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Economic Analysis of Milk Production and the Impact of Agricultural Policies in Egypt (Case Study of Qalioubia Governorate)

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ABSTRACT

The research aims to identify the status quo of dairy production in Egypt in general and the Qalyubia governorate in particular to study all the factors and policies affecting the production of raw milk, as an attempt to put some recommendations that help the decision maker to increase its production. The production functions were estimated in linear and double logarithmic models, as well as the use of the stepwise regression and the policy analysis matrix (PAM) to study the impact of productive policies at the farm level in the sample.The study found the following results:The increase in the number of different types of cattle each year, except the numbers of buffaloes have not been shown to increase significantly.The increase in the quantity of milk of different types annually except for the decrease in the quantity of goat milk, which did not prove its significance. Increased number of female milking cows and buffaloes annually in Egypt.The most important factors influencing the quantity of milk produced at the national level were the amount of feed and farm price of milk and loans of livestock.The most important factors affecting the production of cow's milk and buffalo at the farm level were the amount of concentrated feed, the amount of green fodder and the age of the animal.Feed costs topped the cost items to represent more than 70% in most productive categories.The total cost of the milking head below was in the third productivity category in both cattle and buffalo farms.The third productive category of both cattle and buffalo was the most efficient according to the economic and productivity efficiency measures.The value of wages of workers used in the milk production at local prices is higher than the value of wages calculated at global prices.Lower domestic prices for depreciation of machinery and buildings as fixed costs comparing with global prices.The State bears a small burden of supporting the production of raw milk (feed and veterinary drugs), which in turn increases the productivity of farms specialized in dairy production.The dairy producers in the sample have borne an implicit tax which is the difference between the economic value and the financial value of their milk production and the policies that are adopted for the producers of raw milk is not good for the price of product and production factors.This product was not sufficiently protected, indicating that the state either imposes direct or indirect taxes on the producers of raw milk or supports what is imported.There is a comparative advantage in the production of raw milk, where it is found that the production of raw milk locally is better than relying on imports.The most important problems were the high price of concentrated fodder and lack of good feed for the animal and the spread of diseases that lead to a lack of production with the absence of good drugs centers ranked the first and second.The research also found the following proposals: working on provide concentrated feeds at appropriate prices with support and to activate the role of veterinary drugs to follow diseases before their spread, and to establish dairy collection centers in villages to limit the control of wholesalers and produce The good local breeds in the milk production, establishment of factories for the manufacture of livestock feeders with the tightening of control.Which requires attention to the provision of feed of various kinds and follow the programs of genetic improvement to benefit from improved strains and determine the fair price of the product, and increase loans to producers and attention to small agricultural projects and support until the producer achieve the productive and economic efficiency and expansion of the establishment of large farms.

Keywords: Dairy Production - Policy Matrix Analysis - Qalyubia - Agricultural Policies.

INTRODUCTION

Livestock production is an important component of the agricultural sector, consumer demand for animal products has increased at increasing rates, as a result of increased individual incomes, high standard of living on the one hand, and population growth on the other hand, resulting in a food gap in animal products in general, and dairy products in particular, due to the inability of local producers to meet consumption needs in Egypt.

Recently, agricultural policies have been based on the expansion of imports to meet the deficit between both needs and domestic production, which has led to an increase in the imports quantity and their negative effects that do not conform to the objectives of the economic reform policy adopted by the state.

There are a number of agricultural economic policies that can be adopted to reduce or reduce the food gap of milk in the Arab Republic of Egypt, in light of a set of factors specific to milk production, which involve limited land, capital and human resources available in Egyptian agriculture.

Dairy products can be increased by two main policies, each has its many means and methods. The first policy is to increase the production of milk by bringing about the vertical development of farm animals in Egyptian agriculture, i.e., to obtain more milk production from the same existing animal units, in light of the limited feed capacity, which is based mainly on the cultivated fodder. The second policy is to increase the GDP from milk by increasing production by genetic improvement and breeding new breeds. In this regard, the development will take place both horizontally and vertically.

The Research Problem

Due to the increasing demand for dairy products in Egypt as a result of the increase in population, especially in the number of children, changing consumption patterns and increasing the imports of infant formula to about 166 thousand tons annually, in addition to the decrease in the quantity of milk recently to about 5.31 million tons in 2017 compared with 2007[14], resulting in the inability of local dairy production to pursuit demand, as well as the high prices of milk and dairy products for the average per capita income in Egypt and the low per capita average of about 71.9 kg per capita per year Compare to 96.4 kg in Britain, 100 kg per capita in Australia, 115 kg per capita in Spain, 144.8 kg per capita in Finland and about 240 to 320 kg per capita in Sweden and the European Union in 2015.[21]

The Research Objectives

This paper aims to study and analyze the impact of agricultural policies on dairy production in Egypt by identifying the current situation of dairy production in Egypt in general and Qalyubia governorate in particular and studying the factors and policies affecting the

production of raw milk in an attempt to develop some recommendations that help decision makers increase the production of raw milk.

RESEARCH METHODOLOGY

The study relied on the primary data collected by the questionnaire prepared specifically for this purpose, as well as the published and unpublished secondary data published by several official organizations including: FAO, Central Agency for Public Mobilization and Statistics, Ministry of Agriculture and Land Reclamation, As well as some published scientific researches and studies, and some Arabic and foreign references, in addition to the use of some evaluation criteria for projects, and some appropriate quantitative analysis methods of the published and unpublished secondary data.

Production functions were estimated in the linear and double-log form, the stepwise regression and percentages were also used, as well as the use of the Policy Analysis Matrix (PAM) to study the impact of agricultural policies or prevailing technological pattern at the product level and the level of the farm itself and the level of national economy.

The matrix is measured as follows:[1]

1. Nominal Protection Coefficient (NPC)

It measures the impact of policy on products and their production factors, In the case of products, it is calculated by dividing the output produced financially (at market price) by economically produced products (at the shadow price) and called is the nominal protection coefficient of outputs (NPCO), but in the case of production factors, it is calculated by dividing the value of inputs financially by the value of inputs economically and is called the nominal protection coefficient for inputs (NPCI).

The coefficients can be expressed in the following equations:

NPCO = Total Financial Revenue /Total Economic Revenue
NPCI = Value of inputs financially/ Value of inputs economically

If the NPCO is equal to 1, this indicates that both the farm price and the border price are equal.

This means that the agricultural policy is fair and does not impose taxes on the product, Also, no protectionist policy is taken to protect the production of the product in the local market, but if it exceeds 1, this means a protective policy, i.e., there is support for the product, while lower than 1 means there are implicit taxes on the product, but in the case of production inputs, the value of this coefficient is interpreted in reverse to the counterpart in the case of products.

2- Effective Protection Coefficient (EPC)

It takes into account both the products and the production inputs together, calculated by dividing the value added of the product financially (at market price) by the value added of the product economically (at the shadow price), and can be expressed as follows:

EPC = value added of the product at market price / value added of the product at the shadow price

If this coefficient is equal to 1, it means that the production of that product locally adds to the national economy as much as that is added at the border prices, but if it exceeds 1, it means that the product is produced under the state protection, while is lower than 1 indicates that the state imposes on producers of that commodity may be directly or indirectly or support what is imported from it.

3. Domestic Resource Cost (DRC)

It is calculated by dividing the value of the domestic resources economically on the net return economically. If the coefficient falls lower than 1, it indicates that there is a comparative advantage of the state in producing the product, but if it exceeds 1 it indicates that there is no comparative advantage in producing that product and It is better to switch to produce other products, the international prices (represented by border prices) can represent the direct costs of the alternative opportunity that the country bears or benefit from agricultural products that enter international trade. Therefore, the border prices were estimated as the export price (FOB) and the import prices (CIF) for imported products, adjusted for free-market exchange rates, transport costs and other marketing margins.

Coefficient of Comparative Advantage = DRC economically / value added at shadow price

The conversion factors obtained by World Bank experts on Egypt in 1991 [20] were estimated to be based on a study conducted by John Page on Egypt and used by the World Bank as significant conversion factors in project analysis Namely: 0.958 for human labor, 1.159 for fixed costs represented by depreciation of machinery and buildings, 1.085 for feed, 1.976 for veterinary drugs.

- Sampling technique:

The study was based on the simple random sample of dairy producers in Qalyubia governorate due to its distinct location within the Greater Cairo governorates and its proximity to the urban areas where milk consumption is concentrated and serving the local community. The milk production of Qalyubia governorate was about 201.7 thousand tons representing about 3.8% of the total raw milk in Egypt which 5.31 million tons in 2017. [13]

As for the selection of the Qalyubia governorate because it is within the governorates of Greater Cairo and because it is one of the agricultural governorates except for Shubra Al-Kheima as an industrial zone and the governorate includes 7 administrative centers are (Banha - Toukh – Kafr Shukr - Shebin Alqanater – Alqanater Alkhairia - Qalyub - Alkhanka) (Table 1).

1 - Selection of centers sample:

The Toukh and Qalyub centers were randomly selected from the governorate centers which they are ranked first and second in terms of the number of milking females, representing about 22.4%, 19.6% respectively of the total number of milking females in the Qalyubia governorate which estimated at 106338 head in 2018.2.

2- Selection of villages' sample:

Two villages were selected from Toukh, which has 45 villages, namely the villages of Mit Kenana and Moshtohor. The first and second rank were located at the level of Toukh according to the number of milking females, which represents 16.1%, 1,14% of the total number of females in the center respectively, which is about 20,944 head. and were chosen another two villages from Qalyub Which include 12 villages, namely villages of Meet Halfa and Kom Ashefin were selected according to the number of milking females, which represents 51.2%,

16.3% of the total number of milking females in the center respectively, which is about 23852 head in 2018.

3. Sample distribution:

The total sample size was 165 producers (breeder) representing about 10% of the total population size of the total number of producers (breeders) in the center which the total of 1496 breeder, in addition to choosing 10% of the selected sample size as a reserve to face some of the field problems that prevent to get accurate data. The sample was divided into 3 categories of buffalo and cow farms in Qalyubia Governorate as follows:

First category: (less than 10 heads) the number of (90) producers were selected among the breeders in this category.

Second category: (from 10 to less than 30 heads) the (55) producers were chosen from among the breeders in this category.

Third category: (30 heads and more) the (20) producers were selected from this category.

Table 1. Distribution of the sample of the study in the province of Qalyubia for the productive season 2018/2019

Statement Center	Number of breeders (holder)	% of the breeders number of the total of centers	Milking Females	% of milking females in all centers	Percentage of the breeders × Percentage of heads' Number	Geometric Mean (1)	Adjusted Geometric Mean (2)	Sample Size (3)
Sample distribution to selected centers								
Toukh	1046	69.92	4266	54.46	3807.96	61.71	62.51	103
Qalyub	450	30.08	3567	45.54	1369.80	37.01	37.49	62
Total	1496	100	7833	100	-	98.72	100	165
Distribution of sample on selected villages from Toukh center								
Mit kanana	851	81.36	3407	79.86	6497.54	80.61	80.62	83
Moshtohor	195	18.64	859	20.14	375.38	19.37	19.38	20
Total	1046	100	4266	100	-	99.98	100	103
Distribution of sample on selected villages from Qalyub center								
Meet Halfa	320	71.11	2680	75.13	5342.80	73.09	73.17	45
Koum Ashefin	130	28.89	887	24.87	718.38	26.80	26.83	17
Total	450	100	3567	100	-	99.89	100	62

Source: collected and calculated from the records of the Agriculture Directorate in Qalyubia Governorate - unpublished data.

(1) Geometric Mean = $\sqrt{\text{\% of No. of breeders} \times \text{\% of No. of milking females}}$

(2) Adjusted Geometric Mean = Geometric Mean of each center or village × 100 / Total of Geometric Mean

(3) Sample Size= Adjusted Geometric Mean of each center or village ×the customized size of a sample / 100

RESULTS AND DISCUSSION

1. Development of the number of dairy animals and domestic milk production in Egypt:

1. Development of the number of Development of the number of cows, buffaloes, and goats in Egypt during the period (2000 - 2017):

Table 2 shows that the number of cows during the study period ranged between a minimum of 3530 thousand in 2000 and a maximum of 5023 thousand in 2008 with an annual average rate of about 4574 thousand heads during the period (2000 - 2017), while the number of buffaloes during the study period ranged between a minimum of about 3379 thousand head in 2000 and a maximum of about 4165 thousand head in 2012 with an average annual about 3818.5 thousand head, during the study period, while the number of goats during the same period about 3424 thousand heads in 2000 The highest reached about 4473 thousand heads in 2008 with an annual average of about 4013.4 thousand heads during the study period (2000 - 2017).

Index numbers of cows indicate that Increased by 42.3% in 2008 (maximum during the study period) comparing the base year, and the number of buffaloes increased by 23.26% in 2012 (maximum during the study period) comparing the base year, as well as the number of goats increased by 30.64% in 2008 compared with the base year .

And by studying Time Trends for the Development of Cows, Buffaloes and Goats in Egypt (2000 - 2017), The table (3) shows that the total number of cows in equation (1) increased by a statistically significant annual increase of 65.9 thousand, representing about 1.44% of its annual average of 4574 thousand. (R^2) was about 0.68, which means that 68% of the changes in the number of cows are due to factors that reflect its effect through time factor.

Equation (2) in the same table shows that the total number of buffaloes was a statistically insignificant trend of about 7.62 thousand, which means that the number of buffaloes is relatively stable at around its average which is 3818.5 thousand.

The equation (3) in the same table shows that the total number of goats increased significantly at a significant level of 1%, reaching 42.93 thousand head, representing 1.07% of the annual average of 4013.4 thousand during the study period. R2 Is about 0.60, which means that 60% of the changes in goat numbers are due to factors that reflect its effect through time factor.

Equation (4) in the same table indicates that the total number of cattle of the three species mentioned above increased significantly at a significant level of 1%, reaching about 116.44 thousand heads, representing about 0.93% of the annual average of about 12406 thousand heads during the period 2000 - 2017). The coefficient of determination (R^2) was about 0.52, which means that 52% of the changes in the total number of cattle in the study period are due to factors that reflect its effect through time factor.

Table 2. Development of the number of cows, buffaloes and goats in the Arab Republic of Egypt (thousand head) during the period (2000 - 2017)

Years	Number of cows (000 head)	Index Number*	Number of Buffaloes (000 head)	Index Number	Number of goats (000 head)	Index Number	Total livestock numbers	Index Number
2000	3530	100	3379	100	3424	100	10333	100
2001	3801	107.68	3533	104.56	3497	102.13	10831	104.82
2002	4082	115.64	3717	110	3582	104.61	11381	110.14
2003	4227	119.75	3777	111.78	3811	111.30	11815	114.34
2004	4369	123.77	3845	113.79	3879	113.29	12093	117.03
2005	4485	127.05	3885	114.97	3803	111.07	12173	117.81
2006	4609	130.57	3937	116.51	3877	113.23	12423	120.23
2007	4933	139.75	4105	121.49	4211	122.98	13249	128.22
2008	5023	142.29	4052	119.92	4473	130.64	13548	131.11
2009	4525	128.19	3839	113.61	4139	120.88	12503	121
2010	4729	133.97	3818	112.99	4175	121.93	12722	123.12
2011	4780	135.41	3983	117.88	4258	124.36	13021	126.01
2012	4946	140.11	4165	123.26	4306	125.76	13417	129.85
2013	4744	134.39	3915	115.86	4153	121.29	12812	123.99
2014	4762	134.90	3949	116.87	4185	122.23	12896	124.80
2015	4883	138.33	3701	109.53	4046	118.17	12630	122.23
2016	5012	141.98	3437	101.72	4259	124.39	12708	122.98
2017	4886	138.41	3696	109.38	4163	121.58	12745	123.34
Average	4574		3819		4013		12406	

*** The index number was calculated as the base year 2000 = 100.**

Source: collected and calculated from The Ministry of Agriculture and Land Reclamation, Economic Affairs Sector, Livestock Statistics Sector.

Table 3. Equations of the time trend of the development of numbers of cows, buffaloes and goats in Egypt during the period (2000 - 2017) (Thousand head)

No	Item	Equation	R^2	F	Annual change rate %
1	Total cows numbers	$\hat{Y}_{1t}=3947.61 +65.90\ X_t$ (5.85)	0.68	34.23**	1.44
2	Total buffalo numbers	$\hat{Y}_{2t}=3746.16 +7.62\ X_t$ (0.77)	0.035	0.59	-
3	Total goats numbers	$\hat{Y}_{3t}=3605.62 + 42.93\ X_t$ (4.88)	0.60	28.82**	1.07
4	Total cattle numbers	$\hat{Y}_{4t}=11299.38 + 116.44\ X_t$ (4.20)	0.52	17.67**	0.93

Where $\hat{Y}_1$ = Total number of cows, $\hat{Y}_2$ = Total number of buffaloes, $\hat{Y}_3$ = Total number of goats, and $\hat{Y}_4$= Total livestock.

X_t = time variable where t (1, 2, 3, ..., 18),

( ) the value in parentheses below the variables refers to the calculated value of (T) , (R^2) coefficient of Determination,

**** Indicates statistically significant at the 0.01 significance level**

Source: collected and calculated from the data of table (2).

2. Development of the number of milking female buffaloes and cows in Egypt during the period (2000 - 2017):

The data presented in Table (4) show that the number of milking female cows ranged from a minimum of 1372 thousand in 2000 to a maximum of 1802 thousand in 2017 with an annual average of about 1628 thousand during the period 2000-2017. In the Arab Republic of Egypt, the female lactation was about 1515 thousand in 2000 and a maximum of about 1875 thousand in 2012 with an annual average of about 1677 thousand head during the same period, while the total number of female lactating reached 2887 thousand with a minimum of 3455 thousand head in 2012 with an annual average of about 3305 thousand during the study period.The index numbers of milking female cows indicate a rise in the number of cows by 31.3% in 2017 comparing with the base year and increase in the number of milking female of buffaloes by 23.8% in 2012 comparing with the base year 2000.

And by studying the time trend of the development of the number of milking female cows and buffaloes in Egypt during the period (2000 - 2017), Table (5) shows that trend of the number of milking female cows in equation (1) was increased by 10.39 thousand head statistically significant at 0.05 significant levels.

Table 4. The development of the number of female buffalo and buffalo in Egypt during the period (2000 - 2017)

Years	Milking female cows (thousand head)	Index number*	Milking female buffaloes (thousand head)	Index number*	Total milking females (Thousand head)
2000	1372	100	1515	100	2887
2001	1560	113.7	1640	108.3	3200
2002	1600	116.6	1640	108.3	3240
2003	1582	115.3	1590	105	3172
2004	1635	119.2	1619	106.9	3254
2005	1700	123.9	1640	108.3	3340
2006	1705	124.3	1650	108.9	3355
2007	1690	123.2	1720	113.5	3410
2008	1724	125.7	1700	112.2	3424
2009	1538	112.1	1700	112.2	3238
2010	1540	112.2	1731	114.3	3271
2011	1560	113.7	1800	118.8	3360
2012	1580	115.2	1875	123.8	3455
2013	1583	115.4	1772	117	3355
2014	1600	116.6	1787	118	3387
2015	1743	127	1684	111.2	3427
2016	1785	130.1	1574	103.9	3359
2017	1802	131.3	1549	102.2	3351
Average	1627.7		1677		3304.7

*** The index numbers were calculated as the year 2000 is the base year = 100**

Source: collected and calculated from: FAO, Faostat, www.fao.org

Table 5. Equations of the time trend of the development of the number of dairy females and the quantities of milk production during the period (2000 - 2017)

No.	statement	Type	Equation	R^2	F	Annual change rate %
1	Number of milking female	Cows	$\hat{Y}_{1t} = 1529.09 + 10.39\ X_t$ (2.45)	0.27	6.02*	0.64
2		Buffalos	$\hat{Y}_{2t} = 1617.01 + 6.32\ X_t$ (1.54)	0.13	2.36	0.26
3		Total	$\hat{Y}_{3t} = 3146.1 + 16.71\ X_t$ (3.63)	0.55	13.18*	0.51
4	Milk Quantity produced from	Cows	$\hat{Y}_{4t} = 2198.8 + 46.65\ X_t$ (2.39)	0.26	5.69*	1.77
5		Buffalos	$\hat{Y}_{5t} = 2371.62 + 10.61\ X_t$ (0.94)	0.052	0.88	-
6		Goats	$\hat{Y}_{6t} = 127.46 - 0.1476\ X_t$ (-0.91)	0.049	0.83	-
7		Total of milk quantity	$\hat{Y}_{7t} = 4636.24 + 67.27\ X_t$ (2.51)	0.29	6.29*	1.28

Where Y_1 = Number of milking female cows, Y_2 = Number of milking female buffaloes, Y_3= Total number of milking females, Y_4 = quantity of cow's milk production, Y_5 =quantity of buffalo milk production, Y_6 = quantity of goat milk production, Y_7=total milk production, X_t= The time variable where t is (1, 2, 3, ..., 18),

( ) the value in the parentheses below the variables refers to the calculated value of (T), (R^2) coefficient of Determination, * statistically significant at the 0.05 significance level.

Source: collected and calculated from the data of tables (4), (6).

The rate of change in the number of milking female cows were about 0.64% of the average number of milking female cows during the period (2000 - 2017) of about 1627.7 thousand head, and the coefficient of determination (R^2) about 0.27, which means that 27% of changes in the number of milking female cows due to factors that reflect its effect through time factor.

While equation (2) shows that the number of female buffaloes has not statistically significant trend at 6.32 thousand heads, which means that the relative stability of the female buffalo numbers around the average which is about 1677 thousand heads, while in equation (3) The change rate in milking female numbers was about 0.51% of the average of milking female numbers during the period (2000 - 2017) of about 3304.7 thousand heads, this increase statistically confirmed, The coefficient of determination (R^2) has reached about 0.55, which means that 55% of the changes in the total number of milking female cows and buffaloes are due to factors that reflect its effect through time factor.

3. Development of the quantity of milk produced from cows, buffaloes and goats in Egypt during the study period (2000 - 2017):

In the table (6) the quantity of bovine milk production during the study period ranged from a minimum of about 1618 thousand tons in 2001 and a maximum of about 3212 thousand tons in 2008 at an average annual rate of about 2641.9 thousand tons during the period (2000-2017), while the quantity of milk production of buffalo ranged from a minimum of about 2034 thousand tons in 2017 and a maximum of about 2923 thousand tons in 2014 at an average annual rate of about 2472.4 thousand tons during the period (2000-2017).

While the quantity of milk production from goats during the same period between a minimum of 120 thousand tons in 2000 and a maximum of 133 thousand tons in 2004, an average annual about 126.1 thousand tons during the study period, while the total milk production in Egypt during the study period between A minimum of about 3824 thousand tons in 2000 and a maximum of about 5980 thousand tons in 2008 with an average annual about 5240.4 thousand tons during the study period (2000 - 2017).

And a study of the time trend for the development of milk produced from cows, buffalo, and goats in equation (4) a general trend was estimated at 46.7 thousand tons, which is statistically significant at 0.05 significant level. The change rate in the quantity of cow's milk production was about 1.77% of the average quantity of dairy produced from cows during the period (2000-2017) of about 2641.9 thousand tons, the coefficient of determination (R^2) was 0.262, which means that 26% of the changes in the quantity produced from milk cattle due to factors that reflect its effect through time factor.

Equation (5) in the same table shows that the quantity of buffalo milk production has taken a not statistically significant trend. It is about 10.61 thousand tons, which means the relative stability of the quantity of buffalo milk around the average of about 2472.4 thousand tons. In the same table, the quantity of milk production decreased by about 0.147 thousand tons. This decline is statistically uncertain, which means that its relative stability around its annual average of about 126.1 thousand tons. In the table (5), equation (7) shows that the total milk production of the three species which mentioned above is taking a trend of about 67.27 thousand tons and is statistically significant. The coefficient of determination (R^2) is about 0.29, which means that 29% of the changes in the total milk produced from the three species are due to factors that reflect its effect through time factor.

2. Factors affecting the production capacity of Milk in Egypt:

To study the relationship between milk production and the factors that are supposed to affect the milk production at the national level during the period (2000-2017), which is the quantity produced from green fodder by thousand tons (X_1), the quantity of concentrated fodder by thousand tons (X_2), the amount of dry feed by thousand tons (X_3), farm-gate milk price by pounds/kg (X_4), and the value of livestock loans by million pounds (X_5), Using the stepwise regression in the linear and double-log form to obtain the best forms, which the results of it are consistent with the statistical and economic logic, Table (7) shows that the most important factors influencing the quantity produced at the national level during the period

(2000-2017), Using the linear form are the amount of dry feed (X_3), the farm-gate milk price (X_4), and livestock loans by million pounds (X_5),While the superiority of the log-log model, whose results are consistent with the economic and statistical logic, which shows that by increasing the amount of green fodder (X_1) by 1%, the amount of milk at the national level increased by 0.46%

The increase in the milk price (x4) by 1% increases the milk quantity at the national level by about 0.22%, and the increase of livestock loans by million pounds (x5) by 1% increase the quantity produced of milk by 0.34%, Total elasticity is estimated to be 1.03, that means by increasing the three factors by 1%. Dairy production at the national level increases by 1.03 %, Which indicates the increasing returns to scale, and the coefficient of determination is 0.74, This means that 74% of the change in the quantities of milk produced at the national level, Due to the factors reflected by the time factor and this result is statistically confirmed where the value of (F) calculated 8.75.

As a result, the research recommends working on providing green fodder, setting a fair price for raw milk, increasing the loans granted to milk producers and paying attention to small projects so that the product reaches productive and economic efficiency.

Table 6. Shows the development of the quantity of milk produced from cows, buffalo and goats (in thousand tons) during the study period (2000 - 2017).

Years	Quantity of cow's milk (Thousand tons)	Index number*	Quantity of buffalo milk (Thousand tons)	Index number	Quantity of goat milk (Thousand tons)	Index number	Total milk quantity (Thousand tons)	Index number
2000	1645	100	2059	100	120	100	3824	100
2001	1618	98.4	2213	107.5	123	102.5	3954	103.40
2002	1997	121.4	2087	101.4	126	105	4210	110.09
2003	2598	157.9	2550	123.8	132	110	5280	138.08
2004	2284	138.8	2345	113.9	133	110.8	4762	124.53
2005	2802	170.3	2622	127.3	127	105.8	5551	145.16
2006	2980	181.2	2679	130.1	128	106.7	5787	151.33
2007	3178	193.2	2619	127.2	128	106.7	5925	154.94
2008	3212	195.3	2640	128.2	128	106.7	5980	156.38
2009	2803	170.4	2697	131	124	103.3	5624	147.07
2010	2996	182.1	2653	128.8	125	104.2	5774	150.99
2011	3018	183.5	2568	124.7	127	105.8	5713	149.4
2012	3154	191.7	2564	124.5	131	109.2	5849	152.96
2013	2908	176.8	2523	122.5	123	102.5	5554	145.24
2014	2553	155.2	2923	142	125	104.2	5601	146.47
2015	2729	165.9	2394	116.3	122	101.7	5245	137.16
2016	2630	159.9	2334	113.4	124	103.3	5088	133.05
2017	2450	148.9	2034	98.8	123	102.5	4607	120.48
Average	2641.90		2472.40		126.10		5240.40	

*** The indices were calculated as the year 2000 is the base year = 100**
Source: FAO, Faostat, www.fao.org

Table 7. The stepwise regression for the most important factors influencing milk production at the national level during the period (2000 - 2017)

No.	Item	Equation	R^2	F
1	linear	$\hat{Y}_i$=10617.6 - 0.458 X_{3i} + 297.7 X_{4i} + 0.091 X_{5i} (-3.23) ** (3.42) * (1.93) *	0.66	6.41**
2	Double Log	$\ln\hat{Y}_i$=13.85 +0.463 $\ln X_{1i}$ + 0.219 $\ln X_{4i}$ + 0.344 $\ln X_{5i}$ (2.17) * (4.22) ** (2.00) *	0.74	8.75**

Whereas:
$\hat{Y}$= Quantity produced of milk per thousand tons,
X_1 = Quantity of green fodder production per thousand tons,
X_3 = Quantity of dry feed production per thousand tons,
X_4 = the farm gate price of raw milk (LE/kg)
X_5 = the loans amount for animal production per million pounds
****, * significant at the level of 0.01, 0.05 respectively, () the value in the parentheses below the regression coefficient refer to the calculated value of (T).**
Source: Collected and calculated from Table (1) in the Annex

3. Structure of production costs for milk farms in the study sample in Qalyubia for the season 2018/2019:

Table (8) shows the fixed and variable production costs of the dairy farms of the study sample in Qalyubia for the season 2018/2019, The average production cost of the milking cattle head for both cows and buffaloes during the season in the first production capacity was estimated at 10715, 12221 pounds for the head representing 94.3%, 94.9% of total production costs Which is estimated at LE 11365,12879 for the head respectively, and the average fixed production costs for the head during the season (Including the depreciation of all buildings and constructions, machinery and equipments, transport facilities, electricity, water and drainage networks, the value of the head and the maintenance of barns) Has reached about 650,658 pounds for the single head / season, which represents about 5.7%, 5.1% for both the total production costs for both cows and buffaloes, respectively.

Feed costs are at the top rank of the livestock production costs Where about 70.4%, 72.6% of the total production costs of cattle and buffaloes respectively, and the wages of workers for the dairy head in the season about 16%,

14.7% of the total production costs for cows and buffalo respectively.Then comes the cost of veterinary care for the dairy head in the third rank with a value representing about 7.8%, 7.6% of the total production costs for cows and buffaloes respectively.

As shown in Table (8), the average total production cost of one milking head during the season in the second production capacity of the dairy farms was about 11058 LE, which is higher than in the farms with the third production capacity Which amounted to about 10918 LE, The average cost of total production per head during the season was in The second production capacity of buffalo dairy farms is LE 12448, which is higher than in farms with a third capacity amounting to about 12424 pounds, It is noted that the average total production cost of one milking head during the season in the first capacity farms is the largest compared to the farms of the second and third production capacity, This is due to the high price of head purchase and high feeding costs for the head, Especially concentrated fodders in farms, the first production capacity than in the case of second and third production capacity farms (Where head costs are reduced by increasing production capacity).

Table 8. Structure of production costs of milk cattle farms in the sample field study for the 2018/2019 season.

(Pounds / head)

Items	Cows									Buffalos								
	First production capacity (Less than 10 heads)	% V. c	% T.c	Second production capacity (10 to less than 30 heads)	% V. c	% T.c	Third Production Capacity (30 head and more)	% V. c	% T.c	First production capacity (Less than 10 head)	% V. c	% T.c	Second production capacity (10 to less than 30 heads)	% V. c	% T.c	Third Production Capacity (30 head and more)	% V. c	% T.c
Feeding	8005	74.7	70.4	7658	74.1	69.3	7353	72.6	67.3	9350	76.5	72.6	8740	74.8	70.2	8734	75.1	70.3
Employment	1820	17	16	1690	16.4	15.3	1580	15.6	14.5	1896	15.5	14.7	1795	15.4	14.4	1650	14.2	13.3
Veterinary Drugs and Medicare	890	8.3	7.8	980	9.5	8.9	1200	11.8	11	975	8	7.6	1150	9.8	9.2	1251	10.7	10.1
Total variable costs	10715	100	94.3	10328	100	93.4	10133	100	92.8	12221	100	94.9	11685	100	93.9	11635	100	93.6
Total fixed costs*	650	-	5.7	730	-	6.6	785	-	7.2	658	-	5.1	763	-	6.1	789	-	6.4
Total costs	11365	-	100	11058	-	100	10918	-	100	12879	-	100	12448	-	100	12424	-	100

*** Depreciation (buildings and constructions, machinery and equipments, transportation, electricity and water, drainage, maintenance of barns and restoration of buildings)**

Source: Collected and calculated from the study sample in Qalyubia for the season 2018/2019

4. The production functions of cattle milk in the study sample in Qalyubia Governorate

To study the productive relationship for both producers of cows and buffalos milk and to clarify the factors affecting their production, considering that the quantity produced of cows and buffalos milk (kg /season) is the dependent variable Y, While the independent factors are assumed to have an impact on the quantity produced Which is the quantity of green fodder per kg (X_1), quantity of concentrated animal feed (X_2), quantity of coarse feed per kg during the productive season (X_3), and the number of human labor man / day (X_4), Age of the animal (X_5), experience years of the breeder (X_6), The academic qualification (X_7) measured as a Dummy variable.

The model has been estimated in both linear and logarithmic forms Using Multiple Regression Analysis, in addition to the Stepwise Regression, and to indicate the most important factors affecting the production quantity of cows and buffalos milk and to obtain the best mathematical forms which its results are consistent with the economic and statistical logic.

1. The production functions of cows' Milk in the productive categories in the study sample:

- Cows' milk production functions of the first production category (less than 10 heads):

To study the relationship between the cows' milk production and its production factors in the first category of the producers in the study sample in Qalyubia governorate, using stepwise regression analysis in linear form. It was found that the most influential factor in the quantity of cows' milk production, Is the quantity of green fodder and the amount of concentrated feed, human labor and the relationship between these factors and the quantity produced from dairy cows and that 83% of the changes in the production of cows' milk due to these factors, While the log-log regression which is the best in economic and statistical terms according to the value of (R^2) and the value of (F).

Equation (2) shows that the most important factors affect the quantity produced from cows' milk is the amount of green fodder (X_1), and their effect is that by increasing the amount of green fodder by 1%, so the quantity of cows' milk increases by about 0.61%.

Also, the amount of Rough fodder (X_3) has a direct relation with cow's milk production which means by the increase in the quantity of Rough fodders by 1%. The milk of cows increases by 0.23%.

It also affected by human labor (X_4), As the increase in the human labor by about 1% leads to an increase in the amount of cows' milk by 0.13%, as well as the relationship between the age of the animal and the amount of cows' milk has been shown as the increase in the age of the animal by 1% increased the amount of cows' milk by about 0.54%

The total elasticity was estimated at 1.51, meaning that by increasing the previous productive factors combined by about 1%, the production of cows' milk would increase by 1.51%, which reflects the increasing returns to scale and the producers of cows' milk in the first category in Qalyubia governorate are producing in the first non-economic stage and that the producers of this category can increase their profits by expanding the use of these productive factors, The coefficient of determination (R2) was about 0.85 Which means that 85% of the changes in the quantity of cows' milk

production are due to the above factors, The significance of the model was estimated with calculated (F) at about 25.4 as shown in Table (9).

- Cow's milk production functions for the second productive category (10 to less than 30 heads):

To study the relationship between the production of cows' milk in the study sample In Qalyubia Governorate, using stepwise regression in the linear form, the most significant effect on the quantity of bovine milk was the amount of green fodder, the amount of concentrated fodder, and the age of the animal. The relation between these factors and the quantity produced from cows' milk was 89% and by estimating the double log regression, its economic and statistical preference has been proven according to the value of (R^2), and the value (F).

It was found in equation (4) that the most effective factors on the quantity produced from bovine milk are the quantity of green fodder (X_1) where increase 1% cause increasing the amount of milk from cows by 0.25%, the amount of concentrated fodders (X_2) which also affect the bovine milk production.

In other words, by increasing the amount of concentrated feeds 1%, the amount of milk from cows increases by 0.39%, while as for the age of the animal (X_5), The positive relationship between animal age and the quantity of cows' milk has been shown where increasing the age of the animal by about 1%, The amount of cows' milk increases by 0.42%.

Also proved the impact of the experience of the breeder (X_6), Where the increase in the number of experience years of the breeder by about 1% This leads to an increase in the quantity of cows' milk by 0.061%, Overall elasticity was estimated at 1.12 which means that by increasing the former productive factors combined by about 1% will lead to increase production of cows' milk by 1.12%, which means the increasing returns to scale and the producers of cows' milk in the second category in the Qalyubia governorate produced in the first non-economic stage, and producers in this category still have a chance to increase their production, Thus increasing their profits by expanding the use of these production factors, The coefficient of Determination (R^2) was about 0.93 means that 93% of the changes in the amount of milk production were due to the previous factors and The significance of the model was estimated as calculated (F) by about 24.2 as in Table (9).

- The production functions of cows' milk for the third productive category (30 head and above):

To study the relationship between the production of cows' milk and its production factors in the study sample the in Qalyubia governorate, using stepwise regression in the linear form, found that the most influential factors on the amount of bovine milk in the linear form are the amount of concentrated feed, rough fodder, and the experience of the breeder.

And there is the positive relationship between these factors and the quantity of milk produced from cows and 65% of the changes in the production of cow's milk in the study sample because of these factors, and by estimating the double log form, its economic and statistical preference has been proven according to the value of (R^2) and the value of (F).

Equation (6) shows in the table (9) that the most significant factors affecting the quantity produced of cows' milk in the third category are the quantity of concentrated fodder (X_2), which its effect is positive by increasing the amount of concentrated feeds by 1%, the amount of cows' milk increases by 0.66 %, In addition to the effect of the amount of rough fodders (X_3), in other words, by increasing the amount of rough fodders by 1%, the cows' milk production increases by 0.12%, and the total elasticity was estimated at 0.78 Which means that by increasing the former productive factors combined by 1% will lead to increase production of cows' milk by 0.78%, reflecting the decreasing returns to scale, and that the producers of milk in the third category in the Qalyubia governorate produce in the second economic stage Which means that the producers of this category can increase their profits through the efficient use of these production factors, The coefficient of determination (R^2) was about 0.68 which means that 68% of changes occur in the production of cows' milk because of the previous factors, the model was significant where (F) is estimated at about 22.6 as in Table (9).

2. The production functions of buffalo milk for the producers in the study sample:

- The production functions of buffalo milk for the First productive category (less than 10 heads):

To study the relationship between the production of buffalo milk in the study sample in Qalyubia governorate, using stepwise regression , It was found that the most important factors affecting the amount of buffalo milk in the linear form are the amount of green fodder, the quantity of concentrated fodder, human labor, and the breeder experience and there is a positive relationship between these factors and the quantity produced of buffalo milk, and 93% of the changes in the production of buffalo milk due to these factors.

The double log form, which is the best consistent with the economic and statistical logic according to the value of (R^2) and the value of (F), and in equation (8) was found that the most significant factors affecting the quantity of buffalo milk for small producers are the quantity of green fodder (X_1) and by increasing the amount of green fodder 1% the amount of buffalo milk increases by about 0.06%, and increasing the amount of concentrated feeds was 1% leads to an increase in the amount of buffalo milk by 0.97%. As for the animal age (X_5), there is a positive relationship between the age of the animal and the quantity of buffalo milk. It also affected by the experience of the breeder (X_6), Where the increase in the number of years of the breeder experience 1% leads to an increase in the amount of buffalo milk by about 0.03 %, The total production elasticity was estimated at 1.47, which means that by increasing the previous production factors combined by about 1%, the production of buffalo milk will increase by 1.47%. This reflects the increasing returns to scale and the producers of buffalo milk in the first category in the study sample are producing in the first non-economic stage, and they have a chance to increase their production and can increase their profits by expanding the use of these production factors. The coefficient of determination (R^2) is about 0.96, which means that 96% of the changes in the amount of buffalo milk because of previous factors and confirmed the significance of the model.

Table 9. The different forms of milk production functions produced from cows and buffaloes in the study sample

	Category	No.	Function	Equations	R^2	F
Cow	First	1	Linear	$\hat{Y}= 48.4 + 0.327\ X_1+0.272\ X_3+2.27\ X_4+78.02\ X_5$ $(2.27)^{*}\ (2.68)^{*}\ (2.00)^{*}\ (3.09)^{**}$	0.83	21.2
		2	Double Log	$\text{Ln}\ \hat{Y}= 3.04 + 0.605\ \text{ln}X_1+0.232\ \text{ln}X_3+0.134\ \text{ln}X_4+0.543\ \text{ln}X_5$ $(2.4)^{*}\ (2.56)^{*}\ (2.08)^{*}\ (3.53)^{**}$	0.85	25.4
	Second	3	Linear	$\hat{Y}= 157.4 + 0.058\ X_1+0.134\ X_2+28.5\ X_5$ $(2.07)^{*}\ (2.4)^{*}\ (1.99)^{*}$	0.89	20.9
		4	Double Log	$\text{Ln}\ \hat{Y}= 2.31 + 0.246\ \text{ln}X_1+0.391\ \text{ln}X_2+0.421\ \text{ln}X_5+0.061\ \text{ln}X_6$ $(2.88)^{**}\ (3.87)^{**}\ (3.7)^{**}\ (2.38)^{*}$	0.93	24.2
	Third	5	Linear	$\hat{Y}= 201.9 + 0.277\ X_1+0.543\ X_3+8.1\ X_6$ $(4.00)^{**}\ (3.07)^{**}\ (1.95)^{*}$	0.65	16.2
		6	Double Log	$\text{Ln}\ \hat{Y}= 2.86 + 0.661\ \text{ln}X_2+0.115\ \text{ln}X_3$ $(4.5)^{**}\ (2.51)^{*}$	0.68	22.6
Buffalo	First	7	Linear	$\hat{Y}= 1.25 + 5.23\ X_1+1.409\ X_2+7.53\ X_4+1.4\ X_6$ $(3.13)^{**}\ (3.18)^{**}\ (1.96)^{*}\ (4.33)^{**}$	0.93	52.0
		8	Double Log	$\text{Ln}\ \hat{Y}=0.192 + 0.056\ \text{ln}X_1+0.966\ \text{ln}X_2+0.423\ \text{ln}X_5+0.027\ \text{ln}X_6$ $(2.4)^{*}\ (13.8)^{**}\ (3.5)^{**}\ (2.87)^{*}$	0.96	65.4
	Second	9	Linear	$\hat{Y}= 68.7 + 0.056\ X_1+0.379\ X_2+1.58\ X_4+23.3\ X_5+ 8.75\ X_6$ $(3.9)^{**}\ (2.9)^{**}\ (2.4)^{*}\ (1.95)^{**}\ (1.97)^{*}$	0.72	12.4
		10	Double Log	$\text{Ln}\ \hat{Y}=0.943 + 0.450\ \text{ln}X_1+0.169\ \text{ln}X_2+0.396\ \text{ln}X_3+0.234\ \text{ln}X_5$ $(3.4)^{**}\ (6.9)^{**}\ (4.2)^{**}\ (3.2)^{**}$	0.80	19.4
	Third	11	Linear	$\hat{Y}= 69.44 + 0.194\ X_1+0.065\ X_2+23.2\ X_5$ $(3.81)^{**}\ (2.33)^{*}\ (1.95)^{*}$	0.62	12.3
		12	Double Log	$\text{Ln}\ \hat{Y}=1.42 + 0.57\ \text{ln}X_1+ 0.31\ \text{ln}X_2+0.12\ \text{ln}X_5$ $(3.29)^{**}\ (2.1)^{*}\ (2.2)^{*}$	0.66	23.4

Where: $\hat{Y}$: the estimated amount of cows or buffaloes' milk (kg/season), X_1: the amount of animal feed (Kg/season), X_2: Amount of concentrated feeds (Kg/season), X_3: the amount of rough fodder (Kg/season), X_4: Human labor (Man/day), X_5: the age of the animal (year), X_6: Breeder experience (year), X_7: Academic qualification (Dummy variable).

****, * significant at the level of 0.01, 0.05 respectively, ( ) the value in the parentheses below the regression coefficient refer to the calculated value of (T).**

Source: Collected and calculated from the study sample data in Qalyubia Governorate in 2018/2019.

-Production functions of buffalo milk for the second productive category (10 to less than 30 heads):

To study the relationship between buffalo milk production and the study sample in Qalyubia Governorate, Using the stepwise regression in the linear form, it was found that the most significant factors affecting the amount of buffalo milk in the linear form in the second productive category are the amount of green fodder and the quantity of rough fodder, human labor, animal age and the experience of the breeder. And 72% of changes in buffalo milk production are due to these factors. The double log form which is the best in economic and statistical terms according to the value of (R^2) and the value of (F).

It was found in equation (10) that the most influential factors on the quantity produced from the buffalo milk in the second category of the producers is the quantity of green fodder (X_1) and its effect is that the increase in the amount of green fodder 1% leads to increase the amount of buffalo milk by 0.45%, it also the quantity of concentrated fodders (X_2) has a significant effect, viz, by increasing the amount of concentrated fodders 1%, the amount of milk from buffaloes increases by 0.17% %, As for the age of the animal (X_5) It has become clear the positive relationship between the age of the animal and the quantity of buffalo milk, when the age of the animal increase by 1%, the amount of buffalo milk increase by 0.23%, The total production elasticity was estimated at 1.25 which means that by increasing the former production factors combined by about 1% will lead to increase production of Buffalo milk by about 1.25% which means the increasing returns to scale and the producers of buffalo milk in the second category in the study sample in Qalyubia Governorate produce in the first non-economic stage, and that the producers in the second category still have the opportunity to increase their production and thus increase their profits by expanding the use of these factors of production, and the coefficient of determination (R^2) about 0.80, which means that 80% of the changes in the amount of buffalo milk due to the previous factors and confirmed the significance of the model, according to calculated (F) 19.4.

- The production functions of buffalo milk for the third productive category (30 heads and above):

To study the relationship between buffalo milk production and the study sample in Qalyubia Governorate, Using the stepwise regression in the linear form, the most significant factors effect on the amount of buffalo milk in the linear form were the amount of green fodder, the quantity of concentrated fodder, and the age of the animal, and there is a positive relationship between these factors and the quantity of buffalo milk. The double log form, which is the best in economic and statistical terms according to the value of (R^2) and the value of (F), it was found in equation (12) that the most significant factors affecting the quantity of buffalo milk for producers in the third productive category are the quantity of green fodder (X_1) and its effect is that the increase in the amount of green fodder by 1%, the amount of milk from buffalo increase by 0.57%, and the quantity of concentrated fodders (X_2) and their effect is significant, ie, by increasing the amount of concentrated feeds by 1%, the amount of milk from the buffalo is

increased about 0.31%. As for the age of the animal, the positive relationship between the age of the animal (X_5) and the amount of buffalo milk has been shown. viz, by increasing the age of the animal by 1%, the amount of milk from the buffalo is increased about 0.12%, and the total production elasticity was estimated at 1.011 which means that by increasing the previous production factors combined by about 1%, the production of buffalo milk will increase by the same ratio, which reflects the increasing returns to scale and the producers of buffalo milk in the third productive category in the study sample and they are produced at the beginning of the second economic stage and that producers in this category can increase their profits by expanding the use of these production factors. The coefficient of determination (R^2) is about 0.66, which means that 66% of the changes in the quantity of buffalo milk production because of previous factors and confirmed the significance of the model.

From the above implies that the most important factors affecting the production of milk from cows and buffalo are the amount of concentrated fodder, the amount of green fodder, and the age of the animal, which requires attention to the provision of feed of various kinds and follow the programs of genetic improvement to benefit from improved strains.

5. The production and economic efficiency of milk production farms

Production efficiency is a part of economic efficiency that takes into account the relationship between input and output prices. Economic efficiency is achieved when resources are used to maximize the specific objective of the economic unit under consideration. If the economic unit is the farm, economic efficiency is defined as the maximum profit achievable of available agricultural resources through the optimal use of resources in the light of the knowledge of input and output prices.

Table (10) shows the results of the estimation of some indicators of economic production efficiency in the dairy farms in the study sample in Qalyubia in 2018/2019 and can be reviewed as follows:

1. Criteria for measuring production efficiency in milk production farms in the study sample:

A) The average milking period: This criterion is used to measure the animal's efficiency in its ability to continue producing milk. Table (10) shows that, this indicator was about 223,215 days in the study sample of cows and buffaloes milk farms respectively.

B) Average milk production per day: This indicator is used to measure the efficiency of the conversion of food to milk in the animal body, and the data in Table (10) show that, this indicator was about 7.6, 8.2 kg per day / head in the study sample in the cows and buffalo milk farms, respectively. It is noted that the third productive category of both cows and buffaloes is the most efficient according to this standard, which is about 8, 9 kg / day, respectively, and thus it is clear that buffalo is more efficient in milk production than cows according to these indicators.

Table 10. Criteria for production and economic efficiency of milk cattle farms in the study sample

Economic productivity efficiency criteria	Milking Cows			Milking Buffaloes		
	First productive category Less than 10 heads	Second productive category 10 - Less than 30 heads	Third productive category 30 head and more	First productive category Less than 10 heads	Second productive category 10 - Less than 30 heads	Third productive category 30 head and more
The average number of heads in the farm	8	24	47	8	28	53
Average milking period (day)	210	220	240	200	220	225
Average milk production (kg per day / Head)	7.3	7.5	8	8	7.50	9
Total milk quantity produced (kg / Head)	1533	1650	1920	1600	1650	2025
kg of milk Price (LE)	6.5	7	7	8.5	8.5	9
Revenue of milk quantity sold (LE per kg / Head)	9964.5	11550	13440	13600	14025	18225
Value of the calf sold (LE)	3000	4000	4000	3000	3000	3000
Value of produced manure (LE / Head)	300	300	300	300	300	300
Total Revenue (LE / Head)	13264.5	15850	17740	16900	17325	21525
Total variable Cost (LE / Head)	10715	10328	10133	12221	11685	11635
Total fixed Cost (LE / Head)	650	730	785	658	763	789
Total Costs (LE / Head)	11365	11058	10918	12879	12448	12424
Net Revenue (LE / Head)	1899.5	4792	6822	4021	4877	9101
revenue over variable costs (LE)	2549.5	5522	7607	4679	5640	9890
(Total revenues/total costs) Ratio	1.17	1	2	1	1	2
(Total revenue/variable costs) Ratio	1.24	1.5	1.8	1.4	1.5	1.9
Average cost of producing of milk (LE/kg)	7.4	6.7	5.7	8	7.5	6.1
The profitability of the pound spent on the production of milk (LE/kg)	0.2	0.4	0.6	0.3	0.4	0.7
Product profit margin %	14.3	30.2	38.5	23.8	28.2	42.3
Net revenue of milk production(LE/ Kg)	1.24	2.9	3.6	2.5	3	4.5

Revenue over variable costs = Total revenue - variable costs

The profitability of the invested pound = the profitability of the pound spent on the production of milk (LE/ kg) = net revenue / total costs

Product profit margin% = (net revenue /total revenue) x 100

Net revenue of milk production (LE/ Kg) = net revenue (LE / Head) / Total milk quantity produced (kg / Head)

Source: Collected and calculated from the study sample in Qalyubia for the season 2018/2019

2. Criteria for measuring the economic efficiency in milk production farms in the study sample:

A) Total revenue for the milking head: This indicator was about 13264.5 and 16900 pounds for cows and buffaloes in the first productive category, respectively. The third productive category of cows and buffaloes was the most efficient according to this indicator which amounted to about 17740 and 21525 pounds respectively.

B) (total revenues/total costs) Ratio of: This indicator was about 1.17, 1.3 pounds in the sample of farms for cows and buffalo milk production of the first productive category respectively, i.e., the pound spent to produce 1 kg of buffalo and cow's milk gives total revenue of about 1.17, 1.3 pounds respectively, and that the spent pound achieved a net return of about 0.17 and 0.3 pounds respectively. The third productive category of both the bovine and buffaloes milk production farms was the most efficient according to this indicator, which was about 1.6 and 1.7 pounds respectively.

C) (total revenues/variable costs) Ratio: This indicator is about 1.24, 1.4 pounds in the sample of cows and buffalo milk production farms in the first productive category respectively, i.e., the pound spent on the variable costs of producing 1 kg of buffalo and cow's milk in the season gain 1.24, 1.4 pounds and a net return of about 0.24, 0.4 pounds, respectively. The third productive category in the cow's and buffalo milk production farms was the most efficient according to this indicator, which amounted to about 1.8, 1.9 pounds, respectively.

D) The average cost of producing a kilogram of milk: Table (10) shows that this indicator amounts to 7.4, 8 pounds for the study sample of cows and buffalo milk farms of the first productive category, and The third productive category of cows and buffalo farms is the most efficient according to this indicator, which is about 5.7, 6.1 pounds, respectively.

E) Net revenue of producing a kilogram of milk: Table (10) shows that this indicator was about 1.24, 2.5 pounds for cows and buffaloes, in the first productive category respectively. The third productive category of cows and buffalo was the most efficient according to this indicator, which was about 3.6, 4.5 pounds respectively.

F) The profitability of the pound spent on the production of the kilogram of milk (invested pound revenue): Table (10) shows that this indicator was about 0.2, 0.3 pounds per kilogram of bovine and buffaloes milk, in the first productive category respectively, viz the pound spent on the production of a kilogram of bovine and buffaloes milk will yield an additional total return of about 0.2 and 0.3 pounds, respectively. The third productive category of cows and buffalo milk farms was the most efficient according to this indicator, which was about 0.6 and 0.7 pounds, respectively.

6. Financial and economic analysis of the impact of agricultural policy on the production of dairy cattle in the study sample:

1. With regard to the production costs of the milk cattle head in the study sample:

The financial analysis of the average cost of the milk cattle head production which calculated at farm gate prices in the season 2018/2019 compared to the economic assessment of the average cost items calculated at border prices during the same season.

1- For the cost of the local resource:

A) Workers' wages:

It is clear from the data in Table (11) that the financial assessment of the wages of employed workers in raw milk production in Qalyubia governorate sample exceeds the economic assessment of workers' wages used for the production of raw milk. The average value of financial workers' wages was 1738.5 pounds, while the average of economic value was about 1665.5 pounds, that is mean the value of workers' wages which used in the production of milk at local prices is higher than the value of those wages calculated at international prices.

B) For fixed costs:

Table (11) shows that the financial assessment of the depreciation item (machinery and buildings) as fixed costs used in milk production was less than the economic assessment, and the average financial value of fixed costs was about 729.2 pounds, while the average economic value of these costs is about 845.1 pounds, which means the local prices for machinery and buildings depreciation as fixed costs is lower than the world prices.

C) For costs of production factors:

Table (11) shows that the financial assessment of the average cost of milk production factors from feeds and veterinary drugs was lower than that calculated by the economic assessment used in the production of raw milk during the production season 2018/2019. The total value of production inputs was about 9380.9 pounds, while the average economic value of these inputs amounted to 11135.5 pounds. The domestic prices of these inputs are lower than their international counterparts.

That indicates the country has a small burden of support for the production of raw milk, which in turn increases the productivity of specialized farms in milk production.

Table 11. The financial and economic assessment of the average cost of production of milk cattle in the study sample during the season 2108/2019

Cost Items		Financial assessment	Economic assessment*
Domestic Resource Cost	Workers' wages	1738.5	1665.5
	Fixed costs	729.2	845.1
Total Domestic Resource Cost		2467.7	2510.6
production inputs Cost	Fodders	8306.7	9012.7
	Veterinary drugs	1074.3	2122.8
Total production inputs Cost		9380.9	11135.5
Total Costs		11848.6	13646.1

***The economic value was calculated using the following conversion coefficients: 0.958 for human labor, 1.159 for depreciation as fixed costs, 1.085 for feed, and 1.976 for veterinary drugs.[20]**

Source: Collected and calculated from table (8)

2- For revenue of milk cattle production in the study sample:

Table (12) shows that the financial assessment of the average revenue of milk production in the study sample in Qalioubia governorate during the production season 2018/2019 which calculated at farm gate prices compared to the economic assessment of the revenues calculated at

border prices. The results showed that the financial returns were less than the economic returns, Where the total revenues amounted to about 17040.8 pounds as an average of the three productive categories in the dairy cattle, while the average economic returns amounted to about 18951.9 pounds, which shows that the dairy producers in the study sample have borne the implicit tax which is the differences between the economic and the financial value of their raw milk production.

Table 12. Financial and economic assessment of the revenue of milk cattle production in the study sample of the during the season 2108/2019

Item	Financial assessment	Economic assessment*
Farm gate price per ton of milk (LE)	7750	8854.7
The average productivity of the head from the milk (ton/season)	1.73	-
Value of milk cattle production (LE / ton)	13407.5	15318.6
value of secondary output for the head (LE)	3633.3	3633.3
Total revenue of the cattle head (LE)	17040.8	18951.9

***The price of borders for export goods = Price FOB (FOB) - Freight and insurance costs x Exchange rate - (port to factory transfer costs 3.6% + Packing costs and transfer from factory to farm 3.2%).**
Where shipping costs = 12.5% of the value of exports, insurance costs = (export value + shipping costs) × 2.5% [6]
Source: Collected and calculated from table (10)

2. The impact of economic policies on the production of raw milk in the study sample:

Table (13) represents the measurement results of the nominal protection coefficient of output (NPCO), the nominal protection coefficient of traded input (NPCI), the effective protection coefficient (EPC), and the Domestic resource cost (DRC) for the production of raw milk in the study sample.

A) Nominal Protection Cofficient (NPC)

It is used to estimate the extent of deflection of local prices of raw milk about international prices. Thus, to measure the impact of government intervention in price policy to protect domestic production, either by subsidizing the product or by imposing indirect taxes on it, which measured by estimating the nominal protection coefficients of raw milk in the study sample.

Table (13) shows that the nominal protection coefficient for the production of raw milk in the study sample in Qalyubia governorate reached about 0.9 during the production season 2018/2019, which indicates that there is no fair production policy due to the value of this coefficient is lower than 1, viz, the Raw milk prices are lower than its global counterparts and thus the producers bear implicit taxes up to about 0.1 because they didn't get the real prices for their production, in other words, the dairy producers in Qalyubia governorate get about 90% of the value of their production at international prices, which amounts to about 18951.9 pounds/ton.This means that the policies pursued in producing the raw milk are not in favor of the production for the product price

B) Nominal protection coefficient of inputs (NPCI):

In order to measure the ratio between the cost of commercially traded inputs (production factors) at market prices and those inputs at economic prices, the nominal protection coefficients of commercially traded inputs (feeds and veterinary drugs) were measured and which used in the production of raw milk in the study sample in Qalyubia governorate during the production season 2018/2019.

Table (13) shows that the NPCI reached about 0.84, which shows the decrease in the subsidy size by the State which provided for inputs of production. The value of this coefficient is close to 1. Viz, the prices of the inputs of raw milk production are close to its global counterpart, and the volume of raw milk subsidy is estimated about 16% of the world price of these inputs, which is about 11135.5 pounds.

C) Effective protection coefficient (EPC):

The measurement results in the table (13) showed that the value of the EPC is less than 1, reaching about 0.98, indicating the existence of implicit taxes on the producers of raw milk, i.e. the added value of raw milk at local prices is lower than its global counterparts, which means this product was not adequately protected, indicating that the state either imposes direct or indirect taxes on milk producers or supports what is imported.

D) Domestic resource cost coefficient (DRC):

The results of the measurement in Table (13) showed that the value of the DRC (relative advantage) reached about 0.32, which indicates there is a relative advantage in the production of raw milk, where it is found that the production of raw milk locally is better than relying on its import from the outside.

Table 13. The measurement results of the agricultural policy analysis matrix for the milk production in the study sample during the season 2018/2019

Item	Value
Nominal protection coefficient of output	0.90
Nominal protection coefficient of traded input	0.84
Effective protection coefficient	0.98
Domestic resource cost	0.32

Source: Collected and calculated from table (3)

3. Results of the Agricultural Policy Analysis Matrix:

The results in a table (14) show the effects of the policies on the cost of raw milk production and the total and net return of the study sample in Qalioubia governorate. The previous indicators were used to calculate the agricultural policy matrix for the production of raw milk, and to determine the directions of the agricultural policy adopted by the State for the production and trade of raw milk, which include the extent of deflection of local prices of raw milk about their global counterparts, as well as the existence of price distortions in the markets for raw milk production factors or their comparative advantage, which are represented in achieved revenues. The results of the agricultural policy analysis matrix for raw milk explain that:

A) The total achieved financial revenues are estimated at 17040.8 pounds per ton of milk as an average of the three productive categories of milk cattle, which is less than the economic value compared with these revenues at the border prices at about 10.1%, where the economic value of these revenues was about 18951.9 pounds per ton, which indicates that the producers of raw milk were getting a lower domestic price than their counterparts at world prices.

B) The value of raw milk production inputs (feed and veterinary drugs) is estimated at 9380.9 pounds as a financial value, which is less than the economic cost of

these inputs by 15.8%, where the economic cost is 11135.5 pounds. And found that the transformation of this cost is negative in favor of the milk producers, where the State has subcide the raw milk production inputs, estimated at 1754.6 pounds for the dairy cattle head, in an attempt to encourage the producers of raw milk to increase their production.

C) The value of local non-commercial resources for raw milk was estimated at 2467.7 pounds which is less than the economic cost of about 1.71% which amounted to 2510.6 pounds for the milk cattle head during the season in the study sample. Local resource transfers were negative at 42.9 pounds. The proximity of the cost of local non-commercial resources of raw milk could be attributed to its economic value as a strategic product for food security.

D) The net revenue of raw milk was estimated at 5192.2 pounds per ton, which is about 2.14% less than its counterpart who calculated by economic value of 5305.8 pounds per ton of raw milk. Consequently, the transfers to the net return were negative, estimated at 113.6 pounds per ton of raw milk, which confirms that producers of raw milk in the study sample were getting a local price lower than its counterpart in world prices, and thus they bear the implicit tax which the difference between the net return at the world prices.

Table 14. The analysis of agricultural policy for the production of milk in the study sample during the season 2108/2019

Item	Total revenue	Cost of commercial inputs	Cost of domestic resources	Net revenue
Financial Assessment	17040.8	9380.9	2467.7	5192.2
Economic Assessment	18951.9	11135.5	2510.6	5305.8
Policy Impact	(1911.1)	(1754.6)	(42.9)	(113.6)

( )The numbers in the parentheses are negative
Source: Collected and calculated from Table (11), (12).

7. The problems which face the dairy producers in the study sample:

Table (15) shows the relative importance of the problems face the dairy producers in the study sample in Qalyubia governorate, where high prices of concentrated feeds and spread of diseases with the absence of good drugs were the first and second ranks among these problems which estimated at about 92% and 88% of the total number of respondents in the study sample respectively, While the problem of high prices of drugs and lack of experience of the veterinarian and the problem of the orientation of the production of wheat at the expense of alfalfa area and the problem of the animal type (foreign or local) and their impact on dairy production and the problem of the age of the animal and its impact on the quantity of milk produced in the third and fourth ranks and Fifth and sixth by an estimated 75% 63% 60% 59% of the total number of respondents in the study sample respectively.

The problem of slaughtering young females for high prices and the problem of the absence of milk collection centers led to the difficulty of discharging the product and the problem of not providing actual services to dairy producers from the Ministry of Agriculture. The problem of non-availability of non-traditional feed for producers such as rice straw and others in the seventh, eighth, ninth, and tenth by an estimated 55% 53% 26% 25% of the total number of respondents in the study sample respectively. The problem of the lack of trained workers, the absence of training centers in the governorate, the problem of the phenomenon of Anshus buffaloes, and the difficulty in obtaining loans for purchasing animals have an impact on the producers in the 11th, 12th and 13th ranks by an estimated 16% 15%, 10% of the total number of respondents in the study sample respectively.

Table 15. The problems face the dairy producers in the study sample in Qalyubia governorate

No.	The problems	Relative importance(%)
1	The high price of concentrated fodder	92
2	Lack of the production due to disease outbreaks and lack of good medicines	88
3	High prices of drugs and lack of experience veterinarian	75
4	The negative impact on production as a result of the penchant to produce wheat at the expense of alfalfa cultivated area	63
5	Effect of animal type (foreign or local) on dairy production	60
6	Age of the milk-producing animal affects production	59
7	Slaughtering young female for high prices	55
8	Milk collection centres unavailable make it's difficult to sell the milk	53
9	The Ministry of Agriculture doesn't provide actual services to dairy producers	26
10	unavailability of non-traditional feed for producers such as rice straw and others	25
11	Lack of skilled labor and unavailability of the training centres in the governorate	16
12	the phenomenon of Anshus buffaloes affect the producers	15
13	Difficulty to get loans to buy animals	10

Source: Collected and calculated from questionnaire data in the study sample

8. Dairy producers' suggestions in the study sample:

Table (16) shows the most important suggestions for dairy producers in the study sample in the Qalyubia governorate were that 98% of the producers suggested working to provide concentrated feeds at appropriate prices with the support given to them followed by the proposal of 85% of producers to activate the role of veterinary medicine to follow diseases before spread, 72% of the producers recommended set up milk collection centers in the villages to limit the control of wholesalers, 70% suggested producing good local breeds specializing in milk production, and 68% suggested working on the establishment of factories for the manufacture of feeds with strict control.

Table 16. Suggestions of the dairy producers in the study sample of Qalyubia Governorate

No.	Suggestions	Relative importance(%)
1	Work on providing concentrate feeds at affordable prices with subsidy	98
2	Activate the role of veterinary medicine to follow diseases before they spread	85
3	Establish the milk collection centres in the village to reduce the wholesalers' control	72
4	Producing good local breeds specializing in milk production	70
5	Work on the establishment of fodder factories with the tightening of control on it	68

Source: Collected and calculated from questionnaire data in the study sample

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Annex

Table 1. Factors affecting milk production in Egypt during the period (2000 - 2017)

Year	Quantity produced from Milk	Quantity produced from clover	Quantity produced from dry feed*	Farm gate Price of milk (LE/kg)	Value of livestock loans (million pounds)
2000	3824	58854	19135	1.55	3732
2001	3954	61729	18761	1.58	3987
2002	4210	65214	19402	1.75	4288
2003	5280	65505	19322	1.85	4542
2004	4762	65701	19403	2.16	4602
2005	5551	61465	18862	2.33	4957
2006	5787	61434	17481	2.38	5308
2007	5925	66885	16797	2.80	5990
2008	5980	61444	17406	3.04	6477
2009	5624	56818	17915	3.32	11266
2010	5774	59069	19088	3.60	10987
2011	5803	58030	18742	4.60	4755
2012	5849	54541	18913	4.67	5540
2013	5554	56130	18802	5.05	4338
2014	5600	57140	19200	5.69	3826
2015	5245	58130	19800	6.06	4069
2016	4964	59120	20100	6.72	3809
2017	5270	58625	20250	6.39	3901

***The amount of dry feed includes (wheat straw - barley straw - bean straw).**

Source: Central Agency for Public Mobilization and Statistics (CAPMAS), Livestock Statistics, Annual Bulletin of Crop and Plant Production Statistics, Statistical Yearbook, Miscellaneous Numbers.

التحليل الاقتصادي لإنتاج الألبان وأثر السياسات الزراعية المتبعة في مصر (دراسة حالة في محافظة القليوبية)

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الملخص

يهدف البحث إلى التعرف على الوضع الحالي لإنتاج الألبان في مصر عامة ومحافظة القليوبية خاصة وذلك لدراسة كل من العوامل والسياسات المؤثرة على إنتاج اللبن الخام، كمحاولة لوضع بعض التوصيات التي تساعد متخذ القرار علي زيادة الإنتاج منه، حيث تم تقدير دوال الإنتاج في الصورة الخطية واللوغاريتمية المزدوجة وكذلك استخدام الانحدار المرحلي ومصفوفة تحليل السياسات لدراسة أثر السياسات الإنتاجية المتبعة على مستوي المزرعة بعينة الدراسة.وقد توصلت الدراسة إلى النتائج التالية: تزايد أعداد الماشية باختلاف أنواعها سنويا باستثناء اعداد الجاموس لم تثبت معنوية تزايدها. تزايد كمية الألبان باختلاف أنواعها سنويا باستثناء تناقص كمية إنتاج لبن الماعز والتي لم تثبت معنويتها. تزايد أعداد الأناث الحلابة من الأبقار والجاموس سنويا في مصر. أهم العوامل تأثيرا على الكمية المنتجة من الالبان على المستوى القومي هي كمية الأعلاف وسعر اللبن المزرعي وقروض الثروة الحيوانية. أهم العوامل المؤثرة على انتاج لبن الأبقار والجاموس على مستوي المزرعة هي كمية الاعلاف المركزة وكمية الأعلاف الخضراء وعمر الحيوان. تصدرت قيمة الاعلاف بنود التكاليف لتمثل نحو أكثر من 70٪ في أغلب الفئات الإنتاجية. بلغ متوسط التكاليف الكلية للراس الحلابة ادناه في الفئة الإنتاجية الثالثة في كلا من مزارع الأبقار والجاموس. أن الفئة الإنتاجية الثالثة لكل من الأبقار والجاموس كانت الأكثر كفاءة طبقا لتقديرات معايير الكفاءة الاقتصادية والإنتاجية. ان قيمة أجور العمال المستخدمة في انتاج اللبن بالأسعار المحلية أعلي من قيمة تلك الأجور المحسوبة بالأسعار العالمية. انخفاض الأسعار المحلية لإهلاك الآلات والمباني كتكاليف ثابتة عنها بالنسبة للأسعار العالمية. تحمل الدولة لعبء قليل من دعم مستلزمات انتاج اللبن الخام (الأعلاف والأدوية البيطرية)، والذي يعمل بدوره علي زيادة إنتاجية المزارع المتخصصة في انتاج الألبان. ان منتجي الالبان بعينة الدراسة قد تحملوا ضريبة ضمنية تتمثل في الفروق بين القيمة الاقتصادية والقيمة المالية لإنتاجهم اللبن الخام والسياسات التي يتم انتهاجها لمنتجي اللبن الخام في غير صالح الإنتاج بالنسبة لسعر المنتج ومستلزمات الإنتاج. ان هذا المنتج لم يكن يتمتع بحماية كافية، وذلك مؤشر على ان الدولة اما انها تفرض على منتجي اللبن الخام ضرائب مباشرة او غير مباشرة او انها تدعم ما يتم استيراده منه. وجود ميزة نسبية في انتاج اللبن الخام، حيث يتبين ان انتاج اللبن الخام محليا يعد أفضل من الاعتماد على استيراده من الخارج. جاءت مشكلة ارتفاع اسعار الأعلاف المركزة في المرتبة الأولي تليها مشكلة انتشار الإمراض التي تؤدى الى نقص الإنتاج من بين المشاكل التي تواجه إنتاج الألبان. كذلك توصل البحث الي المقترحات التالية: العمل على توفير الأعلاف المركزة بأسعار ملائمة مع إعطاء دعم لها وتفعيل دور الطب البيطري لمتابعة الإمراض قبل انتشارها، وإنشاء مراكز تجميع للألبان بالقرى للحد من تحكم تجار الجملة وانتاج سلالات محليه جيده متخصصة في إنتاج اللبن، إنشاء مصانع لتصنيع العلائق مع تشديد الرقابة عليها. مما يستوجب الاهتمام بتوفير الاعلاف بأنواعها المختلفة واتباع برامج التحسين الوراثي للاستفادة من السلالات المحسنة وتحديد سعر عادل للمنتج، وزيادة القروض للمنتجين والاهتمام بالمشروعات الزراعية الصغيرة ودعمها حتى يصل المنتج للكفاءة الإنتاجية والاقتصادية والتوسع في انشاء المزارع الكبيرة.

الكلمات الدالة: إنتاج الألبان - تحليل مصفوفة السياسات – القليوبية – السياسات الزراعية.