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ECONOMETRICS ANALISYS OF THE RELATIONSHIP BETWEEN ANIMAL PRODUCTION VALUE AND FODDER VALUE IN EGYPT

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ABSTRACT

The objective of this research is to estimate the production function between value of green and non-green fodder. It also aims at extraction of major statistical indicators related to value of marginal production and production elasticity of independent variables of the function as well as estimation of Substitution Relationship between expenditure on green and non-green fodder. Plus, capacity analysis of farm animals' production in Egypt as well as in the New Valley governorate. This is basically done with the aim of crystallizing some major statistical indicators from the one hand and studying red meat production economic efficiency, on the other in the New Valley. Also, estimation of MRTS of fodder in the case of read meat in the New Valley was targeted as well. This procedure was done with the aim of maximizing return and minimizing cost to drag the legs of investors into this activity.

Findings say that value of marginal production of green fodder reached about 1.04 monetary unit. Concentrates / straw ratio reached about 3.25 and 8.92 monetary unit respectively. As for MRTS between green and non-green fodder it shows a relationship of substitution nature as shown in the positive marginal production value. Marginal rate of replacement between green and non-green fodder is estimated at 0.28 during the period of this study.

Findings show a significant upward trend for census cows, buffaloes, sheep and goats in Egypt reached about 105.40, 89.74, 82.54 and 4.11 thousand heads a year respectively. Cows and buffaloes were the highest with respect to comparative importance in this governorate. There is also a significant upward trend for cows as their census reached about 16.39 thousand heads a year.

Net return of fattening calves in the New Valley reached about L.E 0.96, 2.18, 1065 and 1.60 thousands. Return on each L.E invested reached about L.E 0.11, 0.25, 0.19 and 0.19 thousands respectively. This indicates high economic efficiency in second and third holding categories.

Findings of quantitative analysis of production and cost functions show that optimum weight reached about 423.481, 453 and 460 kg. Respectively. Meanwhile, profit maximizing weight for the three categories and total sample were about 404, 464, 5.3and 533 kg. Respectively.

Findings also say that MRTS (x1X3) for green and dry fodder equal about 5.000, 4.13.4.42 and 4.45 from MRTS(x1x2) of the three categories and total sample respectively. Also, MRTS (X1 X3) equal about 0.88, 3.96, 3.65 and 4.05 of MRTS between dry and concentrates for the three categories and total sample respectively.

INTRODUCTION

The agricultural sector contributes a lot in supplying population with food and clothes needs. It also supplies the industrial sector of inputs of production plus raising foreign currencies to bridge the gaps of the balance of payment. It can be simply accepted as a fact that agricultural production posses a high degree of comparative advantages in the face of world market competition. Animal production activities play a principal role in agricultural

economy. Those activities contribute around 36 % of total value of agricultural production, the annual average of which reaches about L.E 159.09 -2005-2009. This sector provides population with meat, dairy, poultry and eggs. Integration between animal and plant production is a must to attain sustainable development and generate better farm income to raise the level of living for rural families.

Problem of the research:

The food gap between demand and supply of red and white meat is one of the major challenges that face food security and economic policies drawers. This situation can be obviously seen in the poor contribution of animal production to Egypt's agriculture in general and in new lands in particular. The problem of this research is caused basically from the consequence of economic liberalization policies which support cash crops at the expense of green fodder share of land. Therefore, animal fodder supply is far below real needs.

Objective of the Research:

The research seeks to estimate function relationship between animal production value as a dependent variable and green and non-green fodders as independent variables, with the Constance of the other factors. It also seeks to find out statistical indications related to marginal production and production elasticity of the independent variables of the function, estimation of substitution relationship between expenditure on green and non-green fodders. Plus, production capacity analyzing of farm animals to see evolution of this capacity during 1990-2009, this is done with the aim of getting statistical indicators of the general trend of the number of animals, on one hand and studying production worthiness of red meat in new valley on the other, additional estimation of the marginal rate of technology substitution of fodders in this governorate, with the purpose of maximizing returns and minimizing cost to drag investor's leg to this activity.

Methodology and sources of data:

Descriptive and quantitative statistical methods were applied to fulfill the research objectives. In this context, the general time trend in its linear, quadratic and logarithmic images were calculated to select the best images to investigate evolution of animals' census(1990-2009), also functional relationship between animal production value and value of green and non-green fodders in their mathematical images, to get which of them are in consistence with the economic rational. Besides, usage of Cube - Douglas parameter to estimate production function for breeders plus estimation of cost functions, data collection was mainly obtained from secondary published and non-published data from Ministry of Agriculture, CAPMAS as well as questionnaires designed for this research. Data collected covered West El Mawhoub, New valley governorate; size of the sample reached about 106 holders divided into three main categories, (less than 5 heads, 5-10 heads and over 10 heads).

RESULTS

Firstly: Evolution of the comparative importance of animal production value in relation to total agricultural production value:

An animal production is one of the most important economic sectors in Egyptian agriculture and recognizes the importance of the livestock sector for the agriculture sector has been studying the evolution of production value in this sector and its importance for the whole agricultural sector during (1990-2009),Table (1) indicates that animal production value increased from L.E. 8.65 billions in 1990 to L: E. 69.12 billions in 2009, (699.08%), also general time trend took a significant statistical upward trend reached about L.E. 3.03 billions a year. Time factor explains about 89 % of total variables in animal production value in Egypt. This table also shows that animal production contribution to total agricultural production reached 29.08 % in 1997 increased to 37.21% in 2005 with an average 32.67 % over the period of this research.

Table1: Statical parameters of the evolution of total livestock value and agricultural production value in Egypt million pounds (1990-2009)

Items	α	β		R^2	F	Average	Rate of Change (%)
		Value	T				
Total livestock value	2964.39	3026.11	**12.06	0.89	**145.46	28809.75	10.50
Agricultural production value	790.72	7989.84	**12.43	0.90	**154.60	84684.00	9.43

Sourse: collected and calculated from annex table (1) .

Secondly: Index estimates of the relationship between value of Animal production and value of green and non-green fodders:

Growing of fodders is an integral part of procedures taken to secure fodders needed for developing animal production, (milk and its derivatives, meat, leather, wool and eggs).

Dry straw table (2) appendices say that value of concentrates increased from about L.E 3.28 billions in 1995 to about L.E 9.07 billions in 2009 with an increase rate of 176.55% compared with 1995, General time trend in table (2) shows a significant upward trend. L.E. 0.43 billion a year with change rate 8.79 % of average value of concentrates in Egypt. Time trend explains about 84 % of total changes in concentrates value in Egypt.

Table2: Statistical parameters of the development of the fodders value in Egypt during (1995-2009)

Items	α	β		R^2	F	Average	Rate of Change (%)
		Value	T				
Green fodders value	2625.38	733.61	**10.99	0.90	**120.81	8494.27	8.64
Straw value	346.78	188.86	**8.26	0.84	**68.27	1857.67	10.17
concentrate fodders	1437.19	426.42	**8.14	0.84	**66.20	4848.53	8.79
Fodders and straw value	4409.35	1348.89	**11.97	0.92	**143.17	15200.47	8.87

Source: Collected and calculated from annex (table2).

As shown in table (3), functional relationship in its linear image and Kobe & Douglas image which were estimated statistically within transforming to logarithmic image as shown in table (3) from equation one, it is seen that value of marginal production of green fodders reached about 1.04 monetary units. Each monetary unit spent on green fodder results 1.04 rise in animal marginal production value. The equation also says that value of marginal production of concentrates reached 3.25 monetary units. Findings also say that production worthiness is obviously shown in any rising of expenditure on green or dry fodders.

Equation (2) shows that production elasticity of green fodders, concentrates and straw reached about 0.445, 0.38 and 0.419 respectively. This reflects the diminishing returns in relation to capacity.

Table (3): Estimated of measures relation between animal production value and fodder value (1990-2009)

No.	Equations	$\overline{R}^2$	F
1	$= 6302.899 + \underset{(4.04)^{**}}{1.037}\ X_1 + \underset{(2.47)^{*}}{8.918}\ X_2 + \underset{(4.15)^{**}}{3.245}\ X_3\ \underset{(3.84)^{**}}{\hat{Y}i_1}$	0.98	380.81^{**}
2	$= 0.011 + \underset{(0.03)^{**}}{0.445}\ln X_1 + \underset{(4.85)^{**}}{0.419}\ln X_2 + \underset{(4.05)^{**}}{0.383}\ln X_3\ \underset{(4.04)^{**}}{\hat{Y}i_2}$ Ln	0.98	306.14^{**}

Estimated value of livestock= $\hat{Y}$
Green fodder value= X_1
Straw value= X_2
Concentrated fodders value= X_3
Source: Collected and calculated from annex (table2)

Thirdly: Substitution Relationship between Expenditure on Green and Non-Green Fodders:

The following equation clarifies the relationship between value of animal production (Y), value of green fodder (X_1) and non green fodders ($X_{2.3}$). This equation was calculated in its linear image to measure the substitution relationship expenditure on both green and non-green fodders:

$$\widehat{Y} = \underset{(4.78)^{**}}{7614.889} + \underset{(2.91)^{**}}{1.303}X_1 + \underset{(8.99)^{**}}{4.675}\ X_{2.3}$$

$\overline{R}^2 = 0.98$ F= 452.50^{**}

The previous equation indicates that the relationship between green fodders and is of substitution nature. The rate of marginal replacement of green and non-green fodder estimated by 0.28. It is necessary, from the economic point of view, to increase expenditure on green fodder production so as to be equal with value of marginal production of non-green fodder.

Efficiency of feed conversion differs from an animal to another. Thus, it was calculated as a ratio of monetary unit of animal production and monetary unit of fodder and straw.

Table (2) appendices show feed conversion efficiency in animal production sector over 1995 -2009. Findings say that total conversion efficiency reached its lowest level in 1996 (1.77) and its peak in 2006, (2.70).

This means that each L.E. in fodder value produces about L.E. 2.29 of value of animal production.

Fourthly: Economic Analysis of Animal production capacity:

Review and analysis of data stated in tables 3 and 4 show evolution of animal census in Egypt as shown below:

1. Fluctuation of cow census ranging between 2751 and 5023 thousand heads for 1993 and 2008 respectively. There is an upward trend which reached 105.40 thousand heads per year. Value of limitation coefficient indicates that 70% of changes in heads of cows is attributed to factors reflected by the time factor.
2. Fluctuation of buffaloes heads census which ranged from 2419 and 4079 thousand heads for 1990 and 2009 respectively. The increase of maximum and average period reached about 68.62 % and 38.41% respectively for the base year 1960 = 100. There was an upward significant trend reached about 89.74 thousand heads with a change rate of 2.68 % of average census of buffalo's heads. Limitation coefficient indicates that about 98% of changes in buffalo's heads are attributed to factors reflected by the time variable.
3. Fluctuation of sheep census ranging between 3924 thousand heads in 92/93 to 5498 thousand heads in 2008. The increase in maximum and period average reached about 27.09% and 7.92% respectively regarding 1990 as a base year. There was an upward trend which reached a significant rate estimated by about 82.53 thousand heads of sheep a year. Limitation coefficient indicates that about 85% of changes in sheep heads are attributed to factors reflected by the time factor.
4. Fluctuation of goat census ranging between about 3027 thousand heads in 92 and 6020 thousand heads in 1993 respectively. The increase in the maximum reached about 7.93 %. But the average period decreased by about 19.35 % respectively regarding 1990 as the base year. There was a significant upward trend that reached about 4.11 thousand heads a year at a change rate about 0.11% of average census of goats. The limitation coefficient indicates that about 36% of changes in heads are attributed to factors reflected by the time factor.
5. Fluctuation of camel heads census ranging from 122 thousand heads in 1993 to 220 thousands heads in 2009 which represent about 64.89% and 117.02% respectively. There was a downward trend which reached a significant rate of 2.96 thousand heads a year and change rate – 1.93% of camel heads. The limitation coefficient indicates that about 36% of changes in heads are attributed to factors reflected by the time factor.

Table (4): Statistical parameters for development of animal numbers in Egypt (1990-2009)

Items	α	β		R^2	F	Average	Rate of Change (%)
		Value	T				
Cows	2668.97	105.40	**7.56	0.76	**57.22	3775.70	2.79
Buffaloes	2406.01	89.74	**27.99	0.98	**783.69	3348.25	2.68
Sheep's	3790.11	82.53	**10.29	0.85	**105.79	4656.70	2.20
Goats	4863.88	4.11	**142.09	0.54	**3.46	3750.85	0.11
Camels	184.41	-2.96	-**3.18	0.36	**10.13	153.30	-1.93

Source: Collected and calculated from annex (table3).

Cows and buffaloes were, in terms of the comparative importance, the most important farm animals in the New Valley governorate during 2000-2009.

Table (4) says that cow heads increased from 1.50 thousand heads in 2000 to about 193.53 thousands in 2009. Time trend equation, as shown in table (5), shows a significant upward trend reached about 16.39 thousand heads a year, the time factor explains about 82% of changes in cow census in the governorate.

As shown in table (4) and appendices, buffalo's heads ranged between 13 in 2000 to 1033 heads in 2004. There was a significant downward tread reached about 133 heads a year with a change rate-17.82 %. The time factor explains about 90 % of changes in buffalo's census in the governorate.

Table (5): Statistical parameters of evolution of the most important farm animal numbers in New ValleyGovernerate (2000-2009)

Items	α	β		R^2	F	Average	Rate of Change (%)
		Value	T				
Cows	4095.20	16388.98	**6.09	0.82	**37.10	94234.60	17.39
Buffaloes	771.07	1066.78	**6.25	0.90	**17.74	748.10	17.82-
		189.70-	**5.39-				
		9.77	**4.63				

The equipc equation is the best model for time trend equation of buffalo's development in New Valley during (2000-2009).
Source: Collected and calculated from annex (table4).

Fifthly: Economic and Production Efficiency of Fattening cow calves in the New Valley governorate:

1-The relative importance of average costs and revenues per unit of animal:

Comparative advantage of average cost and earning of animal production unit:

Table (6) shows average cost items and returns of animal in the sample's categories. At the beginning of fattening cost of animal unit reached L.E. 3.98. 3.96 And 3.91 thousands representing about 47.11 %, 47.15 % and 47.25 % of total variable costs which reached about L.E 8.44, 8.39 and 8.72 thousands respectively. Cost of feed stuff came next percentage as estimated by about L.E 3.25, 3.20 and 3.15 respectively and %38.52,%38.13and %38.10 respectively, cost of labor came third

percentage was estimated about 0 .92,0.94,0.96 thousands respectively% 11. 32, %11.17and %11.13 0f total variable costs respectively for three catogiers.

Cost of barn, medical insurance of the animal production, veterinarian services, fuel and water reached% 4inthe three catogiers. Fixed costs as (building and equipment depreciation) reached about 3 % of the total cost, table (6) shows that cost of purchase of an animal unit at the beginning of fattening process reached about L.E 3.95 thousands. Cost of feed, labor and other costs reached about 3.20%, 0.94 and 0.82 % of variable cost respectively for the three categories. Cost of barn, insurance reached L.E. 3.20. 0.94 And 0.82 thousands respectively.

Table (6): The relative importance of average costs and revenues per unit of animal during fattening in New Valley Governorate farmers (2010)

Cost items	First category less than(5heads)		Second category(5-10) heads		Third category(morethan10 heads)		Total	
	value	%	value	%	Value	%	value	%
Cost of animal unit	3978	47.11	3956	47.15	3907	47.23	3947	47.16
Cost of feed stuff	3253	38.52	3199	38.13	3152	38.10	3201	38.25
Labor costs	956	11.32	937	11.17	921	11.13	938	11.21
Other costs	257	3.04	298	3.55	292	3.53	282	3.37
Total variable costs	8444	100.00	8390	100.00	8272	100.00	8369	100.00
Total fixed costs	271	-	256	-	231	-	253	-
Total costs	8715	-	8646	-	8503	-	8621	-
Total revenue	9672	-	10824	-	10152	-	10216	-
Net revenue	957	-	2178	-	1649	-	1595	-
Theanimal"s weight at sale	403	-	451	-	423	-	426	-
Total revenue, Total costs	1.11	-	1.25	-	1.19	-	1.19	-
Return of invested pound	0.11	-	0.25	-	0.19	-	0.19	-

Source: Collected and calculated from questioners.

Fixed cost reached about 3% indicating the modesty of barn condition. Data of table (6) show that total return of animal unit at sale in the end of fattening cycle in the three categories reached about L.E. 9.67 , 10.82, 10.15 and 10.22 thousands respectively. Net returns reached about L.E. 0.95, 2.18, 10.65 and 1.60 thousands respectively. Return / total cost ratio reached about L.E. 1.11, 1.25, 1.19 and 10.19 respectively. Return per each L.E. invested reached about L.E 0.11, 0.25, 0.19 and 0.19 respectively, economy of scale theory appears obviously in this context, as larger farms were more efficient, economically than smaller ones. This could be attributed to the lower cost of bigger farms.

2. Estimates of fattening calves production functions:

This research was studied regression relation between total of animal weights at the end of fattening period k.g ($\hat{Y}$) as dependent variable and indepented variable as: green fodder quantity (ton) (X_1), concentrated fodder quantity (ton) (X_2), dry fodder quantity (ton) (X_3)labor)X_4 And animals weights at the beginning of fattening period(X_5).

Stepwise multiple regressions was applied and revealed that double logarithmic image was better in terms of results which were matching with economic rationale.

a. Production function of fattening calves in category one:

Equation (1) in table (7) shows the significant directly proportional relationship between total meat production and green fodder, (concentrates and dry). Rise of fodder by 1% leads to rise in meat product ion by about 0.016%, 0.761% and 0.141% respectively. Concentrates are of the highest influence on meat production in category (1). Production elasticity of resources, included in production function has reached about 0.912. In other words, rise of resources by 1% leads to rise of meat production by about 0.912%. Limitation coefficient indicates that 88.10% of changes in production are attributed to changes explained in the model. (F) Value confirms the significance of this influence at 0.01 level of significance.

b. Production function of fattening calves in category (2):

Equation (2) in table (7) shows the significant directly proportional relationship between total meat production and amount of green fodder, (concentrates and dry). Rise of fodder by 1% leads to rise of meat production by about 0.153 %, 0.615% and 0.201% respectively. Concentrates are of the highest influence on meat production in category (2). Production elasticity of resources included in category (2) reached about 0.969. In other words, rise of resources by 1% leads to rise of meat production by about 0.969%. Limitation coefficient indicates that 79.76 % of change in production is attributed to changes in the explanatory factors in the model. (F) Value assures the significance of such influence at a significance level estimated by (0.01).

c. Production function of fattening calves in category (3):

Equation (3) in table (6) shows the significant directly proportional relationship between total meat production and amount of green fodder, (concentrates and dry). Rise of fodder by 1% leads to rise of meat production by about 0.102%, 0.732 % and 0.140% respectively. Concentrates are of the highest influence on meat production in category (3). Production elasticity of resources included in the production function reached about 0.974. In other words, rise of total resources in the estimated function by 1% leads to rise of meat production by about 0.974%. Limitation coefficient shows that 92.44%. Limitation coefficient shows that 92.44% of changes in production are that 92.44 % of changes in production are attributed to changes explained in the model. (F) Value assures the significance of such influence at the rate of 0.01.

d. Production function of fattening calves in the total sample:

Equation (4) in table (7) shows the directly proportional relationship, at a significant rate, between total meat production and amount of fodder, concentrates and dry stuff. 1% rise in the amount of fodder leads to a rise in meat production by about 0.109%, 0.712 % and 0.161 % respectively, thus, concentrates are of the highest impact on meat production in the sample. In other wards, a rise of 1% in resources included in the estimated function leads to a rise in meat production by about 0.982%. Limitation coefficient indicates that 94.98 % of changes in production is attributed to factors

explained in the model. (F) Value shows the significance of such impact at a significance rate of 0.01

Table7: Estimates of meat production functions at study sample categories (2010)

No.	Category	Production Functions Estimates	Elasticity	$\overline{R}^2$	F
1	1st	$\hat{Yi}_1$ Ln=4.015+0.016LnX$_1$+0.761LnX$_2$+0.141LnX$_3$ (9.45)** (5.11)** (2.99)** (3.87)**	0.918	0.8810	97.28**
2	2nd	$\hat{Yi}_2$ Ln=3.142+0.153LnX$_1$+0.615LnX$_2$+0.201LnX$_3$ (13.23)** (6.78)** (4.89)** (3.55)**	0.969	0.7926	44.31**
3	3rd	$\hat{Yi}_3$ Ln=2.095+0.102LnX$_1$+0.732LnX$_2$+0.140LnX$_3$ (6.06)** (3.90)** (5.14)** (3.02)**	0.974	0.9244	123.35**
4	Total	$\hat{Yi}_4$ Ln=5.305+0.109LnX$_1$+0.712LnX$_2$+0.161LnX$_3$ (22.34)** (6.25)** (8.57)** (4.43)**	0.982	0.9498	663.42**

Source: collected and calculated from questioners.

1. Marginal rate of fodder substitution technology:

Available supply of fodder differs in terms of nutritional value. Concentrates, for instance, are high digestibility around 90 %. Meanwhile, dry stuff has higher rate of fibers and fewer digestibilities. Green fodders are rich in digestible elements and regarded as soft meal.

Table (8) shows that marginal production of category (1) reached about 2.18, 82.54 and 14.36 Kg. live weight of green fodder, concentrates and dry stuff respectively.

Table (8) shows that marginal production of fodder in category (2) reached about 17.22, 75.95 and 18.09 kg. Live weight for green, concentrates and dry stuff respectively. This simply means that marginal production of concentrates is bigger than that of other concentrates in producing red meat. It was shown that MRTS (X1X3) reached about 0.35, meaning that cutting green fodder by one unit requires increasing dry stuff by about 0.95 units. Declining of green fodder when leaving winter towards summer season requires substitution of dry green fodder by dry stuff. Meanwhile, MRTS (X1X2) reached about 0.23, which means that cutting green fodder by one unit requires increasing concentrates by about 0.23 units. This proves the existence of a substitution relationship between green fodder and concentrates. In conclusion there is a necessity to substitute concentrates for dry stuff to keep meals balanced and secure properly nutritional metabolism, table (8) shows that marginal production of fodder in category 3 reached about 14.98, 78.11 and 17.76 .Kg. live weight for green fodder, concentrates and dry stuff. This means that marginal production of concentrates is bigger than that of other fodders, meaning that concentrates are preferred in red meat production. MRTS (X1X2) reached about 0.84, meaning that cutting green fodder by one unit required raising dry stuff by about 0.84 units. In the meantime, MRTS (X1X2) reached about 0.19, meaning that cutting green fodder by one unit requires raising concentrates by about 0.19 units. This indicates that shortage in green fodder leads to

decreasing nutritional value of meals, which requires to be substituted by concentrates. Also, MRTS (X3X2) reached about 0.23, meaning that cutting dry stuff by one unit requires raising concentrates by about 0.23 units, table (8) shows that marginal production of total fodder reached about 15.43, 77.87 and 17.39 Kg. Live weight for green fodder, concentrates and dry stuff respectively. This simply means that marginal production of concentrates is bigger than that of the other fodders, assuring that concentrates are preferable in red meat production. MRTS (X1X3) reached about0.89, meaning that cutting green fodder by one unit requires raising dry by 0.89 units. Whereas, MRTS (X1 X2) reached about 0.020, meaning that cutting green fodder by one unit requires raising concentrates 0.70. Likewise, MRTS (X3X2) reached about 0.22, meaning that cutting dry stuff by one unit requires raising concentrates by 0.22 units.

Table (8): Marginal product and marginal rate of technological replacement of fodder categories (2010)

Statement	Units	1st	2nd	3rd	Total
Marginal Product $_{(X1)}$	Kg	2.18	17.22	14.98	15.43
Marginal Product $_{(X2)}$	Kg	82.54	75.99	78.11	77.87
Marginal Product $_{(X3)}$	Kg	14.36	18.09	17.76	17.39
MRTS$_{(X1/X3)}$	Unit	0.15	0.95	0.84	0.89
MRTS$_{(X1/X2)}$	Unit	0.03	0.23	0.19	0.20
MRTS$_{(X3/X2)}$	Unit	0.17	0.24	0.23	0.22
MRTS$_{(X1/X3)}$ / MRTS$_{(X1/X2)}$	Unit	5.00	4.13	4.42	4.45
MRTS$_{(X1/X3)}$ / MRTS$_{(X3/X2)}$	Unit	0.88	3.96	3.65	4.05

Source: collected and calculated (table7)

4. Estimates of cost functions of meat production in categories of the sample:

Cost functions were estimated in various images. The best image statistically and economically was the quadratic image.

a. Cost function of meat production in the first category:

Equation (1) in table (9) refers to cost function of meat production of cow calves. Optimum weight and profit maximizing weight were estimated at about 423 and 464 Kg. respectively. Optimum weight was realized by about 29% of category one breeders. None of the breeders could achieve the profit maximizing weight. Total return of animal unit decreased by 4.96% and 15.14% compared with total return for both optimum weight and profit maximizing weight respectively.

b. Cost function of meat production in category (2) :

Equation (2) in table (9) refers to cost function of cow calves in category (2). Optimum weight and profit maximizing weight were estimated by about 481 and 546 kg, Respectively 59 % of breeders in category (2) could achieve optimum weight. None of breeders could achieve the profit maximizing weight. Total return of animal unit decreased by 6.71% and 21.06 % compared with total return of optimum weight and profit maximizing weight respectively.

c. Cost function of meat production in category (3):

Equation (3) in table (9) refers to cost function of cow calves in category (3). Optimum weight and profit maximizing weight were estimated by about 453 and 513 kg. Respectively. 52% of breeders in category (3) could achieve optimum weight. None of the breeders could achieve optimum weight. Total return of animal unit decreased by 7.22 % and 21.38 % compared with both optimum and profit maximizing weight respectively.

Table9: Estimates of cost functions of meat production at study sample categories (2010)

No.	Category	Cost Functions Estimates	$\overline{R}^2$	F
1	1st	$T.C_{i1} = \underset{(15.22)^{**}}{1345.291} + \underset{(8.15)^{**}}{17.043}\ X + \underset{(4.10)^{**}}{0.0075}\ X^2$	0.9283	253.55^{**}
2	2nd	$T.C_{i2} = \underset{(15.22)^{**}}{810.541} + \underset{(8.15)^{**}}{20.178}\ X + \underset{(4.10)^{**}}{0.0035}\ X^2$	0.9484	313.25^{**}
3	3rd	$T.C_{i3} = \underset{(15.22)^{**}}{1645.619} + \underset{(8.15)^{**}}{15.785}\ X + \underset{(4.10)^{**}}{0.008}\ X^2$	0.9066	146.53^{**}
4	Total	$T.C_{i4} = \underset{(15.22)^{**}}{1924.342} + \underset{(8.15)^{**}}{14.298}\ X + \underset{(4.10)^{**}}{0.0091}\ X^2$	0.9307	705.82^{**}

Source: Collected and calculated from questioners.

d. Cost function of meat production for total sample:

Equation (4) in table (9) refers to total cost function of cow calves for the total sample. Optimum and profit maximizing weight reached about 460 and 533 kg. Respectively. 34 % of breeders could achieve optimum weight. None of the breeders could achieve profit maximizing weight. Total return of animal unit decreased by 7.95% and 25.14 % compared with optimum and profit maximizing weight respectively.

Recommendations

The research reached a package of recommendations to improve the performance of this activity as shown below:

1. Pay more attention to livestock wealth projects and inject more investments into this activity.
2. Put much emphasis on scientific research and contrive better strains that match Egypt's environment as well as provide vet services at low cost.
3. Supply all types of fodder at reasonable cost plus supply concentrates of high quality.
4. Give much support to young graduates to own and run livestock projects in old and new lands.
5. Establish and develop extension service to give technical assistance to producers to make their effort successful.

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Annex

Table1: The relative importance of the evolution of the animal production value for the evolution of agricultural production in Egypt(1990-2010)

(million pounds)

%	Total agricultural production value	Total animal production value	Years
29.61	29211	8650	1990
29.34	31507	9245	1991
29.14	34220	9972	1992
31.15	37055	11541	1993
35.42	41720	14777	1994
33.04	48122	15898	1995
27.70	56165	15555	1996
29.08	61269	17814	1997
29.65	63640	18871	1998
30.02	68888	20683	1999
30.87	71664	22126	2000
32.11	74739	24002	2001
35.08	84260	29556	2002
35.73	96853	34606	2003
36.92	98928	36524	2004
37.21	126971	47246	2005
36.16	137419	49689	2006
35.44	155945	55260	2007
35.04	185666	65060	2008
36.49	189438	69120	2009
32.76	84684.00	28809.75	Average

Source: Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economics, Agricultural Income Bulletins, various issues

Table2: Development of the animal production value and green and non green fodders in Egypt (1995-2009)

(Million pounds)

Years	Green fodder value	Straw value	Concentrated fodders value	Total of fodders and straw value		Animal production value	Total Conversion efficiency of fodders (pounds)
				Value	%animal production value		
1995	3818	937	3279	8034	50.53	15898	1.98
1996	4224	1010	3554	8788	56.50	15555	1.77
1997	4692	1207	2953	8852	49.69	17814	2.01
1998	5905	1198	2351	9454	50.10	18871	2.00
1999	6634	1306	2722	10662	51.55	20683	1.94
2000	6912	1289	3090	11291	51.03	22126	1.96
2001	7730	1063	3763	12556	52.31	24002	1.91
2002	8589	1262	4575	14426	48.81	29556	2.05
2003	9490	1762	4894	16146	46.66	34606	2.14
2004	9592	1848	4618	16058	43.97	36524	2.27
2005	9138	2401	6376	17915	37.92	47246	2.64
2006	9626	2672	6073	18371	36.97	49689	2.70
2007	10657	2691	7546	20894	37.81	55260	2.64
2008	14709	3451	7866	26026	40.00	65060	2.50
2009	15698	3768	9068	28534	41.28	69120	2.42
Average	8494.27	1857.67	4848.53	15200.47	46.34	34800.67	2.29

Source: collected and calculated from the data: Central Agency for Public Mobilization and Statistics, estimates of income from the agricultural sector, various issues.

Table3: Development of the most important farmer animal numbers in Egypt (1990-2009)

(Thothand heads)

Years	Cows	Index number	Buffalos	Index number	Goats	Index number	Sheep's	Index number	Camels	Efficiency index
1990	3336	100.00	2419	100.00	4315	100.00	4651	100.00	188	100.00
1991	3537	106.03	2527	104.46	4398	101.92	4692	100.88	197	104.79
1992	3612	108.27	2547	105.29	3924	90.94	5020	107.93	208	110.64
1993	2751	82.46	2823	116.70	3924	90.94	3027	65.08	220	117.02
1994	2869	86.00	2920	120.71	4072	94.37	3079	66.20	176	93.62
1995	2996	89.81	3018	124.76	4220	97.80	3131	67.32	131	69.68
1996	3041	91.16	3057	126.37	4240	98.26	3159	67.92	133	70.74
1997	3117	93.44	3096	127.99	4260	98.73	3187	68.52	136	72.34
1998	3217	96.43	3149	130.18	4350	100.81	3261	70.11	142	75.53
1999	3418	102.46	3330	137.66	4391	101.76	3308	71.12	134	71.28
2000	3530	105.82	3379	139.69	4469	103.57	3425	73.64	142	75.53
2001	3801	113.94	3533	146.05	4671	108.25	3491	75.06	134	71.28
2002	4012	120.26	3717	153.66	5105	118.31	3582	77.02	127	67.55
2003	4227	126.71	3777	156.14	4939	114.46	3811	81.94	136	72.34
2004	4369	130.97	3845	158.95	5043	116.87	3879	83.40	129	68.62
2005	4485	134.44	3885	160.60	5232	121.25	3803	81.77	142	75.53
2006	4515	135.34	3897	161.10	5289	122.57	3880	83.42	145	77.13
2007	4680	140.29	3915	161.84	5311	123.08	3920	84.28	159	84.57
2008	5023	150.57	4052	167.51	5498	127.42	4237	91.10	165	87.77
2009	4978	149.22	4079	168.62	5483	127.07	4474	96.19	122	64.89
Average	3775.70	113.18	3348.25	138.41	4656.70	107.92	3750.85	80.65	153.30	81.54

Source: Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economics, Agricultural Income Bulletins, various issues

Table4: Development of the evolution of the most important farmer animal numbers inNewValley (2000-2009)

(Number heads)

ears	Cows			Buffaloes		
	Numbers	Index number	%Egypt	Numbers	Index number	%Egypt
2000	1502	100.00	0.04	13	100.00	0.0004
2001	12931	860.92	0.34	895	6884.62	0.0253
2002	86410	5753.00	2.15	927	7130.77	0.0249
2003	93391	6217.78	2.21	1034	7953.85	0.0274
2004	96915	6452.40	2.22	1053	8100.00	0.0274
2005	109744	7306.52	2.45	812	6246.15	0.0209
2006	112460	7487.35	2.49	826	6353.85	0.0212
2007	109889	7316.18	2.35	626	4815.38	0.0160
2008	125575	8360.52	2.50	642	4938.46	0.0158
2009	193529	12884.75	3.89	653	5023.08	0.0160
Average	94234.60	6273.94	2.06	748.10	5754.62	0.0195

Source: Ministry of Agriculture and Land Reclamation, the Central Administration of Agricultural Economics, Agricultural Income Bulletins, various issues

التحليل القياسى للعلاقه بين قيمة الأعلاف و قيمة الأنتاج الحيوانى فى مصر

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إستهدف البحث تقدير العلاقة الدالية بين قيمة الإنتاج الحيواني كمتغير تابع وقيمة الأعلاف الخضراء وغير الخضراء كمتغيرات مستقلة مع إفتراض ثبات العوامل الأخري التي قد تؤثر علي قيمة الإنتاج، وإستخلاص أهم المؤشرات الإحصائية المتعلقة بقيمة الإنتاج الحدي والمرونة الإنتاجية للمتغيرات المستقلة للدالة وكذلك تقدير العلاقة الإستبدالية بين الإنفاق علي الأعلاف الخضراء وغير الخضراء، بالإضافة لتحليل السعة الإنتاجية للحيوانات المزرعية لإلقاء الضوء علي تطور هذه السعة خلال الفترة (1990-2009) بهدف إستخلاص بعض المؤشرات الإحصائية الهامة لمعادلات الإتجاه الزمني العام المحسوبة لأعداد الحيوانات من ناحية، ومن ناحية أخري دراسة الكفاءة الإنتاجية والإقتصادية لإنتاج اللحوم الحمراء بمحافظة الوادي الجديد من خلال قياس بعض العلاقات الإقتصادية والفنية للتعرف علي أهم العوامل التي تؤثر علي تحقيق الكفاءة الإقتصادية في إنتاج اللحوم الحمراء وتقدير المعدل الحدي للإستبدال التكنولوجي للأعلاف بتلك المحافظة، بهدف تعظيم العائد وتدنيه التكاليف لتشجيع المنتجين والمستثمرين علي الإستثمار في هذا المجال لتضييق الفجوة الغذائية من اللحوم الحمراء بمحافظة الوادي الجديد.

وتشير نتائج التقديرات القياسية للعلاقة الدالية بين قيمة الإنتاج الحيواني وقيمة الأعلاف الخضراء وغير الخضراء إلي أن قيمة الناتج الحدي للأعلاف الخضراء قد بلغت نحو 1.04 وحدة نقدية، بينما بلغت بالنسبة الأعلاف المركزة وللأتبان حوالي 3.25، 8.92 وحدة نقدية علي الترتيب، كما تبين أن المرونة الإنتاجية لكل من الأعلاف الخضراء والمركزة والأتبان تبلغ حوالي 0.445، 0.383، 0.419 علي الترتيب، الأمر الذي يعكس علاقة الإيراد المتناقص إلي السعة في الإنفاق علي كل منهم علي وحدة، وبالنسبة لقياس العلاقة الإستبدالية بين الأعلاف الخضراء والأعلاف غير الخضراء تبين أنها تتسم بالعلاقة الإستبدالية ويتضح ذلك من قيمة الإنتاجية الحدية الموجبة لكل منهما، كما تبين أن معدل الإحلال الحدي بين الأعلاف الخضراء والأعلاف غير الخضراء تقدر بنحو 0.28 ويعني ذلك أنه لكي تتحقق الكفاءة الإقتصادية في إستخدام كل من الأعلاف الخضراء وغير الخضراء فيجب مساواة نسبة الإحلال الحدي بالنسبة السعرية لهما. لذا فإنه من الضروري في حالة الأخذ بتقدير الدالة بالأسعار الثابتة أن تبلغ نسبة السعر الحقيقي لوحدة الوزن للأعلاف غير الخضراء إلي السعر الحقيقي لوحدة الوزن للأعلاف الخضراء حوالي 1.28، كذلك يلاحظ أنه من الضروري من الناحية الإقتصادية زيادة الإنفاق علي الأعلاف الخضراء حتى تتساوي قيمة إنتاجها الحدي مع قيمة الإنتاج الحدي للأعلاف غير الخضراء.

وفيما يتعلق بتطور السعات الإنتاجية الحيوانية، فأشارات النتائج إلي وجود إتجاهاً عاماً متزايداً ومعنوي إحصائياً لكل من عدد الأبقار، الجاموس، الأغنام والماعز بالجمهورية خلال الفترة (1990-2009)،

بلغ حوالي 105.40، 89.74، 82.53، 4.11 ألف رأس سنوياً علي الترتيب، بينما تبين وجود إتجاهاً عاماً متناقصاً ومعنوي إحصائياً لعدد الإبل بالجمهورية خلال نفس الفترة بلغ نحو 2.96 ألف رأس. وفيما يتعلق بتطور الأهمية النسبية لأهم الحيوانات المزرعية المنتجة للحوم بمحافظة الوادي الجديد خلال الفترة (2000-2009)، تبين أن الأبقار والجاموس أهم الحيوانات المزرعية بتلك المحافظة، و أشارات النتائج إلي وجود إتجاهاً عاماً متزايداً ومعنوي إحصائياً لعدد الأبقار بلغ حوالي 16.39 ألف رأس سنوياً. في حين تبين وجود إتجاهاً عاماً متناقصاً ومعنوي إحصائياً لعدد الجاموس بتلك المحافظة بلغ نحو 133 رأس سنوياً لنفس الفترة.

وبدراسة الكفاءة الإنتاجية والإقتصادية لعجول التسمين بمحافظة الوادي الجديد، تبين من دراسة بنود متوسط تكاليف وإيرادات الوحدة الحيوانية وفقاً لفئات الحيازة الثلاث وإجمالي العينة خلال دورة التسمين أن متوسط تكلفة الوحدة الحيوانية بلغ حوالي 8.72، 8.65، 8.50، 8.62 ألف جنية علي الترتيب، بينما بلغ متوسط إجمالي الإيراد نحو 9.67، 10.82، 10.15، 10.22 ألف جنية علي الترتيب، في حين بلغ صافي الإيراد علي التوالي حوالي 0.96، 2.18، 1.65، 1.60 ألف جنية بمتوسط أوزان بيع 403، 451، 423، 426 كجم وزن حي، كما بلغ العائد علي الجنية المستثمر نحو 0.11، 0.25، 0.19، 0.19 جنية علي الترتيب، ما يشير إلي إرتفاع الكفاءة الإنتاجية والإقتصادية بفئة الحيازة الثانية والثالثة.

كذلك أوضحت نتائج التحليل الكمي لدوال الإنتاج والتكاليف أن أهم العوامل المؤثرة علي الإنتاج كانت الأعلاف المركزة والأعلاف الخضراء والأعلاف الجافة، كما تم تحديد الوزنين الأمثل والمعظم للربح لإجمالي الأوزان في نهاية فترة التسمين بفئات الدراسة الثلاث وإجمالي العينة حيث بلغ الوزن الأمثل حوالي 423، 481، 453، 460 كجم علي الترتيب، بينما بلغ الوزن المعظم للربح نحو 464، 564، 513، 533 كجم علي الترتيب.

والمركزة $MRTS_{(X3/X2)}$ كما أظهرت نتائج البحث أن معدل الإحلال الحدي التكنولوجي ما بين الأعلاف الخضراء والجافة $MRTS_{(X1/X3)}$ يعادل حوالي 5.00، 4.13، 4.42، 4.45 من معدل الإحلال الحدي التكنولوجي ما بين الأعلاف الخضراء والمركزة $MRTS_{(X1/X2)}$ لكل من الفئات الثلاث وإجمالي عينة الدراسة علي الترتيب، بينما تبين أن معدل الإحلال الحدي التكنولوجي ما بين الأعلاف الخضراء والجافة $MRTS_{(X1/X3)}$ يعادل حوالي 0.88، 3.96، 3.65، 4.05 من معدل الإحلال الحدي التكنولوجي ما بين الأعلاف الجافة والمركزة .$MRTS_{(X3/X2)}$ لكل من الفئات الثلاث وإجمالي عينة الدراسة علي الترتيب.

قام بتحكيم البحث

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