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Economic Assessment of Hazelnut Production and the Importance of Supply Management Approaches in Turkey

S. Gönenç [*1], **H. Tanrıvermiş** [2] and **M. Bülbül** [3]

Abstract

Turkey is the world's leading producer accounting for about 70% of world hazelnut supply. Hazelnut production is the single most important economic activity (monoculture) and income resource of rural households in the Black Sea Region. Hazelnut sector is supporting since 1962. However, due to inappropriate policies a stock problem has arisen in the sector. The Government has intervened to over production problem with various regulatory measures since 1989. However, results of supply response model showed that legal regulations have not any significant effect on reducing over production. Annual rate of increase of hazelnut production was calculated as 4.48%. And long term supply elasticity was found as 0.09 by Nerlove Model. The inelastic supply restricts the interventions on market by support price mechanism. However, high support prices and purchase guarantee keep farmers in hazelnut farming and encourage them to expand their production area. Monoculture is the most destructive factor which reduces all supply management initiatives. Government is both trying to keep farmers income at a certain level by high support prices, and also trying to apply supply control measures. This situation leads an intervention dilemma and creates a vicious cycle in hazelnut sector. Due to importance of Turkey in World hazelnut trade, it is necessary to solve over production problem in order to stabilize domestic and world prices. This research showed that the most effective way to supply control is to differentiate hazelnut farmer's income sources in order to encourage them to reduce their production area.

Keywords: hazelnut production, hazelnut policy, supply management, supply response

1 Introduction

Hazelnut was native to the black sea coast long before our era, not as a cultivated product but growing in the wild on trees or shrubs on the steep slopes of the mountains that are parallel to the coast for hundreds of kilometres from east to west. Hazelnut has

* corresponding author

[1] Sertaç Gönenç, Ph.D., Department of Agricultural Economics, Agricultural Faculty, Uludag University, 16059, Gorukle, Bursa, Turkey; Tel: +90 224 442 89 70 (283), Fax: +90 224 442 80 77, e-mail: sduman@uludag.edu.tr

[2] Harun Tanrıvermiş, Associate Professor, Department of Agricultural Economics, Agricultural Faculty, Ankara University, Diskapi, Ankara, Turkey, e-mail: tanriver@agri.ankara.edu.tr

[3] Mehmet Bülbül, Professor, Department of Agricultural Economics, Agricultural Faculty, Ankara University, Diskapi, Ankara, Turkey, e-mail: bulbul@agri.ankara.edu.tr

been traded commercially for 600 years (ANONYMOUS, 2001). Hazelnut production is a traditional crop, grown for centuries on productive costal, dry and marginal land largely concentrated in black sea region.

Hazelnut is not only one of the most important export crops of Turkey, but also the main economical activity of nearly 400,000 households under the form of family farming in the Black Sea Region (ANONYMOUS, 2001). These aspects of hazelnut production, which fall within the framework of multi-functionality, are seen as being the key factors in maintaining social, economic and environmental sustainability in the rural parts of the region as well as urban areas due to the employment and trade benefits created by hazelnut processing industry. The hazelnut economy directly and indirectly supports 8 million people. Therefore, stability of hazelnut prices is an important issue. However, price stability depends on stability of output or stability of volume offered for sale.

The control of output in agriculture is subject to two considerable obstacles, the effect of natural conditions and the large number of producers. In the field of agriculture, physical control is clearly very difficult. In the case of fruit, where the trees in any given season cannot be increased or decreased in number, the output, as far as the short time is considered, is almost completely beyond the control of the producer (WALLACE, 1951). Agricultural supply response is a very important issue in that it has an impact on growth, poverty and the environment. Agricultural supply response represents the agricultural output response to change in agricultural prices or to agricultural incentives (MAMINGI, 1997). The price of an agricultural commodity is the main factor that affects agricultural output. In general, many authors use some distributed lags to capture price expectation (BEHRMAN, 1968; BARITELLE and PRICE, 1974; BAPNA *et al.*, 1984; MSHOMBA, 1989; SHARMA, 1992; YAVUZ *et al.*, 2005). However, the lag structure may vary from one type of crop to another. Usually, one would expect perennial crops to have longer lags than annual crops. In some empirical studies, perennial crop supply was specified in terms of crop planting area and yield (BARITELLE and PRICE, 1974; CAMAN and GREEN, 1991; ALSTON *et al.*, 1995; ROSEEN, 1999). In this study, hazelnut supply was specified in terms of production quantity.

In this study, the economic structure of Turkish hazelnut sector and supply control strategies has been examined briefly. The description the model and the data used estimation of the model parameters was explained in the third section of the article and then, growing trend of hazelnut and factors affected hazelnut supply has been modelled and results were discussed in final section.

2 Economic Structure of Turkish Hazelnut Production

The dynamics of world production and markets have not changed much in several decades. World hazelnut production in 2004 was 699,939 tones unshelled. Turkey is the largest producer (70%) and exporter of the world followed by Italy (12%), USA (5.7%) and Spain (2%). The world hazelnut production and export show fluctuations depending on the climatic conditions from year to year. World shelled hazelnut export is around 176,000 tones in 2004 and Turkey controlled 80 % of the commercial trade. The world supply of table hazelnut in shell does not exceed 15,000 tones, and the market is

saturated enough. Germany is the most important hazelnut importer in the world and covers approximately 36 % of the total world import. Around 75 % of total exports go to European countries and Europe consumes 80% of world production (MARTI, 2001; SHEPARD, 2002). In addition, Turkey is currently trying to expand the markets in Asia, Turkic Republics, and Russia.

In Turkey, hazelnut is produced approximately on 570,000 ha land (TANRIVERMIŞ *et al.*, 2006). Growers generally have very small plots. Most eastern producers have an orchard the size of only 1-2.5 ha; on the other hand, some central and western farmers have 10-15 ha orchards. According to the results of General Agricultural Census in 2001, average hazelnut farm size is 1.34 ha in general. Hazelnut farms are 4 times smaller than the average farm size of Turkey which is 6.1 ha (SIS, 2004).

Hazelnut production is the single income source of 61% of the families in the Black Sea Region (TANRIVERMIŞ *et al.*, 2006). Monoculture is a dominant character in hazelnut and tea production activities. The share of hazelnut production value in total provincial crop production value is 60,3% in Giresun, 57,8% in Ordu, 32,1% in Trabzon, 24,3% in Bolu, 17,6% in Sakarya, 9,2% in Zonguldak, 7,3% in Artvin, and 6,2% in Samsun. The production and market risks are relatively high particularly in Giresun and Ordu provinces where the share of hazelnut in total crop production value is more than 50%.

Most farmers are part-time farmer who grow hazelnuts to supplement their primary income, with less than the 1.5 hectares, and use family labour. This low-cost labour is the most important element in the production process to obtain much lower production costs (TANRIVERMIŞ and GÜNDOĞMUŞ, 2001; TANRIVERMIŞ *et al.*, 2004). Sloped land and labour are the main inputs of hazelnut production and there is a very limited possibility to employ these two inputs in any other alternative area.

Hazelnut production regions are separated into 3 groups in Turkey (AÇIL, 1963; SARIMEŞELI, 1992; TANRIVERMIŞ, 1991; GENÇ, 1993; ANONYMOUS, 2001). The first standard production region covers the eastern part of the Black Sea Region. This region is also called as "old hazelnut production region". The second standard production region is the middle and western part of the black sea area. In this region, the hazelnut production history goes back to 40-50 years, thus the orchards are younger and more planned than the first standard region. Average yield of plantations is also higher in this region, and it leads to a rapid increase in production areas. The third region includes the other provinces where hazelnut grows (especially Bursa and Istanbul). The third region is not valuable for exporting and the most of products which are grown in this region is consumed without processing.

Hazelnut is produced in 33 provinces of Turkey, but economical production is realized by 13 provinces, which are located mostly in the first region. During the last 50 years while hazelnut production areas increased 2.5 fold, production quantity increased 200 fold (ANONYMOUS, 2001; TANRIVERMIŞ *et al.*, 2006).

3 Supply Control Strategies for Hazelnut Farming in Turkey

Due to socio-economic importance of the crop, hazelnut production has important political implications in Turkey. Hazelnut has been included to support program in 1962. In the past, the Turkish government has supported prices for hazelnut production by providing funds to Fiskobirlik (Union of Hazelnut Sales Cooperatives). Fiskobirlik has historically served as a conduit for Turkey's government policy decisions. As a result of historically high support prices, hazelnut area and production expanded. Hazelnut prices show variation through years. The pricing of the regulated product frequently occurs in political atmosphere (van Kooten and Taylor, 1989) and it makes more difficult to regulate the market. Free market prices are generally lower than Fiskobirlik's price. When stock quantity is high, free market prices go down up to 40% below than support price. Fluctuating prices damage farmer's income directly.

The domestic consumption quantity of hazelnut is not known due to lack of data. However, this amount is predicted approximately 35,000 tones per year (Tanrivermiş *et al.*, 2006). Hazelnut production, export, domestic consumption and stock data have been given in Table 1. As an average 143,804 tones of hazelnut surplus had to be stocked every year. As a result of inappropriate policies since 1923, hazelnut production areas shifted from sloped areas to first and second class farmlands and over expansion in production area could not be controlled.

Table 1: Hazelnut production, export, domestic consumption and stocks of Turkey

Years	*Production (tone/in shell)*	*Export (tone/shelled)*	*Domestic Consumption (tone/shelled)*	*Stock (tone/in shell)*	*Ratio of Stocks in Production (%)*
1980	302,461	99,219	16,500	37,350	12.35
1985	179,739	108,315	30,000	52,999	24.59
1990	374,566	195,645	30,000	272,296	72.70
1995	474,044	241,436	30,000	61,851	13.05
2000	467,719	177,307	35,000	273,871	58.55
2001	618,919	258,124	40,000	203,145	32.82
2002	620,000	252,779	40,000	229,904	37.08
2003	450,000	220,938	35,000	189,676	42.15
Average of 1964-2003	324,277	140,079	28,521	143,804	% 41

Source: (Tanrivermiş *et al.*, 2006)

Supply management has to be applied in order to cope with excess supply problem. Supply management has referred to a variety of systems to decrease supplies from government purchasing of surplus stocks to providing financial incentives to reduce production (Levy, 2000). In general, supply control measures can be listed as; import control, government purchasing of surplus stocks, acreage controls, providing financial incentives to reduce production, and use of quotas that assign a given amount of product to each (Brandow, 1960; van Kooten and Taylor, 1989; USDA, 1999; Levy, 2000). Different kinds of supply control methods were implemented especially by Canada, the EU

member states and USA up to date (Moschini, 1988; USDA, 1999; Tolman, 2002). In general, import restriction is the first step in supply control. However, in Turkish hazelnut sector there is already no significant import. Thus this measure is not valid for this sector.

In Turkish hazelnut sector a combination of supply control methods have been applied in different periods. These are summarized below:
Government purchasing of surplus stocks; Fiskobirlik is the most important organization of the sector and it aims to stabilize hazelnut prices by withdrawing the surplus product. Fiskobirlik support policy is to buy unlimited quantities of product from producers with an intervention price which is fixed for each production year. However, today the funds of and quantity purchased by Fiskobirlik has reduced. In 2000, the Turkish government reorganized the activities of Agricultural Sale Cooperatives including Fiskobirlik by giving them autonomy and separating their procurement and processing functions by the law of Agricultural Sales Cooperatives and Unions Nr. of 4572 (Tanrivermiş *et al.*, 2006; USDA, 2005). Starting in 1999, with pressure from the World Bank and International Monetary Fund (within the framework of agricultural reform implementation project (ARIP) and stand-by agreement), Turkey has progressively reduced these intervention prices.

Acreage control is a widespread method that governments of many countries resort to in order to cope with over-production. The Turkish Government made a number of legal arrangements in order to regulate and control hazelnut production. A law number of 2844 "Planning of Hazelnut Production and Determination of Hazelnut Production Areas" dated 1983 put into practise and the regulation on "Planning of Hazelnut Production and Determination of Hazelnut Production Areas" came into force in 1989. On 3 February 1993 hazelnut plantation areas were restricted with 13 provinces by the Decision Nr. 93/3985 of Ministry Council. Hence, the plantation of new hazelnut orchards is subject to official permission.

In 1994, Government was decided to pay compensation to the farmers who remove their own hazelnut orchards before completing their economical life by Decision Nr.94/6519. This Decision covers the farmers who have orchards in the first and second classes agricultural lands and in the third class agricultural lands that have less than 6% slope in the provinces that were permitted by Decision Nr. 93/3965.

The farmers were also encouraged to grow other alternative products. In this respect, the Decision Nr. 24382, "Determination of Hazelnut Production Areas and Supporting the Farmers who Remove their Hazelnut Orchard and Plant any Alternative Product instead of Hazelnut" was published and came into force in 2001.

Production quotas have not implemented in the sector yet. Production quotas have been implemented for a long time on some annual crops such as sugar beet, and tobacco in Turkey.

Storage would also be desirable to assure adequate market supplies in years of short crops. Thus storage program to stabilize annual supplies would be one adjunct to supply control (Brandow, 1960). However for perennial crops, storage would not be

an appropriate policy tool for controlling and eliminating overproduction in short-term due to the long productive life of plants. In fact, the conditions of storage facilities may cause high level losses and increase production cost. In reality, storage of hazelnut in the region is not seen as a suitable policy of supply control due to the technical and economic consequences.

In some countries there is too much supply control, but not enough demand control. In Turkey, Hazelnut Promotion Group (HPG) has been established with the joint initiatives of Fiskobirlik, Undersecretariat of Treasury and Black Sea Chambers of Exporters. The main objective of HPG was to promote both domestic and international demand of hazelnut. With this purpose, the Group has prepared generic advertising program and applied a common promotion plan. The first result of hazelnut promotion was good and it was declared that 30% demand increase was observed in new foreign markets after a year of promotion (ANONYMOUS, 2002).

4 Data and the Models

The data used in the study were obtained from various publications of the State Institute of Statistics (SIS) of Turkey and Fiskobirlik's publications. The time series data covers the period between 1950 and 2004. Data set was also arranged according to each Standard Production Region as both time series and panel data.

Trend equation and annual average rate of increase for production area, quantity and yield was estimated by using equation (I) (SNEDECOR and COCHRAN, 1980; ERTEK, 1987; GÜNES and ARIKAN, 1988).

$$W = a\, b^t \tag{1}$$

Where a and b are constants to be estimated and t denotes time.
Applying logarithms to the equation results:

$$\log W = \log a + (\log b)\, t \qquad \text{or} \tag{2}$$

$$Y = \alpha + \beta t \tag{3}$$

where: $Y = \log W$; $\alpha = \log a$ and $\beta = \log b$. If $\log W$ instead of W is plotted against t, the graph will be linear.

This equation was used for three data sets respectively: Y_a denotes production area (ha), Y_q is production quantity (tonne) and Y_y is yield (kg/ha). Coefficients were estimated by SPSS 11.5 statistical package program.

Regional differences in production area, quantity and yield according to three standard production regions were determined by using dummy variables. ANOVA model was used for this purpose. In this model, panel data set was used in order to reduce the effect of time (GUJARATI, 1992; BALTAGI, 1996). The model is given below:

$$Y_i = \alpha_1 + \alpha_2 D_2 + \alpha_3 D_3 + u \tag{4}$$

where:
Y_i: production area, quantity and yield respectively,

D: dummy variable:

$$D_2 = \begin{cases} 1 & : \quad (if\, 2^{nd}\, Region) \\ 0 & : \quad (other) \end{cases} \qquad D_3 = \begin{cases} 1 & : \quad (if\, 3^{rd}\, Region) \\ 0 & : \quad (other) \end{cases}$$

and $\left(\frac{\alpha_i}{\alpha_1}\right)$ denotes changing ratio according to the regions.

In the supply response model, total production quantity (Q_t) has been taken as dependent variable. Price is compatible with supply theory and is therefore used as the independent variable. Plantation of new trees is the function of future expected prices. Future expected prices were a function of a finite number of past prices (BARITELLE and PRICE, 1974). Thus, lagged prices were included in the model. The length of the individual past years price lag left to statistical estimation process.

There are two different prices valid in hazelnut sector; support price (SP) which is declared by the government via Fiskobirlik and free market price (FM) which is constituted around support price. Correlation between the two prices is high (0.80). This high correlation coefficient may cause an imperfect multicollinearity problem in the model, if both of them are used together as independent variables. For this reason, only support price was included the model.

Support purchase, export and stock quantities and export price have been taken as independent variables. These variables were used in the model with one year lagged values. Weather conditions and regulatory supply management measures have been used as dummy variables. Among agro climatic factors, freeze is likely to be the most decisive for hazelnut supply response.

Data set has covered the period between 1950 and 2004. Consumer Price Index (CPI) was used to obtain real price level. The real prices are given as:

$$P^R = \frac{CPI_b}{CPI_c} \times P_c \tag{5}$$

where P^R is real price, CPI_c is the current year's consumer price index, CPI_b is the base year consumer price index and P_c is the current price.

$$\begin{aligned} Q_t \quad = \quad & a + b_1 SPQ_{t-1} + b_2 EQ_{t-1} + b_3 \frac{EP_{t-1}}{CPI} + b_4 S_{t-1} + \sum_{n=5}^{11} b_n \sum_{t=1}^{T} \frac{SP_{t-T}}{CPI} + \\ & b_{12} D_{FR} + b_{13} D_{89} + b_{14} D_{93} + b_{15} D_{94} + b_{16} D_{01} + e \end{aligned} \tag{6}$$

where:
SPQ: support purchase quantity (tone/year)
EQ: export quantity (tone/year)
EP: export price ($/tone)
S: annual stock quantity (tone/year)
SP: Support Price (TL/kg)
D_{FR}: Dummy, freeze
D_{89}: Dummy, year 1989, regulation on determination of hazelnut production areas

D_{93}: Dummy, year 1993, regulation on restriction of hazelnut production areas
D_{94}: Dummy, year 1994, regulation on compensation of producers
D_{01}: Dummy, year 2001, regulation on alternative crop
The long run supply elasticity was calculated by Nerlove's supply response model. The Model consists of the three equations:

$$A_t^* = \alpha_0 + \alpha_1 P_t^* + u_t \tag{7}$$

$$P_t^* = P_{t-1}^* + \beta(P_{t-1} - P_{t-1}^*) \tag{8}$$

$$A_t = A_{t-1} + \gamma(A_t^* - A_{t-1}) \tag{9}$$

where A_t and A_t^* are actual and desired area under cultivation at time t, P_t and P_t^* are actual and expected price at time t and β and γ are the expectation and adjustment coefficients, respectively. Elimination of the unobservable variables A_t^* and P_t^* leads immediately to the reduced form:

$$A_t = b_0 + b_1 P_{t-1} + b_2 A_{t-1} + b_3 A_{t-2} + u_t$$

with $b_0 = \alpha_0\,\beta\,\gamma$, $b_1 = \alpha_1\,\beta\,\gamma$, $b_2 = (1-\beta) + (1-\gamma)$, $b_3 = -1(1-\beta)(1-\gamma)$ and $u_t = \gamma(u_\tau - (1-\beta)\,u_{t-1})$ from which the key parameter α_1 may be retrieved by means of the identity $\alpha_1 = b_1(1 - b_2 - b_3)$. The long term price elasticity ε is then usually calculated as

$$\varepsilon = a_1 \frac{\overline{P}}{\overline{A}} = \frac{b_1\,\overline{P}}{(1 - b_2 - b_3)\,\overline{A}}$$

where $\overline{P}$ and $\overline{A}$ represent historical mean of prices and acreage under cultivation, respectively (Nerlove and Addison, 1958; Braulke, 1982; Begum *et al.*, 2002).

5 Results and Discussion

According to calculated trend results (Table 2), annual average increase rate of hazelnut production areas, production quantity and yield of Turkey are; 1.79%; 4.48% and 1.30% respectively. Difference between hazelnut production regions is statistically important (Table 3) and the highest increase rate of production area and quantity is observed in second production region. This region stimulates Turkish hazelnut production increase and it is recommended that the main supply control mechanism should be intensively applied in this region.

Results of supply response model (Table 4) showed that while one year lagged export price and four years lagged support price increase hazelnut production, one year lagged stock quantity and negative weather conditions (freeze) decrease hazelnut production. Baritelle and Price (1974) found the lag length as 8 years for apples. Yavuz *et al.* (2005) found the lag length as 5 years for hazelnut supply response. Thiele (2002) indicate that negative weather conditions are very important in supply response. In his study, it was found that among the non-price factors, freeze has significantly impaired agricultural growth.

Table 2: Trends according to regions ($W = a\,b^t$)

	Turkey	*Region 1*	*Region 2*	*Region 3*
		Production area (ha)		
$\log a$	5.1450*	5.1340*	4.0500*	2.2750*
A	139636.8200	136144	11220	188.3600
$\log b$	0.0077*	0.0037*	0.0225*	0.0191*
B	1.0179	1.0080	1.0530	1.0450
R^2	0.934	0.6480	0.9500	0.8140
F	706.2500	91.9800	950.4850	218.7400
		Production quantity (tonne)		
$\log a$	4.8140*	4.7510*	3.9550*	2.4290*
A	65162.8300	56363	9015	268.5300
$\log b$	0.0190*	0.0149*	0.0307*	0.0196*
B	1.0448	1.0350	1.0730	1.0460
R^2	0.7960	0.6540	0.8790	0.8670
F	195.6040	94.6560	363.1790	326.1960
		Average yield (kg/ha)		
$\log a$	1.9520*	1.6170*	1.9050*	2.1540*
A	89.5400	41.3900	80.3500	142.5600
$\log b$	0.0054*	0.0112*	0.0082*	0.0005
B	1.0130	1.0260	1.0190	1.0000
R^2	0.4380	0.5130	0.4150	0.0040
F	38.8920	52.7070	35.4180	0.1940

* Statistically significant at 1 % level

Table 3: Regional differences (ANOVA Model)

	α_1	α_2	α_3	R^2	F
Production Area (Y_a)	171379.29*	-115247.40*	-166764.30*	0.83	382.74
Production Quantity ($Y_{\ddot{u}}$)	161040.40*	-71018.54*	-159960.00*	0.50	77.40
Average Yield (Y_v)	91.27*	50.38*	60.94*	0.24	24.11

* Statistically significant at 1 % level

Table 4: Estimated results for supply response model

Variables	β	*Std. Error*	t	*Sig.*
Constant	57723,353	22342.681		2.584
SPQ	2847,738	7486.179	0.049	0.380
EQ	0.050	0.200	0.043	0.250
EP	102.151	34.287	0.354	2.979
S	-0.287	0.128	-0.162	-2.236
D_{FR}	-63702.145	24943.492	-0.176	-2.554
D_{89}	62078.408	38387.735	0.175	1.617
D_{93}	62186.578	77123.487	0.159	0.806
D_{94}	-80697.257	69713.878	-0.199	-1.158
D_{01}	52549.674	67916.597	0.088	0.774
SP_{lag1}	-5041.928	10224.583	-0.084	-0.493
SP_{lag2}	9124.270	8867.255	0.156	1.029
SP_{lag3}	-7714.978	8786.891	-0.135	-0.878
SP_{lag4}	22539.579	9562.314	0.399	2.357
SP_{lag5}	4370.888	10291.200	0.078	0.425
SP_{lag6}	-6539.788	10493.394	-0.111	-0.623
SP_{lag7}	10424.781	8511.224	0.166	1.225

According to results of supply response model, regulatory measures of government have not any significant effect on supply control.

Formulation of an appropriate agricultural price policy for growth and stability requires an understanding of the long term effects of price changes upon producers and consumers (Nerlove and Addison, 1958). Long term supply elasticity of hazelnut production was found as 0.09 by using the Nerlove Model. This highly inelastic supply showed that overproduction can not be explained only high support prices and price control will not be very effective in controlling output. On the other hand it is a fact that a historically high support price is the most important reason which promotes small-scale farmers to continue their production.

There is an intervention dilemma in hazelnut sector. Turkish Government has tried to apply both support and supply control mechanisms at the same time. It was necessary to support prices in order to keep farmer's income at a certain level. On the other hand long term support policies stimulate overproduction and depressed prices. Depressed prices forced Government to support farmers again and this situation has created a vicious cycle in the sector. The base of the problem is monoculture. Small scale farmers

have no other alternative except for hazelnut farming and they had to increase their production area in order to increase their family income.

Recent years, Turkish Government has begun to reduce its interventions and support prices by the conditions of ARIP and stand-by agreements under the auspices of IMF and the World Bank. However due to explanations above it is expected that reduced support prices will not do any important implication on over supply.

Actually government intervention may be sufficient to prevent the over production under monopoly conditions (VAN KOOTEN and TAYLOR, 1989). But the hazelnut sector does not have a monopoly character and there are two prices and alternative sale options in the market as mentioned before.

This results show that the best way to break this vicious cycle and cope with over supply problem is to create new agricultural and/or off-farm income sources. In this respect, incentives and encouragement to organic hazelnut production is accepted as another way to control supply. According to the research results carried out at farm level, transition to organic industry from conventional farming is economically, socially and ecologically viable. It is interesting that average yield and net profit per hectare of planted land is higher than conventional farming in the region (BÜLBÜL, 2002). In addition to the development of organic industry in the region, cultivation of some new crops should be encouraged on farms within the framework of agricultural and rural policies. Hazelnut growers have a tendency to adopt kiwifruit plantation on farms and the research results indicated that labour requirements, gross and net profit per planted area of kiwifruit is more than and hazelnut farming (TANRIVERMIŞ *et al.*, 2006). In fact, the development of new cultivation should be parallel to the domestic and external demand in order to solve surplus of products.

An appropriate alternative is to provide incentives for non-farm activities of hazelnut producers' in order to develop agricultural and non-agricultural activities such as rural tourism, rural industrialization, handicraft activities and agricultural activities other than hazelnut growing like fisheries, forest products and animal products production etc. in the region. Therefore, improvement of living standards and/or stabilization of farm/household incomes should be achieved through differentiations of income sources. Through these means, dependency of economic and social life on hazelnut farming, processing and trade will be decreased and the impacts of monoculture will be mitigated.

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