

## **A CASE STUDY FOR PRODUCTION SYSTEM ANALYSIS OF TURKISH ANGORA GOAT FARMS**

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### **Abstract**

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The aim of this study was to determine both the current economic situation and the major characteristics of Angora goat farms. For this study, 100 goat farms were surveyed in the Ankara province, specifically, the Polatli, Gudul, Ayas, Bepazari, and Nallihan district, to examine the role breeding plays in the rural economy. In addition to technical analyses of Angora goat production, some outstanding traits of Angora goats were determined. There were no significant differences among the Polatli, Nallihan, Ayas and Gudul provinces, except for the Bepazari province in terms of goat population ( $P < 0.05$ ).

Over the last twenty years, the number of angora goats has decreased by almost 89%. Total mohair, milk and meat production has slumped because of the decrease in goat numbers. The main income of these farms is obtained from mohair, meat and the sale of live animals. Most of the milk produced from the goats is consumed by the families of the farmers. Concentrated feed is used by the majority of farms when the goats are housed in pens, especially in wintertime. Among farmers, 91% declared the use of concentrated feed throughout the entire year, whereas 9% of them use it only in wintertime.

*Key words:* Angora goat, farms, production, Turkey, marketing

### **Introduction**

Zander et al. (2008) reported that, domestic animal diversity is the result of communities of livestock-keepers managing their animal genetic resources (AnGRs) according to their own preferences and needs over thousands of years of domestication (Anderson, 2003). Local farmers have developed over time in traditional societies without the use of

formal herd books and highly technical interventions. They represent an important genetic resource particularly in terms of adaptive traits (e.g., disease resistance, drought tolerance, ability to survive on poor diets, ability to walk long distances). A loss of such animal genetic diversity may weaken the chances of future generations to respond adequately to increasing food demand, potential environmental changes (including climate change), disease and other challenges

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and catastrophes we cannot foresee (Koehler-Rollefson, 2002). Angora goats are one of the native breed that of raised particularly for mohair production which is a raw material for textile industry. Not only provide an important source of cash income to farmers through sales of their mohair and their meat, or of the animals themselves, but they are also an important resource for meat and milk, which are high-quality protein supplements, for rural people (Hunter, 1987). The name Angora from which the breed comes (breed comes) originated from ancient name of Ankara, which is located in Central Anatolia and has been the capital of Turkey since 1930 (Yalcin, 1986). Angora goat farms are located mainly in the lowland areas of Central Anatolia. They can also be found in small numbers in some southeastern provinces of the country. Turkey, the USA, and the Republic of South Africa are among the leading countries of the world in Angora goat breeding (Gunes et al., 2002; Van der Westhuysen, 2005).

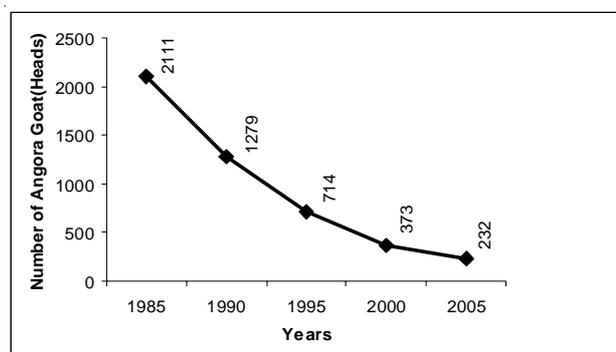
Angora goat farms have been relatively insensitive to external factors, such as the globalization of state economics and regional marketing situations. Comparing Turkish Angora goats with North American and South African goat is important in order to improve their productivity in terms of mohair (Morand Fehr and Boyazoglu, 1999). Data from TURKSTAT (2007) indicates that over the last twenty years the number of Angora goats in Turkey has decreased by almost 89% (Figure 1). This decrease is principally related to socio-economic and political factors, such as migration from rural areas, reduced income from mohair production compared to milk and meat production, insufficient support for Angora goat breeders and restrictions on goat rearing close to woodland areas.

This paper summarizes the Turkish Angora goat and its associated production systems in terms of current technical, economic and social structures.

## Material and Methods

### *Study site*

The Angora goat is perfectly adapted to Central



**Fig. 1. Angora goat population in Turkey over the past 20 years (TURKSTAT, 2007)**

Anatolia because of its steppe conditions (Orkiz, 1980). For this reason, this study was conducted in the Central Anatolian district of Turkey's capital city, Ankara. This site is located between 32:52°E, 39:56°N at an intersection point of highways connecting east to west and north to south through Anatolia. The city is like a pot between four mountains in the Anatolia Plateau, with an altitude of 850-1000 meters. The steppe climate is dominant in Ankara province and, therefore, the summers are warm and dry and the winters are cold and snowy. For this study we administered a public survey that was applied to five districts (Polatli, Gudul, Ayas, Beypazari, and Nallihan) of Ankara province (Figure 2).

### *Sampling procedures, data collection and analysis methods*

Production systems, herd structures, number of animals and membership in the Turkish Mohair Association were used as the main criteria for defining the villages and districts of this study. Accordingly, five districts were selected to consider the number of Angora goat farms. Each district has an animal population of cows, sheep, poultry, and bees, but most farms are dominated by Angora goats. A list of household owners in each district was obtained from the local administrative office of the Agriculture Branch of Ankara. Twenty Angora goat farms per district (a total of 100 from all districts) were randomly selected using the Intentional Illustration Method.

The survey was conducted in the selected farms

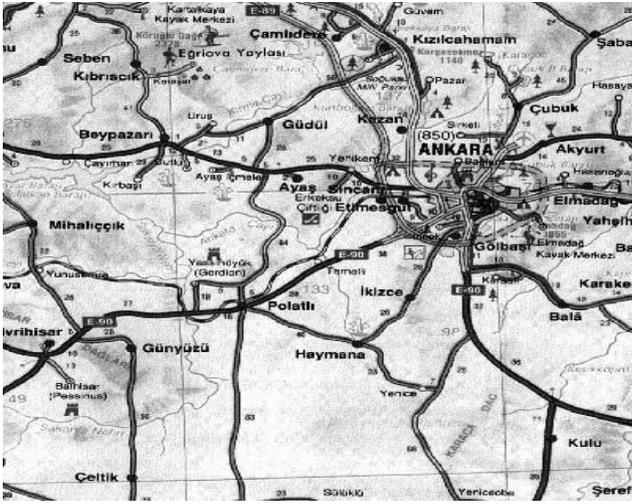


Fig. 2. The survey area

from May to August 2006. Primary data were collected by interviewing key informants, using structured questionnaires and formal discussions. Collection of data then focused on the study sites, in cooperation with the Turkish Directorate of Extension from the Ministry of Agriculture and the Turkish Mohair Association through participatory workshops involving farmers, interviews and participatory observation. Obtained data were stored and analyzed using SPSS (Statistical Program for Social Sci.) software (SPSS 11.0 version, 2002). This research was planned with a completely randomized design to determine differences for composition of herds. A Chi-square test and descriptive and inferential statistics were used to determine the surveyed data. A one-way analysis of variance (ANOVA) was performed using MINITAB, and data in each species were separately evaluated. The means were compared by Duncan's Multiple Range Test ( $P < 0.05$ ), using the MSTATC program (Winer et al., 1991).

## Results and Discussion

### *Characteristics of households and farms*

The average age of farmers ranged from 47 to 57 years old, and 34% of the farmers live with their children even if they are married. The educational level of Angora goat farmers was higher than that of Hair goat

farmers (Darcan et al., 2005). We observed that 84%, 11% and 5% of goat farmers had graduated from primary school, secondary school, and college, respectively. Most of the goat farmers had social assurance (94.2%).

The land area of the Angora goat farms varied between 176.53 and 101.69 da. in each of the five districts, with an average of 129. The Polatlı, Nallihan and Ayas districts utilize irrigated farming more than the other areas districts. Growing grain is served for animals, but sugar beets, sunflowers and watermelons sell at the domestic market. Farmers generally were working their own land, joining plant and animal production systems together (Table 1). Research results indicate that 80.4% of the goat farmers also deal with crop production, with 68.8% of them working their own land. The major crops are wheat, sunflower and sugar beet. A small number of farmers dealt with horticulture (5.9%) as well. It was found that the average number of cattle ranges from three to seven per farm (TURKSTAT 2007). This value changes according to the geographic situation (Table 1).

### *Labor division and decision making*

We observed that a large number of farms were managed by all family members, who all contribute to different chores, as indicated by Wurzinger et al. (2008). Similar to the findings of Darcan et al. (2006), we found that the entire family took part in goat production; women and daughters were particularly responsible for the flock. Male and female teenagers also helped their mothers during milking time. Few males (5.8%) took part in goat production as a second job. Girls and boys herded the goats. Decision making structures were examined in the interviews. It was found that women, for the most part, decided management procedures such as weaning time, feeding time and milking time. Men decided vaccinations against illnesses and the sale of animals and products. Sometimes men consulted a veterinarian for vaccination programs for their animals. The economic power of property ownership belongs to men. Only men decide the price, amount and salary; women do not have the power to make decisions about farm-related

**Table 1**  
**Some selected characteristics leading household and Angora farms and Angora goat farms**

Characteristics	Research areas						P Value
	Polatli	Ayas	Gudul	Bey pazari	Nallihan	SE	
Average age	50.95 <sup>b</sup>	47.80 <sup>b</sup>	56.15 <sup>a</sup>	49.29 <sup>b</sup>	54.37 <sup>ab</sup>	1.333	0.048
Education (%)							
Primary	85	55	95	90.5	78.9		
Secondary	10	20	5	9.5	10.5		
High	5	25	-		10.5		
Occupation (%)							
Farmer	100	85	95	100	84.2		
Retired	-	10	-	-	5.3		
Worker	-	5	5	-	-		
Other	-	-	-	-	10.5		
Agricultural activities							
Average land of farm	131.25	176.53	115.59	116.38	101.69	35.236	0.635
Number of average parcel	7.5	8.21	9.82	7.31	7.25	0.655	0.716
Cultivation of land (%)							
Dry	68.8	52.6	81.3	81.3	56.3		
Irrigated	31.2	47.4	18.7	18.7	43.7		
Land ownership (%)							
Rent (R)	-	10.5	29.4	-	-		
Shareholder (S)	6.3	15.8	5.9	-	6.3		
Owned (O)	68.8	47.4	41.2	87.4	68.8		
R+O	18.8	10.5	17.6	6.3	-		
S+O		15.8	-	6.3	18.8		
R+S+O	6.3	-	5.9	-	6.3		
Crop production (%)							
NONE	20	-	15	15.8	11.1		
YES	80	100	85	84.2	88.9		
Cereal (C)	75	31.6	52.9	68.8	62.5		
C+Sugarbeet (S)	6.3	-	-	-	-		
C+Sunflower (SF)	12.5	10.5	-	18.8	-		
C+Fodder (F)	-	5.3	41.2	-	12.5		
C+Orchard	-	5.3	5.9	-	-		
C+Vegetables (V)	-	26.3	-	12.4	25		
C+S+V	6.3	5.3	-	-	-		
C+SF+V	-	10.5	-	-	-		
C+S+F+V	-	5.3	-	-	-		
Herd composition							
Average of cattle Number	7.57 <sup>a</sup>	5.88 <sup>ab</sup>	3.63 <sup>b</sup>	4.06 <sup>b</sup>	5.18 <sup>ab</sup>	0.487	0.041

Continued Table 1

Average of ruminant Number	312.30 <sup>b</sup>	669.20 <sup>a</sup>	626.95 <sup>a</sup>	429.43 <sup>ab</sup>	320.63 <sup>b</sup>	46.701	0.033
Goat	84.50 <sup>c</sup>	199.25 <sup>ab</sup>	209.00 <sup>a</sup>	163.75 <sup>abc</sup>	95.53 <sup>bc</sup>	16.373	0.038
Billy goat	5.50 <sup>b</sup>	10.63 <sup>ab</sup>	13.10 <sup>a</sup>	8.76 <sup>ab</sup>	6.39 <sup>b</sup>	0.951	0.041
Yearling goat	56.27 <sup>b</sup>	74.89 <sup>ab</sup>	119.26 <sup>a</sup>	77.71 <sup>ab</sup>	55.06 <sup>b</sup>	8.111	0.043
Kid	63.26 <sup>b</sup>	145.30 <sup>a</sup>	143.21 <sup>a</sup>	102.81 <sup>ab</sup>	76.76 <sup>b</sup>	12.937	0.049
Duration of the herd, years	8.40 <sup>a</sup>	7.25 <sup>b</sup>	7.37 <sup>b</sup>	6.48 <sup>bc</sup>	6.26 <sup>c</sup>	0.047	0.001
Average poultry number	14.58 <sup>c</sup>	39.50 <sup>a</sup>	28.64 <sup>b</sup>	9.25 <sup>c</sup>	8.67 <sup>c</sup>	4.143	0.048
Average of bee number	-	3.00 <sup>b</sup>	2.75 <sup>b</sup>	14.50 <sup>a</sup>	6.25 <sup>b</sup>	1.833	0.032
Milk yield (kg per goat)	2.01 <sup>ab</sup>	2.19 <sup>a</sup>	1.86 <sup>bc</sup>	1.66 <sup>cd</sup>	1.43 <sup>d</sup>	0.096	0.001
Goat breeding products, %							
Mohair (M)	25	-	50	4.8	10.5		
M + Stud	55	-	50	-	-		
M + Stud + Meat	10	90	-	95.2	10.5		
M + Meat	10	10	-	-	73.7		
M + Meat + Milk	-	-	-	-	5.3		

Different letters (a,b) within row differ significantly ( $P < 0.05$ )

investments. Thus, men were responsible for all decisions related to organization and planning. The flock is inherited from the father to the elder son.

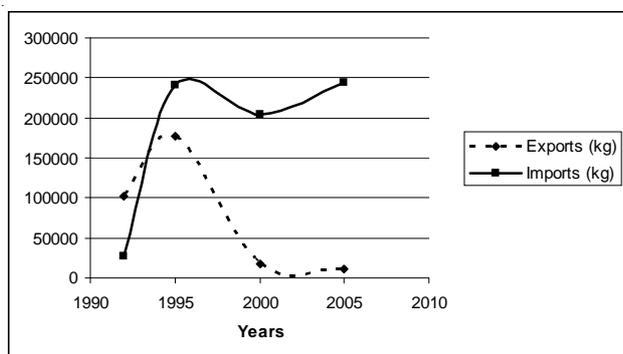
### Management Procedures

The average flock size was between 300 and 600 heads, and animals were kept in the flock until they were 7-8 years old (Table 1). Angora goats used to be crossed with native hair goats to improve meat quality and quantity. This approach is related to the low mohair productivity (1.5-1.6 kg per animal) of Turkish Angora goats compared to those from South Africa (3.2-3.5 kg per animal) and the USA (3.5-4.0 kg per animal) (Daskiran, 2000). This crossbreeding has led to a drop in mohair exportation capacities, resulting in mohair importation to Turkey during the last 20 years (Figure 3). Most goats were fed by concentrate while they were housed, especially in winter-time. Ninety-one percent of farmers declared that they fed their goats throughout the year, while 9% of them fed their goats only in wintertime. The feed consisted particularly of barley, different types of bran, oilcakes and hay. An average 91% of kids were weaned while they were four to six months old. As with hair goat flocks (Darcan et al., 2005), girls or women were

responsible for herding at grazing time. Goat herds grazed in natural forage from March to early October. Almost 100% of the goats were kept in the barn throughout the year. Some goat owners rented a shepherd for six to seven months for grazing. The farmers reported that they do not cross their flocks with native hair goats anymore. The majority of goats showed seasonal breeding.

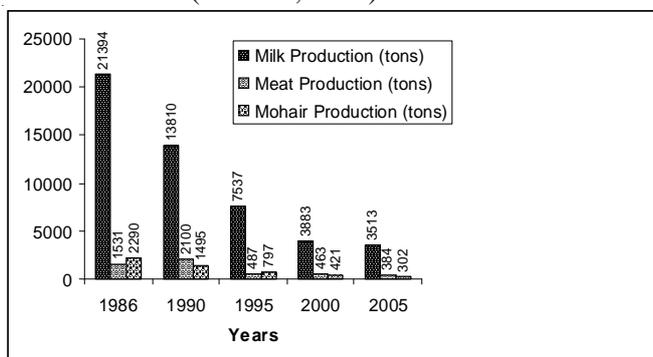
The average daily milk yield of the goats was quite low. Some herds, raised under semi-intensive systems had higher yields than the others. These were from big-scale farms, where goats were fed with small amounts of concentrate together with grazing in summer time. The amount of daily concentrate depended on the appearance of their bodily condition. In addition, kids were kept with their mother till they reached six months old. The mortality rate of kids was 10%.

The three main production traits of Angora goats are given in Figure 4. Depending on the reduction in the population, the total mohair, milk and meat production capacity of the goats decreased. The reduction in mohair and meat was not as sharp as that of milk production, as seen in Figure 4. As indicated above, Angora goat farmers did not obtain a satisfactory income from mohair production. Thus, the cross-



**Fig. 3. Import and export data of mohair in Turkey for the last 15 years**

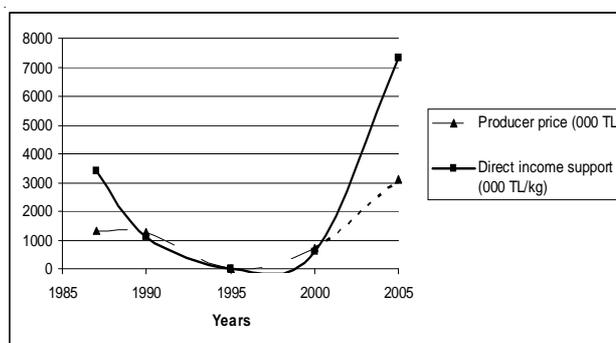
ing of Angora goats to native hair goats has become an issue for improving meat production. The meat production of Angora goats, therefore, increased between 1986 and 1990. However, goat farmers were restrained from giving up Angora goat production. The total mohair production level was decreased in accordance with the decrease of Angora goat numbers. It should be emphasized that mohair is a unique and important animal fiber. For many years, goat carcasses have been sold as low-grade sheep carcasses. Furthermore, Angora goat farms have sponsored an endeavor to have the Angora goat carcass referred to as “chevron” and sold as such on the market. It is maintained that the flesh is quite acceptable, particularly from young goats in good appearance, and some people refer to it as a delicacy. The carcass is particularly thinner-fleshed, and the dressing percentages are correspondingly lower than that of sheep fed in a similar manner (RIRDC, 1997).



**Fig. 4. Change in some production traits of Angora goats in Turkey (TURKSTAT, 2007)**

**Animal health issues**

All Angora goat farms have easy access to the veterinary service but farmers complained about the high cost of Veterinary services. The main diseases reported are enterotoxaemia, brucellosis, and foot and mouth disease. Also, some internal and ectoparasites were also reported by flock owners in the area. These diseases are the most common in the area (Wurzinger et al., 2008). As reported by Wurzinger et al. (2008), farmers resort to traditional methods such as burning the skin of the nose with a hot piece of iron because it is much cheaper than paying for commercial medicines. The government has not supported the farmers in terms of health care or vaccinations.

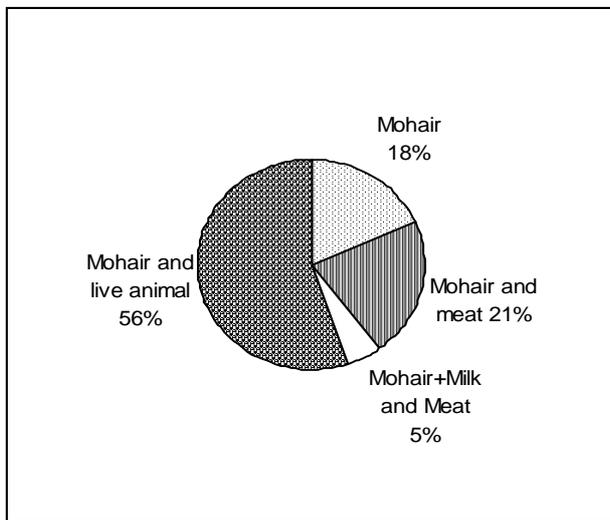


**Fig. 5. The producer price and direct income support of Turkish mohair over the past 20 years**

**Economic aspects and marketing opportunities**

The main income of farms was not based on goat production. Most farms had additional production, such as cattle (64.6%), poultry (35.9%) and beehives (12%).

The producer price and direct income from Turkish mohair are given in Figure 5. The cost is indicated as producer price. As seen in Figure 5, the cost of mohair has not been constant in Turkey. The mohair price and direct income slumped from 1990 to 1995. Then it rose incrementally since 2000. The direct income support given by the Turkish Mohair Association increased following the decrease of mohair production. This support recently motivated every Angora goat farmer to join the association.



**Fig. 6. Characteristics of Angora goat farmers**

Figure 5 clearly shows that prices have fluctuated between 1985 and 2005. The considerable variation in price suggests that farmers should spread the risk of future price falls. Farmers could choose to run other enterprises to provide the bulk of their income, with Angora breeding given more emphasis when prices are high. As demand for mohair is driven largely by fashion, there are likely to be continued fluctuations in the price. On the positive side, there is a world body, the International Mohair Association (IMA) that promotes the use of mohair (RIRDC, 1997). Stockpiles of unsold mohair are now exhausted, and due to a reduction in Angora goat numbers, the supply is lower in all countries.

As seen in Figure 6, the main products of the farms were mohair, meat and live animals. Farmers' families consumed almost all of the produced milk. Sometimes, they do not milk their animals, allowing the milk to be consumed by the kids. Only 23% of farmers raise Angora goats for self-consumption by their families. Does (milked goats) were milked once a day by women or female children. They sold live animals when they needed cash. It has been reported that goats are sold only when necessary to meet family needs, especially in case of emergencies. The aims of Angora goat breeding differed at various farms. For instance, 50% of goat breeding took place for mohair produc-

tion in Beypazari, but between 10% and 95% of the other provinces aimed for meat and milk production, in addition to mohair. It was indicated that the average mohair yield of each animal ranged between 2 and 3.5 kg per year. Shearing was done once a year in April. Additionally, the selling price of mohair was about 7-4-8 USD according to the Turkish Mohair Association. In Turkey, mohair sales showed an important overall value, ranging between 25% and 30% in the total income at farms compared, for example, to Lesotho, where mohair sales contributed between 14% and 20% of the total income generated by the livestock (Ng'ambi et al., 2006). Almost all of this mohair is produced by smallholder farmers, like Ankara goat farmers, on communal rangelands. also In addition, over the past 36 years, Angora goat numbers in Lesotho have been declining at an annual rate of 0.5% (Khitsane, 1999).

Marketing opportunities are very limited. The fleece market is a monopoly, and middlemen earn more money than farmers. Studies targeting genetic improvement should be implemented for the purpose of increasing the quality and quantity of Turkish mohair. Associations and governments should support all farmers to help them sell their products directly to the market. There is a lack of consistency in price and support policies, which vary from one year to the next. A recent and important observation is that associations that offer support are only concerned with flocks of large numbers. The farmers owning a small number of goats are not in a position to profit from any support.

## Conclusion

Angora goats may be the most efficient fiber producers on Earth. Mohair comes from these goats, named after Ankara (Angora before 1930), the Turkish province where they have thrived for centuries. Turkey guarded these goats against exportation until 1849, when seven does and two bucks were imported into the United States. Later, more were imported from Turkey and South Africa, the two principal mohair producers in the 19th century (Anonymous, 2009).

Nowadays, Angora goat rising is in decline because of the high price for herdsman and other high input expenses. Meanwhile, it is a reality that prices of mohair and the selling price of animals has decreased. There were no significant differences in terms of animal population ( $P < 0.05$ ) among the Polatli, Nallihan, Ayas and Gudul provinces, except for Beypazari province. In general, small ruminant animal populations were the highest, per farm, at Gudul and Ayas, while Polatli and Nallihan had the least ( $P = 0.033$  or  $P < 0.05$ ). This situation paralleled that of the goat, billy goat, kid and yearling goat farms, with regard to the distribution numbers of animals.

The cost of total input (e.g., concentrate feed, animal health expenses, shepherd wage etc.) in mohair production is too high when compared with the selling price of fleece. Animal health and veterinary services are not sufficiently provided and are not organized adequately. Vaccination is a payable application for farmers. Herding has labor implications for the farmer. Interviewed goat farmers have not been able find qualified shepherds, and the wages of shepherds is too high, at about 535-600 \$ per month. Because of the gradual transformation of grassland areas into cultivated fields, a considerable decreased has appeared in grassland surface area.

Overgrazing is the one of the main problems for Angora goat farmers. Hence, some precautions, such as alternating grazing and improving pastures, would increase the optimum utility of grasslands.

Most farmers would like to give up Angora goat production, but they do not have any available alternatives within the region. As indicated Budak et al. (2005), the institutional linkage between extension and veterinary services should be strengthened. Routine vaccination systems for small ruminants must be established by the extension service with the collaboration of the veterinary services. Improved price policy support will be an asset.

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