

Sustainability of Small Ruminant Production in Rural Areas of Eastern Mediterranean Region of Turkey

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Abstract

Small ruminant production can be an important component of a sustainable agri-food systems in terms of providing quality source of plant nutrients, being an income generator, and providing an environmentally sound use of certain lands. Animal production is facing a number of challenges today; demands for a lower impact on the environment, such as reducing greenhouse gas emissions and need to be balanced with a stable production and a good income. There are many opportunities to increase the resilience and profitability of small ruminant farms in rural areas. The aim of this study is to determine sustainability and resilience of livestock production in rural areas of Eastern Mediterranean part of Turkey. For this aim, face-to-face survey studies will be conducted to 100 livestock breeders in the area. The breeders will be selected for scale of farms. At the end of the study farms will be classified as small, medium and large and the profitability and production systems will be evaluated for ecological principles and profitability.

Keywords

Sustainability, Profitability, Ecological principle, Sheep, Goat, Rural development, Eastern Mediterranean, Turkey

1. Introduction

The special attributes of farm animals make them particularly important in rural resource poor communities compared to other domestic ruminants include: ability to graze and utilize a wide range of poor quality forages and browse; efficient utilization of marginal lands; carcasses which are conveniently marketed or consumed over a short time period; and flocking instinct which makes herding by younger and older members of family possible (Lebbie,2004).

Animal products (mainly meat and dairy products) have interesting characteristics in their levels of flavor, taste, aromas and leanness as well as the specific composition of fats, proteins, amino and fatty acids. Their quality is very much linked to historical and cultural uniqueness right through the production, marketing and consumption chains. This refers at least in the Mediterranean region, to farming systems with dominant extensive grazing situations, specific technologies and conditions for slaughtering as well as for the transformation process of cheese making and its maturing (Boyazoglu and Morand-Fehr,2001).

Smallholders are the backbone of the rural economy in especially developing countries that depend heavily on agriculture. And the animal farming is one of the most important agricultural sectors for smallholder farmers, as it plays a fundamental role in their daily income and self-sufficiency as well as food security (Jaklic et al., 2014). In most developing countries, milk production depends on smallholder farmers. It also contributes to securing family livelihoods, supporting food and nutrition sovereignty, and maintaining food safety (FAO, 2021). According to Ronchi and Nardone (2003), livestock systems in Mediterranean areas are far removed from an acceptable level of sustainability, considering animal health, environmental impact, quality of products and profitability. Feed availability

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was identified as one of the major constrains for small ruminant systems in the Mediterranean area. At that time, the economic conditions were deplorable, so small farmers relied on producing milk and selling it in the local market in their villages or sending it to city center with a third person, earning some money to barter this milk for other food products (Non-cash exchange trading became very popular, for example, exchanging cheese for hay. It also appeared that farmers sent their livestock daily with the village herds to the pastures; the shepherd supervised them Sidawi et al., 2021). The aim of this study is to determine sustainability and resilience of livestock production in rural areas of Eastern Mediterranean part of Turkey.

2. Materials and Methods

The research study was conducted in Adana district in Eastern Mediterranean part of Turkey (Figure 1). The altitude and animal population have been taken into consideration while defining the villages and districts. These data have been obtained from The Directorates of Agriculture in districts and provinces and from the demarches. The animal farmers in villages of Kirazlıyurt and Kayarcık in Tufanbeyli, Himmetli in Saimbeyli, Kökez and Dölekli in Aladağ, Gildirli, Bolacalı and Güvenç in Karaisalı were interviewed. The public survey has been carried especially on the animal farmers out of the 10 % of the total house number in each village by Intentional Illustration Method. The numbers and the frequency of the questionnaires administered were given in Table 1. As seen in Table 1, totally 118 questionnaires were carried on.



Figure 1: Research Area

Table 1

Questionnaire numbers and distribution by the villages and districts

Research Area	Number of questionnaires
Tufanbeyli	37
Kirazlıyurt	12
Kayarcık	25
Saimbeyli	17
Himmetli	17
Aladağ	26
Dölekli	12
Kökez	14
Karaisalı	27
Gildirli	9
Bolacalı	7
Güvenç	10
Total	100

2.1. Mixed Method Approach

This study relied on the convergence model in the tripartite design of the mixed method approach. The use of a mixed-method design allows questionnaires or surveys and interviews to be conducted together (Al Sidavi et al., 2021; Creswell and Clark, 2006).

As seen in Figure 2, we used the experimental design of qualitative and quantitative surveys and interviews as primary data with supporting data of small ruminant sector as indicated by Al Sidavi et al. (2021). All data used in this survey were collected by face-to-face methods and farmers were selected

and classified for their flock size. All participants' primary income was sheep and goat farming. Small holder farmers were selected for their awareness of environmental, social and economic problems of sector and their region, as well. Before starting the interview, the brief information was given on aim of the study with demarches of each village. The questionnaire was arranged interconnected with each other. To that end, a survey of 36 questions and a Village overview survey consisting of 20 questions were asked to owners of smallholders, as well as family members responsible for animal production on; i) demographic information, ii) their economic aspects, iii) environmental issues, iv) social situation.

Data were transferred to an excel sheets as coded data, to show the descriptive statistical results for each section of variables. SPSS Version 21 software was used for statistical analyses.

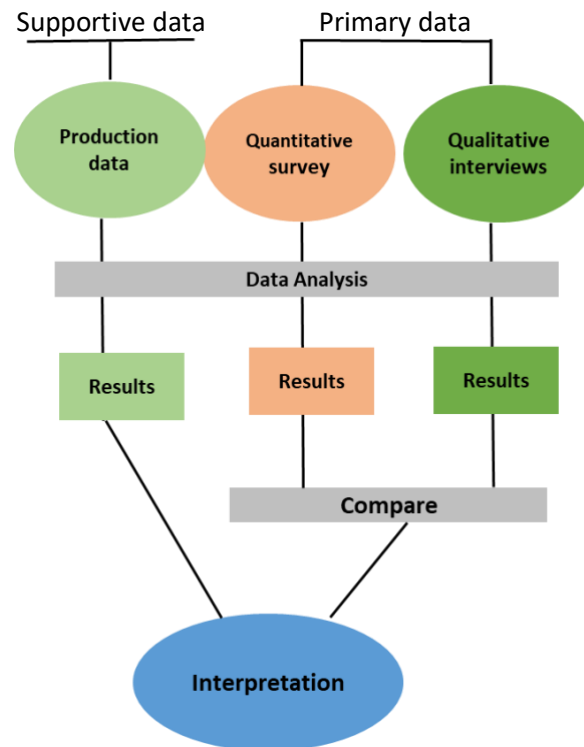


Figure 2: Experimental design of study (Al Sidavi et al., 2021; Creswell and Clark, 2006).

3. Results and Discussion

3.1. Demographic Components

The big part of farmers was older than 30 years old and most of them were between 51-75 years old (48%). Average proportion of the overall farm population and livestock holders over the age of 55 in the area. Although the ageing of the farm population is evident across regions, the pace and levels of ageing differ significantly between as well as within arm business. Rapid rural ageing is occurring in livestock husbandry, which have seen significant increases in the proportion of farmers over 55 in less than a decade. However, in a number of other agricultural activities, the farm demographic structure has remained relatively static for the past two decades.

All farmers have reading and writing skill, 84.8% of the farmers were graduated primary school while only 12% of them graduated from high school. Gender distribution was 45% of participants were female and responsible whole procedures of animal farming.

Some general information according to villages were given Table 2. As it is shown that, the larger villages are Kirazliyurt, Gildirli and Güvenç. Household number of Himmetli village is higher than the others. Additionally, Kayarcik is the most crowded village in the survey area. Kirazliyurt, Kökez, Gildirli, Güvenç, Bolacali and Kayarcik are the mountainous villages. Total surface areas of these

villages contain forest, shrubs areas spread on the high mountains. Due to this fact the total surface area of these villages are seems to be higher.

Table 2

Number of households, population and square measure of the survey area (TUIK, 2022)

Name of Villages	Square measure (ha)	Number of Digits	Population (person)
Kirazliyurt	52000	120	870
Dölekli	200	120	900
Kökez	3300	210	1260
Gildirli	8500	80	250
Bolacali	6000	14	160
Kayarcik	6000	240	2000
Himmatli	2300	342	948
Güvenç	8000	100	600

Mosque, access roads, electricity and communication were available in all villages of the survey area. School and clinic are not available in Bolacali while only clinic was not established in Gildirli villages. River and springs are reported as water supply of some village such as Gildirli, Bolacali and Kirazliyurt while the rest had mains water.

Only 9,4% of the breeders' incomes were based on animal production. The others got income from especially crop production; the secondary incomes were from animal production (27%). And main incomes of the rest of them (18,1) were both animal and crop productions (18.1%). The reason of this fact that the politic and socio-economical aspects of the area. The most of animal keepers give up animal production due to input price especially feed, restricted grassland areas and, market problems (Table 3).

Table 3

Family's main source of income by age group

Age groups	Family's main source of income				Total
	Vegetable production	Animal Breeding	Both	Other	
0-30 %	0,6%	0,6%	0,1%	1,9%	3,2%
31-50 %	21,5%	7,5%	14,7%	37,6%	81,4%
51-75 %	4,8%	1,2%	3,3%	6,0%	15,4%
Total %	27,0%	9,4%	18,1%	45,6%	100,0%

3.2. Social Factors

Turkish culture and traditions play important role in rural society and directly influence small-ruminant raising and marketing. Most of the farms were family managed. The member of whole family took part in agricultural production; particularly women and teenagers were responsible for the almost all agricultural activities of the farms. Women and teenagers were responsible the daily works of animal production as cleaning, feeding, milking, mating, shearing, processing, nursing etc. Women were working in goat activities 3,9 hours a day in average. Woman continued to work in livestock production even if she was pregnant. Few males (12%) took part in livestock production. Livestock production

was unique source of family livelihood in this area. They did not have any other alternatives because of land structure, infrastructure and economic conditions. A main income of families was based on especially goat and sheep productions. The big part of husbands of the women did not give permission for women to go grassland with the flocks (98%). Instead of women the elder daughters and boys go to grassland with herd. Flocks spent the days in higher zones between spring to winter (nomadic system). Greatest part of farms (73%) was involved in housing for their livestock in winter. Small ruminant production is the main agricultural activity in the research area. Hand milking was almost performed by women and young girls (94.0%). Sometimes young boys are also help to their mother. While families had not any boys or girls, men managed milking activity (4%). Only 71% of women dealt with cleaning barn, pots and pans. In some families, all family members dealt with cleaning (12%) to barn. The 95% of the women responsible of milk processing such as cheese, yoghurt etc. Women were manager status in these inner activities while teenagers were in helper position. In other words, 88.4% of men were major decision maker for whole financial issues. When women were widow or her husbands were old, these decisions were given by women. Field studies were generally conducting by women as unpaid family labour when small ruminant activities are performing for home consumption.

On the other hand, to learn women satisfaction from rural life questions of “are you satisfied from your life” and “what are your expectations from your daughter’s life” were asked to women. All of the women explained that they were not satisfied from their life condition.

3.3. Economical Factors

Due to its geographic and socio-economic situation, animal production is very popular in this area. Mediterranean and Anatolian weather systems influence climate of the mountains, bringing hot summers and cold winters into the area. High Platons of Taurus Mountains are the summer homes of all villages and the summer grazing of animal herds. Livestock moves from lower to higher land (nomadic system) where it spends the months from spring to winter.

It was obvious that, a big part of animals was fed by concentrate especially in wintertime, while they were housed. Particularly barley, different types of bran, oilcake and hay were given to the goats in this period of time. Big part of goats had seasonal breeding. Big part of goats and ewes had seasonal breeding. Average 91 % of kids and lambs were weaned while they were 4 to 6 months old. Residual milk was used in feeding together with grazing. Older female child or women were responsible for herding in the grazing time. Flocks were grazed in natural forages from March to November. Feeding was mainly based on natural grazing and agricultural products like straw, stubble and grains.

Table 4
Production systems of small-ruminant farming

Traits	Frequency (%)	
Housing Type	Free (open shed)	27
	Barn	67
	Both	6
Main production	Meat	15
	Milk	77
Concentrate feeding	Both	8
	Yes	88
Daily milking time	No	12
	1 time a day	70
	2 times a day	30
Weaning time	1-2 months	9
	2-4 months	53
	4-6 months	38
Mating Time	Seasonal	71
	Aseasonal	29

All animals grazed and utilized uncultivated parts of farms to transform wasteland into high value commodities. In this way, goats add value to farm enterprises. Oak trees (*Quercus*) were used for feedstuff. Besides olive or acorn tree branches were used as feedstuff in goat production. Sometimes farmers cut the foliage just to feed their animals. This was the big problem in this area due to soil erosion and deforestation. Milk technologies and other conservation methods have developed in the region due to the climate changes. As an example, cheese is produced on daily conditions instead of traditional methods. Only, in a few regions, cheese fermentation is still done by traditional methods. In the past, products were dug into ground or into the snow in highlands where it's impossible these days. Main products of the farms were milk, cheese and yogurt. Farmers' family consumed average 25% of the whole milk. Families prefer to sell their milk as a cheese because of high income opportunity. Approximately 89.30% of the feeders produce white cheese and 25.90% produce Tulum cheese. All farmers produce "lor, çökelek and butter" additionally. Animals were milked twice a day by women or female children. Additionally, they sold live animal when they need cash money. Live animals were used or sold only when necessary to meet family needs, especially in case of emergencies, slaughter is performed only for needs of the family.

Due to economic reasons (such as feed expenses and low price of some products in the market) the farmers eventually could give up animal production. During the insufficient times of the grasslands, animals are kept inside and meanwhile fed by concentrate feeds. Feeding in barn is based on mostly to pulp (77, 1 %) and to straw (75, 4 %) but at the same time, concentrate feeds prepared by the factories are also given highly (72 %). The farmers declared that in the past they used to take their animals to the plains at the end of the winter because the vegetation awakened early, after the reduction of the sources in the plains, they used to go to the backward highlands and pasture their animals.

Some herds which had been raised under semi-intensive systems had higher yield than the others. These were big-scale farms and animals were fed with small amount of concentrate together with grazing in summertime. Daily concentrate amount was depending on their physiological conditions. In addition, new-borns were kept with their mother till they were 6 months old. This is another reason for low yield. Mortality rate of lamb and kids was less than 15 %. Main dairy products of the farms were milk, cheese and yogurt. Farmers' family consumed average 25 % of the whole milk. Families prefer to sell their milk as a cheese because of high income opportunity. Animal keepers produce white cheese, Tulum cheese, lor, çökelek and butter.

Brucella (34%), Ecthyima (54%), Foot and mouth disease (23%) were common diseases in this area. Almost all farmers vaccinated their animals (74%). They reported that, if any disease occurred, either they asked other farmers or bought medicine by themselves. Only 45 % of farmers called a veterinary for their animals. Goats and Sheep were kept in breeding until they are 6 years old.

3.4. Environmental Aspects

The animal production systems and concept of climate change which are in mutual interaction with each other has recently become a popular subject on the agenda, as Turkey is a party to certain international protocols. The impacts of climate change on animal production could be analyzed directly or indirectly. Within this framework, an animal's interaction with environment stemming from its physiological structure, as well as issues of the use of natural resource and waste management become prominent. Another element of oppression on animal production is political and social and economic sanctions which are aimed at decreasing the greenhouse gas emission. The total greenhouse gas emission is closely related to the number of animals. In this regard, the use of small number of animals in production with higher productivity will become an important strategy in the future in terms of animal production. To that end, certain applications particularly aimed at improving the environment and genotype will become prominent. An improvement in climate conditions is closely related to an animal's biological ceiling and the economic level. Accordingly, these two factors have an impact on the level of productivity to be gained per animal. Therefore, measures to be taken to improve environmental factors should be put into practice by taking current conditions into account, which is of utmost importance in terms of profitability. In this regard, efforts aimed at improving the genetic structure seem to be more feasible with regard to the type of animal to be studied and increasing the productivity level per animal. The goats are remarkable as one of the species which will be utilized in

animal production in the future due to their performance to benefit from the feed and ability to continue their productivity under in all heavy conditions, gain advantage from feeding resources which aren't used by other animals and enjoy less methane emission in return. The biological environmental conditions should be taken into consideration in terms of pollution to be caused by preferring conventional methods in the use of natural resources in order to increase production in the unit area. In this respect, issues of protecting the natural life and organic production become prominent. Furthermore, the negative effects on biology deriving from the uncontrolled use of substances cause the emergence of new diseases. The polluted environmental conditions are caused by the greenhouse gas, which is released in animal production, as well as inability to perform the waste management in an effective way. Thus, certain negative conditions emerge in production and human health (Koluman et al., 2019)

The Mediterranean region is especially important with regard to understanding and practicing the impact of climate due to its geographical characteristics and capacity to realize the agricultural and animal productions in different altitudes. To that end, the current project evaluates the current situation of stockbreeding activities which re conducted in different altitudes and qualities, as well as advantageous and disadvantageous sides in terms of the climate change.

Livestock industry accounts about 25% of the agricultural GNP in the country. Although the share of agriculture has relatively decreased in GNP and total exportation, agriculture still keeps its importance due to the high rates of the active population in the sector and employment and its direct relationship with nutrition. Recently, Turkey has become a net importer of livestock products and is increasingly dependent on the world market. While productivity has risen over the last decade, the Government's protective measures have not resulted significant production gains (Table 5).

Table 5

Scenarios of Livestock Population and Livestock Production for next 60 years (Koluman and Gultekin, 2011)

Year	Livestock (head)			Animals Milked (head)			Number of Livestock Slaughtered (head)			Milk Production (ton)			Meat Production (ton)		
	Goat	Sheep	Cattle	Goat	Sheep	Cattle	Goat	Sheep	Cattle	Goat	Sheep	Cattle	Goat	Sheep	Cattle
Present Average (1980-2008)	360337	336600	233853	175764	162726	121971	47156	369010	20562	13498	10380	226565	577	5203	2798
2070	321208	354007	217676	156678	171141	113534	42035	388092	19140	12032	10917	210892	514	5472	2604
2071	280147	328533	195522	136649	158826	101979	36661	360166	17192	10494	10131	189429	448	5079	2339
2072	321208	328533	195522	156678	158826	101979	42035	360166	17192	12032	10131	189429	514	5079	2339
2073	321208	354007	217676	156678	171141	113534	42035	388092	19140	12032	10917	210892	514	5472	2604
2074	321208	354007	217676	156678	171141	113534	42035	388092	19140	12032	10917	210892	514	5472	2604
2075	280147	328533	195522	136649	158826	101979	36661	360166	17192	10494	10131	189429	448	5079	2339
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2079	321208	354007	217676	156678	171141	113534	42035	388092	19140	12032	10917	210892	514	5472	2604
Estimated Average (2070-2079)	304783	341270	206599	148666	164983	107757	39885	374129	18166	11417	10524	200161	488	5276	2472

All the observations and calculations which have been made since 1980s concretely show that the climate change exists. Even the most optimistic scenarios mention an increase by 1-1.5°C in the surface area temperature in the last 100 years and emphasize that this increase might climb to 2.5-5°C in the future. At this point, it should be emphasized that the climate change derives from the "human" factor, rather than natural events. In this regard, the fact that the human factor has an impact on the natural course should be highlighted. A great many conventional methods which are applied to meet the needs of increasing population (food, clothing or subject, etc.) case natural resources to be polluted or destroyed. The measures which are considered within this framework contradict to economic sanctions

and thus they fail in practice. Therefore, if all the units came together to bring forward a planning which is aimed at eliminating the main source of problem with concrete approaches, more realistic perceptions on a solution would emerge (Koluman Darcan et al.,2019).

The “food” is naturally the only indispensable input of life for humanity. Accordingly, agricultural activities involving food production and the nature-agriculture relationship have always been on the agenda. As mentioned above, the intensive use of conventional inputs in the nature-agriculture cycle and the oppression on natural resources have caused agriculture to be put under responsibility and questioned in the process of climate change as well. The animal production and herbal production, as well as the methods which are applied in the course of these productions, should be firstly considered with regard to amounts of greenhouse gas emission.

The problems such as inability to come up with an alternative to stubble burning and similar activities, the lack of an appropriate diet and use of high-quality feed in animal breeding and the pollution which emerges during the production and animal transfer processes should be taken into consideration in the process of climate change. At this point, conventional or traditional production systems will become another issue to be discussed. The drought index of all plants was prepared through a study which was conducted by the Ministry of Agriculture and Rural Affairs (Koluman Darcan et al., 2019).

The presentation of advantageous and disadvantageous sides of local gene resources in the animal and herbal production within a regional projection would also provide a positive approach with regard to the success of programs to be implemented in the long run. In this respect, a solution to the problem with genetic and biotechnological approaches would be possible as well. But the local gene resources’ resistance and endurance to extreme conditions should be emphasized here. A methane emission in which the live weight and productivity level of local animals are considered should be put forth with a projection to be carried out. A pilot study which was performed on this issue is indicated below. The calculations that we have made on the methane emission with origins of animal in Turkey with regard to animal presence according to the annual methane emission data which is released in an enteric way or through manures by the cattle, sheep and goats per animal in different ages and physiological conditions in the IPCC (1997) data, as well as the agricultural counting results are indicated in the table below (Görgülü et al, 2009).

Table 6

The annual methane emission of the cattle, sheep and goats in Turkey with origins of enteric fermentation and manure (Görgülü et al., 2009)

Species	Enteric, ton	Manure, ton	Total, ton	Enteric,%	Species, %
Cattle	675,394	108,457	783,850	86.16	76.53
Sheep	203,800	6,114	209,914	97.09	20.49
Goat	29,600	888	30,488	97.09	2.98
Total	908,794	115,459	1,024,252		

The greenhouse gas in animal production is released particularly from animals (enteric fermentation), for the manure and feed production and from the areas which are used as grassland. Thus it’s of utmost importance to take certain measures with regard to stockbreeding, manure management, storage and expansion and the systems which are used for feed production. There is little research on these emissions in our country. Furthermore, regarding the feeding conditions and productivity levels of our animals, it could be considered that the calculations which were made by us based on the IPCC data might not be sound, because the ruminants in our country are fed with poorly digested, rough and harvest-residue feeds at inadequate grasslands of low quality. In line with an assessment from this point of view, it could be considered that the methane emission should be higher. But it’s known that the methane emission is related to animals’ consumption of dry matters. It could be indicated that the insufficient intake of feeds might limit the methane production and that the high methane production which is caused by the lack of ration balances in our country could be relatively compensated by the low intake of feeds, though not favoured (Görgülü et al., 2009).

It's estimated that the methane emission caused by ruminants in our country totals approximately 1 million tons and that more than 85% of this amount is of enteric origins. Furthermore, it's considered that 76% of total emission is caused by the cattle population. According to statistics from the State Institute of Statistics' (DSI) Branch Office of Environmental Statistics, the methane release caused by enteric fermentation totalled 692,000 tons and that the emission caused by fertilizers totalled 37.6 thousand tons in 2000 (TUIK, 2022). As a conclusion remarks, it's obviously clear that, climate has significant effects on livestock production. Type of grasses, grassland potential, processing of products and especially some Physiological aspects of farm animals has been affected adversely. The future development of livestock farming systems in mountainous area of East Mediterranean part of Turkey in term of intensive systems will largely depend on the application of modern management strategies, especially for planning and monitoring functions together with political and financial adjustments. Grazing should be planned with new regulation in the area. It has to be emphasized here that small ruminant production is essential for this area. People living in this area do not have any other alternatives for the sake of life. Moreover, educational studies should be started at utmost priority right away. People should be acknowledged on new technologies. And lastly some heat-resistant farm Animal species and genotypes should be adapted in the region. Additional feeding is provided all the yearlong to the cattle where the sheep and goat consume the concentrate only when they are kept into the barn. Since the fruitful land is used for cultivation, and since the forests are prohibited for small ruminants, farmers had to start feeding with additional concentrate. Feeding in open land is mainly suitable between 09-17 hours for the cattle and between 03-21 hours for small ruminants. In addition to open feeding lands, it's also possible for the animals to get fed by residues of crop after harvesting. This process didn't change during all those past years. However, it's been learned by the interviews done by farmers in mountainous areas that the goats still got fed in open area even in wintertime. In the past, due to heavy snow falls, this was not possible. On the other hand, it's been also observed that the height of the open area feed (grass) is no longer tall when compared to past, as a result of less falling rain.

Australian pine (*pinus nigra* Arnold), Cedar (*cedrus libani*), crimson pine (*Pinus butia*), Oak (*Quercus* sp L.) and *Ocaliptus* are common trees of forest area. When compared according to types, goats are more selective in feed type, digesting faster and taking better advantage of low-quality feed. They are also gaining the advantage of being more resistant to hot climate. Since sheep and goat production has low production costs, it's widely continued in regions, where other types of less resource needing cultivation processes are done. When all these arguments are taken into consideration, it's obvious to understand why small ruminant production is more intensive in mountainous areas.

Hair goat (Kil), Akkaraman sheep and crossbred of Holstein Friesian x Native Black cattle were the most common breeds in this area. 92 % of families had goat while 69 % families had sheep. Some (76%) of the families had cattle. The average number of cattle was 3-4 heads per family. Besides, poultry was also raised for domestic consumption.

Even if the government had forbidden, goat farmers did not give up goat rearing in forest area, because of the mentioned factors in above.

Grazing in the field edges and harvest residues (stubble) is at the maximum level. Consequently, it is seen that grazing in the residues after the harvesting of crop production is more common than grazing in the natural areas. Grassland capacity and grassland areas decreased almost 67,8 % and 88.8 % during to last 25 years, respectively. The reason of slumping in annual precipitation, cultivation in these areas, early grazing and over-grazing and some regulations for grassland using. The pastures of the village Gildirli was converted with the percentage of 71.53% by 13 families and 37 different plant species. The dominant plant species was determined as *Aegilops ovata* L. The pastures of village Kökez was covered with the percentage of 65.85% by 27 different species from 15 families. The dominant plant species was determined as *Bothriochloa ischaemum*. The pastures of the village Kirazlıyurt was covered with the percentage of 81.04 % by 28 different species from the 10 families. The species *Lolium perenne* was determined as the dominant. Grazing starts in March and ends at the end of November or beginning of the December. But in Aladag, due to snowing, grazing starts and ends earlier than the other regions.

About 87, 3 % of the farmers declared that there have been changes in climate in the areas on which they live. Most of them stated that the temperature of the atmosphere increased (82,5 %) and some of them stated that the temperature of the atmosphere decreased (2,9 %). However, the farmer's response to these questions by stating their opinions about how the changes in climates affected the animal and crop production. It was determined that 77,1 % of the farmers no longer use the traditional ways and 27

% of them use only caves and skins of the animals. Milk products technologies and other conservation methods have developed in the region due to the climate changes. As an example, cheese is produced on daily conditions instead of traditional methods. Only, in a few regions cheese fermentation is still done by the traditional methods. In the past, products were dug into ground or into the snow in highlands where it's impossible these days.

Small ruminant owners indicated a seasonal change in oestrus, and it has moved from spring to summer. Additionally, some of the farmers mentioned about the positive (1, 4 %) and negative (8, 6 %) effects on the milk productivity occurring in the change of climate conditions.

4. Conclusions

This study represents an important step for better understanding the animal production systems in East Mediterranean part of Turkey. It's obviously clear that, productivity per animal should be improved with new breed in this area. Moreover, grazing must be planned in this area. It has to be emphasized here that small ruminant production is essential for this area. People living in this area do not have any other alternatives for the sake of life. The future development of livestock farming systems in mountainous area of East Mediterranean part of Turkey in term of intensive systems will largely depend on the application of modern management strategies, especially for planning and monitoring functions together with political and financial adjustments. Moreover, educational studies should be started at utmost priority right away. People should be acknowledged on new technologies. The economic significance of livestock and research into their uniqueness should increasingly be a priority in this area for sustainability of rural development.

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