

## Optimal Input Usage in Layer Hen Enterprises in Afyonkarahisar Province <sup>[1]</sup>

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### Summary

The present study was conducted to determine the precautions which can be taken to increase the degree of efficiency and productivity of input usage in layer hen enterprises in Afyonkarahisar Province. The material for the study was obtained from the data gathered through questionnaires in 82 enterprises in the year 2005. Cobb-Douglas production function was used in the productivity analysis and a multiple regression model was developed for this purpose. According to the estimation results of the model, a yield increase relative to scale was determined in the enterprises (1.046). For each of the input factors, the marginal value productivity was calculated as 1.16 TL for egg-type pullet 0.92 TL for feed, -1.41 TL for labor cost, -5.58 TL in veterinary-health and 2.96 TL for other expenditures. In conclusion, in this research study which was implemented in Afyonkarahisar Province, it was determined that, although there was an important difference in productivity among the enterprises, the production of feed and egg-type pullet breeding in the same enterprise increased the productivity. Moreover, it is concluded that, with a strong and healthy finance, in case of getting adequate support both in the period of production and input procurement, the enterprises would behave more efficiently in resource utilization.

**Keywords:** *Layer hen production, Marginal Value Productivity (MVP), Average Value Productivity (AVP), Cobb-Douglas*

## Afyonkarahisar İli Yumurta Tavukçuluğu İşletmelerinde Optimum Girdi Kullanımı

### Özet

Bu araştırma, Afyonkarahisar İli yumurta tavukçuluğu işletmelerinde, üretim sürecinde kullanılan girdi unsurlarının kullanımındaki etkinlik derecesini ve verimliliği artırmak için alınabilecek önlemleri tespit etmek amacıyla yapılmıştır. Araştırmanın materyali, 82 adet işletmenin anket yoluyla sağlanan 2005 yılına ait verilerinden elde edilmiştir. Verimlilik analizlerinde Cobb-Douglas üretim fonksiyonu kullanılmış, bu amaçla çoklu regresyon modeli oluşturulmuştur. Model tahmin sonuçlarına göre, işletmelerde ölçeğe göre artan getiri (1.046) saptanmıştır. Girdi unsurlarının her biri için marjinal değer üretkenliği; yarkada 1.16 TL, yemde 0.92 TL, işçilikte -1.41 TL, veteriner-sağlıkta -5.58 TL ve diğer giderlerde 2.96 TL olarak hesaplanmıştır. Sonuç olarak Afyonkarahisar İli'nde yürütülen bu çalışmada, kullanılan yarkanın ve yemin işletmede üretilmesinin verimliliği artırdığı belirlenmiştir. Ayrıca işletmelerin sağlam ve sağlıklı bir finansman ile gerek girdi temini gerekse üretim döneminde yeterli desteği alması halinde kaynak kullanımında daha etkin davranabilecekleri sonucu elde edilmiştir.

**Anahtar sözcükler:** *Yumurta tavukçuluğu, Marjinal Değer Üretkenliği (MDP), Ortalama Değer Üretkenliği (ODP), Cobb-Douglas*



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## INTRODUCTION

Marginal value of input factor used in the production process is great than marginal cost the input using this input greater in production process is behalf of the firms. This is contributing to increase production and also contribute to maximizing of benefit. However, increasing profit is not possible to continue endless. Because, marginal value productivity (MVP) of additional input decreases and arrive to equilibrium point in that point marginal cost is equilibrium to the marginal value. Except of this equilibrium point, using more or less inputs is caused to far away from the maximum profitability<sup>1,2</sup>. If a MVP value of any input factors is less than of that input's marginal cost to obtain maximum profitability, it is necessary to decreases using this input in production process. So, MVP of decreased input is begin to increase and arrives to point of marginal cost marginal revenue point and losses of enterprises is decreases and arrived to equilibrium point that marginal cost is equilibrium to marginal revenue<sup>3</sup>.

In this study, it was aimed to determine optimal usage level of input factors in an important egg production and also aimed to determine to necessary cautions to increase productivity level in layer hen enterprises in Afyonkarahisar Province.

## MATERIAL and METHODS

In this study, totally 82 layer hen enterprises data belonging to 2005 production season was used as a research material. The enterprises, from which the data was gathered through questionnaires, were determined by using random sampling method<sup>3</sup>. Cobb-Douglas production function was applied to the data gathered and the regression analysis were performed in order to analyze how effectively the input

factors were used, and to evaluate the input-output relationship in egg production<sup>4</sup>. The logarithmic function which will be used in this analysis is as follows:

$$\text{Log } Y = b_0 + b_1 \text{ Log } X_1 + b_2 \text{ Log } X_2 + b_3 \text{ Log } X_3 + b_4 \text{ Log } X_4 + \dots + b_n \text{ Log } X_n$$

Where  $b_0$  is the constant coefficient,  $b_1$ ,  $b_2$ ,  $b_3$  and  $b_4$  are regression coefficients. Each of the  $b_i$  ( $i = 1, 2, 3, 4$ ) coefficients define the effects of the independent variable it comes before, on the change of  $Y$ <sup>5</sup>. In the model developed, the dependent variable ( $Y$ ) shows the income obtained from egg sales by enterprises for one period.

## RESULTS

In order to evaluate the relationship between the input factors and the output obtained and to determine the efficiency of resource utilization and to investigate the relationship between the marginal cost and the marginal revenue in the enterprises which were included within the scope of the study, analysis were performed by using the Cobb-Douglas production function. The results of the regression analysis performed are presented in *Table 1*.

## DISCUSSION

The return to scale was found as 1.046 in the enterprises. Thus, it can be said that there is a yield which increases relative to the scale. In certain studies conducted on this topic<sup>6,7</sup>, the calculated productivity of the scale was determined as 0.96 and 0.82.

Provided that the other input factors remain constant, it was determined that when there is a marginal increase of 1 Turkish Lira (TL) in egg-type

**Table 1.** Results of regresion analysis and Cobb-Douglas Production Function  
**Tablo 1.** Regresyon analizi ve Cobb-Douglas Üretim Fonksiyonu sonuçları

Variables	Coefficient ( $x \pm sx$ )	Correction coefficients	Geometric means		AVP ( $Y/X_i$ )	MVP (TL)	T
			Log.	Anti log. (TL)			
Income (Y)			6.008374	1.019.469			
Hen (X <sub>1</sub> )	0.181±0.047	0.173	5.157501	143.714	6.69	1.16	** 3.817
Feed (X <sub>2</sub> )	0.651±0.080	0.622	5.829936	675.984	1.47	0.92	** 8.091
Labor (X <sub>3</sub> )	-0.038±0.033	-0.036	4.394857	24.823	39.27	-1.41	-1.163
Vets and meds (X <sub>4</sub> )	-0.049±0.024	-0.047	4.057228	11.408	118.70	-5.58	* -2.018
Others (X <sub>5</sub> )	0.301±0.082	0.288	4.981622	95.857	10.29	2.96	*** 3.685
Total	1.046	1.000					
N:82	R <sup>2</sup> : 99.2	F: 2084.935	** Sig. F: 0.000	* P<0.05	**P<0.001		

pullet, there will be an increase of 1.16 TL in the output. According to this, it is possible to say that the production of egg-type pullet in the enterprise positively affects the productivity. During the research period, it was seen that the production generally started with chick and the enterprises bred the egg-type pullet themselves. In that period, it was observed that only six enterprises started their production by buying the egg-type pullet from outside.

That the MVP value which occurs in parallel with the 1 TL marginal increase of the feed input is 0.92 TL shows that the enterprises have been at least a little successful in reaching the optimum level. In the research area, 81% of the enterprises have been preparing the feed themselves and the feed conversion rates (FCR), egg yield and the number of eggs produced per chicken were found to have better values in these enterprises when compared to the ones which bought the feed. This situation shows that enterprises which produce the feed themselves prepare a ration which is of better quality than the ones bought from outside. Moreover, the cost of one egg was calculated to be at a lower level in enterprises which produced the feed themselves. That the low quality of the feed, together with decreasing the FCR caused an increase in the egg production cost; that egg production will become a profitable business in enterprises by increasing the efficiency of feed use have been mentioned in certain studies <sup>2,8</sup>.

Yet, it should not be forgotten that the instability between the egg prices and the feed prices is also an important factor in that the MVP value of feed is found lower than the optimum level. Dependence on foreign countries for feed raw materials, that the costs are indexed to foreign currency and the instability of egg prices in the market negatively affect the productivity of the enterprises.

According to the calculated MVP value of the labor cost, the marginal increase of 1 TL causes a negative productivity in the enterprises. In this stance, it may be deduced that the enterprises could not adequately benefit from the labor force they employed. Moreover, that only 20% of the enterprises employ technical staff plays a significant role in productivity. Considering the existence of the statistical relationship between the educational background and the standard of knowledge of the labor force and the profitability of the enterprise, together with the efficiency of using labor force; it is possible to assert that the need for qualified labor force will increase with the increase of specialization <sup>1</sup>.

Need for labor can be decreased through the mechanization and automation provided in parallel with the development of poultry production. By this way, feed losses can be decreased in enterprises which have especially adopted automation in feed distribution <sup>9</sup>. Because it is a known fact that the efficiency of the labor force used in layer hen production is an important factor in especially decreasing the unit costs of production <sup>10</sup>.

One of the indicators of labor productivity is the number of animals per worker. In our study, while outsider labor was employed in 77% of the enterprises, family labor was employed in the remaining 23% of the enterprises. The number of animals per worker was determined as 10621. This rate was found to be higher than the findings obtained in certain studies <sup>11</sup>, and lower than the findings obtained in others <sup>6</sup>.

That negative values were obtained for the MVP values of veterinary services, vaccination and medicine expenditures shows that an effective effort was not made to fight against diseases. That the desired result related to this input factor can not be obtained causes that every Turkish Lira which is spent for health services brings about a decrease in the total yield. The mortality rates observed in enterprises also confirm this finding (11.92%). Determined mortality rates were figured out as higher than some research findings <sup>12-14</sup> and very close to some other findings <sup>11,15</sup>.

It is known that high mortality rate decreases FCR, increases the production cost and as a result of this, decreases the profitability and productivity in enterprises <sup>16</sup>.

It would not be a rational behavior to reduce the expenses involving this item considering the MVP values which belong to the arising negative veterinary-health input factor. As a matter of fact, the health of animals and control studies regarding this issue is an important detail in layer hen production.

One of the variables with a high marginal value productivity which is calculated within the scope of research study is the inputs collected under the name of other costs. The enterprises provide an important increase in the output in return for the use of other costs amounting 1 TL. This situation shows that the enterprises would reach a more effective level of resource use in case the enterprises are supported by a healthy and strong financial politics both in the procurement of animal items and during the production period.

In the studies conducted by Sariözkan and Sakarya<sup>6</sup> and Kurtaslan<sup>17</sup>, the MVP values were calculated as; -0.40 and 0.63 TL for egg-type pullet, 1.65 and 1.46 TL for feed, -2.73 and -0.18 TL for labor and 7.59 and -1.18 TL for veterinary-health respectively. The MVP values calculated under broiler production were reported as follows; 1.86 TL for chick, 0.38 TL for feed, 2.19 TL for labor, 1.29 TL for veterinary-health, 3.52 TL for heating, lightening and water expenditures and 2.42 TL for depreciation-repair-maintenance expenditures<sup>2</sup>.

One of the important factors which decrease the effectiveness in enterprises involved in the livestock sector in Turkey is enterprise scales. It is not possible to provide the rationalization and the efficiency of the resource utilization in small-sized enterprises<sup>18</sup>. However, the capacity of hen layer production in developed countries is at very high levels between 20000 and 1000000<sup>8,19</sup>.

In conclusion, in this research study which was implemented in Afyonkarahisar Province, it was determined that, although there was an important difference in productivity among the enterprises, the production of feed and egg-type pullet breeding in the same enterprise increased the productivity. Moreover, it is concluded that, with a strong and healthy finance, in case of getting adequate support both in the period of production and input procurement, the enterprises would behave more efficiently in resource utilization. On the other hand, the enterprises neither obtained the adequate productivity from the labor nor did they reach the aimed success in veterinary-health services.

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