Investigation of socio-economic factors affecting sustainable rangeland use

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Abstract. This study was carried out in 11 provinces which have more range improvement projects than others in Turkey. The population of this study was the total of the households (producers) in the villages were the study was implemented between 1998-2013. Sampling volume was determined as 719 according to stratified sampling methods, taking into consideration the number of households in the villages. The data obtained were analysed by the methods of Chi-square and Multinomial Logistic Regression and interpretations were made according to the analysis results. It was determined that age and education level of the producers do not have a significant effect on the sustainability of the rangelands. It was found that the effects of the total land ($p<0.05$) and the aim for ranching on sustainability ($p<0.01$) were statistically significant. The participation rate in the rangeland improvement works was sufficient (51.5%).In respect to socio-economic factors, it was found that rangeland improvement works were not successful, the sustainability of rangelands could not be continued, rangeland improvement works were not adopted and sustainable rangeland use was not realized by the current rangeland improvement works.

Keywords. Rangeland improvement and management works – Sustainability of rangelands – Turkey.

Enquête sur les facteurs socio-économiques influant sur la gestion durable des parcours naturels

Resume. *Cette étude a été réalisée dans 11 provinces qui ont plus de projets d'amélioration des parcours que les autres. Trois régions ont été formées avec les provinces, ayant chacune les mêmes caractéristiques. La population de cette étude était l'ensemble des ménages (producteurs) dans les villages où l'étude a été mise en œuvre entre 1998-2013. Le volume d'échantillonnage a été déterminé comme 719 selon les méthodes d'échantillonnage stratifié, en prenant en considération le nombre de ménages dans les villages. Les données obtenues sont analysées par les méthodes de Chi-carré et la régression logistique multinomiale, et les interprétations sont faites selon les résultats d'analyse. Il est établi que l'âge et le niveau d'éducation des producteurs n'avaient pas d'effet significatif sur la durabilité des pâturages dans les analyses réalisées. On constate que les effets de la quantité totale de terres (p <0,05) et le but de l'élevage sur la durabilité (p <0,01) sont statistiquement significatifs. Le taux de participation aux travaux d'amélioration des pâturages est de niveau suffisant (51,5 pour cent). Concernant les facteurs socio-économiques, il a été constaté que les travaux d'amélioration des pâturages n'ont pas réussi, la durabilité des parcours ne pouvait pas être poursuivie, les travaux d'amélioration des parcours n'ont pas été adoptés et l'utilisation durable des parcours n'a pas été réalisée par les travaux d'amélioration des parcours actuels.*

Mots clés. *Amélioration des parcours et travaux de gestion – Durabilité des pâturages – Turquie.*

I – Introduction

Rangelands in Turkey are fully owned by the state and the right to use them is allocated to villages and municipalities. Rangelands are not subject to private ownership, they cannot be misused (the proper use of rangelands are to obtain forage according to legislation in Turkey), prescription is not applied for them and their boundary lines are not restricted.

The source of roughages in Turkey is meadows by means of mowing 5 percent of natural vegetation and 95 percent of the rangelands and summer pastures by means of grazing. Meadows and rangelands in every country are the cheapest feed sources. However,

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rangelands have not been regarded as areas that meet the growing and improving needs of plants and feed needs of animals. Therefore, they have been used in a way that has degraded them, destroying vegetation and making them unproductive. It affects not only livestock production but other agricultural activities, general economy and the future of Turkey. There are six main reasons for degradation of rangelands: over grazing, early grazing, drought, uncontrolled grazing, burning and weed invasion (Ekiz *et al.*, 2001).

Nearly all the producers of the villages in which the rangelands improvement and management works are carried out are of the last subgroup in respect to income and education level. The Ministry of Food, Agriculture and Livestock (MFAL) that is responsible for the management of the rangelands should undertake extension activities for producers about gaining income from ranching which can be possible if rangelands are used in optimum way. To protect the rangelands from negative uses and to increase forage yield, 1,032 range improvement and management projects covering 4,715,396 decares have been implemented between 1998 and 2013. Not only the ranchers but also the views and conditions of other individuals living in the villages should be paid attention for the sustainable rangelands use. For this aim, 11 improvement and management works in three regions of Turkey were implemented, the current uses of rangelands are presented and the effects these works on producers are tried to determine.

II – Materials and methods

The scope of the study is the villages of 11 provinces that have the highest areas of rangeland improvement works. The statistics belonging to the villages were obtained from the Plant Production General Directorate of MFAL. Sample unit was the farms in those villages. Data come from the face to face interviews with the 719 producers who were chosen randomly from those villages. The provinces in the study were divided into three regions according to their similarity in terms of production. Region 1 comprised the provinces of Bursa and Edirne, Region 2 Afyonkarahisar, Aksaray, Niğde and Uşak and Region 3 Ardahan, Artvin, Çorum, Erzurum and Kars. Multinomial Logistic Regression based on likelihood ratio test was used to determine the effect of socio-economic characteristics on sustainability. Moreover, logistic regression assumptions such as normality, linearity and homogeneity of variance were examined and it was found that the assumptions were proved. IBM SPSS v20 statistical program was used in the analyses.

III – Results and discussion

The ages of producers are between 23 and 81, with an average of 50.4 years. 71.6 %of the producers graduated from primary school and they are the most abundant in Region 2 (75.2%). It was found that there is a statistically significant relationship between education levels and regions ($p<0.05$). Majority (97.9%) of the producers live in a rural area. Moreover 29.2% of them have an off-farm income and a big part of them are pensioners from BAĞ-KUR, an insurance directorate of Turkey. Other off-farm incomes come from shop keeping and workmanship.

The Multinomial Logistic Regression was used to determine which socio-economic variables have been effective on sustainability. The compliance test of the model was done using the method of stepwise backward elimination. In step 1, except the region, it was found that the other socio-economic characteristics have no significant effect on sustainability view ($p>0.05$). After omitting these variables, the model passed through step 2. According to this model it can be said the region has a significant effect on the sustainability view ($p<0.001$). The examination related to the variable classes that are effective on sustainability view is given in Table 1. "Region" variable was the only statistically significant (Table 1). As it is seen in Table 1, the probability that a producer says "rangelands is sustainable" varies among regions ($p<0.001$). The producers saying probability of "rangelands can be sustainable" instead of saying not in first

region is exp(B)=11.162 times more than the ones in third region. The probability of producers saying "rangelands cannot be sustainable" instead of "sustainable" in Region 2 is 4.853 times more than in third region.

Table 1. Results of the Multinomial Logistic Regression for the "Region" variable

Sustainability[†]	Region	B	SE	Wald	df[♥]	Exp(B)
I haven't decided yet	1	1.659	0.250	43.932***	1	5.252
	2	1.093	0.292	14.065***	1	2.984
	3	0.000[♣]	-	-	0	-
Sustainable	1	2.413	0.366	43.442***	1	11.162
	2	1.580	0.412	14.671***	1	4.853
	3	0.000[♣]	-	-	0	-

[†]Reference Class: Unsustainable, [♣]This parameter is set to zero because it is redundant (The standard error cannot be calculated for this, of course, since the parameter is set to zero).
[♥]Degrees of Freedom, *p<0.05, **p<0.01, ***p<0.001 SE: Standard Error

The variables of producers' land and animals tenure were examined, too. Average land size is 99.2 decares. Average land size in Region 1 is 91.2, 111.3 in Region 2, and 108.6 in Region 3. According to the chi-square analysis, there is a statistically significant relationship between the total land of producers and regions (p<0.01). 6.1%t of the producers has no land, 53.4% of the producers less than 61 decares, 22.9% has from 62-150 decares and 17.5% over 150 decares. The highest percentage of producers who have no land was observed in Region 2 (6.7%). Region 1 has the highest percentage of producers (62.8%) with less than 61 decares land. Animal numbers were investigated to see the effects of farm structure on sustainability. 87.6 of the producers have no sheep and goats in terms of animal numbers. 2.1 percent of them have 1-3 animal units, 2.6% have 4-10 animal units and 7.6% have more than 10 animal units. The producers who have not sheep and goats are mostly with 92.1% in Region 3. According to the chi-square test, it was found that there is a statistically significant relationship between sheep and goats numbers and regions (p<0.001). In terms of cattle's numbers, 43.8% of the producers have no cattle, 7.9% of them have 1-5 animal units, 21.7% have 6-15 animal units and 26.6% over 15 animal units. It was found that there is a statistically significant relationship between cattle numbers and regions (p<0.001). In terms of total animal numbers, 38% of the producers have no animals, 7% of them have 1-5 animal units, 22.1% have 6-20 animal units, 14.5% have 21-40 animal units and 18.6% have over 40 cattle unit. It can be said there is statistically significant relationship between total animal numbers and regions (p<0.001).

Moreover, it is thought that the aim of ranching can have effects on sustainability. It was found that 60.4% of the producers produce for market, 30% of them for environmental factors (geographical factors-altitude, climate, topography etc.) and 9.6% for family consumption.

The effects of land, animal numbers and aim for ranching on sustainability thoughts were analysed. It was implemented a Multinomial Logistic Regression to determine which farm profile variables had an effect on sustainability. In step 1, animal numbers did not show a significant effect on sustainability views. The model after extracting this variable is given in step 2. According to the model, total land and aim for ranching were statistically significant on the sustainability views of farmers (p<0.05). The examination related to the variable classes that are effective on sustainability views is given in Table 2 with Multinomial Logistic Regression, where total land is the ordinal and the aim for ranching is the nominal variable. The probability of producers who ranch for family consumption saying "rangeland use is sustainable" against "not" is significantly different than that of the producers who ranch for environmental factors and the difference is 22.105 times for the producers who ranch for family consumption. Similarly, the probability of the producers who ranch for market saying "rangelands use is sustainable"

against "not" is significantly different than that of the producers who ranch for environmental factors and the difference is 23.826 times for the producers who ranch for market.

Table 2. Results of Multinomial Logistic Regression for the effects of the farm profile on sustainability views

Sustainability[†]	Factor	Level	B	SE	Wald	df[▾]	Exp(B)
I haven't decided yet	Total land	None	-1.697	1.093	2.410	1	0.183
		≤61	-0.545	0.295	3.417	1	0.580
		62-150	-0.028	0.337	0.007	1	0.972
		>150	0.000[♣]	-	-	0	-
	Aim for ranching/grazing?	Family consumption	0.603	0.448	1.812	1	1.828
		Producing for market	0.773	0.263	8.624**	1	2.167
		Environmental factors	0.000	-	-	0	-
Sustainable	Total land	None	0.661	0.663	0.992	1	1.936
		≤61	-0.079	0.363	0.047	1	0.624
		62-150	0.633	0.412	2.359	1	1.884
		>150	0.000[♣]	-	-	0	-
	Aim for ranching	Family consumption	3.092	0.699	19.583***	1	22.015
		Producing for market	3.171	0.608	27.155***	1	23.826
		Environmental factors	0.000[♣]	-	-	0	-

[†]Reference Class: Unsustainable, [♣]This parameter is set to zero because it is redundant (The standard error cannot be calculated for this, of course, since the parameter is set to zero). [▾]Degrees of Freedom. *p<0.05, **p<0.01, ***p<0.001 SE: Standard Error.

IV – Conclusions

According the results, age and educational level and animal numbers have no effect on farmers' thoughts on sustainable rangeland use. Because of the environmental factors, 74.8% of the ranchers stated that sustainability of rangelands cannot be possible. The probability of ranchers who produce for market saying "rangelands use can be sustainable" is 23.826 times more than the producers who ranch for environmental factors. It was found that in order to sustain rangelands, animal numbers should be increased so that the number of ranchers will increase. 51.5% of the producers participated in improvement works and 48.5% of them not. The producers who participated to improvement works took the agricultural equipment and labor as support. The producer's participation is enough for sustainable rangelands use. If other conditions are provided, it can be said that participation in the works can have positive effect for sustainable rangelands use. The factors that affect the most the sustainability of rangelands are the producers changing their old habits, acquiring technical support and applying the rules provided by rangeland law and its regulations. If these conditions are met sustainable rangeland use will be much more. As a result, it was determined that socio-economic variables have no effect on rangelands improvement works and sustainable rangeland use but the animals in farm and the aim for ranching have an effect on rangelands improvement and management works. Therefore, to sustain rangelands use, training activities about rangeland importance and use should be carried out, animal numbers increase and the improvement works have to be determined considering rangeland structure.

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