Factors Explaining Forest Fires in the Serik and Taşağıl Forest Provinces (SW Anatolia - Turkey)[1]

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Abstract

This study was undertaken to determine the factors causing forest fires in Serik and Taşağıl forest provinces of Antalya Forest Regional Directory in Turkey. These neighboring forest provinces including 78 forest villages was the site of one of the biggest forest fires in the Turkish Recorded History affecting about 15000 hectares. The area is also known to have a high frequency of forest fires.

To accomplish this goal, we gathered information on 21 forest related characteristics, 22 socioeconomic factors for the years from 1998-2010, fire number, and two different index derived by climatic factors. Socioeconomic factors were obtained by scanning the local, regional and national registrations in different databases. All these 43 factors belonging to 78 forest villages were used for the analysis. Different multi numerical analysis techniques such as factor analyzes, cluster analysis and multi regression analysis were applied to reveal the most important factor groups explaining fires in the region. The analyses were done separately for Taşağıl and Serik forest provinces.

Four factor groups including eleven variables were selected for the Taşağıl forest province. These factors groups explained 85 % of the total variance. Similarly, for Serik forest province, four factor groups containing fourteen variables were determined. These groups explained 87% of the total variance. The villages of Taşağıl and Serik provinces were classified according to these factor groups, which could be a useful tool for the fire management in the region.

Keywords: Correlation function, fire-socioeconomic factors, forestry management, social-fire danger factors

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Introduction

The forests of Turkey are part of the Mediterranean Forests, and Turkey's forest belt in the Aegean and Mediterranean Regions shows many ecological similarities with Mediterranean forests. On the other hand, Turkey's geographical location and physical structure is quite different from countries that have a Mediterranean forest belt. This difference is reflected on the biological diversity. In addition, Turkey also has a very different socioeconomic structure from Mediterranean countries. Turkey's forests are administered by the Ministry of Forestry and Water Affairs. The General Directorate of Forestry (GDF) is the largest management unit, with a mission to protect, develop and manage Turkey's forest area of 21.3 million hectares. This unit works with 27 equivalent regional "General Directorates of Forest" organizations at the national level. During the period 1937–2010, 86,769 forest fires were recorded in Turkey, destroying an area of 1,617,701 hectares.

There are 10 functioning "General Directorates of Forestry" in the Aegean and Mediterranean regions. Of the total forest area destroyed by fires between 2000 and 2009, 81% belongs to General Directorates of Forestry in the first 10 areas. When these 10 areas are sorted by area affected, the largest area is within the General Directorate of Forestry of Antalya. These first 10 areas account for 63.35% of the total forest fires that occurred from 2000–2010. The General Directorate of Forestry of Antalya is rank second in the number of forest fire.

The firefighting system in Turkey work mostly in post-fire activities. As a result, a major part of the resources are spent in the post-fire extinguishing activities. The GDFs, which effectively managed forest fires, could develop an action plan with their teams waiting in permanent specific sites in case of any fire (after receiving news of fire outbreaks) and to take action (Passive Defense System) (AKKAŞ et al., 2008).

The GDF approach towards fire prevention measures is as follows: "… It is known that forest fires in Turkey are 91% human-related. Accordingly, the basis of all the preventive measures is societal education. Necessary studies should be undertaken to increase social awareness among universities, high schools, elementary schools, villages, cities, military units, summer villages and holiday sites; and among people working in the tourism sector and campers" (DOĞAN, 2009). However, the investment and action planning for fire prevention are insufficient.

"… The fact that forest fires in Turkey are mostly human-related clearly shows the importance of socioeconomic research studies about communities. Therefore, for a country where 91% of forest fires are human-related, it seems more logical to urgently start working to determine "social fire danger factor" according to socioeconomic variables instead of funding efforts to form a risk assessment system

associated with natural variables such as pure flammable substances and weather conditions."(AKKAŞ et al., 2008).

Various national and international studies were conducted on this subject. In a study of the relationships between forest fires and socioeconomic parameters and agroforestry in Portugal, Almeida and Moura (1992) collected agroforestry and socioeconomic parameters that seem related to forest fires from 274 settlement units in Portugal. Eight settlement area groups were identified via principle components analysis and classification. The study identified principle parameters and information that were effective in each group, to act as a starting point for fire prevention.

Almeida et al. (1986) identified 27 variables from 3 large groups (human, livestock and occupations with soil), which were thought to be related to forest fires. The chosen variables were re-arranged for the settlement areas with consistently homogenous zoning because the area had very heterogeneous socioeconomic structure. A data matrix was formed with 274 units and 27 variables. The data were then analyzed to identify inter-relationships.

In a study of "fire protection system and forest fire management", Kallidromitou1 et al. (1999) defined socioeconomic factors and numbers and types of forest fires. In many areas of the Mediterranean region, the root cause of forest fires are socioeconomic factors, which are the basic elements of causality classification. The application of a Socioeconomic Risk Model (SER) is necessary to characterize the predicted number of forest fires within a unit area, and the factors causing them. Appropriate analytic classes were formed by considering the risk factors. Two different methods were used. Five specific factors were revealed for the socioeconomic model by analyzing data from 4 forest areas and qualitative measurements. The Socioeconomic Risk Model (SER) used 156 risk variables. The study area was classified according to 10 main characteristics (Forestry, Livestock, Agriculture, Land Usage, Demographic Structure, etc.) and 48 sub-groups.

In the present study, the socioeconomic factors affecting forest fires were determined via factor analysis of 45 socioeconomic variables. The grouping of villages at provincial and regional level was determined by cluster analysis, based on the same 45 socioeconomic variables. Forest fires from 1998 to 2010 were classified according to their numbers, and relationship functions between socioeconomic variables and forest fires were developed via multiple regression analysis including stepwise regression method.

In the working area of Directorates of Forestry Management of Taşağıl and Serik, forest villages were ranked according to the distribution of forest fires between 1979 and 2010. Factor groups are composed of socioeconomic variables that were identified by factor analysis as being effective in explaining the occurrence of forest fires. Forest villages were also ranked according to factor groups. The forest

villages with the highest number of forest fires mostly paralleled the rankings for socioeconomic causes of forest fires. Therefore, these factors were termed "**social-fire danger factors."**

"**Fire - socioeconomic reasons correlation function**" was determined between socioeconomic reasons and forest fires for forest villages located in the working areas of Directorates of Forestry Management of Taşağıl and Serik. It was seen that the villages with the largest number of forest fires according to the fires between 1979 and 2010 were generally similar to the villages that were in the first rank according to the variables in the present function.

Material and Method

Fire-related data for the study consist of statistical data about forest fires that occurred in the General Directorate of Forestry of Antalya and in Turkey. Socioeconomic data were obtained from the Turkish Statistical Institute (TUİK) and District Governorship of Serik sources, such as the District Directorate of Agriculture, Directorate of Forestry Management of Serik data, and District Governorship of Manavgat to which Taşağıl town is linked, District Directorate of Agriculture of Manavgat, Directorate of Forestry Management of Taşağıl and Regional Directorate of Forestry of Antalya registers.

Table 1—Counts of Sampled Forest Enterprise Directorate and Forest Villages Number

Towns/ Forest Enterprises	Villages Counts
Manavagat/Taşağıl	26
Serik	52
Tolam	78

Forest fires that occurred in villages linked to Directorates of Forestry Management of Serik and Taşağıl and some socioeconomic features of people living in these villages were examined as variables. In this context, the distribution of forest villages examined in the Directorates of Forestry Management of Serik and Taşağıl are given in Table 1. The socioeconomic variables of 78 villages obtained from both Directorates of Forestry Management and the distribution of forest fires that occurred in these villages between 1998 and 2008 were evaluated. Fire and socioeconomic data used in the current study were obtained from the related institutions and organizations via a source scanning method. Articles about the socioeconomic factors

were also evaluated. The socioeconomic factors contributing to fires within the Directorates of Forestry Management of Serik and Taşağıl include 45 variables classified according to the scope of the main subject (Table 2).

Table 2—General Distribution of Socioeconomic Variables

Variable types	Counts
Forest Area Variables	21
Education Level and Populasyon	7
Agriculture and Animal Husbandary	6
Employment Status	3
Çalışan Nüfusun Is Kollarına Dağılımı	5
Forest Number (1998-2010)	1
Forest Fire İndeksi	2
Total	45

The data were evaluated in two stages. In the first stage, fire data of Directorate General of Forestry of Antalya and the Directorates of Forestry Management of Serik and Taşağıl were evaluated with simple statistical evaluations, expressed as total, average, and percentage. In the second stage, socioeconomic evaluations of both Directorates of Forestry Management were conducted, using multiple numerical analysis methods.

The relationship between the number of forest fires that occurred in forest villages and the socioeconomic structure of the village population was examined using factor analysis, cluster analysis and multi regression analysis (Anonymous, 2012). In the factor analysis in the first group, it was seen that many variables were included in the same factor group. Among the first ranked variables, those with factor loads of 0.8 or more were taken into consideration, with the aim of more reliably identifying the most effective variables.

Next, the clustering of the settlements was examined, using the minimum variance clustering (WARD) method (Murtagh and Legendre 2011). This revealed how the settlement units were grouped according to the chosen socioeconomic variables. The grouping of villages was monitored at district and regional levels, using cluster analysis according to the 43 socioeconomic variables. Multi regression analysis was used to examine the relationship between the 43 socioeconomic variables formed for districts and according to the number of forest fires that occurred between 1998 and 2008. Relationship functions between the selected socioeconomic variables and forest fires identified using multiple and stepwise regression analysis.

Discussion and Results

Forest Fires in Regional Directorate of Forestry of Antalya

From 1979 to 2011, over 6,000 forest fires in the Regional Directorate of Forestry of Antalya affected 56,248 hectares (Anonymous, 2011), (Table 3).

A little over 57% of burned forest areas in the Regional Directorate of Forestry of Antalya between 1979 and 2011 were within the borders of the Directorates of Forestry Management of Serik and Tasşağıl. For the selected years the largest area burned was in the Regional Directorate of Forestry of Taşağıl (35%), followed by the Directorate of Forestry Management of Serik (22%) (Anonymous, 2011). The ranking of Directorates of Forestry Management within the Antalya region differs in terms of the number of forest fires between 1979 and 2011 (Anonymous, 2011). When ranking the directorates by the number of fires, the directorate of Forestry Management of Serik is ranked second, whereas the Directorate of Forestry Management of Taşağıl is ranked fifth (Table 3).

Within the Directorate of Forestry Management of Serik, the settlement of Etler reported the highest number of fires (12%); Yumaklar is ranked second (11%), and Akbaş and Alacami (7%) villages are ranked third and fourth (Table 4) (Coşgun and others 2010).

Within the Directorate of Forestry Management of Taşağıl, the settlement unit with the highest number of fires is Sağirin village (13%), followed respectively by Çardak village (11%), Bozyaka, Karabük (9%), and Altınkaya village (8%) (Table 5) (Coşgun and others 2010).

Table 3—Forest Fire Area in the Forest Enterprises from 1979 to 2011

Forest Enterprises	Number of fires	Total Area
Aksek	363	727.29
Alanya	692	3098.65
Antalya	1255	5869.57
Elmali	35	153.49
Finike	162	1042.45
Gazipaşa	385	1345.20
Gündogmuş	346	1976.91
Kaş	578	2971.79
Korkuteli	78	117.78
Kumluca	372	3176.10
Manavgat	721	3688.31
Serik	908	12460.96
Tasşağıl	591	19619.71
Total	6486	56248.21

Table 4—Distribution of Forest Fires Occurred In Accommodation Unit of the Directorate Land of Serik Forest Enterprises (1998–2008)

Village name	1	5	20	50	200	500	500+	Toplam
Akbas	14	4	1	2	2	1	1	5
Akcapınar	1							1
Alacamı	22	1			1			24
Asagıoba	2	2						4
Belek	9	3						12
Bılgınler	11		1					12
Bozdogan	9	3						12
Bucak		4						4
Bugus	5	1		1		1		8
Catallar	6	1						7
Demırcıler	4	2						6
Denıztepesı	5	2						7
Etler	38	5						43
Gebız	15	3	1	1				20
Gokcepınar	19		1					20
Hacıosmanlar	1							1
Hasdumen	7	3						10
Hasgebe	8	1	1					10
Haskızıloren	3							3
Kadrıye	7	1						8
Kayadıbı	3							3
Kırbas	13	3						16
Kozan	14	4						18
Kumkoy	16	1	1	1				19
Sarıabalı	7	4						11
Serık	1							1
Tekke	1							1
Tonguclu	11							11
Yesılvadı	3							3
Yesılyurt	3		1					4
Yumaklar	37	4	1					42
Zırlankaya	1							1
Total	296	52	8	5	3	2	1	367

Table 5—Distribution of Forest Fires Occurred in Accommodation Unit of the Directorate Land of Taşağıl Forest Enterprises (1998–2008)

Village name	1	5	20	50	200	500	500+	Total
Altınkaya	13	3	1					17
Ballıbucak	7	2						9
Bereket		1	1					2
Beydıgın	7	5	1					13
Bozyaka	11	6					1	18
Burmahan	6						1	7
Cakıs	1							1
Cardak	17	5	2					24
Cavuskoy	1							1
Degırmenozu		2						2
Demırcıler	1	1						2
Denızkent	1	1						2
Duzagac	3	2						5
Gazıler	1	1						2
Gundogdu	5	1						6
Hocalar	5	1	1					7
Karabucak	1	4						5
Karabuk	15	3						18
Kırkkavak	3	2						5
Kısalar	1							1
Kızıldag	4	5	1					10
Sagırın	18	7	1				1	27
Salur	1							1
Tasagıl	8	2	1	1				12
Yavrudogan	7	2						9
Yesılbag	1		1			1		3
Yesılvadı	1							1
Total	139	56	10	1		1	3	210

Socioeconomic Factors related to Fires within Directorates of Forestry Management

The relationship between fires that occurred in the Directorate of Forestry Management of Taşağıl and socioeconomic factors was determined by factor analysis (Tables 6, 7, and 8).

The consistency of the variables used in the factor analysis was tested with KMO (Kaiser-Meyer- Olkin Test) (Kaiser 1974, Cemi and Kaiser 1977) (Table 6). The matrix of variables shows that 4 factors have a high explanatory power of 84.7% (Table 7).

Table 6—KMO and Bartlett's Test of Factor Analysis for Taşağıl Directorate of Forestry Management

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0.565
Bartlett's Test of Sphericity	Approx. Chi-Square	206.414
	df	55
	Sig.	0.000

Table 7—Total Variance Explained of Factor Analysis for Taşağıl Directorate of Forestry Management

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squares Loadings			Rotation Sums of Squares Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulat %
1	3,735	33.95	33.95	3,735	33.95	33.95	3,166	28.78	28.78
2	2,400	21.82	55.77	2,400	21.82	55.77	2,306	20.97	49.748
3	1,877	17.07	72.84	1,877	17.07	72.84	2,033	18.48	68.228
4	1,306	11.87	84.71	1,306	11.87	84.71	1,814	16.49	84.71

Table 8—Rotated Component Matrix of Factor Analysis for Taşağıl Directorate of Forestry Management

Rotated Component Matrix				
Variables	**Component**			
	1	**2**	**3**	**4**
KPL3	0.887			
BNT3	0.867			
GLSMCGC	0.928			
M4	0.844			
ILKMZN		-0.856		
INSTSNY		0.902		
HBNUF		0.764		
KPL1			0.949	
GLSMCGA			0.971	
M3				0.888
HBKBHS				0.905

The analysis shows that there are different variables within four factors (Table 8). The relationship between forest fires and socioeconomic factors includes variables such as the proximity to forests, site (place of growth, productivity power class), age structure of stands, and fire danger class. This factor may be termed "high-value-quality forest areas qualification". The second factor includes elementary school-graduate, population working in the construction sector, and population per household variables. This factor can be termed "education and employment". The third factor, termed "low-value forest areas qualification", includes stand closure and age structure variables. The fourth factor, "sheep and goat farming with low-risk forest area", includes fire risk and the presence of small livestock per household (sheep and goats). Villages are divided into 2 classes in this classification (Figure 1). Two villages in the second group have the lowest incidence of forest fires. The first group is composed of villages such as Beydiğin, Karabucak, Karabük, Sağirin and Bozyaka, most of which are in the upper group in terms of the number of fires.,

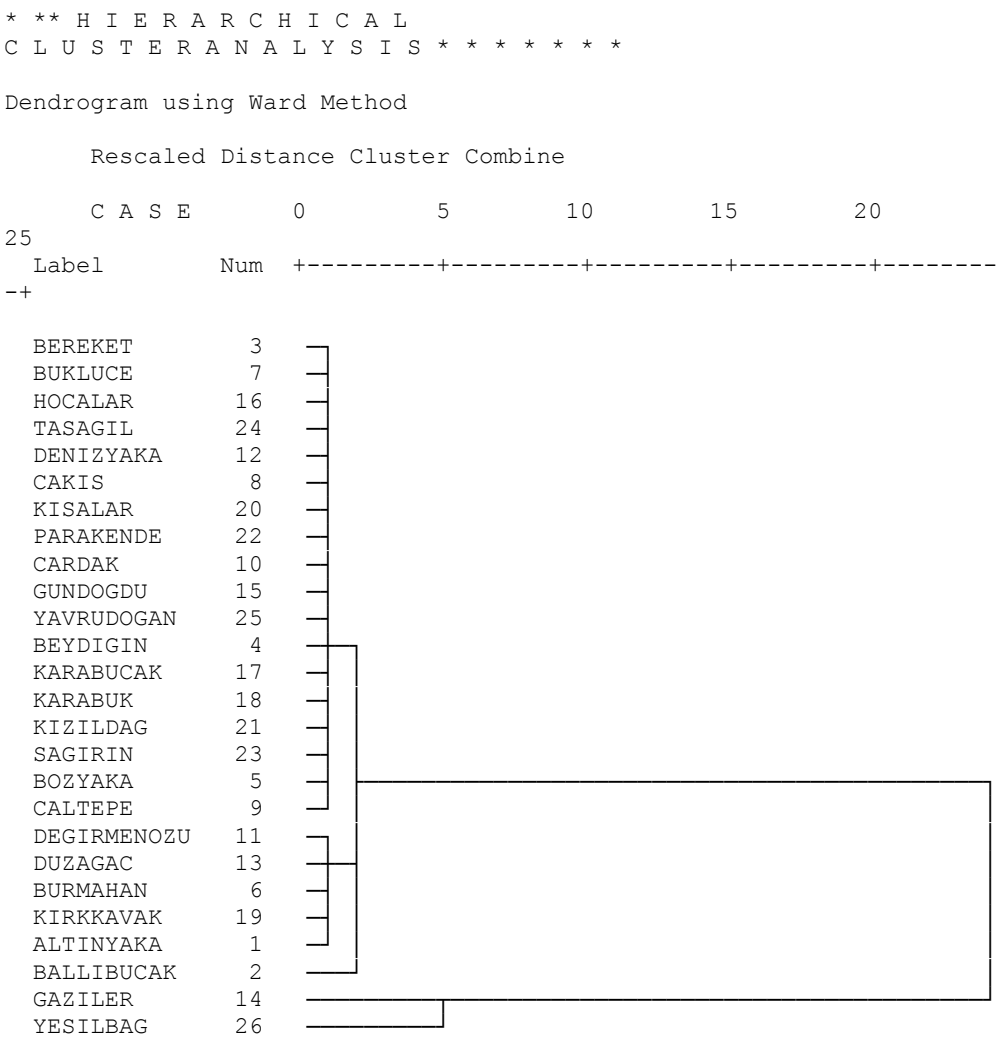

Figure 1—Forest Villages Ranking According to Socioeconomic Factors for Taşağıl Directorate of Forestry Management

The villages of Burmahan, Kırkkavak, and Ballıbucak (except Altınkaya village) in the second sub-group, have a medium ranking in terms of the number of fires. The results of multi regression analysis between socioeconomic factors and the number of fires within the Directorate of Forestry Management of Taşağıl are consistent, and the relationship between variables has a high R^2 value (Table 9). In the relationship between number of fires and socioeconomic factors, variance analysis shows the significance of the coefficient and variables explaining the equation (Table 10).

Table 9—Regression Model Summary on Relationship Between Number of Fire and Socioeconomic Factors in the Taşağıl Directorate of Forestry Management

Model Summary									
				Change Statistics					
R	R^2	Adjusted R^2	Std. Error	R^2 Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
0.878[d]	0.772	0.728	4.753	0.154	14.202	1	21	0.001	1.679

Table 10—Regression Anova Analysis on Relationship between Number of Fire and Socioeconomic Factors In the Taşağıl Directorate of Forestry Management

ANOVA					
Model	**Sum of Squares**	**df**	**Mean Square**	**F**	**Sig.**
Regression	1604.01	4	401.00	17.75	0.000[d]
Residual	474.50	21	22.60		
Total	2078.50	25			

The equation describing the relationship between socioeconomic factors and forest fires within the Taşağıl Directorate of Forest Management between 1979 and 2011 is:

Y = -63.019 + 0.274 KPL1 – 0.211 HBTARALN + 3.143 SIINDSK + 0.642 GLSMSGD (Table 11).

Table 11—Regression Anova Analysis Coefficients on Relationship between Number of Fire and Socioeconomic Factors in the Taşağıl Directorate of Forestry Management

	Coefficients				
	Unstandardized		Standardized		
Model	**Beta**	**Std. Error**	**Beta**	**T**	**Sig.**
Constant	-63.019	15.769		-3.996	0.001
KPL1	0.274	0.070	0.42	3.886	0.001
HBTARALN	-0.211	0.052	-0.499	-4.094	0.001
SIINDKS	3.143	0.703	0.626	4.471	0.000
GLSMCGD	0.642	0.170	0.513	3.769	0.001

Relationship between Socioeconomic Factors and Fires in Serik Directorate of Forest Management

The relationships between socioeconomic factors and forest fires within the Serik Directorate of Forest Management were determined by factor analysis (Tables 12, 13 and 14). The consistency of variables used in the factor analysis was tested with KMO test (Table 12).

Table 12—KMO and Bartlett's Test of Factor Analysis for Serik Directorate of Forestry Management

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.670
Bartlett's Test of Sphericity	Approx. Chi-Square	757.329
	Df	91
	Sig.	0.000

In the matrix of variables obtained, four factors have a high explanatory power (86.7%) (Table 13).

Table 13—Total Variance Explained of Factor Analysis for Serik Directorate of Forestry Management

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squares Loadings			Rotation Sums of Squares Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4,748	33.916	33.916	4,748	33.916	33.916	4,471	31.932	31.932
2	3,360	24.002	57.919	3,360	24.002	57.919	2,963	21.166	53.098
3	2,494	17.813	75.732	2,494	17.813	75.732	2,837	20.268	73.366
4	1,530	10.926	86.658	1,530	10.926	86.658	1,861	13.292	86.658

There are different variables in four factors (Table 14). The first factor in the relationship between forest fires and socioeconomic factors includes the employment status variables according to population and sectors. This factor can be termed “population and employment sectors”. The second factor, named “coniferous mixed and damaged/low-quality forests”, includes forest areas that have a damaged site, coniferous mixed forests, and low fire risk forest areas variables.

The third factor, named “young aged and qualified forest areas and uneducated population” comprises qualified stand closure status and stand development period, forests with a medium-degree fire risk and population variables, which is the education variable. The fourth factor, named “high risk damaged forests”, includes forests with high fire risk and damaged forest areas.

Table 14—Rotated Component Matrix of Factor Analysis for Serik Directorate of Forestry Management

Rotated Component Matrix

Variables	Component			
	1	2	3	4
HBACNP	0.939			
HBNUF	0.937			
TARORMISTHDM	-0.899			
INSTSNY	0.869			
TICLKNTOTEL	0.898			
BNT4		0.964		
M5		0.960		
IBRKAR		0.886		
KPL3			0.922	
GLSMCGB			0.850	
OKBLMYN			0.583	
M3			0.907	
BZK				0.932
M1				0.963

The analysis of fire numbers and socioeconomic variables indicated two classifications (Figure 2). The villages in the first class are large villages and even some that became towns, such as Belkız, Kadriye, Çandır, Karadayı, Abdurrahmanlar, Boğazkent, Kocayatak, and Belek. Because of lack of data the number of fires in the villages in this group could not be determined. Only two villages are in the group with the lowest number of fires. Belek village is in the middle class in terms of number of forest fires. When Belek is excluded, villages in this group transformed into town and were categorized under a sub-group. Similarly, it is interesting that forest fires did not occur in the majority of these villages. Therefore, in terms of the selected socioeconomic variables and number of fires for the years 1979 to 2011, the variables is consistent.

The villages in the second group are more complicated (figure 2). Results show that these villages are divided into two more sub-groups, comprising villages that are mostly in the middle and upper class in terms of the number of forest fires. The equation obtained via multi regression analysis between the number of fires in the Directorate of Forest Management of Serik and socioeconomic factors is consistent, and the relationship between the variables shows a relative high R^2 value of 0.53% (Table 16). In the relationship between the number of fires and socioeconomic factors, analysis of variance indicates that the coefficients and variables that explains the equation are significant (Table 17).

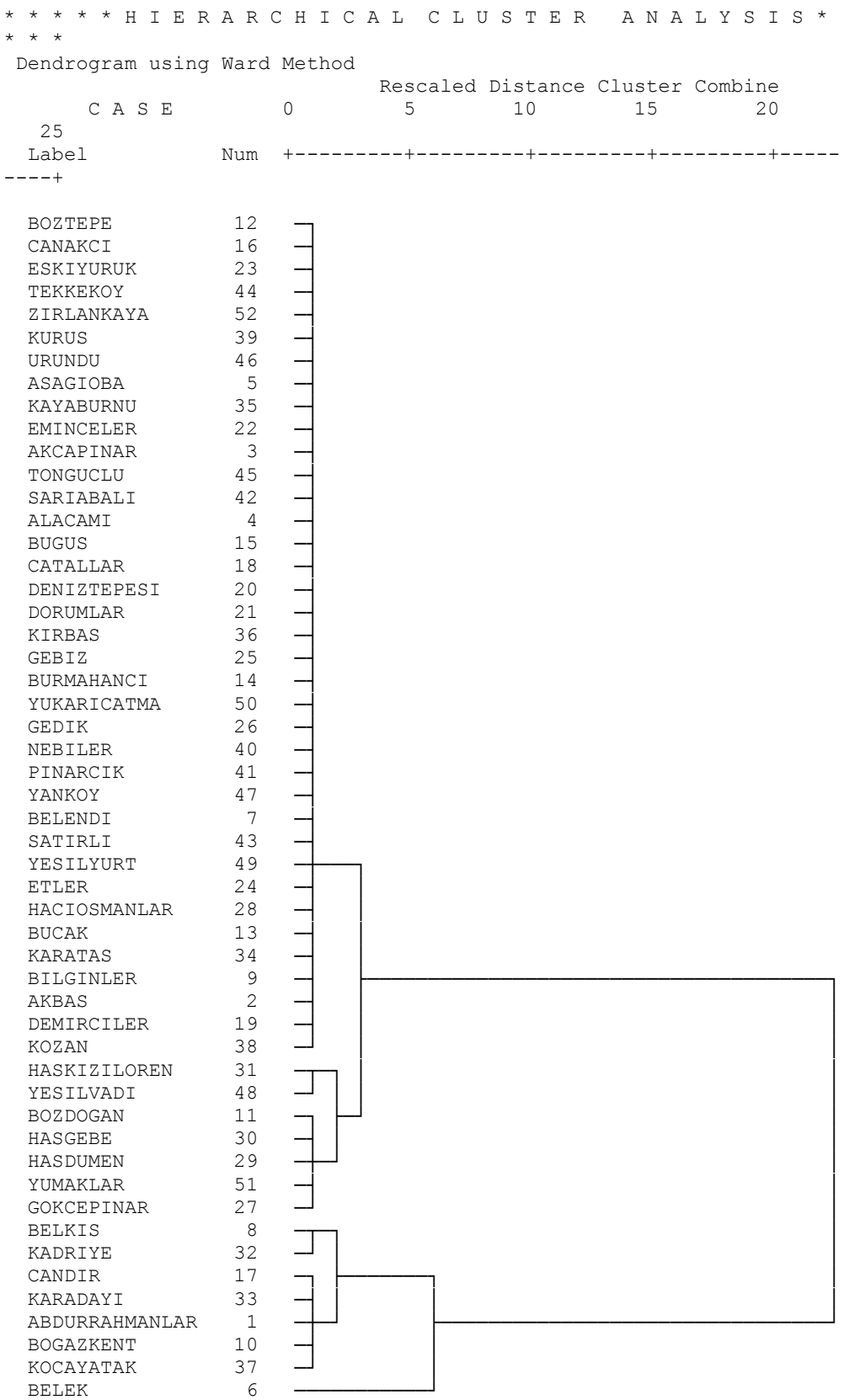

Figure 2: Forest Villages Ranking According to Socio Economic Factors for Serik Directorate of Forestry Management

Table 16: Regression Model Summary on Relationship Between Number of Fire and Socioeconomic Factors in the Serik Directorate of Forestry Management

Model Summary									
			Std.	Change Statistics					
R	R^2	Adjusted R^2	Error of Estimate	R^2 Change	F Change	df1	df2	Sig. F Change	Durbin-Watson
0.730[e]	0.532	0.482	7.218	0.053	5.234	1	46	0.027	1.77

Table 17: Regression Anova Analysis on Relationship between Number of Fire and Socioeconomic Factors In the Serik Directorate of Forestry Management

ANOVA					
Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	2727.873	5	545.575	10.472	0.000
Residual	2396.435	46	52.096		
Total	5124.308	51			

Table 18: Regression Anova Analysis Coefficients on Relationship between Number of Fire and Socioeconomic Factors In the Serik Directorate of Forestry Management

Coefficients					
Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	89.889	21.670		4.148	0.000
BNT3	0.368	0.147	0.283	2.511	0.016
SIINDKS	-3.723	0.915	-0.527	-4.07	0.000
BNMINDKS	-0.018	0.006	-0.412	-3.308	0.002
GLSMCGA	0.207	0.083	0.269	2.505	0.016
ISSIZ	1.560	0.682	0.236	2.288	0.027

The equation describing the relationship between socioeconomic factors and forest fires in the Serik Directorate of Forest Management from 1979 to 2011 is: Y = 89.889 + 0.368 BNT3 – 3.723 SIINDKS – 0.018 BNMIDKS + 0.207 GLSMSGA + 1.560 ISSIZ. (Table 18).

The relationship between forest fires and socioeconomic variables is done by multi regression analysis. This is a highly significant stage. In the present study, the function “fire-socioeconomic reasons relation” between socioeconomic variables and

forest fires was determined for the forest villages located in the working area of Directorate of Forest Management of Taşağıl.

The results shows that the number of fires is directly proportional with a closed forest area, indirectly proportional with an agricultural area per household, in direct proportion to temperature index variable and in direct proportion to forests composed of "D" aged stands.

Important findings are observed when we rank the villages according to the indirectly proportional variables and when we look at the top-5 ranked villages for each variable: Within the Taşağıl Directorate of Forestry Management, this comparison shows that the majority of the villages have a high number of forest fires (Table 19).

Table 19: Forest Villages Ranking According to Function of Relationship Between Number of Fire and Socioeconomic Factors In the Taşağıl Directorate of Forestry Management

VILLAGES	KPL1	VILLAGES	HBTARALN	VILLAGES	SIINDKS	VILLAGES	GLSMCGD
YAVRUDOGAN	53.88	BALLIBUCAK	6.25	BOZYAKA	24.70	ALTINYAKA	33.58
CARDAK	49.70	KIRKKAVAK	8.55	CARDAK	24.64	KARABUK	15.59
HOCALAR	36.52	BOZYAKA	9.87	BEYDIGIN	24.61	BALLIBUCAK	12.91
TASAGIL	32.37	DUZAGAC	9.97	KARABUK	24.61	GAZILER	11.88
ALTINYAKA	25.98	BEYDIGIN	11.42	TASAGIL	24.60	CALTEPE	11.82

The "fire socioeconomic reasons relation function" between socioeconomic variables and forest fires was determined for the forest villages within the Serik Directorate of Forestry Management. The results show that the number of fires is in direct proportion to the third class of site forest areas, in indirect proportion to temperature index and relative humidity index variables; and in direct proportion to forests composed of "A" aged stands and local unemployment levels.

When the "fire- socioeconomic reasons relation function" ranking for forest villages in the Serik Directorate of Forestry Management is compared with fires that occur in villages, the relationship shows that the villages that have a high number of forest fires are in that ranking (Table 20).

Table 20: Forest Villages Ranking According to Function of Relationship Between Number of Fire and Socioeconomic Factors In the Serikl Directorate of Forestry Management

VILLAGES	BNT3	VILLAGES	SIINDKS	VILLAGES	GLSMCGA	VILLAGES	ISSIZ
ALACAMI	30.56	DEMIRCILER	20.03	BILGINLER	62.16	KADRIYE	6.28
DORUMLAR	28.20	BOZDOGAN	20.16	BUGUS	46.71	BELEK	4.66
BUGUS	26.45	YESILVADI	20.23	DENIZTEPESI	39.32	YESILVADI	3.11
GEBIZ	19.32	HASKIZILOREN	20.23	SARIABALI	32.07	TONGUCLU	1.57

Conclusions

Studies of forest fires can be examined in various dimensions. The first dimension could be the examination of the relationships between the values of the number of fires per year and burned areas. The second stage of studies on understanding fires would examine the 'fire triangle' of fire causes (1. inflammable material; 2. oxygen; 3. temperature), the relationship between climate elements, number of fires and burned areas. The third stage comprises modeling studies of the content of flammable substances and their density, etc., which represent an important dimension in understanding forest fires. The most important dimension for understanding forest fires in developed, developing and undeveloped countries is the relationships between socioeconomic factors and, size of burned area and the number of fires.

In the present study, we specifically evaluated the relationships between the number of fires and socioeconomic factors. The first stage determined the socioeconomic variables that are important for forest fires. The socioeconomic variables included in each group were determined by factor analysis. These factors are also effective in the occurrence of forest fires.

According to these factors, classification of the forest villages in the area of study shows that the villages rank by the number of fires occurring for the period 1979 to 2008 track very well the resulting factors. Therefore, these factors should be named as "**social-fire danger factors**".

Cluster analysis is an important indicator as it shows that villages can be grouped according to socioeconomic variables. This analysis method can be used as a complementary analysis method as it allows supporting the evaluations obtained in the process of analyzing forest fires and socioeconomic variables.

An important finding of this work is that the number of fires is directly proportional with a closed forest area, indirectly proportional with an agricultural area per household, in direct proportion to temperature index variable and in direct proportion to forests composed of "D" aged stands. Also, when ranking the villages according to the indirectly proportional variables and when we look at the top-5 ranked villages for each variable within the Taşağıl Directorate of Forestry Management, this comparison shows that the majority of the villages have a high number of forest fires.

The "fire socioeconomic reasons relation function" between socioeconomic variables and forest fires was determined for the forest villages within the Serik Directorate of Forestry Management. The results show that the number of fires is in direct proportion to the third class of site forest areas, in indirect proportion to composed of "A" aged stands and local unemployment levels.

When the "fire- socioeconomic reasons relation function" ranking for forest villages in the Serik Directorate of Forestry Management is compared with fires that occur in villages, the relationship shows that the villages that have a high number of forest fires are in that ranking.

The relationship between forest fires and socioeconomic variables can differ between regions (Coşgun, et al. 2010). It is known that variables have different values in different regionstemperature index and relative humidity index variables; and in direct proportion to forests.

Their effects also differ in magnitude within the analyses.

Results of this work shows that a variable that is effective in one region is not necessarily effective in another region. It is also normal that there are different variables for each region. Therefore, separate evaluations should be made for different regions.

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