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Analysis of effective factors on information sources at Turkish Oregano farms

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Oregano (*Origanum spp.*), culinary herb, is getting more popular because of its health benefits and extensive usage area. Besides Mexico, Greece, Israel, Albania and Morocco, Turkey is also one of the main countries involved in production and export of oregano. Generally oregano is widely grown in Aegean Region of Turkey. This research was carried out to determine the effective factors based on production, structure of farms and information sources on commercial oregano production. For this reason, surveys were conducted on 35 producers in this region, which showed that small farm structure is functional for oregano production in the region. Additionally, it was revealed that decision and appropriation of producers to grow oregano mostly depend on some traditional information sources like fellow farmers, relatives and personal experiences. Multiple correspondence analysis was used to determine how producers access information sources which were under the influence of farm land, cooperative membership and oregano share in income.

Key words: Oregano, Turkey, farms, information sources, multiple correspondences.

INTRODUCTION

Medicinal and culinary herbs have been used since ancient periods. According to the World Health Organization, it has been reported that the amount of culinary herb species in the world is near to 20000. The amount of plant species in Turkey has been accepted as above 9000, moreover, it has been reported that 1000 species of them belong to medicinal and culinary herbs (Uysal, 2003; Anonim, 2006). Almost all of these species naturally grow and very few of them are commercially grown under controlled cultural conditions within very narrow production areas (Sarı et al., 2005).

Oregano is one of the most commonly known culinary herbs worldwide for cooking purposes. It is well known as "the pizza herb" and widely used in Mexican and Italian cuisine in fresh and dried form. The dried herbs are also used in many other processed foods such as alcohol beverages, meat, meat products, snack foods, and milk products. Some of the *Origanum* species are also used as a fragrance component in soap, detergents, perfumes,

cosmetics, flavorings, and pharmaceuticals (Vokou et al., 1993; Kokkini et al., 1994; Bernath and Padulosi, 1996; Skoula et al., 1996). Several species in the Labiatae family are an important source of antimicrobials and antioxidants (Nemeth and Szekely, 2000; Marino et al., 2001; Eguchi et al., 1996; Ozden, 2009). Oregano oil has anti-bacterial, anti-fungal, anti-parasitic, anti-microbial and anti-oxidant properties. Because of these properties of oregano, oregano oil is used in many areas for different purposes. The main phenols with antiseptic properties in oregano oil are carvacrol and thymol (Table 1) (Melegari et al., 1995; Elgayyar et al., 2001; Martinez et al., 2001; Mejlholm and Dalgaard, 2002; Ozden, 2009).

Oregano is a hardy perennial herb growing up to 1000 m in height. It has attractive white to purplish flowers in summer and belongs to the Labiatae family and *Origanum* genus. Oregano is native to Europe and the Middle East. Among the origanum species, O*riganum onites* and *origanum hirtum* grow naturally in wild areas of Greece and Turkey (Figure 1). At present, most of the commercial oregano from the Mediterranean area comes from wild populations in Turkey and Greece or from crops in Israel (Bernath, 1997; Kitiki, 1997; Oliver, 1994; Skoula and Kamenopoulos, 1997; Ozden, 2009). Actually, under

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Table. 1. Chemical composition (%) of volatile oil of *Origanum onites* (Vokou et al. 1988).

Volatile oil	Percentage
α- thujene	0.8
α- pinene	2.8
Camphene	2.0
β- pinene	0.4
Myrcene	3.3
α- phellandrene	0.3
α- terpinene	2.1
P -cymene	7.3
β- phellandrene	0.3
Limonene	0.5
γ- terpinene	10.3
Trans-thujano	0.4
Cis-thujanol	0.1
Linalool	0.2
Borneol	5.1
Terpineol-4	0.9
α-terpineol	0.2
Linalyl acetate	--
Tymol	0.5
Carvacrol	59.4
β-caryophyllene	0.7
α-muurolene	0.1
β-bisabolene	2.3

the commercial name 'Oregano', a large number of plant taxa are found belonging to different species, genera or even families because of its complex taxonomy, economic importance, genetic resources and variability, potential utilization of the genus *Origanum* has not been fully explored and oregano is still under investigation (Letswaart, 1980; Tucker and Maciarello, 1994; Kokkini, 1997; Padulosi, 1997; Putievsky et al., 1997).

Many authors have stated that 14 out of 40 oregano species had naturally grown up to 1500 m altitude in Turkey. *O. onites* cv. İzmir, the biggest share in oregano export of Turkey, is an evergreen perennial shrub.

Oregano production has started firstly under the field conditions in Denizli and secondly in Manisa, Antalya, Isparta, Aydin, Mugla, Burdur and Balikesir Provinces located in the Aegean and Mediterranean Regions of Turkey. Most especially in Denizli research area, oregano production started in 1993 as alternative product instead of tobacco, and its annual production is approximately 5000 tones. In these counties, total oregano production area is above 1000 ha (Ozgur, 2005). As mentioned before, Turkey is among important oregano exporter countries. Her annual export is almost 10000 tones and its value is 15 million US dollars.

MATERIALS AND METHODS

Material of this research is a hypothetical sample that is composed of three variables, namely farm size, ratio of oregano income in total agriculture income and member of sales agriculture cooperatives. Based on the research frame, some data and information via surveys were collected from 35 farms functional in Denizli Region correspondence analysis (Greenacre, 1998). The object of correspondence analysis technique is to analyze categorized data that are transformed into cross tables in the form of rxc or rxcxk and to demonstrate the results in graphs. This method is used commonly for some social research using this technique. It is possible with this technique, to investigate relations in comparison between row and column variables and between different levels of each variable in a smaller dimensional space (Gifi, 1990; Chou, 1994; Mendes, 2002; Akturk, 2004).

Oregano land size, income level within total agriculture income and cooperative membership are considered as variables in this research. Relationship between all of the variables and information sources is investigated. Farm size is shown as i = 3, income of oregano as j = 3, membership of cooperative as k = 2. Sources of information about oregano production are shown as i = 3. Some data are shown in a table as ixjxkxl dimensions and L matrix was formed as below (Mendeş, 2002; Akturk et al., 2007):

$$L = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 0 & 0 & 0 & 0 & 1 & 0 \\ \vdots & & & & & & & & & & \vdots \\ 0 & 1 & 0 & 0 & 0 & 1 & 1 & 0 & 1 & 0 & 1 \end{bmatrix}_{35x11} \quad (1)$$

In these columns of matrix, total level number of the variables was analyzed (3+3+2+3=11), while in the rows interviews (number of tested units) (35) are placed. In case, L matrix changed a 35 x 11 dimension matrix. L matrix is formed by coding categories of four variables in the questions as 1 and others as 0. At this stage, in the L matrix total sum of rows is equal to 1 in a variable's sub-categories, while within all categories it is equal to variable number (p). Analysis of L matrix is established on brut table or brut matrix, which is formed of inner multiplication of L matrix (Gifi, 1990, Mendes, 2002, Akturk et al., 2007). This matrix is obtained by the following equation:

$$B = L^1 L \quad (2)$$

Analysis of Brut table is done via Singular Value Decomposition (SVD) method:

$$C_B^{-1} B C_B^{-1} = U^\wedge U^1 \quad (3)$$

This equation gives the cumulative cluster answer for all categories levels of variables (Gifi, 1990; Akturk et al., 2007). At this equation, C_B matrix is shown as p variables and this matrix is written as follows:

$$C_B = P \begin{bmatrix} C_i & 0 & 0 & 0 \\ 0 & C_j & 0 & 0 \\ 0 & 0 & C_k & 0 \\ 0 & 0 & 0 & C_l \end{bmatrix} \quad (4)$$

Since there are 4 coded variables in this research, diagonal elements of brut matrix are composed of consecutively $4L_i$, $4L_j$, $4L_k$ and $4L_l$ (Gifi, 1990; Faye, 1994).

RESULTS AND DISCUSSION

According to our survey study conducted in Denizli pro-
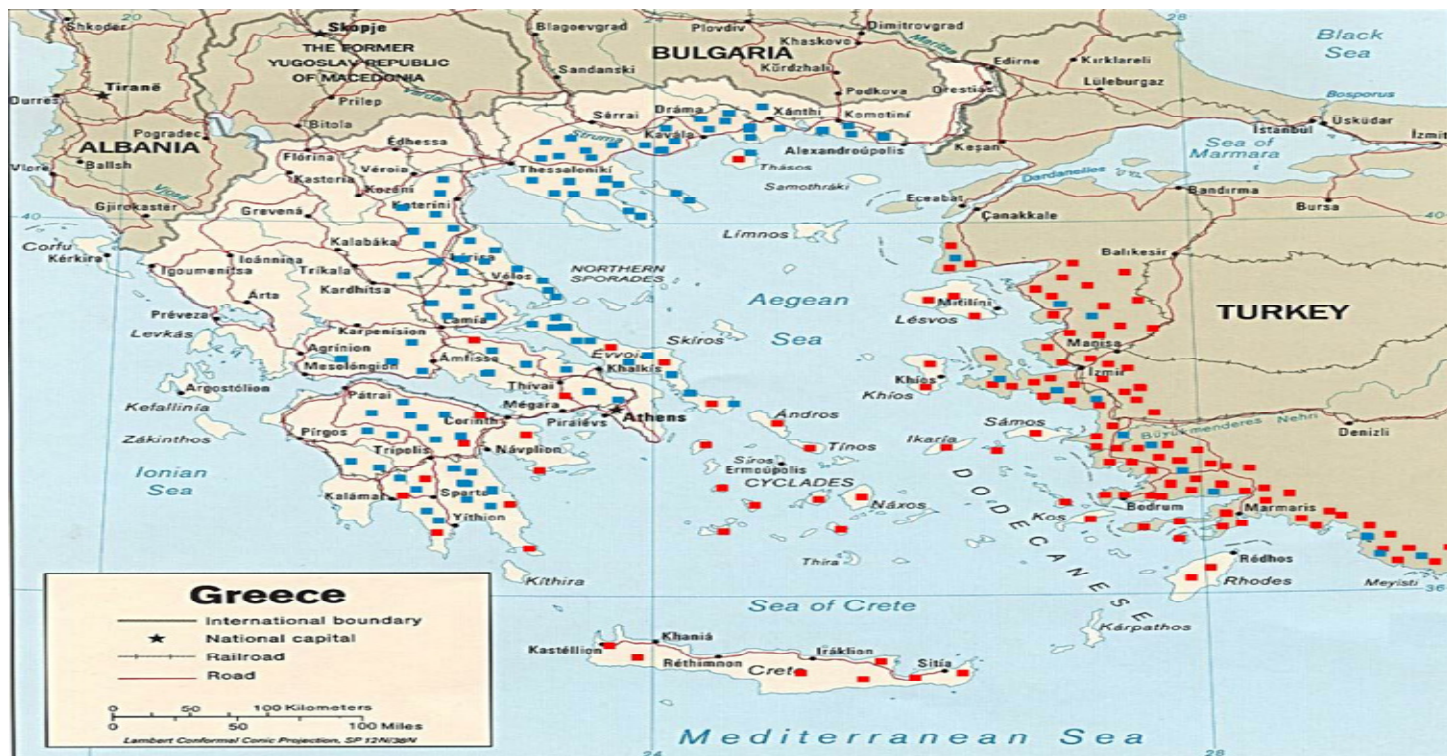
Figure 1. Distribution of *Origanum hirtum* L. (blue spots) and *Origanum onites* L. (red spots) in Greece and Turkey {Adopted from Vokou et al. (1988) and Kokkini et al. (1994)}.

vince, average age of oregano producers altered from the relationship among all variables was examined by multiple 31 to 60 ages. It means that most of the oregano producers were within a medium age group. This could be as a result of their similar action and behavior. Also it was determined that 82% of growers graduated from primary school. Agricultural production was fundamental income source of farmers. Most of the farmers (65%) had medium income level. Besides agricultural production, farms rate having income out of agriculture was 8.5%. Income rate obtained from oregano production was found significant. Data showed that 65.71% of farmers had obtained their 76 - 100% of their total agricultural income from the oregano production. Oregano production income of the rest 34.28% of farms was determined as 26 - 50% of total agricultural income. Studies on economical oregano production and especially information sources have been very limited since oregano production and cultivation has begun lately. In these studies, information sources for the farmers were revealed and some comparisons with the results were made (Beal and Rogers, 1960; Gurler et al., 2002; Santucci, 2003). According to these researches, farmers applied their information sources for crop variability, input usage and some other subject related with agriculture during production period.

Average farm size in oregano production was 7.6 ha. Land allocated to oregano production varies from farm to farm. For example, 47% of farms had a land track rang-

ing from 0 to 5 ha., 36% of them had farm size ranging from 5.1 to 10 ha. Generally, oregano production farms did poly-cultural agriculture. Various products include grain, corn, sunflower, tobacco, strawberry, fruits and vegetables.

Oregano farms are of the poly cultural type production. Oregano based monoculture farms constituted as 28.57% in the study region. As a perennial plant, oregano production lasts 1 - 6 years in 83 % of the farms. Farms harvesting oregano for 7 years and more constituted 17%. These farms with production of 7 plus years had an average size of 5 ha. Moreover, the ratio of farms having oregano land bigger than 5 ha was found only as 2.9%.

Fundamental information sources of the farms for oregano production were local agricultural services, associations of Ministry of Agriculture, relatives-neighbor and farmer's own experiences (Figure 2). In these oregano producing farms, it was determined that technical information required during production stage was mostly obtained from neighbor and/or relatives (85.7%). The number of farms or farmers meeting their information requirement from local agriculture services was as low as 5.7%. The information source in fertilizer usage was the extension staff of local agricultural organization for 37.9% of the farmers interviewed, the cooperatives for 9.5%, the merchants selling fertilizers for 6% and their friends for 2.6%. The others were using fertilizers depending on their own experience without taking any advice. Similarly,
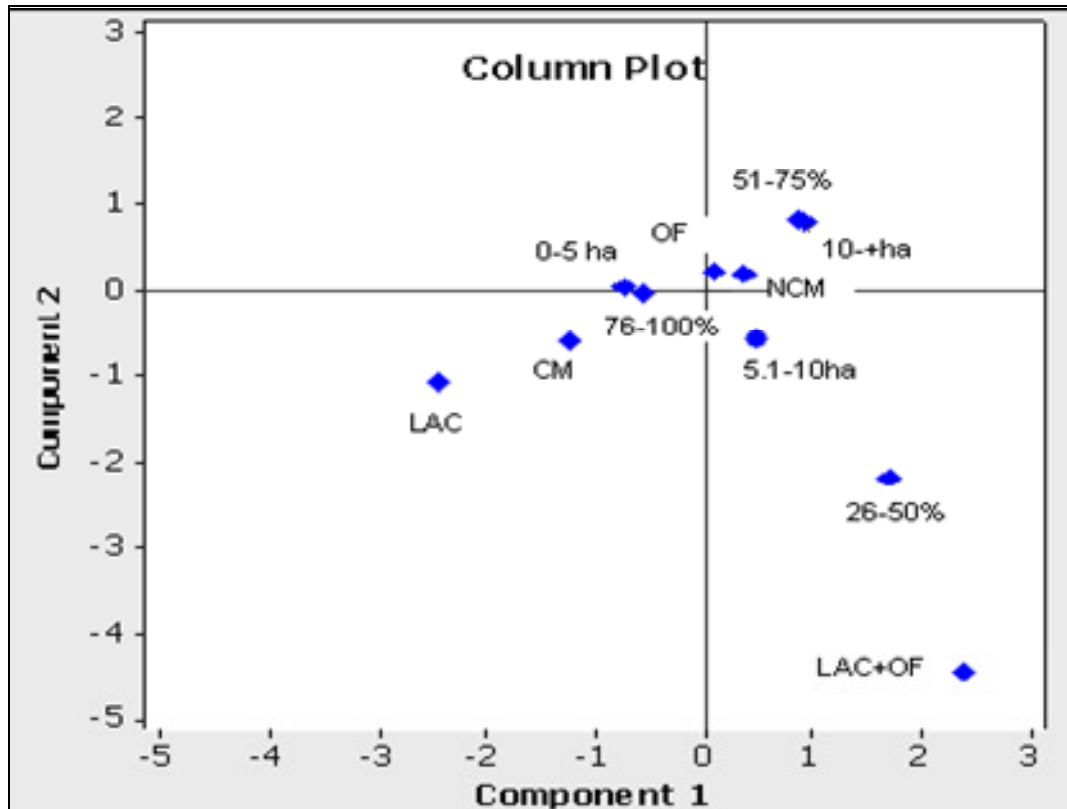
Figure 2. Multiple correspondence analysis diagram (LAC: Local Agricultural Services, CM: Cooperative Member, NCM: Non cooperative Members, OF: Other Farmers and Relatives).

at the research which was carried out in Eskisehir, Kutahya and Usak provinces, 56% of the farmers supplied fertilizer from the cooperatives, while 39.17% from the merchants and 4.2% from other sources. The majority used fertilizers without asking anyone, while 35, 10 and 2.5% inquire information from the extension staff, their other farmers and relatives and the cooperatives, respectively (Gurler et al., 2002). In another research, it was determined that farmers functional on organic agriculture in Italy obtained required information from agricultural extension staff of local agricultural organization and also from other experienced farmers (Santucci, 2003).

In order to increase input usage in agricultural production, to obtain high quality product, to market and so, to improve the life style of farmers, farmer's organization have a big importance (Karlı and Celik, 2003). Agricultural cooperatives, attractive as an appropriated organization model, arise from self help requirements of farmers of small scale farms to solve some problems that have been hard to overcome alone and related with economical conditions (Mulayim, 1999). In this region, there are two oregano production and sale cooperatives established in 1993. The rate of farms having a cooperative membership in this research was 22.9%. It was revealed that reasons of this membership can be listed as sale guaranty (50%), in kind and also in cash helping

(12.5%) and the last, obtain technical information (12.5%).

During agricultural production period, not only demographic specifications but also social and economic factors help to determine beneficial information sources. By the way, the farms could show differences to attain the information (Rogers 1983, Oakley 1985). In this research, four different categorical variables such as farm land, the rate of income gained by oregano production within whole farm income, farm membership to an oregano production cooperative and information sources related with oregano production were checked by multiple adaptation analysis technique. In order to analyze the variables which possibly affected the information source, an initial matrix was established. This matrix and also a Burt matrix obtained by multiplying of inner parts were presented in Table 2.

Diagonal components of this matrix give total value belonging to the four variable categories. It was found that in the three farms, the rate of income from oregano production within total agricultural production was between 26 and 50%. Oregano production income rates in 9 farms were changed from 51 to 75% and in 23 farms from 76 to 100%. From distributions out of diagonal, for example, 9 had medium (51 -75%) oregano income rate in total agricultural income and 21 them had significantly

Table 2. Burt table by variables.

Categories/Variables		Income rate (%)				Information source			Cooperative membership		Land size (ha)		
		26 - 50	51 -75	76 -100	Other farmers	Local agricultural organization	Relatives and others	Yes	No	0 - 5	5.1 - 10	10 +
Income Rate (%)	26-50	3	0	0	2	0	1	0	3	0	2	1
	51-75	0	9	0	9	0	0	0	9	1	5	3
	76-100	0	0	23	21	2	0	8	15	14	7	2
Information Source	Other Farmers	2	9	21	32	0	0	6	26	13	13	6
	Local agriculture organization	0	0	2	0	2	0	2	0	2	0	0
	Relatives and others	1	0	0	0	0	1	0	1	0	1	0
Cooperative Membership	Yes	0	0	8	6	2	0	8	0	4	4	0
	No	3	9	15	26	0	1	0	27	11	10	6
Land Size (ha)	0-5 ha	0	1	14	13	2	0	4	11	15	0	0
	5.1-10 ha	2	5	7	13	0	1	4	10	0	14	0
	10 +	1	3	2	6	0	0	0	6	0	0	6

high oregano income rate (76 - 100%), while only 2 whose information source was a neighbor or a relative or a cooperative, had low income rate from oregano production (26 - 50%).

It was possible to follow from the Burt table that the number of member farms of an oregano production cooperative was 8 and non-member farms were 27.14 farms had 1.4 ha land and 6 farms had bigger than 10 ha land. The results of analysis of the established matrix were presented in Table 3.

Within the total inertia which was evaluated as average criterion of variance in the variable levels, it could be said that inertia amount per dimension was near to each other with the exception of 1st, 6th and 7th dimensions. The per cent share of each dimension within explanation of total inertia has been determined by rating of the inertia value belonging to each dimension to total inertia value. As a result of this analysis, the dimension having the highest explanation rate was found as the 1st

dimension (29.19%). By considering agglutinative shares of the dimensions in the explanation of total inertia, it was determined that the 1st and the 2nd dimension had a share of 51.12% in the explanation of total inertia. In other terms, part of 51.12% of total inertia could be explained with the 1st and the 2nd dimension in the space having 7 dimensions. The relationships among the levels of inertia within a two dimensional space were not significant to explain total inertia. However, only two dimensions were considered in order to interpret the results in this study. Distribution or emphasis of inertia categories within each dimension and contribution of each inertia level to the dimensions were presented in Table 4. The 1st and the 3rd levels of land width were found in the 1st dimension but its 2nd levels were in the 2nd dimension. While the 1st level "Membership to an oregano production cooperative" inertia was in the 2nd dimension, the 2nd level of this inertia was determined in the 1st dimension. Moreover, the

first level of "Information sources related with oregano production" inertia was in the 1st dimension, the 2nd and the 3rd levels of this inertia were in the 2nd dimension. If four inertias evaluated together, it was possible to mention that region inertia was equally affected in the 1st dimension and farms using neighbor-relatives as information sources for oregano production were a member of a cooperative; and land width of these farms ranged from 0 to 5 ha. However, farms using local agricultural organization as information source were a member of a cooperative. At the same time, it was possible to say that in the small scale farms (0 - 5 ha), the rate of oregano production income within total farm income was high (76 - 100%).

In a research conducted in Iowa State of USA in adopting of two new agricultural techniques, it has been stated that the most important information sources of the farmers during adoption period and evaluation of new agricultural technology or products

Table 3. Results of L matrix (Formula 1).

Sizes	Inertia (Alteration)	Proportion of each size (%)	(Cumulative) (%)
1	0.5108	0.2919	0.2919
2	0.3839	0.2194	0.5112
3	0.2662	0.1521	0.6634
4	0.2408	0.1376	0.8010
5	0.1732	0.0990	0.9000
6	0.1014	0.0580	0.9580
7	0.0736	0.0420	1.0000
Total	1.7500		

Table 4. Contribution of inertia categories in each dimension.

Variables		1st Dimension (component 1)	2nd Dimension (component 2)
	26 - 50	1.711	-2.185
Income rate (%)	51 - 75	0.854	0.817
	76 - 100	-0.557	-0.035
		0.077	0.208
	Other farmers		
Information sources	Local agricultural organization	-2.426	-1.099
	Relatives and others	2.376	-4.470
		-1.225	-0.603
	Yes		
Cooperative membership	No	0.363	0.179
		-0.748	0.049
	0 - 5		
Land size (ha)	5.1 - 10	0.404	-0.389
	10 +	0.927	0.784

were other farmers, local agricultural services and commercial companies (Beal and Rogers, 1960). Similarly, Talug (1974) reported that information sources of wheat producers in Polatlı County of Ankara for herbicide usage and weed control were determined as the other farmers in the county and local agricultural organizations. In some other studies, it was reported that the most important information sources for the farmers were not only the other experienced farmers but also the local agricultural organizations (Kampoung, 1998; Kijsomporn, 1998; Punyagard, 1998; Sripakde, 2000). Most of the findings in these studies are similar with our findings based on the information sources of farmers. In this study, experienced farmers, agricultural cooperatives and local agricultural organizations were determined as the most important information sources for the oregano farmers.

Conclusion

In the research, it was found that because of low oregano production income in total agricultural income, farms were out of center and there was no any difference in this variable. In the other words, oregano production income

did not have effect on information source. Cooperative membership of the farms was not found important as much as expected but it could be said that it was mostly effective in marketing period. Although small scale farms had most of their income from oregano production, these farms obtained technical and functional information for oregano production from neighbors, relatives, tradition experiences and information instead of specialists.

The basic reason for oregano production of farmers was to obtain supplementary income for the farm in the research area. However, it was observed that farmers or producers did not have enough information either on production or on other technical subjects for oregano growing. Oregano growing was naturally spread among the people of this region and technical information required for oregano production was gained from the neighbors or relatives. For this reason, support of technical and practical information during decision period and also oregano production stage is especially required. Not only extension experts as dimension but also cooperatives are very important information sources. In some periods, technical supports such as written and visual publications of dimension and research institutes are highly insufficient. During information retrieval stage, organizational formations and planning are necessary.

This is because the way of cultivation currently carried out by traditional methods prevents following of sustainable production techniques. Because of the benefits of oregano for both local and country economy as an export material, it is necessary to inform producers about scientific studies and technical improvements on oregano production. It seems that to be informed of cooperative members in an organizational structure is easier and practical during production and marketing periods. But in this research, it was determined that oregano producers did not have a significant cooperative infrastructure. Studies to inform the producers about cooperatives could be increased by the specialists.

In this study, it was determined that farm characteristics including land size, income and cooperative membership were more effective rather than their individual characteristics during decision period. In order to increase benefit rate of oregano growing, the farms having more income from oregano production in the agricultural income could be considered and their technical information level be increased. Increasing income could encourage other farms to invest in oregano growing.

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