

Traditional Usage of Kermes Oak (*Quercus coccifera* L.) and Pure Hair Goat (*Capra hircus* L.) in a Silvopastoral System on Davras Mountain in Anatolia: Constraints, Problems and Possibilities

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Abstract: In this study, the silvopastoral system of pure hair goat (*Capra hircus* L.) on Davras Mountain has been analyzed by the Diagnosis and Design methodology (D and D). Areas where kermes oak (*Quercus coccifera* L.) is distributed are being used in pure hair goat raising on Davras Mountain. There are major problems in this breeding system. Therefore, the following interventions are proposed to ensure that the pure hair goat breeding system is productive, sustainable and stable: the forest administration should allow villagers to use the Davras mountain area and the areas where there are kermes oaks should be classified as a separate business class entitled pure hair goat grazing class in the forest management plans, excessive and irregular grazing conducted by villagers should be stopped, the annual leaf fodder productivity and the change in nutritional values of the kermes oak as well as the number of pure hair goats that may graze in a unit area for how long and during, which periods should be investigated, grazing plans should be prepared according to the results of this research, pure hair goat breeders should be organized and the grazing program should be regulated by the organization of which these persons are members and the forest administration should inspect whether grazing is performed in a sustainable manner.

Key words: Land use, silvopastoral systems, kermes oak, pure hair goat, Davras mountain, Anatolia

INTRODUCTION

In Underdeveloped Countries (UDCs), the majority of the population lives in rural areas and gains its income through agricultural production. Rural development is a major pursuit to be emphasized in these countries (Moseley, 2003). Agricultural development has been of major importance in the past years among the topics of rural developments and the classic agricultural development policies have been pursued. The policies failed to resolve the rural development problems of UDCs (Chambers, 1983). Agricultural production practices are composed of a production understanding, which is based on monoculture and takes as its basis the significant use of agricultural pesticides and chemical manure. This understanding has had a negative impact over the inhabitants of rural areas who do not have sufficient capital for purchasing agricultural inputs (Singh, 2003). Just like in traditional agricultural practices, traditional forestry practices failed to resolve the problems of the inhabitants of rural areas (Brukey, 1993). Instead of practices, which may enable the inhabitants of rural areas

to benefit from the services provided by forests, practices, which highlight the resources of trees and forests have been provided and the human factor has been excluded (Gilmour and Fisher, 1991). These negative aspects led rural development experts to pursue new aims.

It is known that land has been used successfully by various civilizations in different periods throughout the history of humanity. Experiences of land use, which have developed and shaped in line, with the demands of the inhabitants of rural areas and their successful implementation, constitute the most striking examples. The inhabitants of rural areas have learned to use available resources (agricultural land, forests, pastures, water resources, etc.) in a sustainable manner. The experiences relating to the traditional use of land have been investigated, evaluated and collected under the concept of agroforestry.

Agroforestry is a relatively new name for a set of old practices. At the beginning, through some practices, especially in tropics and developing countries called agroforestry applications, it was recognized by most of the developing countries as well as industrialized

countries. It is clear that agroforestry is a new scientific discipline now such as agriculture and forestry fields (Garrity, 2004).

Some traditional agroforestry practices used by the inhabitants of rural areas in Turkey are not given importance by institutional and academic circles and efforts are aimed at reducing or eliminating these practices. One of these practices relates to pure hair goat breeding by forest villagers (Avci, 2005; MEFO, 2008). Legal arrangements made in relation with the use of forest resources have banned the entry of pure hair goats into public forests. For instance, the regulation on grazing of animals in forests and meadows, summer pastures and winter quarters located within forests, includes the provision reading, grazing of goats, camels and horses shall not be allowed by no means whatsoever in national forests (GFD, 1984).

The areas in Turkey where pure hair goat breeding is most widely conducted are the Aegean, Mediterranean and Southeast Anatolian Regions. Nomads who live in these areas have been breeding pure hair goats in the upper basins of that region for centuries (Boyazoglu *et al.*, 2005; Ocak *et al.*, 2007). Pure hair goat breeding symbolizes a cultural value for nomads, in addition to being a breeding system (Guney and Darcan, 2005).

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. This similarity is demonstrated clearly in kermes oak type. This shrub is woody types, the leaves of which are eaten fondly by the pure hair goats. Unfortunately, grazing of pure hair goats is not allowed in national forests where there are kermes oaks. In addition to the prohibition of grazing, pressure is put on villagers owning pure hair goats and they are prevented from breeding them. Thus, the culture of the inhabitants of that region, who had gained a life experience with pure hair goat breeding, is disappearing.

Various investigations have been conducted regarding grazing at in-forest meadows and forage yield in Turkey (Defne, 1955; Alpay, 1972). Furthermore, there are also studies regarding utilization of leaf fodders of forest trees (Mol, 1982; Sevimsoy and Sun, 1987). In these researches, the damage done by pure hair goats on the forest and the trees have been highlighted and they request has been made for keeping them away from forests. Yet, in the countries located in the Mediterranean Region have noticed the importance of the kermes oak in goat breeding and tried to develop their breeding system (Aldezabal and Garin, 2000; Boyazoglu and Morand, 2001; Ainalis and Tsiouvaras, 2004; Ainalis *et al.*, 2006; Zarovali *et al.*, 2007).

In this study, the pure hair goat breeding system on the Davras Mountain has been investigated. The areas where kermes oaks are distributed are being used for grazing of pure hair goats on the Davras Mountain. The aim of the study is to designate the technical, administrative and social problems related to the breeding of pure hair goats and offer solutions.

MATERIALS AND METHODS

Study area: This study was conducted on Isparta in the West Mediterranean region of Turkey and at an elevation between 950-1.500 m and at 37°47'N latitude, 30°45'E longitude. The tallest peak of the mountain is 2.637 m. The long-term average annual rainfall is 511 mm and the mean air temperature is 12°C. During the winter (December to March) and summer (June to September) seasons, mean air temperature ranges from 1.8-5.9 and 18.3-23.5°C and the rainfall ranges from 52.6-74.9 and 12.0-28.7 mm, respectively. The climate of the area is characterized as semi-arid and cold winters. The soil texture is clay to wet clay, derived from conglomerates of the mesozoic period and colluvials from the river or torrent bank deposits (Atalay, 2006). The organic matter content between 2.60-3.60% and the pH (7.2) are both considered average (Babalik, 2006).

Land inventory and vegetation: Davras Mountain is located in the Mediterranean and Iran-Turan transitional band from a phytogeographic perspective. According to the forest management plan data (FMP, 1997), the overall area covered in the study is 10,068.0; 6,804.0 ha of this land is composed of degraded woodland, 605.0 ha of non-forest land, 205.5 ha of rock areas, 185.5 ha of settlement areas, 5 ha of water dam and 2,263.0 ha of agricultural land.

Kermes oak is present as the main shrub type within the area qualified as degraded woodland in the plans of forest management. This type of shrub is sporadically accompanied with Crimean juniper (*Juniperus excelsa* Bieb.) and hawthorn (*Crateagus monogyna* Jacq). Furthermore, there are also single-year herbaceous taxons such as gum plants (*Euphorbia* L.) and mullein (*Verbascus* L.).

Rural settlements on the Davras Mountain: Villagers who breed pure hair goats have settled on the accommodating skirts of the Davras Mountain. These settlement units are the villages of Savkoy, Buyukhacilar, Kuçukhacilar, Alikoy, Kuçukgokceli, Buyukgokceli and Cobanisa. All of these villages are old settlements. Nomadic people played an important role in the

settlement process. The main occupation of the villagers is farming and raising livestock. Villagers breed livestock for household consumption and commercial purposes.

Site and sample selection: The Davras Mountain area is the district where most problems are experienced in pure hair goat grazing in the province of Isparta. This is the main reason for the selection of this area as the subject of the research.

General information of methodology: Various methods have been developed for investigating the use and researching the use of land in rural areas. The most significant among these are Farming Systems Research/Extension (FSR/E) and the Land evaluation Methodology (Shaner *et al.*, 1982). These methods examine agricultural production systems, but exclude woody types such as trees and shrubs that may be included in the system. Hence, they are impractical for evaluating the agroforestry production systems. The International Council for Research in Agroforestry (ICRAF) has developed the Diagnosis and Design (D and D) Methodology for the diagnosis of land management problems and the design of agroforestry solutions (Raintree, 1987, 1990). D and D is methodology for the diagnosis of land management problems and the design of agroforestry solutions. It was developed to assist agroforestry researchers and development fieldworkers to plan and implement effective research and development projects (Nair, 1993). The D and 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. Possible improvements can include not only agroforestry, but also agronomic, forestry and other possible interventions, for an objective comparison.

The D and 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).

The D and D method developed for this study is based on Raintree (1987, 1990) and consists of three stages, namely, prediagnostic, diagnostic and design and intervention.

Application of D and D in the study: This study aimed at determining examples of silvopastoral on the Davras Mountain, was conducted through team collaboration. The study period was divided into 2 phases. The 1st phase started on March 24, 2008 and ended on April 11, 2008. During the 1st phase, the study team applied Prediagnostic and Diagnostic stages. The 2nd phase took place between May 4-20, 2008. The 2nd phase focused on the Design and intervention stage of D and D.

In the prediagnostic phase, information was provided as to what resources have been used with what technologies for reaching, which purposes. Alternatives to the current production system were investigated and compared with the current utilization mode. The operation of the production system was also analyzed.

The subsequent Diagnostic phase was provided qualitative and quantitative data on the land use system. Moreover, observations were made regarding the production system. Problems, constraints and bottlenecks in the land use system were designated in this phase.

In the 3rd phase, namely design and intervention, proposals were developed for resolving problems. The areas of the production system requiring improvement were designated. The designation of the mode of intervention into the production system presented the general action method as a general policy.

The research started at the micro level D and D study. The micro level D and D investigation of pure hair goat raising involved the household unit. Silvopastoral pattern, the way they are managed and carried out at the household level. Subsequent studies were conducted at the meso level, on the basis of villages. Finally, the studies were concluded upon taking into account the Davras Mountain at the macro level.

RESULTS

General results: Pure hair goat raising is conducted in the form of transhumance in the Davras Mountain. Villagers are specialized in pure hair goat raising and do not avail of any other sources of income. The number of households performing pure hair goat raising is 46, with a total population of 228 in these households. The population per household ranges between 4-6 people and the average population per household is 4.9. There are 12,375 pure hair goats within the study area. The number of goats in the flocks ranges between 75-600 and the average number of goats per household is 269. As the kermes oak area in which grazing takes place is 6804.0 ha, the grazing area is 0.5 ha per pure hair goat. Flocks of goat are being grazed by women and children. They climb to

the grazing land at the end of March and return in November. The main source of feed for pure hair goats is kermes oak. Villagers have built simple accommodation facilities within the areas where they graze their pure hair goats. Pure hair goat breeders live in these barracks during the period when they stay in the highlands. Villagers have built fenced shelters for kids. Water containers are placed in these accommodation facilities for the goats. The drinking water required for the animals are transported by tankers. Villagers select the animals that they will raise for breeding from their own flocks.

The addition of male goats to the flocks for the purpose of impregnating females occurs during the month of September and they are kept within the flock for approximately 10 months. The rate of male goats/female goats is 1/25 during the breeding period. Kids are fed with their mothers milk for a period of 2 months after their birth. The milking period lasts for 3 months and the milking is performed once a day by women. The total milk yield per goat is 55 kg. A pure hair goat has a live weight of up to 20 kg at 1 year of age. The hair of the goats is only sheared once a year in August. As free range breeding is conducted, the manure of pure hair goats cannot be collected, thus, it is not possible to use manure in agricultural production.

Sacrificing certain animals is a ritual in the Feast of the Sacrifice for Turkish people. The people in this area prefer pure hair goats for this aim. Breeding sacrificial animals is the main purpose of pure hair goat breeders. Furthermore, there are also people who market pure hair goats for meat consumption.

The milk and products obtained from pure hair goats are consumed by the families owning the herds and also placed in the markets of villages. The milk they obtain is converted into products such as cheese and/or butter upon being used purely or by being mixed with cattle milk. There is no marketing mechanism for providing goat milk and products to the consumers on a regular basis.

The per household income obtained from pure hair goats on an annual basis is US \$3500. Given that the average number of members in a household is 4.9, it is seen that the annual income per capita is US \$715. As the annual income per capita is US \$9333 in Turkey, it can be concluded that economic status of the villagers is rather bad (SPO, 2008).

D and D results: The findings relating to the pure hair goat breeding system within the framework of the D and D method and the development and improvement of the system have been provided in Table 1.

Prediagnostic stage: Land use system is a silvopastoral production system included into the agroforestry production systems. Silvopastoral systems are combinations of pastures and/or animals and trees. There are problems relating to land use between the villagers raising goats in the region of Davras Mountain and the forest administration. Villagers graze pure hair goats in flocks, in areas where there are kermes oaks. The objective of the villagers in using this land is to raise pure hair goats upon using kermes oaks as leaf fodder. The technology used in the production system is primitive and insufficient.

Diagnostic stage: Pure hair goat raising constitutes a key economic activity. The forest administration has prohibited the grazing of pure hair goats in these areas. As the shepherds, who own goats make them graze in an irregular and disorganized manner within the production system, the feed yield is very low. Pure hair goats eat the terminal shoots of kermes oaks at the beginning of the vegetation season. When terminal shoots are eaten, scrubs grow horizontally rather than vertically. Therefore, kermes oaks in the field are 50-75 cm long, with intertwined branches looking like a floc. The villagers are not organized and act on an individual basis. It is not possible to benefit on a sustainable basis from the Davras Mountain. Due to irregular grazing, the meat and milk yield from the pure hair goat is very low.

Design and intervention stage: Intervention should be made so as to enable the production system to operate in a productive, sustainable and stable manner. Firstly, the forest administration should permit pure hair goat raisers to use. The areas where there are kermes oaks are distributed on the Davras Mountain. The areas where there is kermes oaks should be differentiated as a separate business class entitled pure hair goat grazing area in the management plans. The irregular grazing still conducted by the villagers should be stopped and the grazing capacity of these areas should be designated. The annual yield of kermes oak leaf fodders, the changes in their nutritional values and the number of pure hair goats that may be grazed and when grazing should occur needs to be established.

Goat breeders act on an individual basis within the production system. The Association of Sheep and Goat Breeders has been established within the province of Isparta. One of the prerequisites for becoming a member of the association is to report the number of pure hair goats owned. Seventy percent of goat shepherds in the area where this research was conducted are not a member of this association. They are concerned that if they report

Table 1: Results of the D and D study

D and D stages	Basic questions to be answered	Key factors to consider
Prediagnostic	Site selection: There are problems relating to land use between the villagers who raise goats in the region of Davras Mountain and the forest administration. These problems need to be resolved Definition of the land use system: Silvopastoral systems are combinations of pastures and/or animals and trees Operation of the system: Villagers make the pure hair goats graze in flocks in areas where there are kermes oaks	Resources: The breeding system encompasses Kermes oaks (<i>Quercus coccifera</i> L.) and pure hair goats Technology: The technology utilized is primitive and insufficient Land user objectives: Kermes oaks are used as leaf fodders for feeding pure hair goat Production objectives: Villagers aim to produce meat and milk by raising pure hair goats in this area
Diagnostic	Problems and limiting constraints: The forest administration has prohibited the grazing of pure hair goats in these areas. Villagers make the goats graze in a disorganized and unconscious manner	Problems in meeting system objectives: As kermes oaks are grazed in a disorganized and intense manner, the yield of the fodder is low. It is no possible to benefit from the Davras Mountain in a sustainable manner. As pure hair goats cannot be fed at a sufficient level, the amount of meat and milk is very low Causal factors, constraints and intervention points: Raising pure hair goats is an important economic activity. Villagers are not organized. They act on an individual basis
Design and intervention	How to improve the system: The forest administration should permit the villagers to use the Davras Mountain area. Villagers should get organized as the association of breeders of pure hair goats. The production system should operate in a productive, sustainable and stable manner	Specifications for problem solving or performance enhancing interventions: The grazing method in the field should be conducted with the association of breeders of pure hair goats established by the villagers. Excessive and irregular grazing should be stopped. The villagers should commit that they will not allow excessive and irregular grazing. The grazing should be conducted for a specific period of time, on a periodic basis

the number of pure hair goats they own to official, reprisals will be taken. Hence, the forest administration should reassure goat breeders that will not happen. In cases where the owners of pure hair goats are members of this association, the forest administration shall address the institutional representative of the association of goat breeders and individual goat breeders when problems arise.

The management of the grazing in that area should be assumed by the association established by the villagers and the forest administration should inspect whether grazing is conducted in a sustainable manner. Furthermore, persons who are not members of this association should not be allowed to raise pure hair goats and persons who would like to join the production system for the purpose of raising pure hair goats should request a permit from this association.

DISCUSSION

The land use experiences relating to pure hair goat raising of villagers living in the area of Davras mountain are life experiences developed by the inhabitants of this area. However, the representatives of the forest administration would like to eliminate these life experiences. According to laws, the kermes oaks in the study area are on forest land. According to Article 19 of Forest Law No. 6831. 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 upon 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

Table 2: Periodic change in the number of pure hair goats within the study area

Years	1990	1995	2000	2005	2008
Number	34.903	31.378	32.460	17.742	15.708

TUIK (2008) and research results

according to the plans to be made. The Grazing Regulation drafted for the purpose of enforcing these articles has prohibited the grazing of pure hair goats within national forests. 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 <1 month and will also be fined. On the basis of this law, the forest administration files lawsuits against villagers who graze their pure hair goats in national forests. Persons found guilty by legal authorities are subjected to fines and imprisonment. The forest administration pressures villagers to quit raising pure hair goat. The annual change in the number of pure hair goats raised in the Central province of Isparta located in the study area has been provided in Table 2. As it may be observed, the number of pure hair goats between the years 1990-2008 has decreased by 55%.

The forestry policies implemented in Turkey aimed to decrease and even eliminate pure hair goat raising based on the view that it harms forests. The number of pure hair goats per year has been presented in Table 3 (TUIK, 2008). Upon consideration of these figures, it may be observed that there has been a decrease of 58% in the number of pure hair goats in the last 30 years (1975-2005).

On the other hand, the Ministry Environment and Forestry has prepared the Action Plan for Reducing Goat Damage in 2008 (MEFO, 2008). This action plan aims to diminish the number of pure hair goats raised all over

Table 3: Periodic number of pure hair goats raised in Turkey

Years	1975	1980	1985	1990	1995	2000	2005
Number	15,040.000	15,385.000	11,233.000	9,698.000	8,397.000	6,828.000	6,284.000

TUIK (2008)

Turkey, starting with the Mediterranean Region encompassed by the study area. Twenty-five provinces in the Aegean and Mediterranean Regions, where pure hair goat raising is widespread, were selected as the area of implementation of the action plan. The total number pure hair goats in these provinces is 3,472,000. It is 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. According to the action plan, the current number of pure hair goats in the Province of Isparta where the study is conducted is 161,000 and this number will be decreased to 49,000 in consequence to the 5-year implementation. In other words, the current number of goats will be diminished by 70%. This plan has been prepared without asking for the opinion of the people who raise pure hair goats. The human factor has been excluded in the resolving the difference between the forest resources and pure hair goat breeders. Yet, the precautions to be adopted against the grazing of pure hair goats in the forest are socioeconomic as much as they are technical.

Within the content of the action plan, there are also efforts for detecting the alternative sources of income instead of pure hair goats so as to enable the villagers to earn their living from these areas. Furthermore, areas without risk of erosion or floods and which are not suitable for forestation, but are suitable for raising goats due to the vegetation cover, shall be designated as grazing areas. Hence, some villagers will be permitted to grow pure hair goats. But, the fact that the action plan does not take into consideration the areas where kermes oaks are distributed constitutes a major deficiency.

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, kermes oaks have 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 done manually, but could not successful due to the negative drawbacks in ecological conditions and the resistant nature of this shrub type. Today, it is aimed to

afforest 1000s of ha of land in the upper basins of the Aegean and Mediterranean Regions, yet these areas are not suitable for establishing industrial forest plantations.

On the other hand, the Action Plan for Preventing Goat Damage recommends the raising of Saanen milk goats for breeding instead of pure hair goats in areas where goat raising will be allowed. The following statement has been delivered by a pure hair goat breeder within the area where the study was conducted: we have raised saanen goats, as a family. But the geographic and climactic structure of the Davras Mountain is not suitable for raising Saanen goats due to their physiological nature. We have quit this as we were incurring losses. We don't know what to do now. This thought provoking remark describes the desperation of the goat breeders from the Davras Mountain.

CONCLUSION

This study has defined and analyzed the land usage system of an area where pure hair goat raising is conducted on the Davras Mountain. A life synergy and breeding system has been established between the pure hair goat and the kermes oak. However, the current understanding of silviculture may results in the elimination of the synergy and most importantly, a local culture. Efforts should be made for developing this breeding system and not for eliminating it. The general breeding practices for the settlement as well as the mode of intervention into the system have been detailed in study. We recommend that the Ministry of Environment and Forestry modify their outlook towards pure hair goats and breeders because, none of the animal types proposed in the goat action plan constitute an alternative for the pure hair goat and cannot harmonize with the ecosystem of the pure hair goat.

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