/84	Hybrid 30/84	-----	-----
	Cairo and Helwan	-----	-----	-----	-----	-----
	Middle Egypt	October 6 and Giza	Individual Hybrid 2055	Sun Hybrid	Individual	-----
BeniSuef		Individual Hybrid 3062	-----	-----	Individual Hybrid 3062	-----
Fayoum		Individual Hybrid 155	-----	-----	-----	-----
Minya		Hybrid 30 11 n	-----	-----	-----	-----
Assiut		Individual Hybrid 3062	-----	-----	Individual Hybrid 162	-----
Upper Egypt	Sohag	Individual Hybrid 3062	-----	-----	-----	-----
	Qena	Individual Hybrid 3062	Local	-----	-----	Local
	Aswan	Local	Local	-----	Local	-----
	Luxor	Individual Hybrid 3062	-----	-----	Local	-----
Outside Valley	New Valley	-----	-----	-----	Individual Hybrid 162	-----
	El Nubaria	Individual Hybrid 3062	-----	-----	Unique Individual Hybrid	Yellow Gold

Source: Collected and counted from data of the Central Administration of Agricultural Economics - The Ministry of Agriculture and Land Reclamation.

It is shown from the redistribution of varieties of summer and Nile white maize in the old lands in Table (4) the increase in the produced quantity by about 2.2 million ardebs and about 0.94 million ardebs representing about 6.18% and 19.1% respectively of the total current produced amount of summer and Nile white maize crop. The increase in the produced quantity of summer and Nile white maize in the new lands was about 1.05 and 0.04 million ardebs representing about 39.18% and 12.90%, respectively (Table 5).

Table 4: The impact of cultivation of highly productive summer and Nile white maize varieties of in old lands in different governorates on the total produced quantity in 2011.

Statement	Current State Million ardebs	Summer White Maize			Nile White Maize			Increase in Production (%)
		Recommended State million ardebs	Difference Million ardebs	Increase in Production (%)	Current State Million ardebs	Recommended State million ardebs	Difference Million ardebs	
Lower Egypt	20.9	22.22	1.32	6.31	2.53	3.13	0.6	23.71
Middle Egypt	10.3	10.44	0.14	1.35	2.15	2.36	0.21	8.90
Upper Egypt	4.4	5.14	0.74	16.82	0.25	0.38	0.13	52.00
Outside Valley	-	-	-	-	-	-	-	-
Total	35.6	37.8	2.2	6.18	4.93	5.87	0.94	19.10

Source: Collected and counted from data of the Central Administration of Agricultural Economics - The Ministry of Agriculture and Land Reclamation.

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Ministry of Agriculture and Land Reclamation.

Table 5: The impact of cultivation of highly productive summer and Nile white maize varieties of in new lands in different governorates on the total produced quantity in 2011.

Statement	Current State Million ardebs	Summer White Maize			Nile White Maize			Increase in Production (%)
		Recommended State million ardebs	Difference Million ardebs	Increase in Production (%)	Current State Million ardebs	Recommended State million ardebs	Difference Million ardebs	
Lower Egypt	1.34	1.47	0.13	9.70	0.07	0.09	0.02	28.57
Middle Egypt	0.43	0.45	0.02	4.65	0.013	0.02	0.007	53.85
Upper Egypt	0.04	0.05	-----	-----	0.014	0.024	0.01	71.43
Outside Valley	0.85	1.75	0.90	155.17	0.21	0.21	-----	-----
Total	2.68	3.73	1.05	39.18	0.31	0.35	0.04	12.90

Source: Collected and counted from data of the Central Administration of Agricultural Economics - The Ministry of Agriculture and Land Reclamation.

It is clear from Table (6) that the re-distribution of summer and Nile yellow maize varieties in the old lands has led to increase the produced quantity of maize by about 0.952% and 0.04% million ardebs representing about 18.34% and 4.08%, respectively. Table (7) also indicates the increase in the produced quantity of summer and Nile yellow maize cultivated in the new lands by about 0.11 and 0.037 million ardebs representing about 8.4% and 14.4% of the total current production of 2011.

Table 6: The impact of cultivation of highly productive summer and Nile yellow maize varieties of in old lands in different governorates on the total produced quantity in 2011.

Statement	Current State Million ardebs	Summer Yellow Maize			Nile Yellow Maize			Increase in Production (%)
		Recommended State million ardebs	Difference Million ardebs	Increase in Production (%)	Current State Million ardebs	Recommended State million ardebs	Difference Million ardebs	
Lower Egypt	3.34	3.53	0.19	5.70	0.887	0.921	0.034	3.83
Middle Egypt	0.376	0.398	0.002	5.85	0.002	0.003	0.001	50.00
Upper Egypt	1.48	2.20	0.72	48.60	0.090	0.10	0.01	11.11
Outside Valley	-----	0,02	0,02	Indefinitely	-----	-----	-----	-----
Total	--	--	--	--	--	--	--	--
Total	5.19	6.15	0.952	18.34	0.980	1.02	0.04	4.08

Source: Collected and counted from data of the Central Administration of Agricultural Economics - The Ministry of Agriculture and Land Reclamation.

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Table 7: The impact of cultivation of highly productive Summer and Nile yellow maize varieties of in new lands in different governorates on the total produced quantity in 2011.

Statement	Current State Million ardebs	Summer Yellow Maize			Nile Yellow Maize			Increase in Production (%)
		Recommended State million ardebs	Difference Million ardebs	Increase in Production (%)	Current State Million ardebs	Recommended State million ardebs	Difference Million ardebs	
Lower Egypt	0.54	0.57	0.03	5.56	0.176	0.21	0.034	19.32
Middle Egypt	0.005	0.005	--	---	----	----	----	----
Upper Egypt	0.10	0.12	0.02	20.00	0.003	0.003	----	----
Outside Valley	0.67	0.72	0.05	7.46	0.078	0.08	0.002	2.56
Total	1.31	1.42	0.11	8.40	0.257	0.294	0.37	14.40

Source: Collected and counted from data of the Central Administration of Agricultural Economics - The Ministry of Agriculture and Land Reclamation.

Consequently, the total production of white maize on the level of the republic increases by about 4.16 million ardebs, representing about 9.56% (Table 8). The increase in the produced amount of yellow maize is about 1.14 million ardebs representing about 14.78%. The increase in total production for each of the white and yellow maize is about 5.3 million ardebs representing about 10.34% of the total produced quantity on the level of the republic in the current situation.

Table 8: The impact of cultivation of highly productive white and yellow maize varieties on the level of the republic on the total quantity produced in millions ardebs in 2011.

Statement	White Maize	Yellow Maize	White & Yellow Maize
Current State	43.5	7.74	51.2
Recommended State	47.75	8.88	56.63
Difference	4.25	1.14	5.39
Increase in Production (%)	9.77	14.73	10.53

Source: Collected and counted from Tables 4.5, 6, 7

The percentage of self-sufficiency of maize has reached about 64.7% in 2006, then fell to about 60.8% and 59.72% in 2007 and 2010, respectively, and amounted to about 67.7% in 2011. The anticipated increase of production by redistributing and cultivating highly productive varieties, each variety in the suitable governorate for it, can make self-sufficiency ratio about 71.77% as a result of the increase in the total production of maize with remaining rates of consumption as they are. Scientists and researchers are now devising new hybrids resistant to thirst and climate change.

The Ministry of Agriculture is conducting a national campaign to promote the cultivation of corn in 21 governorates and it includes the cultivation of four guiding and educational fields yellow and white individual hybrids in 78 centers all over the country to work on spreading highly productive seeds that are resistant to insects and plant diseases with production that exceeds 34 ardeb per feddan, while the current production average of cultivated lands does not exceed 23 ardeb which means huge losses for the farmer due to the absence of guiding recommendations for farmers and the increase in imports, which amounted to about 5 million tons of yellow maize that worth about 6930 million pounds in 2012 to cover the needs of the feed factories.

Second: Variety; New Individual Hybrid Yellow 173:

This product gives about 32 ardebs per feddan and it takes about 90 days only in the ground, which provides about twenty days of duration of the crop in the ground and therefore less number of irrigations needed by the crop, reaching about 5 irrigations only (Table 9).

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Table 9: Comparison between the currently cultivated varieties and variety: new individual hybrid yellow 173.

Statement	Current Varieties	Variety 173	Saving (%)
Cultivation Duration per days	110	90	18.2
No. of Irrigations	6	5	16.7
Amount of Irrigation Water/ Summer Acre m ³	2976	2551	14.3
Amount of Irrigation Water/ Summer Acre m ³	2440	2033	16.7

Source: Collected and counted from data of the Central Administration of Agricultural Economics - The Ministry of Agriculture and Land Reclamation.

Summer maize acre needs about 2976 m³ of water for irrigation and using a variety yellow individual hybrid 173 reduces the number of irrigations to 5 irrigations only and therefore decreases the amount of water needed by the acre to about 2551 m³ as one irrigation consumes about 420 m³ of water and as the cultivated area of summer yellow maize is about 307.47 thousand feddan in old and new lands, the amount of water provided by the hybrid yellow 173 if it is cultivated over the country can be about 129.15 thousand m³, and can be used to cultivate new crops.

As the period of the crop in the ground is short, Nile maize can be cultivated after harvest which means that maize will be cultivated twice before the winter plantings season and this can provide a large proportion of imported maize and a large proportion of feed ingredients for livestock, poultry and fish. About 63.5 thousand feddan of Nile maize can be cultivated by the quantity of water provided by the variety yellow hybrid 173.

Therefore, it is essential that the officials in the country change the policies in which the country relies on importing from abroad to cover the local food gap. This requires the attention of government's support for scientific research, and forming a connection between Egyptian agricultural policy makers and between different research centers in Egypt in order to implement the cultivation of new varieties, especially the strategic crops that are resistant to climate change and the lack of irrigation water with high productivity. Thus, the negative effects of climate change on Egyptian food security can be controlled, so all published researches which are characterized by the scientific application in the field of production have to be applied.

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