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Sustainable goat production in Turkey: Current situation and solution proposals

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Abstract: Goat production is a traditional occupation, which has been performed for many centuries especially in rural regions of Turkey. Although Turkey has suitable conditions both ecological and social for goat production, the number of goats dramatically decreased in the last two decades until 2010. It was aimed to investigate current goat production system and the reasons that caused dramatic decrease of goat stocks in Turkey. Materials of study were obtained from statistical data, forest legislations, land use observations and unstructured interviews. Diagnosis and Design Methodology developed by the International Council for Research in Agroforestry (ICRAF) was used to reach the results. As a result, it was identified that there were problems regarding the use of land between villagers breeding goats and the forest administration and this problem affected goat production negatively. The forestry policies implemented in Turkey aimed to decrease and even eliminate goat production based on the view that it harms forests. For this reason, the number of goats dramatically decreased to 5 million in 2009. After Turkish government allowed goat grazing in state forests using grazing management plan with a decision adopted in 2011, the effect of this change gave positive results in a short time and this number increased to about 10 million in 2014.
Keywords: Goat production system, Forest legislations, Turkey

Türkiye'de sürdürülebilir keçi yetiştiriciliği: Mevcut durum ve çözüm önerileri

Özet: Keçi yetiştiriciliği, Türkiye'nin özellikle kırsal bölgelerinde yüzyıllardır yürütülen geleneksel bir uğraştır. Türkiye, keçi yetiştiriciliği için gerek ekolojik gerekse sosyal açıdan uygun koşullara sahip olmasına rağmen, yetiştirilen keçi sayısı, 2010 yılına kadar önemli ölçüde azalmıştır. Bu çalışma, Türkiye'deki keçi sayısındaki azalmanın nedenlerini ve geleneksel keçi yetiştiriciliği sistemini araştırmayı hedeflemiştir. Çalışmanın materyali araştırma konusu ile ilgili istatistikler ve arazi çalışmalarında gözlem ve mülakatlardan elde edilen verilerdir. Sonuçların değerlendirilmesinde Uluslararası Tarımsal Ormancılık Konseyi (ICRAF) tarafından geliştirilen Tarımsal Ormancılık Tanıma, Değerlendirme ve Geliştirme Tekniği (ATDG) kullanılmıştır. Sonuç olarak, keçi yetiştiriciliği yapan köylülerle, orman idaresi arasında arazi kullanımlarına yönelik sorunlar bulunduğu ve bu sorunların keçi yetiştiriciliğini olumsuz etkilediği belirlenmiştir. Keçilerin ormanlara zarar verdiğini öne çıkaran ormancılık politikaları keçi yetiştiriciliğini ortadan kaldırmayı hedeflemiştir. 2009 yılında ülkedeki keçi sayısının 5 milyona düşmesindeki en büyük sebebin bu olduğu ortaya çıkmıştır. Hükümetin, 2011 yılında devlet ormanlarında otlatma yönetim planlarına göre keçi otlatmasına izin vermesi ile birlikte, keçi sayısı 2014 yılında 10 milyona yükseltmiştir.
Anahtar kelimeler: Keçi yetiştiriciliği, Ormancılık mevzuatı, Türkiye

1. Introduction

It is known that there have been successful land utilization experiences in various periods of human history. Land utilization experiences which developed and were shaped in line with the requests of the inhabitants of rural regions and their successful applications constitute the most striking examples in this field (Thirgood, 1981). This is because; the inhabitants of rural regions have learned to utilize agricultural land, forests, pastures, water resources in a sustainable manner (Nair, 1993). Currently, one of the most important production models of the inhabitants of rural regions is pure hair goat (*Capra hircus* L.) breeding which has been conducted in the Mediterranean forest ecosystem for a long time and has adapted itself very well to these areas. Pure hair goat production plays a key role in increasing sustainable production the income level of the rural (Ortas, 2008a). Pure hair goats which are estimated to have lived in Mediterranean scrubland areas since 4000 BC, have maintained their existence as part of nature until today (Le Houérou, 1981). Pure hair goats, which bear the capacity to adapt to any type of land conditions and movement, generally prefer to feed in forests and brush areas instead of flat meadows (Morand-Fehr and Boyazoglu, 1999; Papachristou et al., 2005). Goats can easily be raised in very bad environmental conditions because they utilize food resources which cannot be used by other farm animals (Papanastasis, 1981). Goat production is the most important sources of income in settlement units located within and along forests where there is no land to conduct plant production (Taskin et al., 2010). Pure hair goats are animals which can easily be converted into money and be raised in

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simple and cheap shelters (Kaymakci and Engindeniz, 2010). Domestic goats are blamed for much of the destruction of the Mediterranean forests. There is hardly a single study on deforestation in the Mediterranean Basin which does not indicate goats as a primary cause. In discussing the factors underlying deforestation in the Mediterranean countries, for instance, grazing by farm animals is considered among the major causes, with goats being singled out for their predilection for woody forage. The prejudices against goats were so strong a few decades ago that several countries had to take decisive measures to reduce their numbers or even to eliminate them completely by subsidizing their slaughter. Over the last few years, however, it has been realized that it is not goats *per se* that are the real culprit but the continuous, uncontrolled overgrazing for which humans are responsible (French, 1970). All farm animals, if they are not managed properly, can damage forests through overgrazing (Owen, 1979). At present, the campaign against goats has largely ceased, although the policies excluding them and other domestic animals from Mediterranean forests still persist (Papanastasis, 1985). Goats represent an efficient localized production system for people locked into poverty. Some countries on the northern shores of the Mediterranean have reduced or eliminated goats in forests in recent decades, but this was more a result of increased economic growth that attracted poor goat breeders to urban centers than of better management technique (Darcan et al. 2005). However, the majority of the countries in the region continue to experience acute problems because of irrational grazing patterns. Unless a solution is found, the already diminished forest resources will further deteriorate, resulting in desertification - something which has already happened in the drier parts of the region. The best solution appears to be the proper integration of goats into Mediterranean Silvopastoral systems (Papanastasis, 1985). The stocks of goats in Turkey and some continents of the world were given Table 1.

Goats have always been an important livestock species for the world; but in the past 10 years the global goat population has grown faster than other livestock such as buffalo, cattle, and sheep (Gillies, 2014). The population of goats in the world was around 975.8 million heads in 2013. The largest populations are in Asia (571.1 million) and Africa (348 million), this includes 94% of the world population (FAOSTAT, 2015). The world goat population growth has been constant (2.6% annual growth rate over the period 1986–2007 and 2.8% considering solely developing countries). The global increase is expected to continue (Rosegrant, 2009). Unfortunately, contrast pattern is observed in Turkey (see Table 1) and the goat stocks decreased from year to year. Turkey has about 22 million hectares of forest area, 99% of which is state owned. This consists of 27% of the country's land area and is managed by the General Directorate of Forestry (GDF) which is a governmental body (Tolunay and Turkoglu, 2014). There are about 7 million forest villagers residing in more than 21,000 forest villages in Turkey. The goat production is an important and traditional source of income for these people in Turkey (Alkan and Korkmaz, 2009; Alkan et al., 2009). Although Turkey has range forages and scrublands sufficiently (Yalcin, 1986) and goat production is one of the traditional occupations in these areas, the number of goats dramatically decreased to 5 million heads in 2009 for some reasons, while this number was above 10 million at the beginning of 1990s. The greatest decrease in number of goats was recorded in the period 1990-2009. This study has investigated the current goat production system in Turkey and the reasons that caused dramatic decrease of goat stocks from year to year in last two decades until 2009 in Turkey by using Diagnosis and Design (D&D) Methodology.

2. Materials and methods

Diagnosis and Design Methodology developed by The International Council for Research in Agroforestry (ICRAF) and used in a lot of researches by Raintree (1987 and 1990) and Tolunay et al. (2007) for the diagnosis of land management problems and the design of agroforestry solutions was used in this study. Materials were obtained from statistical data, forest legislations, observation and unstructured interviews with the villages involved with pure hair goat breeding and forest protection officers.

The D&D methodology offers a possible set of procedures for a logical and step-wise approach to the evaluation of land-use systems, through a pre-diagnostic analysis, a rapid field appraisal of selected land-use systems, and additional focused surveys of how a system works. These are integrated within an analysis of system constraints highlighting potential key interaction or 'leverage' points. Solutions to improve the system can then be focused on these points (Raintree, 1990). The D&D approach is based on scale-neutrality, which enables it to be applied at different levels in the hierarchy of land-use systems. Thus, the procedure can be applied with minor modifications at the micro level (household management unit such as the family farm), meso level (local community, village or watershed), or macro level (a region, country, or ecozone) (Tolunay et al., 2009). The micro level D&D investigation of pure hair goat breeding involved household units. Unstructured interviews were conducted for this purpose with the household in the villages involved with pure hair goat breeding in the province of Isparta in the Western Mediterranean Region. The issues faced by pure hair goat breeders while grazing in state forests were identified. Furthermore, the production system of pure hair goat breeding was analyzed via land observations.

Table 1. Stocks of goats in Turkey and some continents of the world (million heads)

Continents/country	1983	1993	2003	2007	2008	2009	2010	2011	2012	2013
Turkey	18.2	10.5	6.5	6.1	5.4	5.0	6.1	7.1	8.2	9.1
Asia	290.5	370.5	495.6	561.6	566.1	570.6	565.3	561.9	566.1	571.1
Africa	149.0	181.2	261.7	308.2	320.3	323.6	330.6	348.7	357.3	348.0
World	491.3	610.9	815.9	927.7	944.8	952.5	954.1	968.5	980.2	975.8

Source: FAOSTAT, 2015

The meso level D&D study identified the village level reflections of the issues experienced at a household level in the villages affiliated with the province of Isparta. Unstructured interviews were made at this phase with forest protection officers responsible for protecting forests and the issues faced by pure hair goat breeders were identified. The regional level study is based on the observations and assessments performed in the Western Mediterranean Region, covering the provinces of Isparta, Burdur and Antalya. In addition, the views of the representatives of local alliances of sheep and goat breeding and forest administration executives evaluated with regard to reasons of dramatic decrease in goat stocks. A top level D&D study, the issues was explained on the basis of forest legislations and practices of the Ministry of Forest and Water Affairs (MFWA), Ministry of Food Agriculture and Livestock (MFAL), General Directorate of Forestry (GDF), Alliance of Sheep and Goat Breeding Associations (ASGBA).

3. Results and discussion

3.1. Evaluation of goat production system in Turkey

The most common goat species raised in Turkey is the pure hair goat (*Capra hircus* L.). Although pure hair goats are bred in every region of the country, it has gained intensity particularly in the Mediterranean, Aegean and Southeastern Anatolia regions (Ozder, 1997). There are similarities between the borders of the regions where pure hair goats are bred and natural distribution borders of some types of trees and shrubs within the Mediterranean scrub vegetation (Vrahnakis et al., 2005; Tolunay et al., 2011). This similarity is demonstrated clearly in kermes oak (*Quercus coccifera* L.) and boz pirnal oak (*Qercus aucheri* Jaub.&Spach.) types. Both types of shrubs are woody types, whose leaves are eaten fondly by pure hair goats. Pure hair goats have selected as their habitat the natural distribution area of these two types of shrubs (Tolunay et al., 2009). Turkey map showing the distribution of pure hair goats (Bekiroğlu and Tolunay, 2010) and picture of pure hair goat flock were given in Figure 1 and 2.

The goat production system in Turkey generated by D&D Methodology and evaluation of unstructured interviews was demonstrated Table 2. The system and problems was evaluated five titles which were definition, identification of problems, intervention, effectuation and, monitoring and evaluation.

When the examined of the goat production system in Table 2, it was understood that goats were not allowed in state forests on the ground that they damaged forests in Turkey previously. The forest administration regarded goat grazing in state forests as a crime. People who were caught while grazing goats in state forests and who were detected to have committed a crime were subjected to imprisonment or fined. This situation caused to dispose of their goats and abandon the production system of pure hair goat owning villagers. Therefore, conflicts and hostilities occurred between the forest administration and the forest villagers who bred goats. This big dilemma affected sustainable goat breeding negatively. Goat producers did not have any other alternatives for their subsistence. Some of the villagers did not give up the production in forest areas, even though it was forbidden by the regulations (Darcan et al. 2005). Especially, grazing in forest area and protected areas was prohibited by forestry registrations such as Action Plan for Reducing Goat Damage prepared by GDF. Thus, livestock (especially nomadic livestock) production decreased in many districts (Alkan and Korkmaz, 2009). Alkan and Ugur (2015) reported that various prohibitions and limitations for grazing in forest area affected views and perceptions of livestock breeders negatively. In addition, not uniting the goat breeders under an organization causes negative situation.

Figure 1. Distributions of the pure hair goat (*Capra hircus* L.) in Turkey (Bekiroğlu and Tolunay, 2010).

Figure 2. A flock of pure hair goat in Mediterranean Region of Turkey (Photo: Ahmet Tolunay)

Table 2. Evaluation of the goat production system in Turkey

Definition	* Pure hair goat breeding production system is a silvopastoral production system included into the agroforestry production systems. * Villagers breeding pure hair goats graze their animals in herds in forest areas. * Pure hair goat breeding is an important economic activity. *The production system includes tree/shrub species and pure hair goats. * Goat breeders are not well organized.
Identification of problems	* Many people thought that goats are harmful for forests and goats should be removed from forests. * The forest administration banned the grazing of pure hair goats in forest areas until 2011. * A sustainable benefit could not be obtained from forest resources. * The villagers performed grazing in an irregular and unconscious manner. * There were problems in the utilization of land between the villagers breeding pure hair goats and the forest administration. * The number of goats dramatically decreased to about 5 million heads in 2009.
Intervention	* Forestry legislation about grazing in forest area was changed by Government in 2011 * The forest administration allowed pure hair goat breeders to utilize forest resources. * The grazing management in the forest area was conducted by the GDF. * Breeders informed about regular grazing.
Effectuation	* Grazing plans was prepared by GDF * The decreasing of pure hair goat numbers was stopped * Excessive and irregular grazing stopped. * Grazing plans which divided grazing into certain timeframes and periods prepared. * The grazing capacity of the areas where pure hair goat grazing was performed and designated. * The number of pure hair goats increased to about 10 million in 2014
Monitoring and evalutation	* The production system should be operated in a productive, sustainable and balanced manner. * Special importance was placed on coordination and cooperation * The results obtained should be assessed and the system should be revised. * Have we reached the desired results? Is the area used in a sustainable manner? Has there been any increase in the income of breeders? These questions must be answered.

Moreover, Tolunay et al. (2013) declared that decrease of goat stocks in Turkey was caused by socio-economic and political reasons. The designation of the forbidden forest areas for goat pasturing by governmental policies and migration of rural people from villages to the city centers had negative effects on the goat production. Rural people are most affected by natural resource management, and these residents have a substantial influence on the success of management decisions. Therefore, it is possible to consider forest community residents as major stakeholders of these natural resources, and a strategic partner of forestry organizations (Alkan and Kilic, 2014).

In many developed countries, goat products are marketed as organic and healthy products and have become an export item in some countries (Morand-Fehr et al., 2004; Boyazoglu et al., 2005). Goat production is profitable because goats adapt themselves well to hard conditions without need for any additional feeding. Using proper management, goats generate a significant impact in the fight against weeds, reduce fire risks and conserve wildlife (Yılmaz et al., 2009). The economic value of pure hair goat production has been ignored for a long time; yet, this is the cheapest and most ecological production system through which goats utilize the maquis and bushes which the other livestock animals cannot consume (Gursoy, 2006; Parlak et al. 2011).

Forest resources face numerous threats in many countries. For instance, the people living within and adjacent to forests are perceived as a threat for forests. Many entities and organizations strive to reduce this threat level or to totally eliminate it. It is claimed that pure hair goat breeding, which is traditionally conducted in developing countries and is one of the main means of subsistence for the people, damages forests. Thus, foresters who are responsible for the management and protection of forests, strive to reduce the number of pure hair goats and to direct the people performing this activity towards others means of subsistence. Many part of Turkey, the villagers are used the leaves from trees (mainly oaks) as fodder. The tradition with cutting branches from deciduous trees (Quercus spp.) and give the leaves to the goats has created very old trees with high nature conservation values (Jansson and Coskun, 2008; Novak et al., 2011; Sama et al., 2011).

3.2. Key historic developments in goat breeding in Turkey

3.2.1. Overall perspective displayed from past until today

In Turkey, goats have been declared guilty on the grounds that they harm forests. Thus, foresters who are responsible for the management and protection of forests, strive to reduce the number of pure hair goats and to direct the people performing this activity towards others means of subsistence. According to Article 19 of the Forest Act No. 6831(effective date of code: 1956, the law in force that has had many regulations so far) (Forest Act 6831, 1956); "*It is*

prohibited to allow the entry of any type of animals into national forests". Whereas, according to Article 21 of the Law; "*The grazing of animals allowed to enter the meadows inside national forests from outside collectively or in flocks shall depend on the permit to be granted by the forest administration according to the plans to be made.*" The "*Grazing Regulation*" drafted for the purpose of enforcing these articles had prohibited the grazing of pure hair goats within national forests (GDF, 2012). Article 95 of the said law reads: "*Those who allow the entry of animals into forests without permission, in violation of the provisions of this law shall be imprisoned for no less than 1 month and will also be fined*." On the basis of this law, the forest administration filed lawsuits against villagers who graze their pure hair goats in national forests. Persons found guilty by legal authorities were subjected to fines and imprisonment. The forest administration pressured villagers to quit raising pure hair goat (Daskiran, 2013).

2005: *The Scapegoat;* The "International Forest, Goat, Erosion and Tourism Symposium" was held in Adana on April 12-13, 2005. Statements on topics such as "*goats are harmful for forests*", "*goats should be removed from forests*" and "*goats should be eliminated*" were presented in this symposium. Furthermore, the statements "*goats are cursed*" and "*goats are more harmful than fire*" were also used (Ortas, 2008b; Tolunay et al., 2015).

2008: *Let's Eliminate Goats;* The Ministry of Forest and Water Affairs had prepared the *"Action Plan for Reducing Goat Damage"* in 2008. This action plan aims to diminish the number of pure hair goats raised all over Turkey, starting with the Mediterranean Region encompassed by the study area. In the Aegean and Mediterranean Regions 25 provinces, where pure hair goat breeding is widespread, were selected as the area of implementation of the action plan (Tolunay et al., 2015). The total number of pure hair goats in these provinces amounts to 3,472,000. It was planned to decrease the total number of pure hair goats to 1,010,000 with the implementations to be conducted between the years 2008-2012. This plan had been prepared without seeking the opinion of the people who raise pure hair goats. The human factor had been excluded in trying to settle the difference between the forest resources and pure hair goat breeders (GDF, 2008).

2009: Erroneous forestry implementations; No productive forests may be composed with the kermes oak as this type of tree is not preferred by foresters. The areas including this type of shrub are defined as degraded forests in the forest management plans and are classified as fields to be reforested. From past to present, forest plantations geared towards industrial production have been established in areas where this type of shrub is distributed and where the slope of the land is convenient to be processed with machinery in Turkey. Although, maquis vegetation had been removed along with their roots from their sites, they could not be eliminated. In places where it is not possible to conduct field work with machinery, afforestation work has been performed manually, but could not be successful due to the negative drawbacks in ecological conditions and the resistant nature of this type of shrub. Today, it is aimed to afforest thousands of hectares of land in the upper basins of the Aegean and Mediterranean Regions, yet these areas are not suitable for establishing industrial forest plantations (Tolunay et al., 2009).

Problems solved in year 2011; However, this trend indicated a radical change as a result of the efforts of the related representatives of political parties, members of parliament, technicians, goat breeders and departments of universities and the support of the Sheep and Goat Breeders Association, and the mentioned application of the government was renounced in 2009. The Turkish government made a radical change in forestry legislation and state forests were permitted for pure hair goat grazing in 2011. It was accepted by the government that goats are useful – and not harmful – for the forest as long as they are grazed according to some rules, and that the forest is a grazing space for goats. The effect of this change gave its positive results in a short time. The decreasing of pure hair goat number was stopped, and increased to 10,169,348 heads in Turkey in 2014. The number of pure hair goats in Turkey was shown Table 3.

Tolunay et al. (2010) explained that there are two different situations regarding pure hair goat breeding until today. The two statuses in forest-goat dilemma were given Table 4 and Figure 3. The first situation is the condition where foresters win and pure hair goat breeders lose; forest villagers are relocated to settle outside forest areas and more areas are converted into pure forests. It is forbidden to graze goats within state forest areas, and villagers pay high fines as they graze illegally and hate foresters. This is encountered in countries where planned and technical forestry is conducted but where forest resources are protected via strict legal rules. The second situation is the condition where both foresters and pure hair goat breeders win. Thus, the forest administration accepts the need of villagers to graze and allocates suitable forest areas for grazing. On the other hand, villagers accept to comply with the rules placed by the forest administration and both parties obtain productivity in the settlement area and the risk for forest fires is reduced. When a suitable grazing by goats in forest area is chosen and correctly managed, with goats which will reduce the understory, it can prevent fires, and help to maintain the firebreak network (Rigueiro-Rodríguez et al., 2004; Xanthopoulos et al., 2006). The status to be reached in forest-goat dilemma is the condition where both foresters and pure hair goat breeders win.

Table 3. The number of pure hair goats by years in Turkey (TSI, 2015)

Years	Pure hair goat (head)	Years	Pure hair goat (head)
1993	9,192,000	2004	6,379,900
1994	8,767,000	2005	6,284,498
1995	8,397,000	2006	6,433,744
1996	8,242,000	2007	6,095,292
1997	7,761,000	2008	5,435,393
1998	7,523,000	*2009*	*4,981,299**
1999	7,284,000	2010	6,140,627
2000	6,828,000	2011	7,126,862
2001	6,676,000	2012	8,199,184
2002	6,519,332	2013	9,059,259
2003	6,516,088	2014	10,169,348

* Breaking point.

Table 4. Two different statuses in forest-goat dilemma

1st situation	2nd situation
Foresters win, goat breeders lose	Both win
* Forest villagers settle in areas outside the forest.	* The forest administration accepts the need of villagers to graze.
* Large areas are converted into pure forests.	* Suitable forest areas are allocated to villagers for grazing.
* Grazing goats in forest areas is banned.	* Villagers accept the rules placed by the forest administration.
* Villagers graze goats illegally and pay high fines.	* Both parties obtain more productivity in the settlement area.
* Villagers hate foresters.	* The risk of forest fires is reduced.

Figure 3 demonstrates the breaking point of this change. As a result, grazing plans prepared in order to enable villagers to graze goats in state forests and villagers allowed to graze goats in the state forest. The forest administration prepared the grazing management plans with scientific basis considering. Based on some experience obtained from Tunisia and Greece, it is estimated that the grazing capacity is 1.5 goats per 1 ha land (Tolunay et al., 2014).

4. Conclusions

The MFWA in Turkey prepared a plan to decrease goat population of Turkey in 2008. According to this plan, trees were to be planted in empty areas, and the number of goats was to be reduced from 6 million to two million. In accordance with the provisions of Forest Law No. 6831, the forest administration had prohibited the grazing of pure hair goats in these areas which were part of state forests. Turkish government made a radical change in forestry legislation and the state forests were allowed to pure hair goat grazing in 2011. It was accepted by the government that goats are useful for the forest- not destroying- as long as they are grazed according to some rules, and that the forest is a grazing space for goats. The effect of this change gave its positive results in a short time. The number of goats had decreased until 2009, but after this date, this fall stopped. The number of goats increased to 10,169,348 heads in 2014. Goat grazing at the forest lands and maquis areas would be useful not only for forests but also for goat population and the level of production as well. The widespread opinion claiming that *"goats damage forests"* has changed. This is a very useful development for goat husbandry, and goats are now being given to be native gene source by foresters in Turkey. After this stage, the profitable goat production systems can be established by improving processing facilities and market demand. The MFAL and the MFWA should take social and economic precautions to increase the income of goat breeders. The increase in income of goat breeders can prevent the immigration from rural areas to cities. Kaymakci et al. (2005) and Taskin et al. (2006) suggested the cooperation of the goat breeders and gathering the small organizations as a solution proposal.

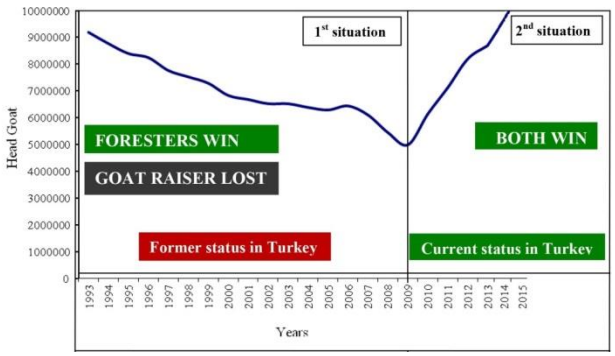

Figure 3. Breaking point for the goat-forest dilemma in Turkey

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