

Factors Affecting Honey Production in Apiculture in Turkey

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Abstract: In determining the relation between the factors affecting honey production in Turkey, Multiple Regression Method has been used. As a result of the analysis made, the following factors, among those that affect honey production, have been found to be statistically important: honey consumption per person, number of beehives, the money that the producers get and honey exportation values. Although Turkey has very favourable conditions for apiculture, it cannot yet fully employ this source. It is clear that in order to reach the desired production and exportation figures in apiculture, there are some problems that need to be solved. One of the most important problems in apiculture is refining. The solution to this problem is through the breeders acquiring the habit of using queen bees and the spread of institutions that will breed these required queen bees. Therefore, the organisations that aim at providing regular publications and training services for beekeepers must be supported. Professional organisations in apiculture must be organised in the form of associations, chambers, and production and sales cooperatives. Apiculture must also be taken into account in activities towards erosion control, pasture treatment, forest care, etc., and care must be taken to utilise plants that are important for agriculture, during these activities. Activities for regulating and inspecting apiculture activities must be emphasized.

Keywords: Apiculture, Honey Production, Multiple Regression Method, Turkey

INTRODUCTION

Humans have kept bees for the production and harvest of honey since 4000 BC. In past societies, honey was of great importance, particularly for its medicinal purposes. It was believed to be a powerful aphrodisiac and a valuable antibacterial wound dressing^[10].

Beekeeping does not stand apart from other branches of agriculture, and its products do not have guaranteed market outlets at high prices. Practical beekeepers, research scientists and extension workers continue to concentrate their collective effort mainly on increased productivity with little regard to marketing. In agriculture, generally, the same objectives have been pursued blindly and the consequent "harvest" of over-production in developed countries is now being reaped. In barely four decades food shortages have been replaced with large surpluses^[18].

With bees, many of the economically valuable traits such as honey propolis and pollen can only be measured at the colony level, being greatly influenced by the environment of the hive, both internal and external. This makes it difficult, in many cases, to establish the measurement and the accuracy of the parameter under study^[19].

Apiculture is currently one of the most widespread agricultural activities carried out throughout the world. There are approximately 56 million bee hives in the world, which produce around 1.2 billion tons of honey. About ¼ of the honey produced is being traded and 90% of the exportation is made from around 20 countries that produce honey. China is the country with the highest number of beehives with 65 million units, and honey production is 306.000 tons^[9].

Average honey production per hive is 20 kg throughout the world, and this figure is 33 in China, 40 in Argentina, 27 in Mexico, 64 in Canada, 55 in Australia, 40 in Hungary, and 16 kg in Turkey. These countries are also the highest honey exporting countries in the world. The countries that are the best honey importers are Germany, the USA, Japan, England, Italy, Switzerland, France, Austria and other European countries. Germany alone imports more honey than the entire honey production in Turkey.

In addition to honey, bee products such as propolis, royal jelly, pollens and wax are also significant in the world trade. On the other hand, in countries with developed agriculture, in addition to production of bee products, and even rather mainly, vegetative production is exercised in order to increase

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quantity and quality. For example in the USA, the producers engaged in vegetative production pay a bee- rent of 41 million \$ to beekeepers in order to ensure pollenisation in the plants they produce, and moreover, they earn 3.2 billion \$ thanks to the contribution of the bees in their production.

On the other hand, bee products such as bee, propolis, bee poison, royal jelly etc. are used in several countries for apitherapy. Furthermore, apiculture is one of the rare agricultural activities carried out without impacting the nature and the environment.

Apiculture in Turkey is a socio economic activity carried out for a very long time, as a tradition. With around 4 million hives and 63 thousand tons of honey production, Turkey ranks third and fourth respectively in the world, which demonstrates that it is among the significant countries of the world as far as both hive numbers and honey production are concerned. Nevertheless, Turkey ranking the 10th in the world honey trade with a share of 1.87% is not in line with the number of hives and honey production quantities.

MATERIALS AND METHODS

The data used in the study were obtained from^[3,5] ^[6,7] the sources.

Cobb-Douglas type function has been used in identifying the relation between honey production in Turkey and the factors that affect it.

The Cobb-Douglas type function used in the research can generally be expressed as

$$Y = X_1^{\beta_1} X_2^{\beta_2} X_3^{\beta_3} \dots X_k^{\beta_k}$$

When the Cobb-Douglas function is expressed in the logarithmic form, it becomes

$$\text{Log } Y = \text{Log } a + b_1 \text{Log } X_1 + b_2 \text{Log } X_2 + b_3 \text{Log } X_3 + \dots b_k \text{Log } X_k$$

In the equation, the determination coefficient (R²), production elasticity of independent variables (b_i), standard errors (S_{bi}) and their levels of significance (t_{bi}), geometrical means (X_i G and YG), the standard deviation of the equation (Se) and the significance level (F test) are values that can be found directly via multiple regression analysis ^[11].

In the regression model created, the existence of autocorrelation among the variables has been checked. Durbin-Watson and Von-Neuman coefficients have been used in order to check the existence of an auto-correlation^[1].

A decision has been made about the existence of an auto-correlation by comparing the calculated coefficients with the table critical values. It has been

seen that when the Von-Neuman V value is between the V and V' limit values in the critical values table, there are no auto-correlation problems in the function.

The MV_{X_i} formula has been used in calculating the marginal yield of the variables^[4].

$$MV_{X_i} = b_{X_i} * \frac{YG}{X_i G}$$

In the formula, MV_{X_i} expresses the marginal yield of X_i in the geometrical mean, YG is the geometrical mean of Y (Yield), and X_i G is the geometrical mean of X_i.

RESULTS AND DISCUSSIONS

Honey production quantity has been taken as the dependent variable in identifying the factors that affect honey production in Turkey. The variables that are included in the function as independent variables and the characteristics of the variables in the function are as follows:

- Y = Honey Production Quantity (Kg)
- X₁ = Honey Consumption Per Person (Kg)
- X₂ = Number of Hives (Units)
- X₃ = Money Paid to Producers (\$/Kg)
- X₄ = Honey Exportation Value (\$)
- X₅ = Wax Production (Kg)
- X₆ = Trend (1,2,3,4,5,.....24), n=24

$$Y = 3.670 X_1^{0.823} X_2^{0.554} X_3^{0.0180} X_4^{0.0201} X_5^{0.0470} X_6^{0.0158}$$

The parameters and the statistical results for honey production in Turkey and the factors that affect it have been given in Table 1.

The functional determination coefficient is (R²)=99.7. According to the F statistical test, (F_n= 878.66 > F_t = 2.51) it has been found different from zero at 1% level of significance. Accordingly all the independent variables in the function explain 99.7% of the changes in the Y independent variable. The standard deviation of the equation has been found as 0.0093. In the equation, the existence of an auto-correlation has been sought between the variables. The DW statistics calculated for the equation is 1.63. Accordingly, the Von Neumann value is V_{Hs} = 1.73 and the critical values are V=1.36 and V'=3.11. Accordingly, when V<V_{Hs}<V', there is no auto-correlation at 1% level.

Among the factors that affect honey production; honey consumption per person, number of hives, fees paid to producers and honey exportation values are of statistical significance, although wax production and trend variables do not have statistical significance.

Table 1: Parameters and Statistical Results of Honey Production and Factors that Affect It

	Constant	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	R ²	Adj-R ²	F	DW	V
Coef	3.670	0.823	0.554	0.0180	0.0201	0.0470	0.0158	99.7	99.6	878.66	1.63	1.73
t-ratio	8.51	15.21	4.74	2.37	1.71	0.61	0.74					
P	0.000	0.000	0.000	0.030	0.106	0.551	0.472					
St.Dev.	0.556	0.054	0.117	0.008	0.012	0.077	0.022					

Table 2: Geometric Means, Factor Elasticity and Marginal Yield of Factors in Honey Production

	X ₁ Honey Consumption Per Person (Kg)	X ₂ Number of Hives (Units)	X ₃ Money Paid to Producers (\$/Kg)	X ₄ Honey Exportation Value (\$)	X ₅ Wax Production (Kg)	X ₆ Trend (1,2,..24)	Y Honey Production Quantity (Kg)
Geometric Means	0.856	3338873.77	2.624	5589848.02	2892011.40	10.44	9488011.09
Factor Elasticity	0.823	0.554	0.0180	0.0201	0.0470	0.0158	∑bi=1.4779
Marginal Yield	47580178.89	8.211	339475.69	0.178	0.804	74895.65	

In Table 2, the geometrical means, production elasticity and marginal yields concerning honey production in Turkey and the factors that affect it are given.

In the function, the sum of the elasticity of the factors is $\sum bi=1.4779$, and we can mention the yield that increase by scale. Indeed, when all the factors are increased by 1%, there is an increase of approximately 1.48% in production.

According to the table, when the geometrical means of other factors are kept as constants, and honey consumption per person is increased by 1 kg, honey production will increase by 47580178.89 kg. Again, when the number of hives are increased by 1, it will increase by 8.211 kg per hive. When the prices paid to producers are increased by 1 \$, honey production will increase by 339475.69 kg. Wax production and the trend variable symbolising the change in consumer tastes and habits in time have a positive effect on honey production as well. However, when the P-significance levels of this factor elasticity are checked, it is observed that they are not statistically significant. Apiculture is going to be one of the most sustainable agricultural activities in the future. Sustainable apiculture means that beekeeping will improve and continue, and preserve its existence^[21]. Apiculture is a massive sector, which depends on nature the most compared to other animal production sectors, and it covers producers, wholesalers, packaging and distribution companies, and exporters. Therefore, when devising ethical rules for apiculture, rules of sustenance and profitability, and laws of nature covering the entire sector must be taken into account^[20]. The principles that the beekeepers must keep in mind in order to improve the course of apiculture can be listed as productivity, profitability, protection, research, professionalism and ensuring recognition^[22]. The increase of the hive number is equivalent to the increase of the arable land. This, in addition to the

development of apiculture' methods, and derivation of good races, which leads also to increase the production of honey^[8].

The remains of pesticides, naphthalene, and antibiotics used for fighting diseases and pests, fake honey found in the market, or feeding bees with sugar syrup and similar products during harvest time impact the pure and natural image of bee products and cause concern and unwillingness among consumers^[15].

In USA, during 1986-1994, prices ranged from \$.49 to \$.55/pound. There is great inconsistency in prices among states. For example, in 1998 average price per pound varied from \$1.65 in Nevada to \$.58 in Mississippi. At least 10 states report an average price above \$1 per pound, while the vast majority are in the \$.50 to \$.80 per pound range. Glancing at the figures appears to indicate that states with fewer colonies and less production have the highest prices (IL, KY, MD, NV, VT, VA). This appears to indicate that beekeepers in these states are receiving a higher return, probably because many are retailing their honey. The large producing states are languishing in the \$.64/pound range, since much of that honey is sold wholesale^[18].

There are lots more grandchildren in Kuwait to cook for these days-the population increased by almost half a million between 1993 and 1998. In the same time period, total annual honey imports have grown 3 percent overall-and for the United States, imports rose 6 percent. Economists link the growth in honey trade to the increase in people-since domestic honey production in Kuwait is almost nonexistent^[14].

In Uganda; lot of honey continues to flow into the country from higher honey potential south Sudan and Democratic Republic of Congo (D.R.C). Lot of honeys being produce from local hives, such as logs bamboos and holed trees. Thus the honey quality control measures remain the biggest issue in the honey industry. The government policies, plan for

modernization of agriculture and investment, if amplified with involvement of investors and donor support, will lead to remarkable changes^[12].

Honey prices have jumped by more than 50 per cent in the past year, with the Australian honey industry feeling the effects of the drought. The price of raw honey has soared by 140 per cent, forcing honey packers to import honey from Argentina. Victorian Apiarists Association president Graeme Matthews said the slump in honey production was to blame for the price increase^[23].

In the other study, scientists reported that the huge demand and insufficient supply has pushed up the price of honey products^[13].

The research that is to analyze of apiaries technical and economical aspects in Turkey (Izmir and Mugla). First of all, technical, social and economical aspects of apiaries are given under three sub-groups by the numbers of colonies (100 ≥, 101-150, 150<) Than, physical input- output relationships and annual activity results (total honey production value, variable and fixed costs, net returns and unit costs of honey production) of these apiaries are examined. These apiaries were movable and used at least 2-3 honey flows during one production season. The provincial differences in costs and returns of beekeeping enterprise are determined and it is estimated the number of colonies which is economically profitable^[16].

The fact that the transition from primitive hives to modern hives in Turkey has been completed to a great extent, and some increase in the average honey production per swarm can be considered as positive steps in apiculture.

Apiculture has direct contributions to the country economy as it is an agricultural activity, and indirect contributions as well, as it is a socio-economic issue and it has contributions in vegetative production. Apiculture does not depend on soil, and it can be a single means of living for families with very little or no soil. Moreover, it is the cheapest agricultural activity, and the only one that offers employment easily. Furthermore, apiculture has no direct or indirect adverse effects on the environment and on nature. The contribution of apiculture in the country economy with honey and wax production is around 114 million \$. Considering that the contribution of apiculture on the economy via pollenisation is at least 10-15 times the contribution via honey and wax, apiculture has a contribution of 1.14-1.71 billion \$ on the country economy^[2].

Furthermore, it offers a source of employment for approximately 150.000 people, most of which live in rural areas, without sufficient lands, which also demonstrates the significance of apiculture for the Turkish economy.

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