Coleg Prifysgol
Gogledd Cymru
University College
of North Wales

Bangor, Gwynedd LL57 2UW
Wales, United Kingdom
Tel. (0248) 351151 x359
Telex 61100

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ECONOMICS OF PRODUCTIVE TRAITS OF SOME EGG-LAYER STRAINS UNDER EGYPTIAN CONDITIONS

Ibrahim Soliman*and I., Fayz M. Marai**,

***Associate Professor of Agricultural Economics**

**** Professor of Animal Production,**

Faculty of Agriculture, Zagazig University, Egypt

SUMMARY

The study showed that selection for the high egg yield per hen housed is not always economically successful. Selection for the minimum cost (optimum level of egg yield) is economically, recommended. Less mortality rate leads to higher profit per L.E (Egyptian Pound) of costs, which reflects mainly a higher rate of culled layer-hens as a secondary output of the layer farms? Even though, mortality variation is due to the changes in the farm management and environmental conditions. Therefore, a selection policy in this direction is not economically feasible.

Hibro-strain showed the lowest productive performance of a high instability level and high cost per egg. The Egyptian improved strain (Dokki-4), although it had a lower egg yield and a higher feed consumption per egg than the NHL strain, both showed the same cost level per egg. This reflects the effect of diminishing return concept on the costs of production.

INTRODUCTION

Improvements in productive traits tend to improve the economic efficiency (Smith, 1971; Pym et al., 1979 and Mauldin, 1981). Hurnick et al (1984) showed that the correlations of mortality (r = - .85), feed consumption per bird marketed (r =- .50) and feed conversion (r = - .81) with profit per broiler were highly significant but that of weight gain per bird marketed (r = 0.32) was not. The same authors found that none of other variables was significantly correlated with profit. However, they did not show the multi-correlations among the concerned performance trails.

The present study is an attempt to determine the major performance traits that affect the egg costs of production on the Egyptian farms, Identification of these traits and their responses to the costs provide indicators for a better policy towards minimization of the costs of the egg production which is now higher than the international costs. The study included three common layer strains in Egypt: Dokki-4 (a hybrid Egyptian strain), NHL, and

Hibro, as foreign strains.

MATERIALS AND METHODS

The productive performance traits concerned were: the mortality rate (MORT), number of eggs produced per hen housed per month (EGPHH) and feed consumption per egg (FEDEG). Costs were calculated per egg (CSTEG). Observations were the monthly averages of full year records. The records of a separate farm for each strain were used. Four successive years records were included. Total observations were 12 (3 strains x 4 records). The farm scale ranged from 6,000 to 10,000 layer-hens. The farms belong to the Sharkey's Governorate (the east part of the Nile Delta). Prices, feeds and other technological aspects were similar in all the farms.

The correlation matrix was estimated for the concerned variables to identify the magnitude and the direction of the association among all variables. The best fitted regression model was estimated for the causal relationship between the cost per egg and the identified performance traits from the correlation matrix. The ANOVA (one way classification) and the studentized range test were used, successively, to test the significant difference between pairs of means among the strains for the performance traits.

RESULTS AND DISCUSSION

Correlations between costs per egg and each of number of the eggs per hen housed per month (r = - .62) and the feed consumption rate per egg (r = +.57), were statistically significant (Table 1). The multi colinearity among the two performance traits was highly significant with a negative value (r = -.95). Therefore, only one variable (egg yield per hen housed.) was included in the cost per egg estimated response function. The other performance trait (feed consumption per egg) was derived separately from another estimated relationship with the egg yield. This model goes with the economical concepts, as well as, the biological behavior.

The best fitted model for the relationship between the cost per egg (CSTEG) as a dependant variable and the number of eggs per hen housed per month (EGPHH) as an independent variable was selected according to the magnitude of the coefficient of variation (R^2) and the statistical significance of the regression coefficient. It was a curvilinear-quadratic form with a minimal limit point (equation 1). The values between brackets under the estimated regression coefficients are the corresponding standard error estimates.

$$CSTEG = 26.1164 - 3.4133\ (EGPHH) + .1268\ (EGPHH)^{2.} \ldots\ldots\ldots\ldots \text{Equation 1}$$

$$(.8020) \qquad (.0547) \qquad R^2 = 0.8106$$

Equation 2 was derived from Equation 1 to represent the marginal cost relation. From this derived function the minimum cost per egg occurs at 13.459 eggs per hen housed per month.

$$[\Delta(CSTEG)/ \Delta(EGPHH)] = -3.4133 + .2536\ EGPHH \ldots\ldots\ldots\ldots \text{Equation 2}$$

The feed consumption per egg is predicted, at the minimum cost per egg, from the estimated relationship (Equation 3). This predicted value was around 266 grams of feed per egg.

$$FEDEC = 530.8118 - 19.6630\ EGPHH \ldots\ldots\ldots\ldots \text{Equation 3}$$

$$(4.241) \qquad R^{2\,=} - .881$$

Table 2 shows that the NHL- strain has the highest egg yield and the lowest feed consumption rate with the highest stability performance (lowest C.V. value). Even though, substitution of its average egg yield (Table 2) into Equation 1 resulted in a cost level per egg similar to that level predicted for the (Dokki-4) strain, although it has a significant lower egg yield as tested in Table 3. Thereof, the breeding policy to select for the highest egg yield is not always economically successful. Instead of that, the selection criteria for the minimum cost, i.e. the optimum egg yield is recommended from the economical point of view.

Hibro-strain was of the worst performance (Table 2), since it showed the highest cost per egg. The differences among these two performance traits of the three strains were significant at (Table 3). The studentized range test confirmed this result.

On the other hand, the relationship between the mortality rate and the cost per egg was not significant (r = 0.38), as shown in Table I. This is probably due to the direct effect of the mortality on the number of the culled layer-hens as a secondary output, rather than its indirect effect on the costs of production. The estimated significant negative correlation of the mortality rate (r = -.539), with the net return per 1- Egyptian pound of costs per month confirmed this hypothesis. The apparent differences among the mortality rates of the three strains (Table 2) were not statistically significant at .05. This indicates that a breeding policy to select for less mortality and consequently a higher profit (Hurnick et al., 1984) has not a direct effect on the egg production. In the present study, the mortality variation was mainly due to the changes in the management and environmental conditions (Table 3).

Table 1. Correlation Matrix

Variable	**MORT**	**EGPHH**	**FEDEG**	**CSTEG**
MORT	1	-0.194^{ns}	$+0.005^{ns}$	$+0.382^{ns}$
EGPHH		1	-0.951^{**}	-0.616^{**}
FEDEG			1	$+0.571^{*}$
CSTEG				1

ns = not statistically significant
* = statistically significant at P<0.05
** = statistically significant at P<0.01

Table 2 Estimated Means of the Productive Performance Traits

Strain	**Mortality rate % per 12 months**		**Eggs Produced per hen Housed/Month**		**Feed Consumption Per egg Per month(g)**	
	û	**C.V.(%)**	**X**	**C.V.(%)**	**X**	**C.V.(%)**
Dokki-4	11.3	18.9	11.3	10.4	317.7	9.5
Hibro	33.3	36.5	8.65	35.2	368.0	12.2
NHL	28.3	152.4	15.86	9.6	202.7	3.9

û = estimated mean, (CV) % = Coefficient of variability as percentage

Table 3 Results of ANOVA and Productive Performance Traits between the Strains

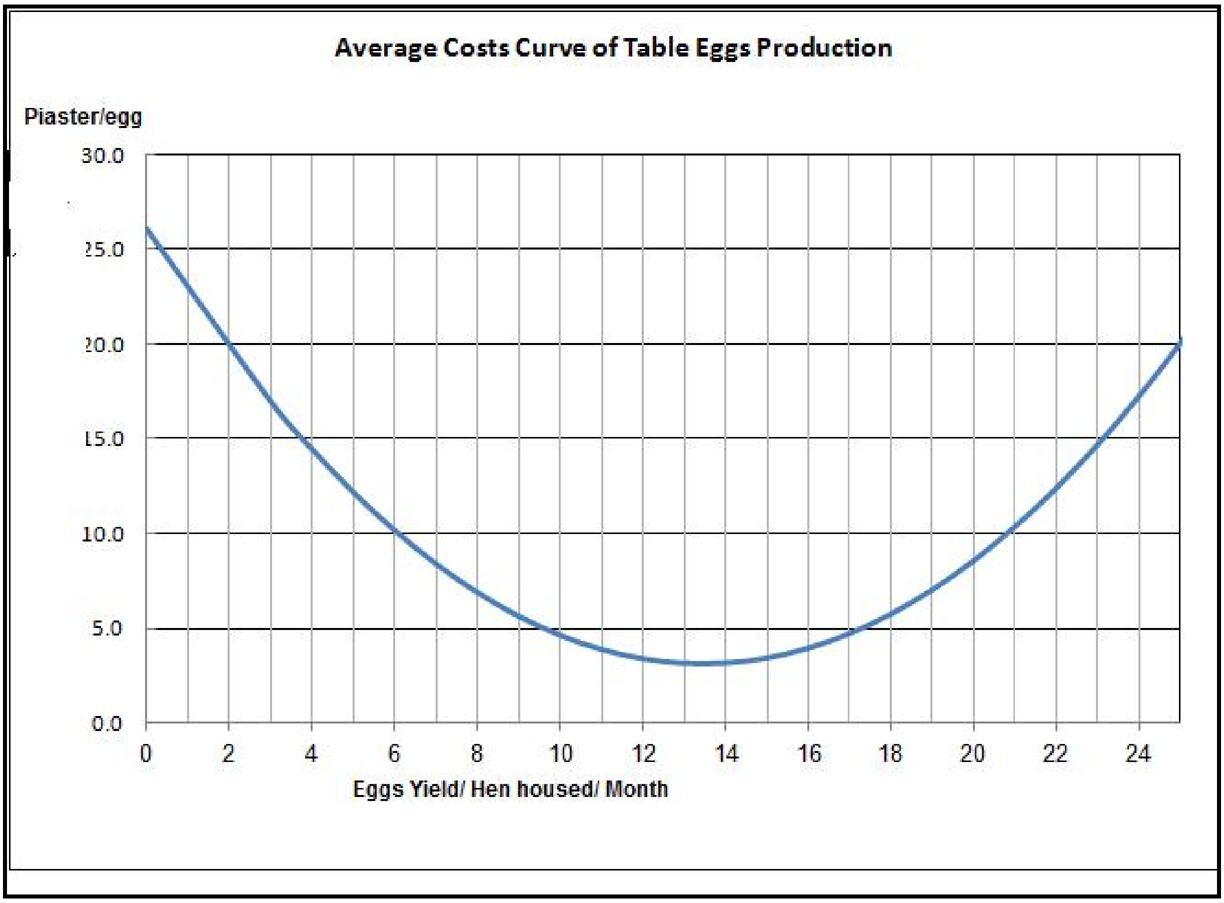
Estimated value	**MORT**	**EGPHH**	**FEDEG**
Calculated F-ratio	3.22^{ns}	9.18*	21.29**
$(MSE)^{1/2}$	12.85	2.4	36.46
Grand Mean	24.3%	11.9 eggs	296.29 (K. Cal)
C.V.%	52.9	20.2	12.3

$(MSE)^{1/2}$ = square root of the mean squares error (within)

C.V.% = (MSE/Grand mean)%; which reflects the variability percentage due to the farm management conditions over time.

ns = not statistically Significant, * = Significant at P<0.05, ** = significant at P. 0.01

Figure (1)



One Egyptian Pound = 100 Piaster

Source: Drawn from Equation (2)

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