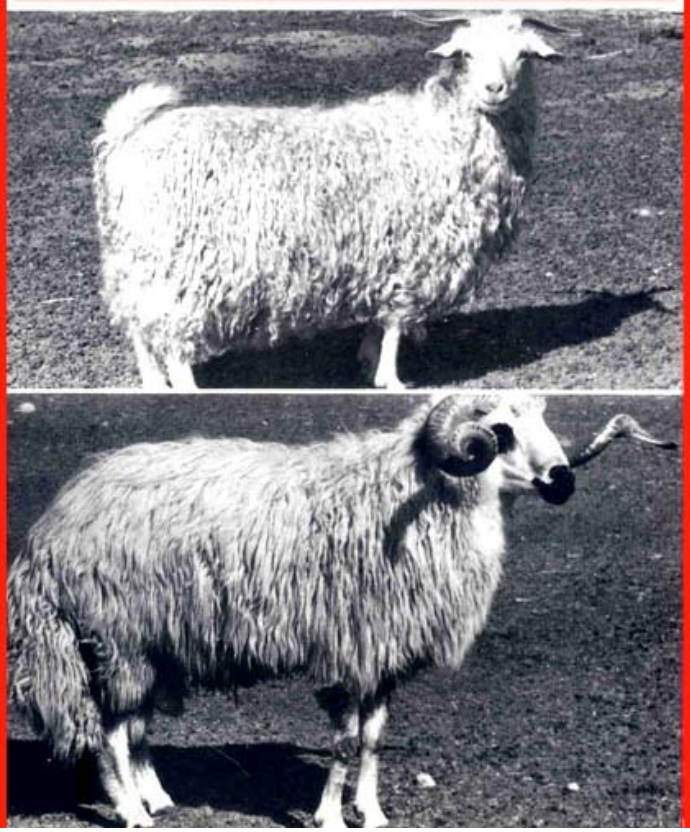
Sheep and goats in Turkey



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FAO ANIMAL PRODUCTION AND PROTECTION PAPER 60

Sheep and goats in Turkey

by

B. C. Yalçin

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FOREWORD

The 65.5 million sheep and goats in Turkey constitute the largest national herd in the Near East region. At present, they contribute 43 percent to the total, meat and 33 percent to the total milk produced in the country. The meat produced from sheep and goats in 1984 was 56 percent higher than that from cattle and buffaloes. Apart from meeting the domestic demand, the 1984 foreign exchange earning from the export of live sheep, goats, their meat and mohair amounted to about US$ 360 million. In addition some 76 thousand tons of skins produced in 1984 constituted a major part of the raw material for the leather industry.

The growing opportunities for the export of live sheep and mutton demand intensification of production together with the streamlining of marketing System. Research and demonstration of improved Systems are basic elements of the development requirements in this regard. It was felt that a concise review was needed of the available resources, the present production Systems and the research currently being carried out in the country.

At FAO's request, Dr. B.C. Yalçin, Head, Department of Animal Breeding, Faculty of Veterinary Science, University of Istanbut, prepared a comprehensive review which is presented here as an FAO Animal Production and Health Paper. The paper is one of a series of reviews that is being published by the Near East Regional Cooperative Network on Small Ruminants Research and Development for each participating country.

Following is the list of publications of the Near East Regional Cooperative Network on Small Ruminants Research and Development.

1. Report of the TCDC Workshop on the improved utilization of feed resources for sheep fattening in the Near East, Amman, April 1981.(Arabic and English)
2. Intensive Sheep Production in the Near East (Economides). Animal Production and Health Paper No. 40.1983.(English)
3. Report of the FAO Expert Consultation on Small Ruminant Research and Development in the Near East, Tunis, October 1984. (Arabic and English)
4. Small Ruminants in the Near East: I. Selected papers presented at Tunis Expert Consultation. Animal Production and Health Paper No. 54. (Arabic and English)
5. Small Ruminants in the Near East: II. Selected papers presented from World Animal Review. Animal Production and Health Paper No. 55. 1985. (Arabic and English)
6. Sheep and Goats in Pakistan (Hasnain). Animal Production and Health Paper No. 56. 1985. (English)
7. Sheep and Goats in Turkey (Yalçin). Animal Production and Health Paper No.1986. (English)

Abdul Wahab Qureshi
Near East Regional Animal Production and Health Officer
Animal Production and Health Division, Rome

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1. INTRODUCTION

Sheep and goats were probably among the earliest animal species to be domesticated by man. Reed (1974), reviewing the existing evidence on the domestication of sheep, goats, cattle and pigs, concludes that the Near East, and particularly the area in the northeastern corner of the Mediterranean, was the primary area for the early domestication of these four basic food animals. Of these animals, sheep were present in northern Iraq by 10,750 B.P., and goats, along with sheep, were present in eastern Asia Minor (Anatolian Turkey) by about 9000 B.P.

The modem sheep breeds in this area probably originated from the wild varieties of sheep (Ovis orientalis vignei). The wild goat (Capra hircus) is considered to be the chief ancestor of the various breeds of domestic goats; its most important variety is the Benzoar goat (Capra hircus aegagrus), which exists on the high mountains of Anadolia.

Sheep and goats have an important place in the economy of Turkey and in the nutrition of its people. They convert otherwise unuseable vegetaion on poor grazing lands to meat, milk, fiber and skins. Of the 984 thousand tons of total indigenous meat produced in 1983 in Turkey, 468 thousand tons came from sheep and goats, 246 thousand tons from cattle and buffaloes and remiaining 270 thousand tons from poultry and other farm animal species. Total milk production in that year was 5 926 thousand tons, 1 300 thousand tons being sheep milk, 636 thousand tons goat milk, 3 700 thousand tons cow milk and 290 thousand tons buffalo milk (FAO, 1984). Thus, sheep and goats together contributed 47.5 percent of the annual meat and 32.6 percent of the annual milk output of Turkey in 1983. In the same year, production of greasy wool , mohair, hair, and fresh sheep and goat skins were 62.3, 4.6, 8.6 and 80,4 thousand tons, respectively (FAO, 1984; SIS, 1985).

Sheep, goats and their products (meat, wool , mohair and skins) have always been among the traditional export items of animal origin in Turkey. Their share in the export earnings of the country increased greatly after 1980. Currently, over 2 million heads of live sheep, about 500 thousand heads of live goats and over 50 thousand tons of sheep-meat are exported annually, main importing countries being Near East countries. During the years 1982–1984, annual foreign exchange earnings from the exports varied between 217 and 286 million US dollars for live sheep and goats, 105 and 110 million US dollars for sheep-meat and 32 and 56 million US dollars for wool, mohair and hair (SIS, 1985). Sheep and goats contribute also indirectly to the export earnings of the country through providing raw materials for the export-oriented carpet, textile, leather and food industries.

Eastern, soultheastern and central regions of Turkey are greatly arid or semi-arid; the vast natural grazing lands and steppes in these regions are more suitable for sheep and goat raising than crop and dairy cattle production. Sheep and goats are the major source of livelihood for the rural inhabitants of these regions. They meet immediate nutritional needs of their owners and, through carpet industry, they provide occupation to many artisan families. Even in the more productive western regions of the country, where agriculture is increasingly intensified, sheep production continues to be a profitable business for sheep raisers as well as for feedlot operators, and it is often incorporated in a system of mixed farming.

In Turkey, as in the other Near East countries, sheep meat, sheep milk and sheep-milk products are valuable and generally preferred commodities. Goat meat

and goat milk are the main sources of animal protein for the inhabitants of the mountainous regions. On the other hand, human population of the country is increasing at a rate of 2.8 percent, annually. This rapid population growth and rising standards of living will increase the demand for goods of animal origin, especially for mutton and lamb. In addition, there is presently a good demand for sheep meat in the high-income countries of the region, and a demand for mohair in the world market. Therefore, sheep and goat raising in Turkey is likely to maintain its importance in the future, provided that natural resources of the country are better utilized and improved management practices are used.

The objective of this report is to give information on the phenotypic characteristics and production performances of the sheep and goat breeds in Turkey, on their management Systems, and on the research work carried out on different aspects of sheep and goat production in this country.

2. LAND AND CLIMATE

According to the preliminary results of 1985 census, the population of Turkey is 51.4 millions. Annual rate of population increase during the period from 1980 to 1985 was 2.8 percent (SIS, 1985). It is estimated that, in 1983, 50.1 percent of economically active population was occupied in agriculture (FAO, 1984).

The country has a total area of 78.1 million hectares and a land area of 77.1 million hectares. The land area consists of 27.3 million hectares of arable and permanent crop area (35.4 percent), 9.4 million hectares of permanent pastures (12.2 percent), 20.2 million hectares of forests and woodland (26.2 percent) and 20.2 million hectares of other land (26.2 percent) (FAO, 1984).

There are approximately 3.6 million agricultural holdings in the country; of these holdings, 11 percent are angaged only in crop production, 86 percent in both crop and animal production and 3 percent only in animal production (SIS, 1981). It is estimated that, in about 0.8 – 1.0 million holdings, animal production contributes more than half of the income of the holding; thus about 25 percent of the 4 million rural families angaged in agriculture depend for their livelihood mainly on animal production (Aral, 1984).

The area of Turkey consists of two main parts, the Anatolian peninsula and the Thrace. The Anatolian peninsula, the Asian part, is bounded in the north by the Black Sea, in the west by the Aegean Sea and in the south by the Mediterranean Sea. The Thrace, the European part, lies to the north of Marmara Sea and in the west it extends to Greek and Bulgarian borders. The Anatolian peninsula itself consists of several agricultural regions, each having different topography and climate.

Central Anatolia is the largest agricultural region of Turkey. High mountain ranges along the Black Sea and the Mediterranean separate this region from the sea; to the west it merges into the Aegean and Marmara Regions and to the east into the mountainous Eastern Anatolia. The climate is semi-arid. Average temparatures are 21–23°C during the hottest month and 0 - (-3)°C during the coldest month. Annual precipitation averages around 400 mm and decreases towards the interior to less than 300 mm. Summer is hot and dry, winter cold, and spring short but wet. The majority of the region consists of treeless steppe, with an average altitude of about 900 m.

Eastern Anatolia is a mountainous region with lofty ranges rising above the high broad plateau. Having an average altitude of more than 1500 m and being away from the moderating effects of the sea breezes, this region is-subject to cold winters. In

different provinces, average temparatures in the coldest month vary from (-11) to (-4)°C and those in the hottest month from 17 to 23°C . The winters are usually dry and rainfall occurs in spring and beginning of summer. The wide expenses of range lands, meadows and pastures make this region more suited to animal production. However, as the region has the longest and severest winters in Turkey, feed shortages frequently occur in winter months.

The agricultural region of Black Sea strip is narrowest in the east where mountain ranges sharply isolate it from the interior; in the hinterland of Samsun, where the mountain ranges are lower, and towards Kocaeli, where the mountains are interrupted, it widens as a result of marine influence. Precipitation is heavy in the eastern part of the region (annual precipitation in Rize being 2323 mm) but decreases westwards (annual precipitation in Samsun bering 735 mm). Average temparatures are 20 – 23°C during the warmest month and 0–7°C during the coldest month. The climate enables the region to support natural forest. The steepness of the mountains, in many places reaching 40° , makes use of plough difficult, especially in the east. Therefore, the area of arable land is limited. Corn is the dominant crop of the region.

The Mediterranean coastal strip is very narrow in the west and centre where the Taurus Mountains, rising to 3000 metres and more, reach almost to the coast. Arable lands are few and dispersed, confined for the most part to the small alluvial plains and to some valley bottoms. Soil erosion is active and accelerated by the steepness of the slopes and intensity of the rainfall. During the long hot summers, on the other hand, deficiency of water is the main problem in agriculture. The coastal strip widens in the east towards the alluvial Çukurova plain, one of the most intensively cultivated regions of Turkey, producing cotton, cereals, corn, citrus and vegetables. Mean annual temparatures in the coldest and hottest months are 9°C and 28°C, respectively. In different provinces, annual precipitation varies from 600 mm to 1100 mm; maximum rainfall is in the winter.

On the Aegean coast, mountain ranges are transverse to the coast and broad plains extend between the mountain ranges to the Central Anatolian Plateau; thus marine influence can penetrate fairly deeply inland. Annual precipitation, its distribution and annual temperatures are similar in the coastal provinces to those in the Mediterranean region; precipitation decreases gradually eastwards.

The Marmara Region is transitional between the Black Sea and Aegean Regions. The climate is predominantly Mediterranean; however, dry-season aridity is not as great as along the Mediterranean coast. Temparature and rainfall wary markedly within relatively short distances. In the Anatolian part of the region, along the south and east of Marmara Sea, fertile plains and lakes lie between east-west mountain ranges. The Thracian part of the region, lying to the north of Marmara Sea, is exposed in the winter to cola northerly wings blowing from the Black Sea. Interior Thrace, bounded by - mountain ranges on the north and south, is semi-arid and steppe in character; in natural vegetation and climate it reserves to Central Anatolia. Nevertheless the relatively more favourable topography and denser population have contributed to make the region one of the most intensively cultivated in the country. Average temparatures of these regions are 23-27°C in the warmest month and 1-8°C in the coldest month, with annual precipitations of 590 - 810 mm.

Southeastern Anatolia is the foreland of the Taurus Mountains, a region of extensive limestone plateaux, 500 to 600 metres high, dissected by a network of valleys. The region is divided into two drainage basins, that of Tigris in the east and of

Eufrates in the west. Southwards becoming gradually lower, it extends to Syria and Iraq. The climiate is continental; summer temparatures are as high as in tropical deserts and winter temparatures close to zero. Aridity is severe. The maximum precipitation falls in winter and spring. The annual rainfall is insufficient and highly variable (350–700 mm). The principal crops of the region are wheat and barley. An extensive irrigation project, Southeastern Anatolian Project, to be completed in the near future, is likely to change the agricultural picture of the region.

3. FEED RESOURCES, PRODUCTION SYSTEMS AND MANAGEMENT PRACTICES

3.1. Feed Resources

Range forages and grasslands constitute a large part of the feed supply for sheep and goats in Turkey. Stubbles and fallow areas are other resources utilized for meeting the nutritional requirements of these species. Goats, in addition, have access to bushes, shrubs and forest areas; however, utilization of these areas by goats has become increasingly limited because of the measures applied by the state for protecting woodlands and forests.

With the mecanization of agriculture since 1950, rangelands and grasslands have been subjected to heavy ploughing for arable crop production. Thus the area of range lands and grasslands has been reduced from 37.8 million hectares in 1950 to 21.7 million hectares in 1975; the number of farm animals increased by approximately 70 percent during the same preiod (SIS, 1950 and 1976). In other words, more animals are now grazing smaller areas. Rangelands are further deteriorated under excessive and uncontrolled grazing, low rainfall and droughts. It was shown (Özmen, 1984) that common village ranges in Konya Province in Central Anatolia are grazed 71 percent heavier than the recommended intensity, which was found to be 1.3 – 4.8 hectares per animal unit for a six-month grazing period. The rangelands in the other regions of Turkey are of relatively better quality than that in Central Anatolia; however, overgrazing is a countrywide problem.

Composition of range vegetation vary according to regions and elevation. The fllowing are more frequent herbaceous species found in different regions:

Thrace: Aegilops triuncialis, Agropyron elongatum, A. intermedium, Agrostis alba, Bromus tectorum, Botriochola ischaemum, Carex glauca, Chrysopogon gryllus, Cynodon dactylon, Cynosorus cristatus, Dactylis glomerata, Festuca ovina, Genista sylvestris, Koeleria cristata, Koeleria degneii, Lathyrus graceus, Lolium perenne , Lotus angustissimus, Medicago truncatula, Onobrychis alba, C. gracilis, Phieum pratense, Plantago holesteum, Poa bulbosa,. pratensis, Potentillrecta, Sanguisorba muricata, Stipa pennata, Thymus striatus, Trifolium campestre, T. incarnatum, T. repens, T. subterraneum. Vicia incana, V. sativa. (Uluocak, 1974).

Central Anatolia :Aegilops caudata, Aovata, Agropyroncristatum, A. orientale, Andropogon sp. , Artemisia fragans, Astragallus collinus, A. ovalis, Bromus scoparius, Btectorum, Chrysopogongryllus, Dactyiis glomerata, Elymuscaput-medusae, Festuca ovina, Hedysarum varium, Medicago lupinastrum, M. sativa, Onobrychis armena, Poa bulbosa, Saivisp., Stipa lagascae, Stipa pennata, Thymus squarrosus, Trifolium fragiferum . (Tarman, 1962; Alinoglu, 1984).

Eastern Anatolia : Agropyron cristatum, A. elongatum, A. repens, Agrostis, ajba, Alopecurus spp., Andropogon caucasicus, Artemisia sp., Astragalus sp., Bromus inermis, B. macrostacys, Cynodon dactylon, Dactylis glomerata, Elymus caput-

medusae, Festuca ovina, Hordeum bulbosum, H. murinum, Koeleria cristata, K. glauca, K. phleoides , Lolium prenne, Lotus carnculatus, L. purpurea, Melilotus officinal is, Onobrychi s sp., Phleum pratanse, Poa bulbosa, P. persica, Thymus sp. Trifolium ambiguum, T. incarnatum, T. repens, T. pratense. Vicia sp. (Erkun and Nixon, 1955; Sari, 1976; Uluocak, 1984).

Proportion of good quality herbs is reported as 70–80 percent for the grazing lands of Eastern Anatolia and Black Sea Region and 15–20 percent for Central Anatolian steppes (Gencakan, 1970). In Konya Province of Central Anatolia grasses, legumes and other families were found to constitute respectively 28.2, 4.2 and 67.6 percent of the plant cover of village ranges; there were great variations between villages in this respect. Hay yield of the village ranges, when harvested from the surface of the soil, varied from 359 kg/ha to 1617 kg/ha with an average value of 754 kg/ha. Corresponding values for qualitygrades of these ranges were 1.20, 4.36 and 3.03 (Özmen, 1984). For Eastern Anatolia and southeastern Anatolia, average hay yieids were reported as 800 kg/ha and 300 kg/ha, respectively.

Stubble, i.e. cereal crop aftermath, is an important feed resource for sheep and goats in Turkey. After the harvest of cereals, animals are grazed on the harvested fields during autumn and, in some regions, through winter. Amount of stubble consumed, over a seven-month period, on wheat and barley fields near Ankara is estimated between 272 and 315 kg/ha, and the total amount of stubble consumed in Turkey annually is estimated to be 2.5 – 3.0 million tons (Büyükburç, 1984).

Traditionally, a cereal crop / fallow rotation is practiced in dryland farming in Turkey. As a result of this practice, annually, about 8.5 million hectares of agricultural land is left to fallow. However, the plants growing on these fields serve as a forage resource for sheep and goats.

Basic feedstuffs produced in the country are hay, straw, barley, oats, maize, wheat-bran, dried sugarbeet pulp, molasses, sunflower oil meal and cottonseed oil meal.

3.2. Production Systems

Sheep and goat production in Turkey is based mainly on the utilization of the areas unsuitable for cultivation, of stubbles and fallow areas. . Therefore, availability of forages, seasonality of vegetation and topographical and climatic conditions determine the type of production system to be used in different localities and regions. Three types of production System are in operation; these are sedentary, transhumant and nomadic Systems.

3.2.1. Sedentary System :

In this system, sheep and goat flocks are kept at or close to the village or farm all the year round. During the day they are grazed either on the common village range or on privately-owned or hired grazing areas; they also have access to stubbles and fallow fields. For the night they return to their sheds in the village or on the farm. These flocks are shepherded all the time during grazing. Sedentary flocks are wintered in simple sheds for 1–5 months depending on the region and severity of the climatic conditions.

Sedentary system is common in sheep raising in ail the regions of the country and in Angora raising in Central Anatolia. It is less frequent among hairy goat flocks. Village flocks managed under this System may consist of 200–300 sheep or

goats; number of animals in private farm flocks vary between 50 and 300. Household sheep and goat keeping in the villages and towns may also be considered within this System. These family flocks may consist of 2–5 sheep or goats of milk type. They graze the vegetation in the gardens and around the nearby crop fields.

3.2.2. Transhumant System :

The traditional transhumant System of sheep and goat production is still common in different parts of the country, especially in the mountainous Mediterranean, Black Sea and Eastern Anatolian regions. Transhumant sheep and goat flocks move out of the hotter and drier lowland areas in the end of spring to graze on the better and cooler grazing areas of highlands and plateaus. After remaining there for 4–5 months, they return to their base villages or farms in autumn, where they are fed or grazed through following spring.

The grazing areas on highlands and plateaus are in general state property. Those belonging to private persons are rented by flock owners for grazing. Flocks may be private or communal, i.e. owned by different persons. In the latter case, individual owners contribute to the shepherding, grazing and other expenses according to the numbers of their animals in the flock. The transport of the animals to the summer grazing areas is either by walking or by road.

Transhumant flocks are generally larger than sedentary flocks, their sizes varying between 300 and 500 animals. Usually, they are composed either of sheep or of goats, but sheep flocks may have few goats in them. In some regions, like northeast Turkey, sheep and goats are often run in mixed flocks.

3.2.3. Nomadic System :

Nomadic System of production involves eastern and southeastern regions of the country and is limited to sheep keeping only. In these regions, it is practiced alongside with the transhumant and sedentary Systems. Nomadic flocks follow the seasonal growth of the vegetation in a migration from the lowland winter ranges in southeastern Anatolia to highland summer pastures in eastern Anatolia and back. As different from transhumant flocks, they neither have any base village nor any form of shelter. During their annual migration cycle, they cover much longer distances, often totalling several hundreds of kilometers. As a result of this System, great numbers of flocks are gathered in the southeastern Anatolian ranges, especially in Diyarbakir and Urfa Provinces, in the autumn, and they remain there until mid-spring.

Tribes may contain several sections and families and have several flocks. Members of the families move together with their flocks and live in the tents made of goat hair. Flocks belonging to one tribe consist usually of sheep from only one breed; tribesmen belonging to Beritan tribe for example keep only Red Karaman sheep. Each tribe may have up to 150.000 – 200.000 sheep.

The implementation of the Southeastern Anatolian Irrigation Project in the near future will bring part of the grazingland in the region under cultivation. In accordance with this, government has plans for settling nomadic flock owners in the area. These developments are expected to reduce the number of nomadic sheep flocks in the region. However, the system is likely to persist in the decades to come but at a smaller scale.

3.3. General Nutrition and Managemenet Practices

3.3.1. Nutrition :

Nutrition of sheep in Turkey during the grazing season depends almost entirely on grazing of natural pastures, stubble and fallow fields. Grazing season starts between February and April depending on the region, elevation, the distrance from the sea and severity of winter. Vegetation dries off in the beginning of summer in almost all regions except on high grazing lands. With the commencement of rains in autumn, some revival of vegetation occurs on the lowland ranges. Grazing season usually continue until the end of November in central and eastern regions and in the higher parts of southeastern Anatolia. The quality and density of grass on the central and southeastern ranges are generally low.

In the Aegean, Marmara and Thrace Regions vegetation and pasture quality are better, and grazing season longer than in the above regions. In the milder coastal strips of Eastern Black Sea and Mediterranean Regions sheep and goats are grazed all the year round. The grazing lands in these parts of the country provide fairly adequate nutrition during the grazing season. However, they are getting smaller due to the widening of the corp-producing areas.

The nutritional pattern in spring, summer and autumn is essentially the same for all types of production systems, the only source of nutrition being natural pastures, stubbles and fallows. Nutrition of sheep during the winter, however, differs according to the type of the flock. Nomadic flocks are maintained even in the winter on rangelands without extra feeding. Sedentary and transhumant flocks, on the other hand, are wintered on the owners farms or in the villages, when they are fed on straw and, if available, on hay; a few of the flock owners feed their sheep about 100 to 200 g per head daily of barley toward the end of pregnancy and during early lactation. Lambs suckle their mothers twice a day during the first month (or first two months) of life, and for another month they go to pasture with their mothers; they are weaned at 1 1/2 – 3 months of age.

The Angora goats are raised mainly in Central Anatolia, generally as sedentary flocks. The nutritional pattern is much the same as for sheep in the region. Only a small proportion of the Angora goat flocks are associated with brushy land. The main sources of nutrition for common hair goats of hilly and mountaineous regions are shrubs, bushes and grazing areas around forests.

3.3.2. Housing :

Sedentary and trarnshumant sheep and Angora goat flocks are usually housed in the winter. The sheds are simple and often unhygienic, and made of stone, bricks, mud bricks or wood depending on the availability of these materials. Courtyards and open shelters near or adjoining the houses are also used for this purpose. In cold regions some kind of shelter is also provided for hair goats in the winter; in mild regions they are kept in simple enclosures or in a nearby cave, if available, when necessary. Housing is a means of protecting the adult animals and the new-born against cold weather and predators, particularly in regions receiving heavy snawfall in the winter. Nomadic flocks spend the winter on the lowland ranges without the provision of any kind of shelter. In the open conditions, flocks are always shepherded and special shepherd dogs are used for protecting the flocks against predator animals.

3.3.3. Mating :

The majority of sheep and goat breeds in Turkey are belived to be seasonal breeders. Within this seasonal limitation, the time of mating is influenced by the availability of forages on the grazingland during and after lambing. As a result, matings

take place within the following periods in different regions: September–October in Central Anatolia, October–November in eastern Anatolia, August–September in southeastern Anatolia and Mediterranean and Black Sea Regions, July–August in Aegean Region and Thrace, and June–July in Southern Marmara Region. In Central Anatolia Angora goats are usually mated about one month later than sheep for kidding in a more suitable time. In southern Marmara Region and Thrace, mating in some sheep flocks is one or one and a half months earlier than the usual time for the production of out of season lambs.

Rams and bucks are usually kept in the flock during the grazing season. However, some sedentary sheep and Angora goat owners introduce their rams or bucks into the flock only for the mating season; in this case mating continues over a period of 35 to 40 days. In general, ewes and does do not receive any supplementary feeding before and during the mating season. For some flocks, stubble provides a fairly good level of nutrition at that time, and serves as a means of flushing. Rams and Angora bucks, on the other hand, are usually fed some concentrates starting about one month before and continuing during mating season.

Age at first mating is normally 18 months for both males and females. In some Angora goat flocks, does are mated for the first time at 30 months. Ewes and does are used in reproduction up to 7 or 8 years of age. Rams and bucks are usually culled at younger ages (4 to 6 years). Number of females put to each male vary between 30 and 40.

In the majority of the sheep and Angora goat flocks of state farms, males are kept separated from females all the time, and matings are carried out by the use of artificial insemination; in these flocks females in estrus state are identified with the use of aproned males. Artificial insemination is also practiced in some of the producers flocks in Central Anatolia for inseminating fat-tailed native ewes with Merino semen.

3.3.4. Lambing

Lambing takes place in February, March and April in central and eastern regions, and in December, January and February in the coastal regions and in southeastern Anatolia. The ewes and Angora does belonging to sedentary and transhumant flocks give birth to their young usually in the shed. Lambs and kids remain there for the first one or two months of their lives. During that time they sucle their mothers twice a day and receive some hay and concentrates. Later they go for grazing with their mothers until weaning. Lambs and hairy type kids are weaned between one and a half and three months of age. In the majority of the flocks in Thrace and southern Marmara Region lambs are weaned at as early as one and a half months, the chief reason for this being to milk the ewes to obtain more marketable milk.

3.3.5. Milking

Milking of sheep and hair goats is a general practice in Turkey. After weaning, animals are milked by hand for two to three months. Milking period is longer in Awassi and Sakiz breeds. The majority of Angora goat flocks are not milked, the reasons for this being long suckling period and poor milk production in this breed. Milk obtained from sheep and goats is partly used locally for the nutritional needs of the rural owners, and excess milk is used or sold for cheese making.

3.3.6. Shearing

Shearing of sheep takes place in May and during the first half of June in different regions of the country. Angora goats are usually shorn earlier (in April); shedding or partial peeling of fleece in the early spring is the main reason for this early shearing. The majority sheep owners and goat raisers shear their animals once in a year. However, in some sheep flocks of Awassi, Karayaka and Imroz breeds shearing twice-a-year is also practiced.

3.3.7. Production Recording

Identification and production recording of animals are almost non-existent in sheep and goat flocks belonging to the producers; nor is there any breed association for these species in the country. In some flocks animals are marked or branded with a special sign only for showing their ownership. Selection and culling decisions are therefore made by visual appraisal and according to the experiences of the owners or shepherds.

In sheep and Angora goat flocks of the state farms, on the other hand, animals are identified by ear-tagging and/or tatooing, and in the majority of them parentage is kept and production characteristics are individually recorded. Merino type sheep and Angora goats are fleece-sampled and fleece characteristics are measured in state wool laboratories. In the state farms, pure flocks of native sheep breeds, Merinos and Angora goats are maintained and improved through selection. Rams and bucks from these improved flocks are made available to the producers at suitable prices, as an attempt to pass the genetic superiority of these flocks to the producers flocks. However, in view of the large sheep and Angora goat populations in the country, the impact of this activity on the overall improvement is limited.

3.3.8. Disease

Several bacterial infections, some zoonotic in character, are still encountered among sheep and goats in Turkey and cause deaths and production losses in these species. More important ones are Anthrax, Brucellosis, Campylobacteriosis, Enterotoxaemia, Infectious Necrotic Hepatitis, Listeriosis Necrobacillosis, Pasteurellosis, Contagious Agalactia, Pleuropneumonia Contagiosa Caprum (Arda et al., 1983).

As to the viral infections, mention should be made to Echtyma, Sheep and Goat Pox, Foot-and-Mouth Disease, Adenovirus infections and Blue Tong. Clinical cases of Louping III are reported from Thrace Region. Para Influensa and Border Disease have been serologically identified (Burgu, 1983).

For most of these bacterial and viral diseases vaccines are produced within the country. Systematic vaccinations, as well as spot vaccinations in the case of an outbreak, are applied to sheep and goats by the government veterinary services. A project for the eradication of Brucellossis in the country has been in operation since 1983; according to this project lambs and kids are vaccinated with Rev. I vaccine. In Thrace Region, which has been chosen as buffer-zone for the control of Foot-and-Mouth Disease, sheep and goats, together with-cattle, are systematically vaccinated against the agent; in the Anatolian part ring vaccinations are carried out when outbreaks occur.

The climatic conditions of Turkey is suitable for the development of helminth parazites. Diseases caused by them are quite widespread in the country. Helminth diseases in sheep and goats, often accompanied by poor nutrition, lead to great economic losses in terms of meat, milk and wool, and to deaths. Important helminth species attacking sheep and goats in Turkey are Dictyocaulus filaria, Protostrongylus rufescens, P. unciphorus Trichostrongylus spp., Ostertagia spp.,

Haemonchus contortus, Monezia expansa, Chyst hydatic, Coenurus cerebralis, Cysticercus tenuicolis, Fasciola hepatica, F. gigantuca and Dicrocoelium lanceatum (Tinar, 1983).

Of the metabolic disorders, Muscular distrophia and Enzootic ataxia are encountered among sheep and goats in certain ereas.

Wastage and mortality in the ewe flocks were studied in a survey of flocks in different regions of Turkey (Roberts et al., 1968). The results indicated that malnutrition was not an important cause of death, that disease of one kind or another caused substantial losses in approximately half the lowland flocks, and that in the upland flocks, mortality attributable either to disease or malnutrition was negligible. Shepherding was found to be highly competent and perinatal disease of both ewes and lambs was very low. Disregarding some exceptional disposals and losses, the mean annual wastage was about 20 percent, made up of 12 percent sold in the normal course of farming, 0.5 percent killed by wolves, 1.5 percent eliminated for brucellosis, 2 percent unaccounted for and 4 percent mortality.

In spite of the poor nutritional and unsuitable weather conditions and prevalance of various diseases, lamb losses are less than one would expect. In the majority of studies, lamb mortality up to the weaning age was found to be less than 10 percent. This is probably due to the hardiness of the native sheep and goat breeds, competent shepherding, and to the housing of the animals in the majority of the flocks during critical periods

4. POPULATION AND PRODUCTION

4.1. Sheep and Goat Populations and their Distributions

Turkey is among the major sheep and goat raising countries of the world, with a sheep population of 48.7 million heads and a goat population of 16.7 million heads in 1983. Table 4.1 shows the trends in sheep and goat numbers since 1951, and Table 4.2 gives the composition of the sheep population in the country in relation to breeds.

Except for minor fluctuations, sheep number increased rapidly until 1981 when the number in 1951 was doubled. It decreased in 1983, partly as a result of the increase in the exports of live sheep since the end of 1982. Number of hair goats increased moderately until 1960. Thereafter it showed a fairly consistent decline which resulted from measures taken for the protection of forests and woodlands, and from measures applied for reducing hairgoat numbers since the initiation of development plans in 1962. Among these measures were substituting sheep and cattle for the hair goats in forest areas, and encourraging mass consumption and export of these goats. Number of Angora goats declined from a hig level of 6.0 millions in 1960 to 3.5 millions in 1975, and then showed a slight recovery reaching 3.8 millions in 1981. However, over the next two years it declined to 3.1 millions. Prohibition of their grazing in bushy and brushy areas, and low and fluctuating mohair prices are the main reasons for the reduction and inconsistency in Angora goat numbers.

Of the sheep population, 97 percent belong to indigenous breeds and remaining 3 percent are Merino type sheep. Eleven sheep breeds have been described; five are fat-tailed (White Karaman, Red Karaman, Dağliç, Awassi and Karakul), four are thin-tailed (Kivircik, Karayaka, Turkish Merino and Gökçeada/Imroz), one is semi-fat-tailed (Sakiz) and one fat-rumped (Tuj). Fat-tailed breeds are mostly distributed in the

inland and thin-tailed breeds in the coastal regions of the country. The distribution areas of these sheep breeds are shown on Figure 4.1.

Table 4.1. Sheep and goat numbers in different years (Index: 1951 = 100; numbers: thousands)

	Sheep		Hair Goats		Angora Goats	
Years	Number	Index	Number	Index	Number	Index
1951	24 832	100	16 531	100	4 370	100
1954	26 808	108	16 121	98	4 958	113
1957	29 209	118	17 248	104	4 573	105
1960	34 463	139	18 637	113	5 996	137
1963	32 279	130	15 918	96	5 587	128
1966	34 663	140	15 315	93	5 617	128
1969	36 351	146	15 336	93	4 931	113
1972	38 806	156	14 820	90	3 643	83
1975	41 366	167	15 216	92	3 547	81
1978	43 942	177	14 805	90	3 642	83
1980	48 630	196	15 385	93	3 658	84
1981	49 598	200	15 070	91	3 856	88
1982	49 636	200	14 655	89	3 558	81
1983	48 707	196	13 615	82	3 117	71

Source; SIS (1955 – 1984).

Table 4.2. Composition of sheep population in relation to breeds (1983)

Sheep Breeds	Number (thousand)	Proportion (percent)
Fat-Tailed		
White Karaman	21 034	43.2
Red Karaman	11 892	24.4
Dağliç	5 980	12.3
Awassi	1 110	2.3
Karakul	24	0.05
Thin-Tailed		
Kivircik	3 735	7.7
Karayaka	1 719	3.5
Turkish Merino	1 456	3.0
Gökçeada (Imroz)	73	0.15
Other		
Sakiz	29	0.06
Local breeds and crosses	1 655	3.4
Ail Breeds	48 707	100.0

Source: SIS (1984).

Among the sheep breeds, White Karaman is the most numerous breed (43.2 percent), folloved by Red Karaman (24.4 percent), Dagliç (12.3 percent) and Kivircik (7.7 percent). Karakul, Sakiz and Imroz have small populations varying from 0.05 to 0.15 percent. 3.4 percent of the sheep population consists of local breeds and native crosses (Table 4.2).

Of the 16,7 million goats, 13.6 millions (81.4 percent) are common hair goats and 3.1 millions (18.6 percent) are Angora goats (SIS, 1984). The number of milk-type goats in the country is estimated around 120 thousands; they are not included in the officiai statistics. Hair goats are distributed in ail the regions of the country, and Angora goats mainly in Central Anatolia. milk goats are mostly raised in and around towns and cities of coastal regions; they can be found sporadically in the other regions. Figure 4.2 shows the distribution of the goat breeds in the country.

4.2. Sheep and Goat Production :

Sheep and goat in Turkey make important contributions to the meat and milk output of the country. The annual production figures for meat obtained from sheep and goats are given in Table 4.3, and those for sheep and goat milk in Table 4.4.

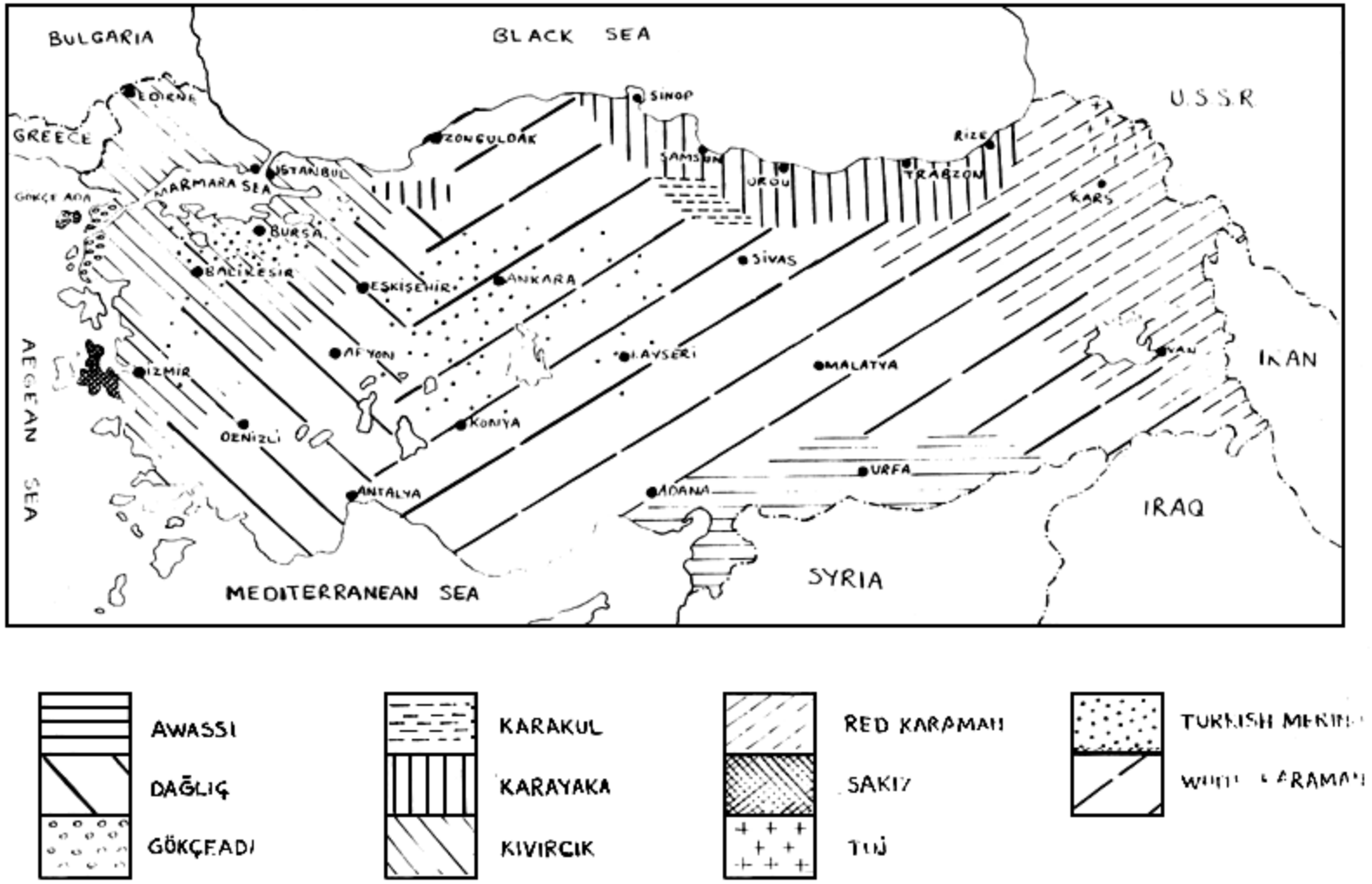

Figure 4.1. distribution of Sheep Breeds in Turkey

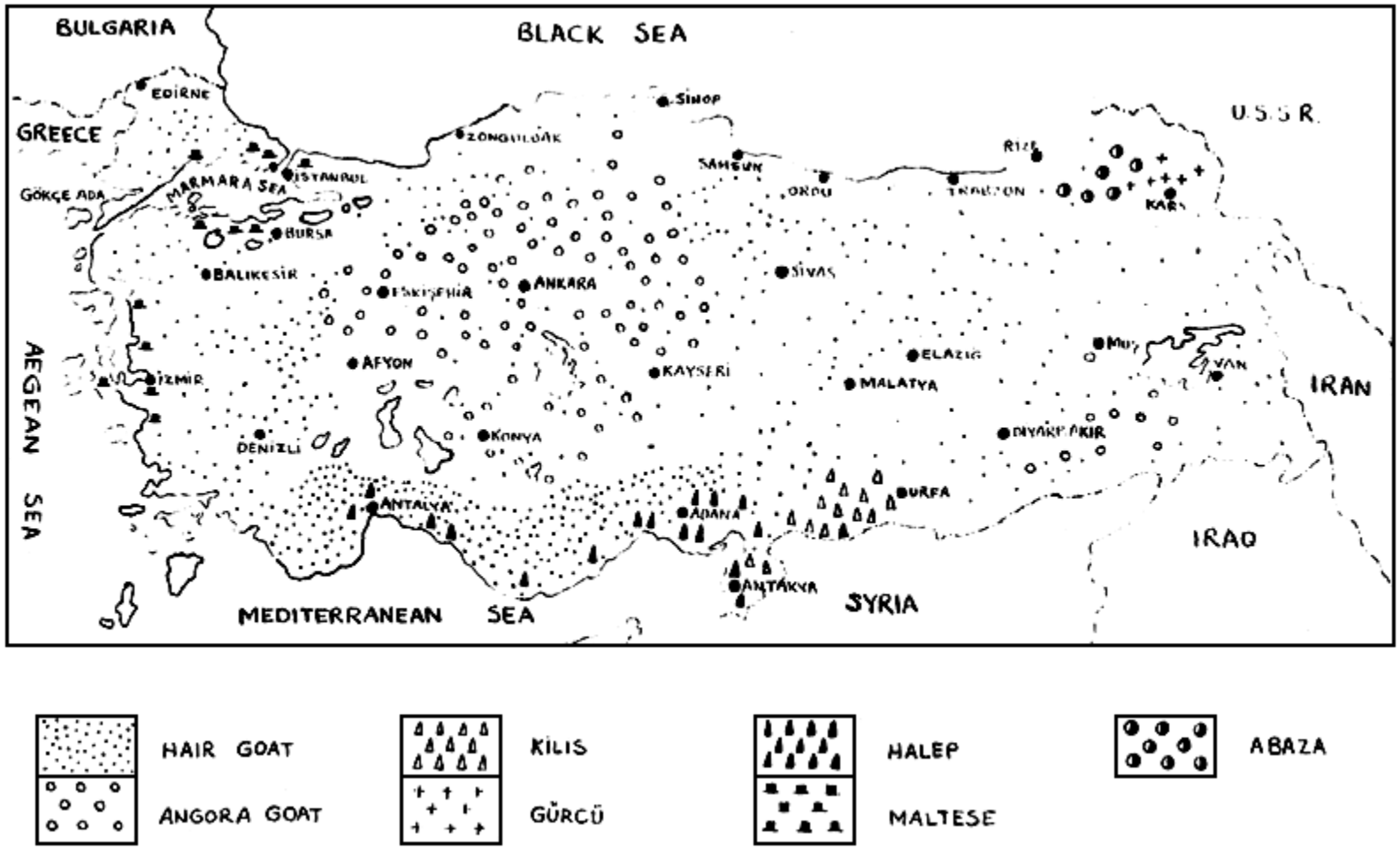

Figure 4.2. distribution of Goat Breeds in Turkey

In 1983, respectively 303 and 130 thousand tons of meat were obtained from the slaughterings in the country of sheep and goats. Total indigenous sheep and goat meat production in the same year, which includes the meat equivalent of exported live animal, was 468 thousand tons; it corresponds to 47.6 percent of total indigenous meat produced in the country.

In the same year sheep milk production was 1 300 thousand tons and goat milk production was 636 thousand tons, these corresponding to 21.2 and 10.7 percent of the total milk production of the country in that year. Over the period from 1969 to 1983 goat milk production remained fairly constant, while sheep milk production increased about 50 percent; this increase in sheep milk production is mainly associated with the increases in the sheep numbers. However, the proportion of sheep milk in the total milk production increased slightly during this period, while that of goat milk showed a considerable reduction. The contribution of these two species together to the milk output of the country is still at a high level (32.6 percent in 1983).

Table 4.3. Annual production of sheep and goat meat in Turkey

	Total meat Indigenous	Sheep meat Slaught.	Goat meat Slaught.	Sheep and Goat meat, Indigenous	
Years	1000 tons	1000 tons	1000 tons	1000 tons	percent
1969-71	652	226	101	333	51.1
1974-76	777	311	67	384	49.4
1981	868	286	63	373	43.0
1983	984	303	130	468	47.6

Source: FAO (1978 and 1984).

Table 4.4. Annual production of sheep and goat milk in Turkey.

Years	Total milk 1000 tons	Sheep milk 1000 tons	percent	Goat milk 1000 tons	percent
1969–71	4 308	866	20.1	603	14.0
1974–76	4 832	986	20.4	627	13.0
1981	5 608	1 176	21.0	612	10.9
1983	5 926	1 300	21.9	636	10.7

Source; FAO (1978 and 1984).

The greatest part of the wool produced by the sheep in Turkey is of coarse-wool type; most of it is used in the carpet industry. Mohair produced by Angora goats is a valuable textile fiber and an important export commodity. These species also provide skins needed by the growing leather industry of the country. Production figures for these items are given in Table 4.5.

Table 4.5. Annual production of wool, mohair, hair and fresh skins (in tons)

Years	Greasy Wool (1)	Greasy Mohair (1)	Hair (1)	Fresh Sheep Skins (2)	Fresh Goat Skins (2)
1969–71	42 207	6 873	8 820	48 642	13 274
1974–76	53 213	5 563	8 932	69 737	9 765
1981	62 310	6 085	8 960	63 871	8 338
1983	62 260	4 580	8 625	67 200	13 200

Sources: (1). SIS (1984).
(2). FAO (1978 and 1984).

Milk, wool and skins obtained from sheep and goats are used almost completely for domestic purposes. Part of the mutton and lamb, live sheep and goats and of the mohair produced in the country are exported. Exported quantities and export values of these items are given in Table 4.6.

Table 4.6. Exports of the main sheep and goat products from Turkey

Year	Live Sheep (head)	Live Goats (head)	Mutton+Lamb (Tons)	Mohair (Tons)
1981	1 608 592	210 267	24 711	3 690
1982	2 006 904	446 923	44 372	4 254
1983	2 070 430	497 654	44 681	4 346
1984	2 117 614	486 282	51 878	----
Year	Live Sheep (million $)	Live Goats (million $)	Mutton+Lamb (million $)	Mohair (Million $)
1981	186.8	25.0	76.2	18.0
1982	248.0	38.0	117.2	18.0
1983	233.1	37.6	104.8	18.4
1984	188.3	29.1	109.4	---

Source: DTFT, 1985.

Live sheep and goats are mainly exported to Saudi Arabia, Jordan, Lebanon, Libya, Kuwait and Dubai, and mutton and lamb to Iran, Algeria, Iraq as well as to the above Near Eastern countries.

With the exception of fine-wool, importation of sheep and goat products into Turkey is negligible. About 20–25 percent of the greasy fine-wool required by the textile industry is produced within the country. and the remaining 75–80 percent is imported. During the years 1981–1984, quantities of fine-wool (mostly greasy) annually imported into the country varied from 8.0 to 14.4 thousand tons. (SIS, 1985).

5. BREEDS OF SHEEP AND GOATS

Detailed information on the sheep and goat breeds of Turkey is given in the following sections. The section on each breed include general knowledge about the breed, its distribution and numbers, and describes its phenotipic appearance, production performance and any breed improvement work and crossbreeding activity.

5.1. Sheep Breeds

The great majority of the sheep population of Turkey is composed of multipurpose native breeds, producing meat, milk and wool. The relative importance of each of these production attributes varies from breed to breed. It is estimated that (Açil and Demirci, 1983). on the average, respectively 70, 23 and 7 percent of the gross production value is contributed by the sales of meat animal, milk and wool.

5.1.1 White Karaman (Plate 1)

General : The White Karaman is an indigenous breed of Turkey. The Turkish name for the breed is Akkaraman. Like the other fat-tailed sheep breeds in the country, it is very hardy and strives well under poor feeding and extreme climatic conditions. Besides the common type two local types (Kangal and Karakaş) and one colour variety (Southern Karaman) are recognized within the breed. The colour of the southern Karaman is usually black.

Distribution and Numbers : The white Karaman breed is distributed throughout Central Anatolia, and into the parts of eastern and southeastern regions. It is also found in the parts of Black Sea and Mediterranean Regions adjacent to Central Anatolia. Kangal type is raised in Sivas and Malatya provinces and Karakaş type in Diyarbakir province. Southern Karaman is found at the foothills of Taurus Mountains facing Central Anatolia. The White Karaman covers approximately half of the country's surface area. It has the largest population among the sheep breeds of the country; in 1983 it numbered 21 million or 43.2 percent of the total sheep population.

Nutrition and Management : In the main distribution area, i.e. in Central Anatolia, nutrition of sheep during the grazing season, which lasts from April to the end of November, depends almost completely on grazing of poor quality pastures and stubble. Sheep are housed in simple and generally unhygienic sheep-sheds during winter, when they are fed on straw; in some flocks animals receive some hay and limited amount of concentrates for a short period before and after lambing. Mating takes place in September and October, with lambing in February and March. Lambs are weaned at about 2–3 months of age, after which ewes are milked. The milking period is 2–3 months.

Phenotypic Description : The White Karaman is a fat-tailed sheep. Average weight of the tail is from 4 to 6 kg; it can be as heavy as 25 kg in some mature rams. The thin end of the tail bends twice on the main part and forms an S-shaped curve. The colour is white with black around the nose, and rarely around the eyes and on the legs. Only about 10 percent of the rams are horned. Ewes are polled; very rarely thay have small horns. Ewes are drooping. The fleece is of carpet-wool type, with a coarse and long outer coat and fine and short inner coat. Head, underside of neck and legs are usually devoid of wool.

Body Measurements : The White Karaman is in general a medium-sized breed. However, of the two local types Kangal is larger and Karakaş is smaller than the usual type. Mean values for some body measurements of the ewes from usual and Kangal types are shown below (Sandikçioğlu, 1961; Başpinar, 1985).

	Usual type (cm)		Kangal type (cm)	
Body Measurement	Mean	S.E.	Mean	S.E.
Hight at withers	64.7	0.29	68.7	0.39
Body length	63.2	0.30	69.9	0.44
Chest depth	30.2	0.21	31.9	0.17
Chest width (front)	16.2	0.11	18.2	0.14
Chest girth	81.0	0.31	92.7	0.52
Cannon circumference	7.8	0.05	8.2	0.06
	(n = 100)		(n = 122)	

Production Performance : Production levels for different characteristics of the breed are given below (Sandikçtoğlu, 1961; Sandikçioğlu et al., 1968; Düzgüeş and Pekel, 1968; Yalçin and Aktaş, 1969 and 1976; Özcan and Yalçin, 1977; Yalçin, 1979; Başpinar, 1985):

Characteristics of ewes	Performance level
Body weight (kg)	40 – 45
Lactation milk yield (kg)	40 – 55
Lactation length (day)	140 – 150
Milk fat (percent)	6.5
Greasy fleece weight (kg)	1.5 – 2.0
Staple length (cm)	8 – 12
Fiber diameter (micron)	29 – 35
Clean wool yield (percent)	62 – 70
Breaking strength (g)	15 – 21
Fiber elasticity (percent)	24 – 27
Medullated fibers (percent)	1 – 7
Birth rate (percent)	85 – 88
Twinning rate (percent)	4 – 5

Lamb weights (both sexes)	n	Mean (kg)
Birth weight	237	3.92
45-day weight	231	14.01
75-day weight	229	18.93
105-day weight (weaning)	226	23.61
Lamb survival (both sexes)		Percent
Survival to 45 days		97.5
Survival to 75 days		96.6
Survival to 105 days (weaning)		95.4

Lamb growth and survival data refer to the White the Karaman flock at Ereğli Animal Breeding Research Institute, Konya (Yalçin and Aktaş. 1976). Survival rate in the field flocks is likely to be lower; however, survival to weaning (2–3 months of age) is estimated to be around 10 percent in white Karaman and roost of the other native sheep breeds.

Breed Improvement : Most of the state farms in the region have large pure White Karaman flocks and angaged in the improvement of the breed. These are

Gözlü State Farm and Ereğli Animal Breeding Research Institute in - Konya, Bala and Polatli State Farms in Ankara, Malya State Farm in Kirşehir, ulaş and Hafik State Farms in Sivas, and Sultansuyu State farm in Malatya. The rams from these nucleus flocks are made available to White Karaman breeders at suitable prices.

White Karaman is crossed with Karayaka and Dağliç breeds where its distribution area is overlapped with that of these two breeds. The sheep called Amasya Herik is probably the result of White Karaman x Karayaka crossbreeding. The sheep obtained from White Karaman x Dağliç matings is known as Çandir and the reciprocal cross as Kesber.

At present, the most important crossbreeding programme in the breed is being carried out through A.I., using Mutton Merino semen. A.I. is necessary at the first stage of this crossbreeding, as Merino rams cannot mate with White Karaman ewes naturally because of the fat tail of the latter. More than a million Merino type sheep now present in Central Anatolia resulted from this crossbreeding (see Central Anatolian Merino, Section 5.1.8) The White Karaman was also crossed with lie de France and Awassi for experimental purposes (Yalçin and Aktaş, 1971 and 1976).

5.1.2. Red Karaman (Plate 2)

General : The Red Karaman bears some similarities with White Karaman, and in fact carries the word Karaman in its name. According to Mason (1967), however, it merits classification as a separate breed, along with the White Karaman, and not merely as a colour variant of the Karaman. The Turkish names KiziI Karaman and Mor Karaman are used for the breed, often interchangeably, because of its reddish-brown colour. Kizil is the Turkish word for red and Mor is the Turkish word for maroon. The breed also exists in the port of Iran bordering Turkey, with the name used in the literature as Kizil, Gezel or Ghezel.

Distribution and numbers : The Red Karaman is distributed in the northeastern provinces of Turkey, namely Kars, Erzurum, Agri, Muş, Bingöl, Van, Bitlis, Erzincan and Elaziğ. The White Karaman also occurs in the above provinces in smaller numbers. Nomadic flocks of the Red Karaman are seen in the southeastern provinces of Diyarbakir and Urfa during winter. The number of Red Karaman sheep in Turkey in 1983 was estimated to be 11.9 million; this corresponds to 24.4 percent of the total sheep population of the country.

Nutrition and Management : The Red Karaman flocks are managed under either sedentary or migratory (nomadic or transhumant) systems. Migratory flocks spend the summer on mountain grazing in eastern Anatolia and migrate to their winter base or to warmer lowland areas in southeastern Anatolia for the rest of the year. Most of the lambings take place in April (about one month later than in Central Anatolia). The nutrition of the sheep can be considered to be good during summer and early autumn, but maintenance of the animals during the long winter months is often difficult. Other management aspects are generally similar to those described for the White Karaman.

Phenotypic Description : The Red Karaman is a fat-tailed sheep. The fat tail and the end-piece form an S-shape as in White Karaman. The size of the body and the tail are larger than in White Karaman. The colour is brown or reddish-brown; the colour is darker on head, neck and legs. In general, ewes and rams are polled; about 1 percent of ewes and 10 percent of rams may have small horns. Ears are pendulous or semi-pendulous. The wool is of mixed, coarse carpet type, with low density and open head, neck, belly and legs.

Body Measurements : Mean values for some body measurements of Red Karaman ewes were found as follows (Baspinar, 1985):

Body measurement	Mean (cm)	S.E. (cm)
Hight at withers	66.9	1.03
Body length	67.4	1.37
Chest depth	31.0	0.55
Chest width (front)	18.6	0.37
Chest girth	92.2	1.51
Cannon circumference	8.0	0.14
	(n = 16)	

Production Performance : Mean levels, reported from several sources, for different production characteristics of Red Karaman sheep are summarized below (Yalçin and Müftüoğlu, 1969; Müftüoğlu, 1974; Köprücü, 1975; Tellioğlu, 1975; Özcan and Yalçm, 1977; Yalçin, 1979; Başpinar, 1985):

Characteristics of ewes	Performance level
Body weight (kg)	44 – 48
Lactation milk yield (kg)	50 – 65
Lactation length (day)	140 – 150
Greasy fleece weight (kg)	1.2 – 1.5
Staple length (cm)	10 – 12
Fiber diameter (micron)	30 – 34
Clean wool yield (percent)	65 – 72
Breaking strength (g)	16 – 20
Fiber elasticity (percent)	24 – 31
Medullated fibers (percent)	20
Birth rate (percent)	84 – 87
Twinning rate (percent)	4 – 8

Lamb weights (both sexes)	n	Mean (kg)
Birth weight	172	3.40
Weaning weight (93 days)	169	20.03
6–month weight	165	28.70

Lamb survival (both sexes)	Percent
Survival to weaning (93 days)	98.2
Survival to 6 months	95.9

The above data refer to the Red Karaman lambs raised at Altindere State Farm, Van (Müftüoğlu, 1974). Survival rate of lambs in field flocks, especially in the nomadic flocks is likely to be considerably lower.

Breed Improvement : Sorne state farms and university farms keep pure Red Karaman flocks for improvement and research purposes. (Göle and Iğdir state Farms in Kars, Alpaslan State Farm in Mus, Altindere State Farm in Van, and Atatürk University Farm in Erzurum). As with the other sheep breeds in Turkey, no flock book or scheme of production recording is available for the Red Karaman sheep kept in the

producers' flocks. Crossbreeding experiments involving Mutton Merino and Red Karaman breeds were carried out at Altindere State Farm, Van, and at Atatürk University Farm, Erzurum (Yalçin and Müftüoğlu, 1969; Müftüoğlu, 1974; Tellioğlu, 1975). A programme for upgrading Red Karaman field flocks using A.I. with Merino semen was implemented in 1960'S ; this programme has been discontinued.

5.1.3. Dağliç (Plates 3 and 4)

General : The Dağliç is the third largest breed in the country in population size. In some localities it is wrongly named as Gicik (Batu, 1962). The Herik, which is a different sheep raised in the north, is sometimes wrongly called Dağliç. The Herik can be distinguished from the Dağliç by the absence of the median groove on the tail. The fact that the shape of the fat tail of the Dağliç is intermediate between Kivircik and White Karaman and that its area of distribution lies between those of these two breeds, gives the impression that the breed has as its origin a mixture of Kivircik and White Karaman, However, there is quite convincing evidence to the contrary (Mason, 1967); the Dağliç was probably indigenous in Anatolian Turkey before the introduction of Kivircik from Thrace.

Distribution and Numbers : The main breeding area of the Dağliç covers the central-west provinces of Afyon, Eskişehir, Kütahya, Uşak, Burdur, Isparta, Bilecik and Bolu. The area of distribution begins at Sakarya river and extends westwards towards the Aegean coastal provinces, where it gradually gives place to Kivircik and Dağliç x Kivirick crossbreeds. The breed is also raised in Aydin, Mugla, Denizli, Manisa, tzmir and western parts of Konya, and in the hilly parts of Çanakkale and Balikesir in smaller numbers, The number of Dağliç sheep in 1983 was 6.0 million, i.e. 12.3 percent of the total sheep population in the country. The feeding and management practices in Dağliç flocks are genarally similar to those explaned for the White Karaman.

Phenotypic Description: The Dağliç is fat-tailed but the tail is smaller than that of the White Karaman. The shape is also different; its thin end does not turn over the fat tail to form an S-shaped curve, but hangs straight down. There is a median groove on the external side of the tail. The colour is white, with black spots around mouth, eyes and genital organs, and on the legs. About 95 percent of rams have large spiral horns; ewes are polled. The fleece is similar to that of the White Karaman. Wool is carpet-wool type, but lustrous; it is coarser than Kivircik wool but finer than White Karaman wool. The Dağliç wool is the most preferred wool for carpet making.

Body Measurements : The Dağliç is one of the smallest breeds in Turkey. Mean values for the body measurements of Dağliç ewes at Çifteler State Farm, Eskişehir, and in some field flocks are given below (Yarkin, 1958; Demir, 1983):

Body Measurement	Çifteler Flock (cm)		Field Flocks (cm)	
	Mean	S.E.	Mean	S.E.
Hight at withers	61.4	0.41	61.0	0.30
Body length	60.1	0.52	67.2	0.34
Chest depth	29.5	0.45	27.4	0.26
Chest width (front)	16.4	0.21	16.5	0.13
Chest girth	84.9	0.56	78.6	0.49
Cannon circumference	7.3	0.04	7.2	0.04
	(n = 41)		(n = 108)	

Production Performance : Production performance of the Dağliç was studied by several workers. The results of these studies are summarized below (Yarkin, 1958; Yarkin and Yavuz, 1964; Togay et al., 1961; Gbnul, 1974; Qzcan and Yalçin, 1977; Yalçin et al., 1977; Yalçin and Ayabakan, 1977; Evrim,1973a; Yalçin, 1979; Demir, 1983; Baspinar, 1985):

Characteristics of ewes	Performance level
Body weignt (kg)	35 – 40
Lactation milk yield (kg)	40 – 50
Lactation length (day)	130 – 140
Greasy fleece weight (kg)	1.8 – 2.3
Staple length (cm)	11 – 18
Fiber diameter (micron)	27 – 31
Clean wool yield (percent)	68 – 70
Breaking strength (g)	17 – 30
Fiber elasticity (percent)	24 – 33
Medullated fibers (percent)	6 – 11
Birth rate (percent)	81 – 90
Twinning rate (percent)	1 – 2

	Male lambs (kg)			Female lambs (kg)		
Lamb growth	n	Mean	S.E.	n	Mean	S.E.
Birth weight	727	3.5	0.02	777	3.4	0.01
60–day weight	716	14.4	0.10	767	13.4	0.07
120–day weight	709	25.0	0.14	760	22.8	0.10

Lamb survival	Male lambs (Percent)	Female lambs (Percent)
Survival to 60 days	98.5	98.6
Survival to 120 days	97.5	97.7

The above growth and survival data were obtained from the Dağliç lambs raised at Çifteler State Farm, Eskişehir (Evrim, 1978). Similarly high figures for lamb survival were reported from the same flock by Yalçm et al.(1977) and Demir (1983), No data are available on growth and survival rates of Dagliç lambs in the field flocks.

Breed Improyement : A pure Dağliç flock is kept at Çifteler State Farm, Eskişehir. The Dağliç is crossed with white Karaman in the eastern parts of its distribution area to produce the sheep called Çandir and Kesber (See Section 5.1.1). In the westren parts of its distribution area it is crossed with Kivircik; the sheep obtained from Dağliç x Kivircik matings is known as Pirlak, and that obtained from Kivircik x Dağliç is known as Kama-kuyruk. (Akinci, 1925; Yarkin, 1958; Batu, 1962).

Crossbreeding between Mutton Merino and the Dağliç has been carried out since 1960 in some field flocks in Eskisehir, Afyon, Isparta and Burdur provinces for producing crossbreed sheep with better meat and wool, and with better wool guality. Since 1975 Ramliç rams are also used in these flocks for the same purpose. Ramliç is a new type of sheep developed at Çifteler State Farm, Eskişehir, by American Rambouillet x Dağliç crossbreeding (Yalçin, 1980).

5.1.4. Awassi (Plates 5 and 6)

General : The Awassi is the typical sheep of Syria, Lebanon, Iraq, Israel and Jordan (Mason, 1967). It is also raised along the Syrian border of Turkey, under the name İvesi or Arab sheep.

Distribution and Numbers : The main area of distribution is in the southeastern provinces of Gaziantep, Urfa and Mardin. It is also found in Hatay and Adana provinces of eastern Mediterranean Region. Recently the Awassi has been introduced into Aegean Region and Central Anatolia for crossing with Kivircik and White Karaman, respectively, in order to improve milk production. There were about 1.1 million Awassi sheep in Turkey in 1983, 2.3 percent of the total number of sheep in the country.

Nutrition and Management : Feeding of ewes commences in the middle of December, when lambing starts, and continues until the beginning of. March. During this time the main source of feed for ewes is straw; some flock-owners feed their animals limited amounts of barley or wheat bran. For the rest of the year grazing on natural pastures or stubble is the only means of nutrition. Lambs are weaned at about one and a half to two months of age. From the beginning of March to the beginning of June ewes are milked twice-a-day and for another month once-a-day. For this purpose, private flocks are brought home, while most village flocks are milked on the range. In contrast to most milk breeds, the Awassi is managed in large flocks (200–300 ewes); it has a strong flocking instinct.

Phenotypic Description : The colour is white on the body and brown on the head, neck and legs. There may be a white blaze on the head. Rarely, there are brown spotting on the body. In some animals brown is replaced by black and these are called Karabas (black head). The profile of the head in convex (Roman nose). The ear is long and drooping. The fat tail is similar to that of the White Karaman, but in the Awassi the free end of the 5-curve is short or absent. The fat tail is shorter and wider than in the White Karaman. Approximately 80–85 percent of rams have strong spiral horns; ewes are usually hornless. The wool of Awassi is of carpet-wool type and one of the coarsest among Turkish sheep breeds.

Body Measurements : The breed is one of the largest in Turkey. Mean values of some body measurements of Awassi ewes are given by Başpmar (1985) as follows:

Body Measurement	Mean (cm)	S.E. (cm)
Hight at withers	65.3	0.36
Body length	67.5	0.55
Chest depth	30.4	0.26
Chest width (front)	17.5	0.20
Chest girth	91.4	0.88
Cannon circumference	8.2	0.10

(n = 62)

Production Performance : The Awassi is principally a milk breed, but meat production from this breed is also important. Mean levels for different production characteristics of Awassi ewes and lambs are shown below (Köseoğlu and Aytuğ, 1961 a; Özcan and Kaymaz, 1968; Yalçin and Aktaş, 1969; Eliçin, 1970; Sidal, 1972; Tekeş, 1973; Özcan and Yalçin, 1977; Yalçin, 1979; Başpinar, 1985):

Characteristics of ewes	Performance level
Body weight (kg)	44 – 48
Lactation milk yield (kg)	90 – 155
Lactation length (day)	170 – 200
Milk fat (percent)	6.1 – 7.0
Greasy fleece weight (kg)	1.3 – 2.4
Staple length (cm)	11 – 16
Fiber diameter (micron)	32 – 35
Clean wool yield (percent)	60 – 65
Breaking strength (g)	20
Fiber elasticity (percent)	27
Medulated fibers (percent)	3 – 6
Birth rate (percent)	80 – 85
Twinning rate (percent)	6 – 10

Average body weight of ewes under experimental farm conditions is 50–55 kg (Yarkih and Eliçin, 1966; Yalçin and Aktaş, 1969). Average lactation milk yield, which includes the milksuckled by the lamb, varies from 90 to 135 kg in the field (Sidal , 1972) and from 125 to 181 kg at state farms (Köseoğlu and Aytuğ, 1961 Özcan and Kaymaz, 1968; Yalçin and Aktaş, 1969; Eliçin, 1970) Record ewes have yields as high as 390 kg (Köseoğlu and Aytuğ 1961 a). Under favourable experimental farm conditions average milkyield of Awassi ewes is reported as 181 – 202 kg (Bulgurlu, 1960; Yarkin and öztan, 1967).

The growth performance in Awassi breed is generally considered to be better than that in the other native breeds of the country. Average weights of Awassi lambs at different ages were found in Çukurova State Farm, Adana, and Ceylanpinar State Farm, Urfa, as follows (Köseoğlu and Aytuğ, 1961 a; Yarkin and öztan, 1967) :

Age of	Çukurova Farm (kg)			Ceylanpinar Farm (kg)		
Lamb	n	Mean	S.E.	n	Mean	S.E.
Males						
Birth	123	4.4	0.06	11	5.1	0.18
60-day	123	17.7	0.26	11	20.8	0.64
120-day	123	28.7	0.31	-	-	-
180-day	66	37.3	0.44	11	42.6	0.34
Females						
Birth	97	4.1	0.06	9	4.9	0.13
60-day	97	16.4	0.22	9	19.4	0.45
120-day	97	25.3	0.28	-	-	-
180-day	44	34.8	0.45	9	38.2	0.36

Survival rate to 75 and 180 days were found respectively 98 and 92 percent for Awassi lambs raised at Ereğli Animal Breeding Research Institute, Konya (Yalçin and Aktaş, 1969).

Breed Improvement : As a rule, purebreeding is practiced in the breed. Large Awassi flocks are kept at Ceylanpinar State Farm, Urfa, and at Çukurova State

Farm, Adana, These flocks are recorded and improved by selective breeding. In selection, the main emphasis is on milk production, but some attention is also paid to grawth rate and body weight. Improved rams from these elite flocks are sold to the producers in the region. Crossbreeding within the breed is not used. However, rams of the Awassi breed are used for crossing with Red Karaman and, to a lesser extent, with White Karaman, for improving the milk production of these breeds.

5.1.5. Karakul (Plates 7 and S)

General : Karakul breeding in Turkey goes back to 1929 when 16 rams and 20 ewes of this breed were introduced from Russia. Through upprading of some native breeds (Red Karaman, Tuj, White Karaman and Kivircik) with Karakul rams, by 1950 a large flock of Karakuls had been established at Çifteler State Farm, near Eskişehir, in Central Anatolia. In 1958, a second group of Karakuls (2 rams and 6 ewes) arrived at Lalahan Animal Breeding Research Institute, near Ankara, from Afghanistan and a small flock of Karakuls was established in this institute. The rams obtained from these elite flocks have been used on Karakul type sheep already existing in the provinces of Tokat and Antalya, for a long time.

Distribution and Numbers : Small populations of sheep resembling to Karakul has existed in Tokat province to the north of the country and in Antalya province in the south since long before its importation from Russia and Afghanistan. The number of Karakul type sheep in Turkey was estimated to be around 24,000 in 1983. Nutrition and management is similar to that explained for the White Karaman.

Phenotypic Description : The coat colour is black in lambs and dark grey in adult sheep. The head, legs and tail of adults are black. The fat tail is narrower and longer than that of the White Karaman. 70–80 percent of rams have horns. The majority of ewes are polled, but 30–40 percent of ewes may have small horns. The wool is coarse. The pelt of newborn lambs is typical of Karakul lambs, but only a very small proportion of lambs are slaughtered for their pelt.

Body Measurements : Mean values for some body measurements of Karakul ewes raised at Çifteler State Farm, Eskişehir, are given by Özcan and Batu (1966) as follows:

Body measurement	Mean (cm)	S.E (cm)
Height at withers	66.5	0.31
Body length	66.3	0.28
Chest depth	29.7	0.32
Chest width (front)	17.2	0.17
Chest girth	82.8	0.38
Cannon circumference	7.5	0.03

(n =50)

Production Performance : Levels of the different production characteristics of Karakul sheep are given below (Batu and Özcan, 1966; Özcan and Yalçin, 1977):

Characteristics of ewes	Performance
Body weight (kg)	38 – 42
Lactation milk yield (kg)	55 – 60
Lactation length (day)	130 – 140
Greasy fleece weight (kg)	2.0 – 2.4
Staple Length (cm)	15 – 18
Fiber diameter (micron)	30 – 35
Clean wool yield (percent)	60 – 65
Birth rate (percent)	75 – 85
Twinning rate (percent)	8 – 15

Average birth weights of male and female Karakul lambs at Çifteler State Farm was found 3.5 and 3.2 kg, respectively (Batu and Özcan, 1966).

Breed Improvement : Until recently, elite flocks of Karakul breed had been kept at Çifteler State Farm, Eskisehir, and Lalahan Animal Breeding Research Institute, Ankara, and rams from these flocks had been sold to the producers having Karakul type sheep in Tokat and Antalya Provinces. These elite flocks have recently been transferred to Kazova State Farm, in Tokat, so that rams from this farm could be made readily available for use in the nearby Karakul flocks.

5.1.6. Kivircjk (Plates 9 and 10)

General : Early authors considered the Kivircik of Turkey and the Tsigai of southeast Europe as the same breed (Akinci, 1925; Spöttel , 1929). According to Mason (1967), the Kivircik appears to have developed from the Tsigai breed, and is probably identical with the Karbonat breed of Bulgaria. It also occurs in western Thrace, Greece, where it is known as Thraki. However, Ryder and Sephenson (1968) suggest that the Tsigai originated from the Kivircik during the Turkish occupation; there are mediaeval records in Bulgaria in which the Kivircik is a named breed (Brooke and Ryder, 1978).

Distribution and Numbers : The Kivircik is the exclusive breed of sheep in the Thracian part of Turkey (Edirne, Kirkiareli, Tekirdağ and Istanbul); it is also raised in the southern and eastern provinces of Marmara Region (Bursa, Balikesir, Çanakkale, İzmit, Sakarya) and in some Aegean provinces (Manisa, izmir, Aydin). The number of Kivircik sheep in Turkey was estimated to be 3.7 million in 1983; this is approximately 7.7 percent of the total sheep in the country.

Nutrition and Management : The feeding pattern is similar to that in White Karaman, but the level of nutrition is better as a result of the longer grazing season and better quality of pastures in western Anatolia and Thrace. There are also some management differences. Mating of Kivircik ewes takes place in June and July in the southern Marmara Region, and in July and August in Thrace. Therefore lambs are available for sale long before the lambs of other breeds come to market. Most of the lambs are weaned as early as at one and a half months of age, so that ewes can be milked longer. In Thrace, in particular, sheep's milk is mostly used for making a special kind of white cheese (Edirne cheese). Which is very popular in Turkey. Sheep are managed in flocks of 50–300 animals. Some flocks in southern Marmara Region are transhumant; they are taken to the mountains for the summer and brought down to the plains and valleys in the autumn.

Phenotypic Description : The colour of the Kivircik is white (Belka Kivircik). A small proportion of the animals may have black marks on head and legs. Ocassionally brown and black animals are seen in white Kivircik flock; these are probably the traces of coloured variety of the breed (Karnobat). Flocks of this coloured variety, once raised in Thrace, no more exist in Turkey. The tail of the Kivircik is thin and long, usually reaching the hocks. In pure animals there is no fat deposit in the tail. Such a deposit at the base of the tail indicates the presence of Dağliç blood. Rams have horizontal spiral horns extending sideways. Ewes are usually polled. The ear is relatively short and extend horizontally. The fleece is of carpet-wool type, but wool is of better quality than the wool of ail other local breeds. Wool from young animals can be used in worsted manufacture.

Body Measurements : Kivircik is a medium-sized breed. Average values for body measurements of Kivircik ewes raised at İnanli State Farm in Thrace and in the field flocks in Balikesir and Çanakkale provinces are shown below (Yarkin, 1956; Özcan, 1970 a):

	İnanli Flock (cm)		Field Flocks (cm)	
Body measurement	Mean	S.E	Mean	S. E
Hight at withers	66.1	0.27	64.1	0.41
Body length	67.1	0.95	71.4	0.46
Chest depth	27.9	0.61	29.1	0.24
Chest width (front)	18.1	0.33	19.1	0.23
Chest girth	85.1	0.62	85.7	0.60
Cannon circumference	7.4	0.03	7.3	0.05
	(n = 50)		(n = 58)	

Production Performance : Mean levels of the different production traits in the breed have been determined in a number of studies, and reported by several sources (Yarkin, 1956; 3atu, 1962; Sönmez and Wassmuth, 1964; Utkanlar et al., 1964 a and 1964 b; Mason, 1967; Özcan, 1970 a and 1970 b; Qzcan and Aki, 1973 and 1974b; Sonmez et al-, 1976; Özcan and Yalçin, 1977; Yalçin, 1979; Başpuiar, 1985). Range of these mean values are given below for different production traits:

Characteristics of ewes	Performance
Body weight (kg)	39 – 42
Lactation milk yield (kg)	60 – 90
Lactation length (day)	140 – 180
Greasy fleece weight (kg)	1.3 – 1.7
Staple length (cm)	8 – 12
Fiber diameter (micron)	29 – 33
Clean wool yield (percent)	60 – 65
Breaking strength (g)	18 – 27
Fiber elasticity (Percent)	21 – 24
Medullated fibers (percent)	0.8 – 2.6
Birth rate (percent)	82 – 90
Twinning rate (percent)	10 – 20

Growth performances of single-born Kivircik lambs at two state farms are shown below:

Age of	İnanli Farm (kg)			Tahirova Farm (kg)		
Lamb	n	Mean	S.E.	n	Mean	S.E.
Males						
Birth	87	4.3	0.05	73	3.9	0.1
60 days	86	16.4	0.39	71	20.1	0.3
90 days	86	19.4	0.55	43	27.1	0.5
180 days	84	25.9	0.61	6	37.5	1.4
Females						
Birth	80	4.0	0.06	65	3.8	0.1
60 days	79	15.7	0.41	63	19.1	0.3
90 days	78	18.8	0.64	52	23.7	0.4
180 days	78	24.1	0.57	38	29.0	0.8

Growth performance at İnanli State farm is representative of lambs under usual conditions in Thrace while that at Tahirova State Farm is represetative of lambs under good feeding conditions. Survival rate to 90 days and 180 days were respectively 98.8 and 97.1 percent for lambs at İnanli; at Tahirova, survival rate to weaning (75 days) was found to be 93.7 percent (Özcan and Aki, 1974a; Sonmez et al., 1976). Meat quality is considered to be the best among the sheep breeds in the country.

Breed Improvement : There are two state farms in Thrace working on breed evaluation, improvement and research. Kivircik rams bred in these farms are made available to Kivircik breeders at suitable prices. They are the İnanli State Farm, Muratli, Tekirdağ, and the Tlirkgeldi State Farm, Lüleburgaz, Kirklareli.

Crossbreeding of Kivircik sheep with German Mutton Merino was carried out at Karacabey State Farm, Bursa, and in the southern Marmara Region in the 1930's and led to the formation of Karacabey Merino, the first of the Merino types developed in Turkey. At present, there is no official crossbreeding programme involving Kivircik sheep; the Merino x Kivircik crossbreeding programme in the southern Marmara Region has long been discontinued. The number of Karacabey Merinos in the region is around 200,000. The Kivircik was also crossed with East Friesian and Texel breeds during 1970's for experimental purposes (See Section 6.1.3.). The breed is now generally bred pure, especially in Thrace. A small number of Kivircik in northwest Anatolia are being crossed with Dağliç, Sakiz, Merino and East Friesian breeds.

5.1.7. Karayaka (Plates 11 and 12)

General : There is practically no information about the history of the breed. However, it is likely to be indigenous to Anatolia. Karayaka is the name of a village in the Tokat province which lies close to Samsun and Ordu provinces. The breed has characteristic features unlike those of any breed outside Turkey.

Distribution and Numbers : The breed is distributed along the eastern half of the Black Sea coast, especially in Ordu, Giresun, Samsun, Tokat and Sinop; it is also raised at Düzce, in the western Black Sea Region. There were approximately 1.7 million Karayaka sheep in Turkey in 1983, i.e. 3.5 percent of the total sheep population of the country.

Nutrition and Management : The quality of grazing in the distribution area is much better and grazing season is longer than in most of the other regions. Flock size vary from 5 to 200; it is smaller on the coastal strip and larger in the interior. Most of the sheep go to the mountanis in the summer in large communal flocks and return for the winter.

Phenotypic Description : The body is usually white but about 10 percent, of the animals are coloured (black or brown). White animals are of two types: Çakrak and Karagöz. In the Çakrak, head, ears, legs and tail are coloured. The Karagöz, which is more numerous, has black marks around eyes and mouth and on the legs; it is more resistant to cold than the Çakrak. The Çakrak is larger than the Karagöz (Batu, 1962). The tail is thin and long; some animals have a smal fat deposit at the base of the tail. Rams generally have thick spiral horns; ewes are usually hornless. Wool is very coarse but very suitable for matresses. There is a tuft of wool on the forehead.

Body Measurements : The Karayaka is a small-sized breed. Average body measurements of Karayaka ewes were found as follows (Başpinar, 1985):

Body measurement	Mean (cm)	S.E. (cm)
Hight at withers	61.1	0.39
Body length	67.4	0.51
Chest depth	30.3	0.21
Chest width (front)	18.1	0.22
Chest girth	89.9	0.80
Cannon circumference	7.8	0.08

(n = 41)

Production Performance : Mean levels for the main production characteristics of the breed are as follows (Öznacar, 1962; Mason., 1967; Özcan and Yalçin, 1977; Yalçin, 1979; Antürk et al., 198b; Başpinar, 1985):

Characteristics of ewes	Performance level
Body weight (kg)	35 – 40
Lactation milk yield (kg)	40 – 45
Lactation length (day)	130 – 140
Fleece weight (kg)	1.8 – 2.4
Staple length (cm)	21 – 28
Fiber diameter (micron)	39 – 43
Clean wool yield (percent)	64 – 66
Medullated fibers (percent)	22 – 27
Birth rate (percent)	85 – 90
Twinning rate	4 – 8

Milk production of the Karayaka is one of the lowest among the native breeds in the country, but the breed is relatively early-maturing. Meat quality is considered good; in this respect, the Karayaka cornes second after Kivimk.

Aritürk et al. (1985), working on the Karayaka flock at Karaköy State Farm in Samsun, reported the mean lamb weights at different ages as follows:

Age of lamb	Mean lambs (kg)			Female lambs (kg)		
	n	Mean	S.E.	n	Mean	S.E.
Birth	112	3.8	0.04	98	3.5	0.06
45 days	112	12.1	0.17	98	11.4	0.22
75 days	112	17.6	0.26	98	15.8	0.26
105 days	112	22.3	0.31	98	19.7	0.34
180 days	58	28.7	0.48	84	24.6	0.38

In the same study, survival rates of lambs to 45, 75 and 105 days of age were 97, 96 and 9b percent, respectively.

Breed Improvement : The Karayaka has long been raised by purebreeding, largely due to geographical isolation. A crossbreeding experiment (Özcan, 1960) carried out in 1950's between Karayaka and Merino breeds was soon discontinued. At present, there is no systematic crossbreeding involving this brecd. Work on the improvement of Karayaka sheep is being carried out at Karaköy State Farm in Samsun and Gökhöyük State Farm in Amasya.

5.1.8. Turkish Merinos

The Merino was first introduced into Turkey from Spain in 1843. In 1928 Hungarian Merinos and in 1934 and later years German Mutton and Land Merinos were imported. Of these only the Mutton Merinos were used for improving the native sheep in the country.

Karacabey Merino (Plate 13)

General : Mutton Merinos, brought to Karacabey State Farm, Bursa, in 1934, were crossed with Kivircik sheep on this farm as well as on the private farms in Bursa and Balikesir provinces. Crossbreeding between these two breeds was carried out in the form of upgrading to Merino. However, at Karacabey State Farm careful selection was also applied, and as a result a new Merino type, Karacabey Merino, was developed. It contains about 95 percent German Mutton Merino and 5 percent Kivircik genotype.

Distribution and Numbers : Karacabey Merinos are raised mainly in Bursa and Balikesir provinces of Marmara Region. Presently the number of Merino sheep in this region is approximately 250,000. The feeding and management conditions are similar to those of Kivircik sheep raised in the same provinces (See Section 5.1.6.).

Phenotypic Description : These sheep are white with a uniform fleece and a long tail. The ewes are polled and 10–15 percent of rams are horned In body conformation, it resembles to the Mutton Merino.

Body Measurements : Mean values for some body measurements of Karacabey Merino ewes are given by Akçapinar (1983 a) as follows:

Body measurement	Mean (cm)	S.E (cm)
Hight at withers	68.4	0.16
Body length	67.7	0.20
Chest depth	31.5	0.12
Chest girth	94.4	0.31
Cannon circumference	H. 6	0,02

(n = 250)

Production Performance : Levels of different production characteristics of Karacabey Merino sheep are given below (Batu et al , 1965; Öznacar, 1973; Örkiz, 1972; Yalçm, 1979; İmeryüz, 1979; Akçapinar, 1933 a):

Characteristics of ewes	Performance level
Body weight (kg)	50 – 55
Lactation milk yield (kg)	50 – 70
Lactation length (day)	130 – 140
Greasy fleece weight (kg)	3.0 – 3.4
Staple lengtb (en)	6.5 – 7.0
Fiber dianeter (micron).	21 – 23
Clean wool yield (percent)	48 – 54
Breaking strength (g)	7.8 – 9.3
Fiber elasticity (percent)	21 – 26
Birth rate (percent)	85 – 95
Twinning rate (percent)	10 – 25

Growth performances over a five-year period of single-born Karacabey Merino lambs at Bandirma Merino Breeding Farm, Balikesir, were as follows (İmeryüz, 1979):

	Male lambs (kg)			Female lambs (kg)		
Age of Lamb	n	Mean	S.E.	n	Mean	S.E.
Birth	521	4.4	0–03	538	4.2	0.03
45 days	509	15.2	0.12	525	14.6	0.13
75 days	499	22.4	0.18	513	21.6	0.17
110 days	491	28.8	0.25	510	27.3	0.22
180 days	217	39.9	0.45	503	34.0	0.24

In the same study, survival rates to 45, 110 and 180 days and to one year of age were found to be 97.1, 94.6, 93–3 and 88.6, respectively.

Body weight, fleece weight and fleece quality of Karacabey Merino sheep are much superior to those of Kivircik. On the other hand, lambs have a satisfactory growth performance and a good survival ability.

Improvement : Two state farms in southern Marmara Region, one in Bursa (Karacabey State Farm) and one in Balikesir (Bandirma Merino Breeding Farm), are angaged in the improvement of Karacabey Merino sheep. Each of them maintain 1500–2500 breeding females. Rams from these elite flocks are made available to Merino breeders in the region or elsewhere, and also for use in the A.I. programmes. Good Merino flocks also exist in the field (particularly in Bursa province).

Central Anatolian Merino (Plate 14)

General : Crossbreeding between German Mutton Merino and native White Karaman since 1952, at Konya State Farm, with selection among crossbreds for growth and wool production, has led to the formation of the second Turkish Merino type, namely Central Anatolian Merino. It has approximately 80 percent Mutton Merino and 20 percent White Karaman genotype. As it was developed at Konya State Farm, it was first named as Konya Merino (Yalçin et al, 1972). I.I. was and is necessary at the first stage of this crossbreeding; Mutton Merino rams can nat mate with White Karaman ewes

naturally because of the fat tail the latter. Later, similar crossbreeding programmes were carried out at the other state farms in Central Anatolia, and resulting Merino type was named as Anatolian Merino. because the Merino sheep obtained in different farms through Mutton Merino x White Karaman crossbreeding are similar and their distribution is limited only to Central Anatolia, the name Central Anatolian Merino is preferred here.

Distribution and Numbers : Central Anatolian Merino sheep and Merino x White Karaman crosses are distributed allmost ail the provinces of Central Anatolia. However, flocks of this type are more frequent in Ankara, Eskişehir and Konya provinces. The number of Central Anatolian Merino sheep and Merino crosses in the region is estimated to be 1.2 million in 1983. Together with Karacabey Merino, they make up about 3 percent of the sheep population in the country.

Phenotypic Description : The colour is white. The tail is thin and long. Both rams and ewes are polled. The wool is fine and uniform.

Body Measurements : In a field flock, mean values for some body measurements of Central Anatolian Merino ewes were found as follows (Başpinar, 1985):

Body Measurement	Mean (cm)	S.E.(cm)
Hight at withers	64.9	0.37
Body lenqth	70.9	0.52
Chest depth	31.2	0.20
Chest width (fount)	20.1	0.20
Chest girth	95.5	0.79
Cannon circumference	8,3	0,10
	(n = 62)	

Production Performance :

The Central Anatolian Merino flock at Konya State Farm, where the type was first developed, has fairly high production levels in spite of relatively poor feeding conditions. Yalçin et al.(1972) and Özcan and Yalçin (1977) gave the following figures:

Characteristics of ewes	Production level
Body weight (kg)	55
Lactation milk yield (kg)	40 –50
Lactation length (day)	140 – 150
Greasy fleece weight (kg)	3.7
Staple length (cm)	7.8
Fiber diameter (micron)	22.4
Clean wool yield (percent)	54 – 58
Breaking strength (g)	8.2
Fiber elasticity (percent)	23.3
Birth rate	89
Litter size	1.45

Weights of Central Anatolian Merino lambs at different ages were found at Konya State Farm as follows (Yalçin et al., 1972):

Lamb	Single Male (kg)			Single Female (kg)		
Weights	n	Mean	S.E.	n	Mean	S.E.
Birth weight	370	4.7	0.04	370	4.5	0.04
45-day weight	353	15.5	0.13	354	14.7	0.12
105-day weight	351	28.9	0.23	351	26.8	0.20
180-day weight	342	34.2	0.30	246	31.3	0.22

In the same study, lamb survival rates to 60 days, 105 days (weaning) and 180 days were 96.5, 94.6 and 93.0, respectively, over ail birth types and sexes.

Improvement : At present, there are large production-recorded Central Anatolian Merino flocks at state farms in the region (Konya and Altinova State Farms in Konya, Bâlâ and Polatli State Farms and Lalahan Animal Breeding Research Institute in Ankara). Rams from these elite flocks are being used on the producers' Merino or Merino cross ewes, or through A.I. on White Karaman ewes. Selection in the field flocks is based on the subjective judgement of the owners, as there is no recording scheme at the moment involving these flocks.

5.1.9. Gökçeada (Imroz) (Plate 15)

General : The names Gokçeada or Imroz are used for the breed; however it is more frequently referred to as Gokçeada. Gokçeada is a Turkish island in the Aegean Sea, off northwestern Anatolia. On this island the breed has been known for more than a hundred years.

Distribution and Numbers : It is the only breed raised on the Gökçeada island. This sheep is also raised on the mainland in the province of Çanakkale. It numbers only about 73,000 head. The feeding and management conditions for this sheep are similar to those of the Kivircik raised in southern Marmara Region.

Phenotypic Description : The colour is white, with black marks around the mouth, nose and eyes and on the ears and rarely on the tip of the legs. The tail is thin and long, usually reaching below the hocks. Rams have strong spiral horns extending sideways; ewes are usually polled but up to 30 percent of the ewes may have small scurs. The head is narrow and its profile is straight. The wool is very coarse and long, and it covers the top of the head. Shearing is usually done twice a year.

Body Measurements : The breed is one of the smallest among the sheep breeds in the country. Mean values for some body measurements of the ewes of this breed at Kumkale State Farm, Çanakkale, are given by Özcan (1965) as follows:

Body measurement	Mean (cm)	S. E (cm)
Height at withers	62.0	0.19
Body length	63.4	0.14
Chest depth	29.1	0.10
Chest width (front)	17.2	0.09
Chest girth	84.8	0.18
Cannon circumference	7.4	0.02

(n = 201)

Production Performance : Özcan and Yalçin (1977) and Yalçin (1979) give the following mean values for different production characteristics of the breed:

Characteristics of ewes	Performance level
Body weight (kg)	35 – 40
Lactation milk yield (kg)	70 – 100
Lactation length (day)	150 – 170
Creasy fleece weight (kg)	1.6 – 2.0
Staple length (cm)	26 – 30
Fiber diameter (micron)	32 – 40
Twinning rate (percent)	10 – 20

The breed responds quite well to better feeding and management. Özcan et al . (1980) and Yalçin et al. (1980) reported the following mean values for different characteristics of Gökçeada (Imroz) ewes and lambs from a study carried out under semi-intensive conditions at Kumkale:

Characteristics of ewes	n	Mean	S.E .
Body weight (kg)	888	47.6	0.15
Lactation milk yield (kg)	118	187.2	4.38
Lactation length (day)	118	237.4	1.84
Greasy fleece weight (kg)			
First shearing	1118	1.52	0.02
Second shearing	454	0.32	0.01
Staple length (cm)			
First shearing	67	18.4	0.04
Second shearing	18	6.1	1.14
Fiber diameter (micron)			
First shearing	67	36.0	0.46
Second shearing	18	35.4	0.72
Medullated fibers (percent)			
First shearing	67	10.7	0.95
Second shearing	18	7.6	1.14

In the flock, birth rate was 96.9 percent and average litter size was 1.27. In the same study, average weights of single lambs at different ages were found as follows:

	Male lambs (kg)			Female lambs (kg)		
Lamb weights	N	Mean	S.E.	n	Mean	S.E
Birth weight	273	4.0	0.03	238	3.9	0.03
60-day weight	266	18.1	0.15	235	16.3	0.14
120-day weight	255	27.3	0.20	231	23.5	0.19
180-day weight	246	32.3	0.23	227	28.0	0.21

Lamb survival rates to 60, 120 and 180 days were respectively 96, 93 and 91 percent, over all birth types and sexes.

Breed Improvement : There are two state farms working on the improvement and evaluation of the Gökçeada (Imroz) breed: Kumkale State arm, Çanakkale and Gökçeada State Farm, on the island of Gökçeada, Canakkale.

Gökçeada sheep are bred pure. However, a crossbreeding experiment involving this breed and the East Friesian has been reported (Sönmez and Alpbaz. 1975). Even if favourable results are obtained from such crossing, its economic benefit will be extremeley limited because of the small population size of the breed, and, if extended to field flocks, its biological cansequence may be the disappearance of a relatively good breed within a short time.

5.1.10. Sakiz (Plates 16, 17 and 18)

General : Sakiz is the Turkish name for the Greek island of Chios in the Aegean Sea. The Chios breed of Greece and Sakiz breed of Turkey are probaby the same breed. The Sakiz breed is also called Çeşme in Turkey. The Sakiz sheep was probably brought to Çeşme, a town on the Karaburun peninsula in the province of Izmir, about 150 years ago. Initially, it was crossed with the Kamakuyruk, a semi-fat-tailed sheep; but Sakiz genotype was later increased with subsequent importations. The fat deposit at the base of the tail may be a result of this crossbreeding.

"The origin of the breed is not known. It was at one time suggested that it originated from a cross of Greek Zackel and Turkish fat-tailed Karaman. This however would nat account for its wool which is much finer than that of either of these breeds. Besides, the Karaman occurs in Central and eastern, rather than in western Anatolia. If it is indeed derived from a cross of thin and fat-tailed breeds the circumstantial evidence would suggest that the Chios breed is derived (like the Kamakuyruk) from the Kivircik and Dağliç, both of which are present in western Anatolia and which could provide the finer wool and fat tail respectively" (Mason, 1967).

Distribution and Numbers : The breed is distributed along the coastal towns of Çeşme, Urla and Seferihisar of the Izmir province. It can also be found sporadically in other Aegean towns and along the Marmara Sea. It is poorly adapted in other parts of the country. Its numbers are estimated to be around 30,000 in 1983.

Nutrition and Management :Management of Sakiz sheep is quite different from that of Kivircik, a breed also raised in Izmir. Sakiz sheep art kept in groups of 2–6 animals to suppy meat and milk required by individual families. During most of the year they are fed in fruit gardens and in the fields of vegetables and other crops. During the winter they are kept and fed in simple stalls.

Phenotypic Description : The colour is white with black spots and speckles around mouth, eyes, and on ears and legs. The tail is long, but has a triangular fat deposit at the base. Rams have long spiral horns; ewes are usully polled. The wool is finer than in the White Karaman.

Body Measurements : The breed is the tallest among local sheep breeds. The body is relatively narrow. Mean values for some of the body measurements of Sakiz ewes in family flocks in Çeşme, Izmir, are given below (Özcan, 1965):

Body measurement	Mean (cm)	S.E. (cm)
Height at withers	70.1	0.16
Body length	70.0	0.20
Chest depth	30.9	0.12
Chest width (front)	18.6	0.13
Chest girth	88.0	0.20
Cannon circumference	7.4	0.02

(n = 302)

Production Performance : The Sakiz has a high milk yield and an outstanding prolificacy. Levels of different production characteristics of the breed are as follows (Aritürk and Özcan, 1960; Mason, 1967; Özcan, 1965, Özcan and Yalçin, 1977; Yalçin, 1979):

Characteristics of ewes	Performance level
Body weight (kg)	40 – 45
Lactation milk yield (kg)	120 – 180
Lactation length (day)	160 – 180
Greasy fleece weight (kg)	1.6 – 2.0
Staple length (cm)	11 – 15
Fiber diameter (micron)	28 – 34
Clean wool yield (percent)	60 – 70
Litter size	1.7 – 2.3

In a small experimental flock, average lactation yields of 2–6 year-old Sakiz ewes, kept under good feeding and management conditions, were from 188 to 259 kg, with an overall average of 211 kg; corresponding values for lactation length were 168, 210 and 191 days (Rulgurlu,1960). Average liveweights at different ages of Sakiz lambs at Çeşme were found to be as follows (Özcan, 1965):

Age of	Single lambs (kg)		Twin lambs (kg)		Other birth types (kg)	
lamb	Mean	S.E.	Mean	S.E.	Mean	S.E.
Birth	4.6	0.07	3.7	0.05	3.4	0.17
3 months	27.4	0.22	23.2	0.18	19.0	0.36
6 months	35.9	0.32	33.5	0.24	25.1	0.42
9 months	42.4	0.30	41.2	0.19	29.0	0.56
12 months	46.2	0.41	44.7	0.34	32.6	0.62

Mortality rates up to four months of age were 11.2, 12.6, 20.6 and 23.4 percent for lambs of single twin, triplet and other birth types, respectively.

Breed Improvement : There is a recorded Sakiz flock at Boztepe State Farm in Antalya. A small Sakiz flock is also kept at the Aegean University Farm, Izmir. Ministry of Agriculture, Forestry and Rural Affairs had a ram stud (koc deposu) at Çeşme, where good Sakiz rams had been kept and made available for mating of Sakiz ewes owned by families in the region. The activities of this ram stud have been discontinued. Milk recording and registration of sheep is not practiced in the field.

Sakiz sheep are bred pure. Sakiz rams, however, are sometimes crossed with Kivircik ewes in western Anatolia to improve prolificacy and milk production.

5.1.11. Tuj (Plates 19 and 20)

General : This breed is raised in the extreme northeast of Turkey near the Russian border. On the other side of the border it is bred under the name of Tushinskii. In Turkey it is also called Kars, Çildir or Kesik.

Distribution and Numbers : The distribution of this breed is limited to the province of Kars, and particularly to the town called Çildir, Its number is estimated around 120,000. Nutrition and management conditions resemble to that explained for Red Karaman.

Phenotypic Description : The colour of the Tuj is usually white with dark markings around eyes and on the legs. According to Batu (1962) the breed belongs to fat-rumped group. It has a short fat-tail which is bent upwards so that underside of the tail can be seen when the animal is at standing position. There is also fat deposit on both sides of the rump. From the back, two lobs of fat, each extending from the base of the tail to either side of the rump, can be distinguished. However, the original Tuj was crossed with local fat-tailed sheep in the area; therefore, some animals deviate considerably from this characteristic type of fat deposition. Ewes are polled; rams have strong horns. The wool is of the mixed coarse type, but it is considered to be of better quality than White Karaman and Red Karaman wools.

Body Measurements : Yarkin and Eker (1954), studying different characteristics of the Tuj breed in Çildir area in the province of Kars, obtained the following mean values for some body measurements of ewes:

Body measurement	Mean (cm)	S. E. (cm)
Height at withers	62.6	0.54
Chest depth	29.2	0.37
Chest width (front)	18.9	0.26
Chest girth	89.7	0.86
Cannon circumference	7.7	0.08

(n = 46)

Production Performance : The Tuj, in Turkey, is a light-medium breed with fairly good fattening ability and meat quality. Average body weight of ewes is estimated about 38–42 kg and the lactation milk yield 50–55 kg. Annual wool production in ewes is around 1.8 – 2.0 kg with an average fiber diameter of 30 – 32 microns (Yarkin and Eker, 1954; Özcan and Yalçin, 1977; Yalçin, 1979).

5.1.12. Other Types :

In addition to the above sheep breeds, there are some local types of sheep in the country. These are Kamakuyruk, Herik, Ödemis and Hemsin.

Kamakuyruk : The Kamakuyruk is a sheep similar to the Kivircik in production performance and phenotypic appearance, with one difference that it has a different tail shape. There is a fat deposit at the base of the tail. This fat deposit is gradually diminishes towards the end of the tail, giving to the tail a cone-shape. In the Kivircik the tail is thin throughont its length. Kamakuyruk is the Turkish word for "cone-shaped tail".

The matings between Kivircik rams and Dağliç ewes produce F_1 crosses fitting the above description. However, *inter se* matings among F_1 crosses has been carried out in some provinces of western Anatolia, so that, today, one can speak of of a

particular type of sheep, i.e. Kamakuyruk. It occurs frequently in the provinces of Izmir and Balikesir, and less frequently in the provinces of Canakkale and Bursa. Production performance, phenotypic appearance other than tail shape, and nutrition and management are similar to those explained for Kivircik breed (See Section 5.1.6).

Herik : The Herik sheep are distributed in some provinces along the eastern Black Sea coast and in the provinces adjacent to them (Samsun, Trabzon, Rize, Amasya, Sivas and Corum). In some of these provinces it is known as Amasya Herik. A similar sheep also occurs in Van and in the nearby provinces in eastern Anatolia. According to Yarkin and Eker (1954) the name Herik is also used for the Tuj sheep in Kars.

The Herik is generally similar to the Dağliç, but it has a different type of fat tail. The fat tail of Dağliç is oval, it has a median groove on it, and it ends with a thin tail-end hanging straight down. The fat tail in Herik is wide at the base, narrows towards the end, and it does not have the median groove and the end piece. (Yarkin, 1964).

The Herik is somewhat smaller than Dağlic but it bears some resemblance to Dağliç in other characteristics, i.e. type, fleece and productivity. Rams are horned and ewes are generally polled.

Ödems : It is a local type different from other breeds in Turkey. It has a limited distribution area around " Ödemis, a town in Izmir province. The fleece is white; the face is usually black or brown. Coloured marks can often be seen on the legs. Ewes and the majority of rams are polled; some ewes may have small horns. Animals have lob ears. Ödemis sheep have a large and long fat tail which is twisted to form an S-shape; the tail is similar to that of the White Karaman. (Plate 21)

The Ödemis is a medium-sized sheep; in ewes, average body weight is 40–50 kg, with a withers night of 60–65 cm. The lactation milk yield is considered quite good (up to 150 kg). The wool is of mixed coarse type and staples are relatively short. The average fleece weight, staple length and fiber diameter are 1.0 – 1.5 kg, 9 – 14 cm and 33 – 42 micron, respectively (Sönmez, 1966; Brook an Ryder, 1978; Sarican, unpublised).

Hemsin : It is distributed in the northeastern corner of Anatolia and especially in Artvin province and Ardahan. It is also found in the other provinces along the eastern Black Sea. The tail is long and thin, but there is a fat deposit at the base of the tail. Rams are horned; ewes are usually polled. The coat colour may be brown, black or white. White animals have colour marks on the head and legs. The wool is of mixed coarse type. According to Sönmez (1966) it is similar to the Karaman in size and it has a low milk yield.

5.2. Goat Breeds

The goat population of Turkey consists mainly of hair goats and Angora goats. Hair goats are meat-an-milk type animals while Angora goats are primarily raised for mohair. The numbers of other goat breeds in the country are small; of these the Kilns, Gürcü and Abaza are basically milk type breeds with relatively good meat production, and the Malta and Halep are milking breeds. The Saanen and German White goat are kept for experimental purposes.

5.2.1 The Angora Goat (Plates 25, 26 and 27)

General : The breed is named after the town Angora (now the city of Ankara), in Central Anatolia, where it was first developed. In Turkey, it is called Ankara goat or Tiftik goat. Tiftik is the Turkish word for mohair.

The beginning of Angora goat raising in Turkey goes back to as early as 2400 B.C. (Akinci, 1924). Several authors reported Ankara Region in Central Anatolia as the area of origin for this goat. Other sources belive that it originated from some point in Central Asia. However it is generally accepted that Angora goat has been developed and gained its known characteristics on the Anatolian Plain, and particularly in the region then known as Angora (Batu, 1940; Van der Westhuysen et al., 1981; and Shelton, 1981).

Exportation of mohair from Turkey began for the first time in 1820; the establishment of mohair spinning in England since 1835 created a great demand for mohair from this country, which at that time was the only producer (Van der Westhuysen et al., 1981). Angora goats were first introduced to South Africa in 1836 and to the U.S.A. in 1849; these and further exportations from Turkey formed the bases of Angora goat raising in these two countries. Outside Turkey, South Africa and the U.S.A. Angora goats are also raised today in Lesotho, Argentina, Russia, Australia and New Zealand in smaller scales.

Distribution and Numbers : In Turkey, Angora goats are raised mainly on the Central Anatolian plains. It is most frequent in the provinces of Ankara, Konya, Eskişehir, Afyon, Çankiri, Kastamonu, Yozgat, Çorum, Niğde, Kirşehir and Bolu. The best quality mohair is produced in Beypazan and Ayaş districts, near Ankara; Angora goats are also found in smaller numbers in some southeastern provinces of the country (in the provinces of Siirt and Mardin). The number of Angora goats in the country declined from a high level of 6.0 millions in 1960 to 3.5 millions in 1975; their number in 1983 was 3.1 million, i.e. 18.6 percent of the total goat population in the country.

Nutrition and Management : The nutrition of goats during grazing season depends almost completely on grazing poor quality pastures and cereal stubbles. The grazing season generally starts in the beginning of April and ends towards the end of November. Only a smal1 proportion of the Angora goat population is associated with brushy and shrub areas. In winter, as well as during rainy and cool periods in grazing season, animals are kept in simple and generally unhygienic sheds, when they are fed on limited amount of hay and cereal straw; few flock owners feed their animals with cereal grains at a rate of 150–200 g per head/day, during cold periods (20–30 days). Kids suckle their mothers twice a day for the first two or three months of their lives; thereafter they usually graze with their mothers up to the weaning age (3 to 4 months).

The number of goats owned by each holder varies from 3–5 to more than a thousand. The majority of holdings have from 50 to 100 goats. Units having more than 100 goats are managed as separate flocks. Smaller units are either run together with sheep or put together into a composite village flock for grazing.

A representative Angora goat flock is composed of the following age and sex categories: breeding females 45 percent, bucks 4 percent, yearling females 25 percent, yearling males 6 percent and castrated young males 20 percent. Castrated young males produce significantly heavier fleeces than breeding females with a comparable fleece quality. Their proportion in the flock varies from 10 to 30 percent according to the regions.

Matings usually take place between the middle of October and end of November. Because of the generally low body weights, only a small proportion (1/3 or 1/4) of yearling females are used in reproduction for the first time at 18 months old; the majority of yearling females are carried to the next mating season to be mated for the first time at 2 1/2 years of age. Does with good reproduction, fleece weight. fleece quality and a favourable body condition are used in repdoduction up to 7 or 8 years of age; exceptional animals are kept in the flock up to the age of 10 years. Three or four bucks are used per 100 does. Kids are born in the shed, and receive relatively good care during the first two months of their lives. Shearing is done once in a year, usually at the end of March and in April (Yalçin et al., 1983).

Phenotypic Description : The colour is usually white. About 94 percent of the animals, raised in the main distribution area (Central Anatolia), produce white fleeces. The Angora goats in the provinces of Siirt and Mardin are coloured; the colour may be brown, grey or black. The head is small and narrowed towards the nose. Both males and females are horned. Horns are strong and slightly spiral in bucks; in does they are medium-sized and extend towards posterior. The fleece of Angora goat is lustrous and of usually silver-white colour, and consists of long, strong and relatively uniform fibers called mohair. The fleece covers the belly, upper part of the legs, neck and overhead. Usually there is a tuft of mohair on the forehead.

Body Measurements : The Angora goat is a small-sized animal. Mean values found for some body measurements of Angora does at Lalahan Animal Breeding Research Iustitute, near Ankara, and in field flocks in the seven provinces of Central Anatolia are as follows (Sincer and Öznacar, 1960; Aköz and Sincer, 1961):

	Field Flocks (cm)	Lalahan flock (cm)	
Body measurement	Range of means	Mean	S.E.
Height at withers	51.3 – 55.2	57.8	0.15
Body length	53.6 – 55.7	62.2	0.14
Chest depth	21 .9 – 25.4	26.2	0.10
Chest width (behind scapula)	11.1 – 14.1	17.8	0.11
Chest girth	64.3 – 68.9	75.3	0.22
Cannon circumference	7.0 – 7.4	7.1	0.02

Production Performance : The primary product of Angora goats is mohair; meat and milk from this animal is of secondary importance. Mean values for the important mohair characteristics of Angora does at Lalahan Animal Breeding Research Institute, Ankara, and in the randomly selected producers' flocks in Central Anatolia were found as follows (Aritürk et al., 1979; Müftüoğlu and Örkiz, 1982):

Mohair characteristics	Yearling females n	Yearling females Mean	Yearling females S.E.	Breeding does n	Breeding does Mean	Breeding does S.E.
Lalahan Flock						
Greasy Fleece Wt. (kg)	545	1.49	0.03	1772	2.96	0.02
Clean Fleece Wt. (kg)	545	1.08	0.01	1772	2.11	0.01
Clean Mohair Yield (percent)	545	72.2	0.29	1772	71.5	0.18
Staple Length (cm)	545	15.6	0.09	1772	16.4	0.05
Fiber Diameter (micron)	545	26.0	0.08	1772	35.8	0.07
Breaking Strength (g)	545	16.4	0.12	1772	25.7	0.11
Fiber Elasticity (percent)	545	29.5	0.18	1772	35.0	0.12

	n	Mean	n	Mean
Producers Flocks				
Greasy Fleece Wt. (kg)	604	0.94	1026	1 .59
Clean Mohair Yiled (percent)	...	78.8	....	77.0
Staple Length (cm)	384	12.4	557	13.8
Fiber Diameter (micron)	384	27.5	557	33.3
Kemp (percent)	384	3.99	557	4.12
Medullated Fibers (percent)	384	1 .24	557	1 .26

The average values for the primary, secondary and total number of follicles were found from the skin samples of 3 years old does as 1.35, 12.79 and 14.14, respectively (Batu and Özcan. 1964).

Data on the reproductive performance of Angora goats are available only for flocks at experiment stations and state farms. The levels of different reproductive traits for flocks at Lalahan Animal Breeding Research Institute, Ankara, and Çifteler State Farm, Eskisehir, are shown below; the figures for both farms are based on five consecutive kiddings. and are given for young does (1 1/2 years old) and mature does (2 1/2 years and and older), separately (Yalçin, 1982 a):

Traits studied	Lalahan Flock Young Does	Lalahan Flock Mature Does	Çifteler Flock Young Does	Çifteler Flock Mature Does
Number of Does at Mating	274	880	1160	3556
Does Kidding (percent)	63.1	89.8	28.9	85.2
Kids Born/Does Kidding	1.00	1 .05	1 .00	1.01
Kids Born/Does Mated (percent)	63.1	94.0	28.9	86.1
Kids Raised/Does Mated (percent)	53.6	86.1	26.9	82.8

The above results, obtained under rather extensive conditions of these farms, show that mature does have a good repdoductive performance, while the reproductive performance of young does is low. Percentage of twin births is low (0–5 percent); it is not a desired characteristic under the Central Anatolian conditions. Aritürk et al.(1979) give the following figures on the growth preformances of single-born Angora goat kids raised in Lalahan flock:

	Male kids (kg)			Female kids (kg)		
Kid weights	n	Mean	S.E.	n	Mean	S.E.
Birth weight	661	2.6	0.02	622	2.3	0.01
Weaning (4 1/2 mos) weight	656	16.8	0.07	612	14.7	0.10
12-month weight	588	24.3	0.23	545	18.8	0.17

In the same study, average shearing body weight of Angora does was found to be 29.1 kg.

Breed Improvement : In Turkey, Angora goats are raised in a pure-breeding system. Flocks are normally self-contained and closed to animals from other goat breeds. Replacement males and females are bred from within the flocks. This inevitably leads to some degree of in breading in small units. However, during the years of favourable mohair prices breeders bring in bucks from well-known Angora goat flocks.

Three state institutions maintain elite Angora goat flocks, and provide the produces with good quality bucks at reasonable prices. These are Lalahan Animal Breeding Research Institute in Ankara, Çifteler State Farm in Eskisehir, and Bayazitoğlu State Farm in Yozgat; the elite flocks in these farms have 250, 1100 and 300 breeding does, respectively. Goats on these farms are pedigreed and their production records are regularly kept. Selection is based on greasy fleece weight, fleece quality and body weight. Individual fleece measurements are made at Wool Laboratories of the Ministry of Agriculture, Forestry and Rural Affairs.

Breeding animals are also avaitable from field flocks with long breeding tradition. Together with state farms they play an important role in maintaining the mohair quality of Angora goats in this country. Because the selection and culling in the majority of these field flocks are based on the subjective judgement of the breeders, their potential in improving the overall productivity of the breed is not properly used.

Mohair prices greatly influence breeding operations in Angora goat raising. While high and sustained mohair prices create an incentive for a more careful selection and culling in a purebreeding system, low and fluctuating prices hinder these efforts and may even alter the type of mating system to be used. After a period of low mohair prices, some flock owners bring in bucks from ordinary goat flocks for crossbreeding with their Angora does; the aim is to obtain crossbred males with better meat production and crossbred females with better milk production. In such years, there is little demand for good quality bucks, bred in state farms and top grade field flocks; some owners even reduce the size of their flocks by selling part of their breeding animals for slaughter. Thus, unfavourable prices face the producers with economic difficulties, which in turn cause reduction in the Angora goat population of the country and deterioration in the quality of the national mohair clip.

5.2.2. Hair Goat (Plates 28 and 29)

General : The Turkish name for the hair goat is Kil Keçi, Kil meaning hair and Keci meaning goat. It is also called Adi Keçi (Ordinary Goat or Common Goat) or Kara Keci (Black Goat).

Distribution and Numbers : The hair goats are raised in all parts of Turkey, particularly in the mountainous and brushy areas of Mediterranean, Aegean and southeastern Anatolian Regions (Adana, Kahramanmaras, tçel , Antalya, Burdur, Isparta, Muğla, Denizli, Kütahya, Izmir, Manisa, Balikesir, Çanakkale, Adiyaman, Bitlis, Siirt, Urfa , Gaziantep, Mardin and Hakkâri provinces). They are quite frequent in Thrace

(Kirklareli and Tekirdağ provinces), in some provinces in the eastern Black Sea Region (Amasya, Tokat, Gümüshane) and in the mountainous part of eastern Anatolia (Erzincan, Elaziğ, Sivas, Muş, Bingöl, Ağri, Tunceli and Van). In the plains of Central Anatolia it occurs rarely, leaving its place to the Angora goat. As a result of the measures taken, the number of hair goats declined from 18.6 million heads in 1960 to 13.6 million heads in 1983.

Nutrition and Management : Hair goats raised in hilly and mountainous regions depend for their nutrition on shrubs and bushes and on grazing areas in and around forests and woodlands. In coastal areas browsing continues almost all the year round. The majority of goat flocks of these regions are moved for the summer to better browsing and grazing areas on highlands and mountains. In steppes and plains grazing management, and feeding of hair goats are similar to those of sheep. Time of mating or lambing depend on the region, but it is generally similar to that in sheep in different, regions. Simple sheds in the villages or nearby caves are used for sheltering the animals in the winter. Kids are weaned at about 2 to 3 months of age. Affer weaning, goats are milked for about 2 to 3 months.

Phenotypic Description : The colour is generally black. For this reason, this goat is also called as Black Goat. However, brown, grey, white or spotted animals are also seen. Bucks and does are generally horned, bucks having strong horns. The ear is generally large and drooping, but animals with medium-sized or short ears are also seen. Hair is coarse, long and without undulation. Inside of the flece there is a thin coat of fine and soft fibers.

Body Measurements : The body size is considered large. Batu (1951) gives the following mean values obtained by Spottel for some body measurements of does:

Body measurement	Mean (cm)
Hight at withers	72.4
Body length	71.5
Chest depth	31.7
Chest width (front)	17.5
Chest girth	81.6

The body size is larger for the goats raised in the mountainous and hilly Mediterranean and Aegean Regions than tohse raised on the Central Anatolian plains, probably because of the better browsing conditions in the former.

Production Performance : The levels of different production characteristics of the hair goats in Turkey are given bay Özcan and Yalçin (1977) as follows:

Characteristics of does	Performance level
Body weight (kg)	40 – 45
Lactation milk yield (kg)	60 – 70
Lactation length (day)	150 – 160
Milk fat (percent)	4 – 5
Hair production (kg)	0.5 – 0.6
Birth rate (percent)	80 – 85
Twinning rate (percent)	5 – 15

Lactation milk yield is higher under better feeding and browsing conditions (100–120 kg). In a study by Sönmez (1974), average first and second lactation milk yields of hair goats kept at the Aegean University Farm in Izmir were 88 and 107 kg, respectively; corresponding values for lactation length were 154 and 151 days. In the same study, mean weights of single-born hair goat kids were 2.6 and 2.5 kg at birth and 12.1 and 11.3 kg at 84 days of age, respectively. Kid mortality to 84 days of age was found to be 12 percent.

Utkanlar et al.(1963), studying the characteristics of cashmere-like fibers in the fleeces of hair goats, reported that mean diameters of these fibers varied from 16.8 to 18.4 micron in goats of different regions, and that they did not contain kempy and medullated fibers; the amount of cashmere-like fibers was on the average 40–50 g per animal.

5.2.3. Kilis Goat

General : The Kilis goat has been developed by crossing native hair goats with Aleppo goats (according to some authors, with Damascus goat) and by subsequent interbreeding among the crossbred generations. This goat has long been considered a separate breed. Kilis is the name of a town in the province of Gaziantep where this goat is raised most frequently.

Distribution and Numbers : Kilis goats are distributed in the province of Gaziantep, and particularly in the town of Kilis, in southestarn Anatolia. They are also raised in Hatay, a province near Gaziantep. Both of these provinces lie along the Syrian border. Their present number is estimated to be around 60.000 heads. They are kept in small flocks of 2–10 goats.

Phenotypic Description : The coat colour is generally black; brown, grey and spotted animals are also seen. The majority of the animals are horned. They have long pendulous ears, but animals with relatively short ears are also encountered. The hair is straight, long and coarse. The Kills goat is a small-sized animal with an average withers' hight of around 55 cm.

Production Performance : Levels of different production traits for the Kills does were reported as follows (Yarkin and Eker, 1961; Yarkin and Sönmez, 1961 b; Yarkin, 1965; Şengonca, 1974; Sönmez, 1975; Özcan and Yalçin, 1977; Şengonca, 1982; Tuncel and Yener, 1983).

Characteristics of does	Performance level
Body weight (kg)	30 – 35
Lactation milk yield (kg)	200 – 300
Lactation length (day)	190 – 230
Milk fat (percent)	4.0 – 4.5
Hair production (g)	0.5 – 0.6
Birth rate (percent)	85 – 90
Twinning rate (percent)	15 – 25

The performance of the Kilis goat under improved feeding and management conditions of the Faculty of Agriculture, University of Ankara, was studied by Eker et al.(1975 a), Mean values for lactation milk yield, lactation length, milk fat and body weight of does were 327 kg, 260 days, 4.4 percent and 40 kg, respectively. Tuncel et al.(1976), working with Kilis goats in the Regional Research Station in Antalya,

reported the following values for different production characteristics: lactation milk yield 566 kg, lactation length 222 days, litter size 1.54 and survival of kids to six months of age 88 percent.

5.2.4. Other Goat Breeds

Gürcü Goat : This breed is distributed in the northeastern Anatolia, particularly in the Çildir area of Kars province. It is a breed of Caucasia in the U.S.S.R. Because of this, it is also called Kafkas goat or Tiflis goat in Turkey (Batu, 1951).

The colour may be black, grey, white or spotted. In white animals, head, ears and upper part of the neck may be black. The bucks have strong and long upward horns; the length of the horns may be up to 50 cm. The does may or may nat have horns. Ears are long (about 15 cm). There is a tuft of hair on the forehead. (Plate 30)

It is a large breed, with 70–75 cm night at withers in does. The lactation milk yield is about. 200–250 kg in about 150–180 days. The udders are well-developed. It is considered a milking breed. The coat has characteristics similar to that in hair goats.

Abaza Goat : It is raised in the northeastern Anatolia. The body is covered with pink-white fibers with coloured markings around mouth, eyes and on legs. The coat is made up of short and soft fibers. The bucks have long, flat and sward-like horns. The does are usually polled. The mammary system is well-developed. Average lactation yield is around 200 kg (özcan and Yalçin, 1977).

Malta Goat (Maltese Goat) : This goat is raised in Aegean and Marmara Regions, more frequently in the provinces of Izmir and Istanbul. It is kept in small family flocks of 2–5 animals. These goats were brought to Turkey long ago from Mediterranean and Aegean islands. The size of its population in the country is very small.

The colour is usually brown-and-white spotted or brown; however, black, white and black-and-white animals are also seen. The profile of the head is roman. The ears are long, wide and drooping. Animals usually have a pair of wattles on the neck close to the chin. The beard is absent. The animals are usually polled; if present, the horns are small.

Body size is smaller than in Swiss breeds. Average body weight in does is 40–45 kg and hight at withers is 60–65 cm. It is a milking breed with well-developed udders. Average lactation milk yield is around 400 kg in about 190–220 days. Litter size is around 1.8. The hair covering the body is short and soft (Özcan and Yalçin, 1977; Şengonca, 1982; Tuncel and Yener, 1983).

Halep Goat (Aleppo Goat): Halep goats are raised in the southern provinces of Turkey in small numbers. Its name derives from the city of Aleppo in Syria. It is a milk breed kept in the towns and around cities, in groups of 2–5 animals. This goat thrives well in lowland areas; it is not adapted to cold regions and poor feeding conditions.

The colour of animals vary from yellow to brown; however, spotted animals are also seen. They are usually polled. The ears are very large and drooping; average length of the ear is around 25 cm. They usually have a pair of wattles (appendages) on the neck. The hair cover is short and soft.

The body size is medium-large with an average withers' hight of 65–70 cm and a body weight of 40–50 kg in does. The udders are wel1-developed . The mean lactation milk yield is 500–600 kg in a lactation period of 200–220 days. It is a prolific breed with an average litter size of 1.7 (Özcan and Yalçin, 1977).

6. RESEARCH ON SHEEP AND GOAT PRODUCTION

In Turkey, research on sheep and goat production is carried out in the research institutes and state farms belonging to the Ministry of Agriculture, Forestry and Rural Affairs, and in the veterinary and agricultural faculties of the various universities. These activities are also supported by the Scientific and Technical Research Council of Turkey which finance individual research projects and affiliated research units. This chapter deals with research work together with problems in sheep and goat production, with special emphasis on breeding, nutrition and manageme

6.1. Research on Sheep Production

6.1.1. Production Potential

Much of the research on sheep production in Turkey was concerned until 1960 with the body conformation and production levels of individual sheep breeds under extensive and semi-intensive conditions of the government institutions. Since then, considerable information has been accumulated on their performance under more intensive conditions and under field conditions. The results of the majority of these studies have already been referred to in Section 5.1. Some of these worth mentioning for demonstrating production potentials of the sheep breeds in the country Results of the other studies related to production are also given below.

Reproduction : In different breeds of sheep in the country the birth rate is in general at a satisfactory level (80–85 percent). In the majority of the breeds percentage of twin births is low. The average litte size in White Karaman, Red Karaman, Dağliç, Awassi, Karakul, Karayaka and Tuj breeds very from 1.0 to 1.1, and in Kivircik and Gökçeada breeds it is in the order of 1.1 – 1.2. The most prolific breed in the country is the Sakiz with an average litter size of 1.7 – 2.3, followed by Central Anatolian Merino which has a litter size of 1.4 – 1.5 (See Section 5.1)

However, the results of the recent research work show that their reproductive potential is higher than the above figures suggest. Under slightly better feeding and good management conditions, birth rate was 85–91 percent in White Karaman (Yalçin and Aktaş, 1976; Örkiz et al., 1984), 84 percent in Red Karaman and 82 percent in Awassi (Özsoy and Vanli, 1984 a), 88–89 percent in Dağliç (Yalçin et al., 1977; Evrim 1978 a), 85 percent in Kivtrcik (Sönmez et al., 1976), 87 percent in Karayaka (Aritürk et al., 1985) and 97 percent in Gökçeada breed (Yalçin et al . , 1980). Average litter size under similar conditions was 1.15 – 1.22 for White Karaman (Yalçin and Aktaş, 1976; Öykiz et al., 1984), 1.27 for Red Karaman (Akçapinar et al., 1984), 1.30 for Kivircik (Sönmez et al., 1981) and 1.26 for Gökceda sheep (Yalçin et al., 1980). Litter sizes of five groups of White Karaman ewes, flushed with feed of different energy levels for four weeks before mating, varied from 1.20 to 1.50 (Işik, 1980).

Higher levels of prolificacy were obtained with intravaginal application of hormone sponges (impregnated with 40 mg Cronolone) and subsequent PMSG injection to White Karaman and Anatolian Merino ewes (Aşkin, 1982). With this treatment, proportions of single, twin, triplet and quadriplet births in Anatolian Merino ewes were 43.9, 52.4, 3.5 and 0.2 percent in the given order; the proportions of the first three birth types in White Karaman ewes were 50.6, 46.4 and 3.0 percent, respectively. Average litter size was 1.60 in Anatolian Merino and 1.52 in the White Karaman. Köseoğlu (1978), treating Karakul ewes in the beginning of breeding season with intradermal injection of 500 IU PMSG in three successive days, obtained litter sizes of 1.47 – 1.71 and 1.00 – 1.18 for treated and untreated groups, in that order.

At present, there is limited information on the primary reproductive characteristics of sheep breeds in Turkey. In Karacabey Merino, the average length of estrus cycle and duration of estrus was found to be 17.6 days and 30.1 hours, respectively (Çetinkaya, 1979). Mean levels of the primary reproductive characteristics of different native breeds were studied by Kaymakçi (1982); the results of this study are given in Table 6.1.

Table 6.1. Mean values for the primary reproductive characteristics of different sheep breeds in Turkey.

Characteristics Studied	Dağlic (Acipayam)	Sakiz (İzmir)	Awassi (İzmir)	Kivircik (İzmir)	Kivircik (Turkgeldi)
Age at first estrus (day)	225	217	304	301	-
Weight at first estrus (kg)	-	33.5	36.0	36.5	-
Duration of estrus (hour)	29.5	34.8	32.0	28.6	27.8
Length of estrus cycle (day)	15.7	16,5	16.9	17.1	17.9
Duration of breeding season (day)	146	116	104	103	248

The results of this study supports the general experience that the native sheep breeds of Turkey are in general seasonal breeders.

Örkiz and On (1978) studied the out-of-season reproductive performances of Karacabey and Central Anatolian Merino ewes. Ewes which were barren at the end of the normal lambing season were mated soon after lambing; in the two groups birth rates were 54 and 79 percent and average litter sizes were 1.15 and 1.11, respectively.

In addition to its known advantages, syncronization of estrus and lambings in sheep in Turkey is particularly important in facilitating A.I. operations in the field. In a study by Dzkoca (1966), Merino x White Karaman ewes were treated with 15 nig progesterone intramuscularly for five successive days followed by 500 I.U. PXSG injection on the sixth day; lambingsrelated to the first inseminations were completed in 11 and 55 days in treatment and control groups, respectively. Özkoca (1968) also compared the results of intravaginal and intramuscular progestagen administrations in Merino x White Karaman ewes. In the group treated with 30 mg intravaginal Cronolone for 17 days, 98 percent of the ewes showed estrus in 5 days and lambed within 9 days; the pregnancy rate was 87 percent. In the group receiving a daily dose of 15 mg Corluton for five days, all the ewes were mated within 9 days; lambing was compleded within 7 days and a pregnancy rate of 90 percent was obtained. In another study (Aşkin, 1982), intravaginal administration of sponges (impregnated with 40 mg Cronolone) were administered to groups of White Karaman and Anatolian Merino ewes for 14 days, and soon after the removal of the sponges 200, 400 and 600 I.U. PMSG was injected to the ewes in different sub-groups. In White Karaman and Anatolian Merino groups respectively 92 and 91 percent, of ewes lambed within seven days; in the control froups mating lasted 45 days and lambing was completed in about. 50 days. Birth rate was similar in treatment and control groups. The dose of PMSG did not influence birth rate; litter size was significantly increased with PMSG administration, effect being greater with the higher doses.

Artificial insemination in sheep has been used since 1934 in this country. In fact, it is the only means for carrying out crossbreeding programmes involving thin-tailed improved breeds and fat-tailed native breeds (for example Merino x White Karaman

crossbreeding). The use of fresh ram semen in I.A in sheep causes serious difficulties in the field. A number of studies have been carried out in order to investigate the usefulness of different semen diluters and the effects on fertility of storing ram semen at 5°C for different durations (Dzkoca, 1961 a, 1951 b, 1964 and 1967; Gökcen, 1981). Results with diluted semen were generally favourable, but storing semen for more than 6 hours at 5°C resulted in with lower fertility as compared to controls. Low birth rates (18–27 percent) were obtained with frozen ram semen (Gökcen, 1977), There is need for further research for obtaining better fertility results with frozen ram semen.

Growth and Fattening Performance : The available information on the growth performances of various sheep breeds have already been given in Section 5.1, Data on the fattening performances of different breeds are summarized below. Results of the fattening experiments have shown that lambs of some of the native breeds have quite satisfactory fattening performance.

In spite of the relatively small body size in the Kivircik breed, the lambs of this breed appears to have a good fattening ability, as shown by an experiment (Aki, 1977) carried out at İnanli State Farm in Tekirdağ (Table 6.2). In this experiment, groups of differently rared 90-day-old Ktvircik single-born male lambs were either kept on range entirely or fattened intensively to 150 days of age. At the end of 60-day period average liveweights of range groups were 34.5 – 37.6 kg and those of intensively fattened groups were 42.8 – 45.8 kg; corresponding average daily gains were 103– 130 g and 240 – 255 g, respectively. When range groups were intensively fattened from 150 days to 210 days they showed compensatory growth by reaching average weights of 51.8 – 55.2 kg and gaining daily 278 – 293 g during the 60-day fattening period. Fattening from 90 days to 150 days improved carcass quality in terms of dressing percentage and proportion of separable meat in the sample joint.

Table 6.2. Performance of male Kivircik lambs under different rearinq and fattening regimes.

Traits Studied	Type of rearing		
	Group 1	Group 2	Group 3
No. of lambs	48	48	48
Birth weight (kg)	4.1	4.0	4.0
90-day weight (kg)	28.4	29.1	30.5
Dressing percentage	49.8	51.8	52.6
Separable meat (percent)	62.7	62.4	62.4
Separable fat (percent)	11.8	11.3	11.3
Bone (percent)	24.2	24.4	23.6

	Type of fattening					
	Group 1		Group 2		Group 3	
	Range	Feedlot	Range	Feedlot	Range	Feedlot
No. of lambs	22	22	22	22	22	22
90-day weight (kg)	28.3	28.4	29.1	29.1	30.4	30.5
Fattening period (day)	60	60	60	60	60	60
150-day weight (kg)	34.5	42.8	36.9	43.6	37.6	45.8
Dressing percentage	-	54.0	-	53.3		54.5

Separable meat (percent)	-	67.5	-	69.8	-	70.0
Separable fat (percent)	-	12.3	-	10.9	-	10.9
Bone (percent)	-	17.6	-	16.6	-	16.0

	Feedlot	Feedlot	Feedlot
No. of lambs	22	20	22
150-day weight (day)	34.5	36.9	37.6
Fattening period (day)	60	60	60
210-day weight (kg)	51.8	53.6	55.2

Group 1: weaned at 45 days
Group 2: partially weaned at 45 days then suckled after milking for the next 45 days.
Group 3: weaned at 90 days.

Fattening performance of Kivircik lambs was compared with that of Merino in a study by Bayindir et al. (1985). In this study, male lambs weaned at an age of 3 months were put on fattening for 56 days and fed 100 g hay per head/day and a concentrate mixture ad libitum . The results of this fattening trial are shown in Tablo 6.3. Performances of the two groups were similar.

Table 6.3. Comparative fattening performances of Kivircik and Merino lambs.

Traits		Kivircik lambs			Merino lambs	
Studied	n	x	S.E.	n	x	S.E.
Initial weight (kg)	11	29.3	2.15	11	28.7	2.16
Final weight (kg)	11	44.6	2.42	11	45.0	2.81
Average daily gain (g)	11	274	45	11	292	48
Hot carcass weight (kg)	11	22.6	1.21	11	22.7	1.73
Cold carcass weight (kg)	10	22.0	1.16	10	22.0	1.72
Dressing percent, (hot)	10	50.7	0.98	10	51 .0	2.08
Dressing percent (cold)	10	49.4	1.01	10	49,6	2.12
Internal fat (kg)	10	0.68	0.21	10	0.39	0.17
Full rumen weight (kg)	10	4.90	0,67	10	4.75	0.47

Average daily weight gains of early weaned (one month) White Karaman lambs over a fattening period of 84 days varied from 229 g to 245 g, with dressing percentages of 45–48; the corresponding figures for lambs weaned at two months age were 230–242 g and 47–48 percent (Günes et al., 1974). In another study (Eliçin et al., 1976), single-born male White Karaman lambs weaned at two months of age were intensively fattened for 73 days; at the end of the fattening period they reached an average weight of 38.8 kg gaining daily 266 g during the fattening period. Red Karaman and Awassi male lambs, fattened for 84 days at an age of 214 days, gained daily 218 g and 244 g, respectively, in a fattening study at the Atatürk University Farm in Erzurum (Özsoy and Vanli, 1984 b).

Growth performances of White Karaman (Kangal type) and Red Karaman single-born lambs were studied at the Research Farm of Faculty of Veterinary Science in Elaziğ, by Akçapinar and Kadak (1982), under similar conditions (Table 6.4.). Lambs of both breeds showed a good growth performance under the farm conditions.

Table 6.4. Growth performances of White Karaman and Red Karaman lambs.

Age of lamb	Male lambs (kg)			Female lambs (kg)		
	n	$\bar{x}$	S.E.	n	$\bar{x}$	S.E.
White Karaman						
Birth	15	4.4	0.21	12	3.9	0.24
90 days	14	28.6	1.40	11	23.9	1,32
120 days	12	35.5	1.68	11	29.3	1.53
180 days	12	43.0	2.03	11	35.5	1.78
Red Karaman						
Birth	7	4.4	0,42	11	4.7	0.20
90 days	7	24.2	2.15	11	26.6	0.85
120 days	7	28.2	2.69	11	30,9	1.11
180 days	5	37.4	4.31	11	35.8	1.32

Comparative fattening performances of Dağliç, White Karaman and Kivircik male lambs were investigated by Akçapinar (1931 a, b and c) at the Lalahan Animal Breeding Research Institute near Ankara. Lambs were brought from different farms and fattened up to 50 kg liveweight at the institute.-The results of this study are summarized in Table 6.5. Dağliç, White Karaman and Kivircik groups reached from 20 kg liveweight to 50 kg liveweight in respectively 148, 106 and .121 days. Amounts of concentrate feed and dry alfalfa consumed per kg liveweight were respectively as follows: Dağliç 5.34 and 2.45 kg, White Karaman 3.66 and 1.70 kg, and Kivircik 4.37 and 2.00 kg. At diferent stages, proportion of fat on the tail was 15.2 – 16.6 percent in Dağliç lambs and 12.5 – 21.7 percent in Akkaraman lambs; Kivircik lambs did not have any fat on the tail. Kivircik carcasses were more fleshy than Dağliç and White Karaman carcasses as judged by MLD area. In general, Akkaraman lambs had the best fattening performance, followed by Kivircik and Dağliç lambs. However, if the amount of fat on the tail is taken into account, the Kivircik seems to have the best fattening performance. Oaglic, Kivircik and White Karaman lambs could be fattened up to 30, 35 and 45 kg leveweight, respectively, with tolerable fat deposition in the carcass.

In other studies, the effects on the fattening performances of lambs of different nutritive ratios (Digestible Crude Protein: Starch Unit), grazing on fresh grass and legume mixtures, ratios of straw and other roughage: in the ration, and feeding urea and ammonium sulphate were investigated (Okuyan et al., 1973; Eliçin et al., 1974; özkan, 1976; Erdinc, 1979; Tuncer, 1981; Eliçin et al. , 1983; Cangir et al., 1983; Cangir et al., 1984).

The age of lambs at the beginning of the fattening is an important factor affecting fattening performance, feed consumption and feed efficiency. In general, lambs are put to fattening at an age of 1–3 months in western regions of country; in other regions fattening of older lambs (6–8 months) is preferred. Eliçin et al.(1983). reviewing the research work carried out on the nutritional espects of lamb fattening in Turkey, concluded that, under normal management and nutritional conditions, lambs may be weaned at an age of 1 1/2 months of age and put on fettening. They should be fed with a ration containing 12–13 percent crude protein and an enegy content of 600–650 starch units; 20–25 percent of the ration may consist of roughage such as hay or alfalfa hay. Preference of 1 1/2 – 2 1/2 month old lambs to 6–8 month old lambs, and cross-bred lambs to native lambs would be beneficial in respect of profitability of the fettening.

Suitable length of fattening would be 56–70 days for young lambs and 42–56 days for 6–8 month-old lambs.

Table 6.5. Fattening performances of Dağliç, White Karaman and Kivircik lambs

Traits	Dağlic			White Karaman			Kivircik		
Studied	n	$\bar{x}$	S.E.	n	$\bar{x}$	S.E.	n	$\bar{x}$	S.E.
Initial weight (kg)	38	20.0	0.04	39	20.0	0.04	40	20.0	0.04
56-day weight (kg)	31	32.0	0.28	32	35.8	0.36	32	34.4	0.30
112-day weight (kg)	16	43.4	0.30	8	50.1	0.55	16	46.2	0.70
A.D.G. to 56 days (g)	31	214	-	32	283	-	32	256	-
A.D.G. to 112 days (g)	16	209	-	8	269	-	16	234	-
Days to 30 kg weight	38	46.4	0.98	39	36.3	0.88	40	39.5	0.95
Days to 40 kg weight	24	93.5	1.36	24	70.6	1.60	24	87.1	2.62
Days to 50 kg weight	8	148.2	3.17	8	105.9	3.70	8	120.6	4.33
Dressing percent. at 30 kg	7	45.8	0.50	7	46.7	0.60	8	46.4	0.60
Dressing percent. at 40 kg	8	52.0	0.70	8	49.9	0.60	8	50.6	0.20
Dressing percent. at 50 kg	8	54.8	0.50	8	55.2	0.80	8	50.5	0.40
MLD area (12–13 ribs)									
at 30 kg (cm^2)	7	19.5	0.81	7	19.7	1 .06	8	20.3	1 .03
at 40 kg (cm^2)	8	21.8	0.76	8	21.5	1 .04	8	24.9	1 .01
at 50 kg (cm^2)	8	27.9	3.59	8	26.7	0.88	8	29.2	0.83
Percent meat in leg: at 30 kg	7	61.9	1.40	7	65.1	1 .40	8	62.8	0.80
at 40 kg	8	56.2	0.70	8	60.8	1 .20	8	57.7	0.80
at 50 kg	8	52.6	1.20	8	57.3	0.70	8	56.8	0.60
Percent fat in leg: at 30 kg	7	18.8	1 .20	7	14.0	1 .20	8	16.8	0.70
at 40 kg	8	28.1	0.90	8	18.1	1.60	8	25.6	0.80
at 50 kg	8	32.9	1.20	8	26.0	1.00	8	28.1	0.60
Percent bone in leg: at 30 kg	7	18.8	0.50	7	20.1	0.60	8	19.7	0.40
at 40 kg	8	15.5	0.20	8	21.0	0.50	8	16.6	0.30
at 50 kg	8	14.5	0.30	8	16.5	0.50	8	15.2	0.20
Tail fat (in carcass)									
at 30 kg (percent)	7	15.2	1 .20	7	12.5	0.60	-	-	-
at 40 kg (percent)	8	16.6	0.50	8	17.5	1.10	-	-	-
at 50 kg (percent)	8	16.6	0.50	8	21.7	0.50	-	-	-
Kidney fat (in carcass)									
at 30 kg (percent)	7	1.0	0.T0	7	0.7	0,10	8	1 .5	0.10
at 40 kg (percent)	8	1.7	0.20	8	0.7	0.10	8	3.5	0.50
at 50 kg (percent)	8	2.1	0.30	8	0.8	0.10	8	4.4	0.30

Other Production Traits: The ranges of mean values given in Sections 5.1.1 – 5.1.11 for body weight, lactation milk yield and wool production characteristics represent performance levels obtained under conditions varying from extensive to semi-intensive, either in the field or on state farms. Under these conditions productivity is generally low. Average body weight after shearing is 40–48 kg in White Karaman, Red Karaman, Awassi and Sakiz ewes, and 35–42 kg in Dağliç, Karakul, Kivircik, Karayaka, Gökçeada (Imroz) and Tuj ewes. Average lactation milk yield (which include the amount suckled by lambs) varies from 90 to 160 kg in Awassi and Sakiz breeds, from 60 to 90 kg in Kivircik and Gökçeada breeds, and from 40–65 kg in the remaining six native breeds. In these native breeds of sheep, average greasy fleece weight is in general between 1.5 kg and 2.0 kg. However, with the possible exception of the Sakiz, these

breeds are hardy and resist well to diseases, droughts, scarcity of feed end extreme climatic conditions.

Studies on their production performances under good feeding and management conditions is scanty; however considerable volume of data have been acumulated on the performance under relatively good conditions. The mean values obtained in these studies for body weight, lactation milk yield and greasy fleece weight of ewes are presented in Table 6.6.

Table 6.6. Mean values for body weight, lactation milk yield and greasy fleece weight of ewes of different native breeds under relatively good conditions.

Breed	n	$\bar{X}$	S.E. (kg)	Source
Body Weight				
White Karaman	197	55.0	0.48	Yalcin and Aktaş (1969)
(Kangal)	223	58.0	0.44	Yalcin and Aktaş (1969)
	287	64.7	0.39	Örkiz et al. (1984)
Red Karaman	670	53.6	0.31	Vanli (1976)
Dağliç	737	39.7	0.18	Demir (1983)
Awassi	694	56.3	0.40	Vanli et al.(1984)
	56	53.3	1.25	Sönmez et al. (1971)
	60	47.1	1.03	Sönmez et al .(1971)
	85	51.6	1.26	Yalçin and Aktaş (1969)
Kivircik	40	49,7	1.10	Sönmez et al.(1976)
Karayaka	100	44.4	0.38	Özcan (1960)
Sakiz	50	52.0	0.98	Aritürk and Özcan (1960)
Gbkceada	888	47.6	0.15	Özcan et al. (1980)
Lactation Milk Yield				
Red Karaman	104	132.9	-	Akçapinar et al.(1984)
Dağlic	70	57,0	1.9	Demir (1983)
Awassi	27	173.7	8.9	Bulgurlu (1960)
	29	211.1	9.9	Bulgurlu and Sevgican (1964)
	162	158.0	-	Sönmez and Wassmuth (1964)
	14	202.4	14.1	Yarkin and Öztan (1967)
	18	179.5	8.8	Yarkin and Öztan (1967)
	290	200,7	2.9	Giirsoy and Özcan (1983)
	271	218.8	1 7	Gursoy and Özcan (1983)
Kivirelk	125	119,2	2.8	Yarkin (1956)
	152	77.2	6.2	Sönmez and Kizilay (1972)
Sakiz	12	211.0	9.6	Bulgurlu (1960)
	52	205.0	-	Sönmez and Wassmuth (1964)
Gökçeada	118	187.2	4.38	Yalçin et al. (1980)
Greasy Fleece Weight				
White Karaman	100	1.58	0.04	Sandikcioğlu (1960)
Red Karaman	260	1.89	0.06	Özsoy (1983)
Dağlic	741	2,26	0.02	Demir (1983)
Awassi	152	2.18	0.02	Yarkin and Eliçin (1966)
	694	2.92	0.05	Vanli et al .(1984)
	105	2.10	0.04	Yalçin and Aktaş (1969)
Kivircik	150	1.81	0.03	Yarkin (1956)
Karayaka	56	2.40	0.07	Özcan (1960)
Sakiz	655	1.82	0.01	Özcan (1965)
Gökceda	239	1.89	0.03	Özcan (1965)

Skin follicle populations of the sheep breeds in the country were determined by Batu and Özcan (1962) and Özcan (1965), using skin samples taken from the rib area of the 3-year-old non-pregnant ewes. Mean values for the primary (n_p), secondary (n_s) and total number of foolicles (n_{p+s}) per mm^2 skin area and number of secondary follicles per primary follicle ($n_{s/p}$,) are shown in Table 6.7.

Table 6.7. Mean numbers of skin follicles in different sheep breeds of Turkey (in 1 mm^2 skin area)

Breed of Sheep	Number of Animals	n_P		n_s		n_{p+s}		$n_{s/p}$	
		Mean	S.E.	Mean	S.E.	Mean	S.E.	Mean	S.E.
White Karaman	19	1.8	0.15	10.5	1.27	12.4	1.36	5.7	0.45
Dağliç	19	2.9	0.18	13.5	0.78	16.4	0.85	4.9	0.37
Awassi	19	2.5	0.14	9.0	0.52	11.5	0.61	3.6	0.14
Karakul	17	3.9	0.25	14.9	1 .30	18.8	1.50	3.9	0.19
Kivircik	20	2.5	0.11	9.2	0.63	11,6	0.69	3.7	0.22
Karayaka	19	2.1	0.21	8.6	0.55	10.7	0.61	4.1	0.26
Gökçeada	17	3.2	0.18	13.5	1.09	16.7	1.21	4.2	0.25
Sakiz	17	2.8	0.20	11.7	0.75	14.5	0.85	4.3	0.31
Turkish Merino	21	2.3	0.12	24.8	1.45	27.1	1.52	10.7	0.53

The information given in this section (Section 6.1.1) indicates that lambs of Kivircik, White Karaman, Red Karaman and Awassi breeds respond quite well to fattening, and that Awassi, Sakiz and Gökçeada breeds have high milk production potential. Fertility is in general good in all the native breeds; the Sakiz is outstanding in prolificacy. Substantial data are available on the production performance of White Karaman, Awassi, Kivircik and Sakiz breeds. Such information is scanty for the Red Karaman, Dağliç, Karayaka, and Tuj . Further research is needed for a better evaluation of the production potential of the native sheep breeds under extensive, semi-intensive and intensive conditions. Studies of this type will be more informative if groups of two or more breeds are compared under similar conditions.

6.1.2. Improvement Through Purebreeding and Selection

In view of the inadequate feeding and management conditions prevailing in the country purebreeding in the greater portions of native sheep breeds is likely to continue in the future. In a purebreding system, estimates of genetic and phenotypic parameters for different production traits are essential in formulating an effective selection programme and achieving optimum genetic improvement. Repeatabilities and heritabilities estimated for different traits of sheep breeds in the country are presented in Table 6.8.

Repeatability estimates for body weight, wool and milk production traits were high indicating that culling for these traits on the basis of first production year is likely to yield considerable improvement in the subsequent productivity of the flocks. They also indicate that selection for these traits can be based on a single record. Low estimates were found for litter size and lamb weights; they show that performance in the first production year is not a good criterium for culling and selecting for these traits.

Heritability estimates for litter size, birth weight and weaning weight in the Dağliç, Kivircik, Karakul and Merino were low (0.06 – 0.29), while those for body weight in White Karaman and Karacabey Merino, greasy fleece weight in White Karaman, Red

Karaman, Dağliç and Merino, and milk production in Awassi were from moderate to hiqh (0.30 – 0.63). They indicate that the rate of progress by selection for prolificacy and lamb growth rate will be slow; but it should be moderate to high for body weight, greasy fleece weight and milk production in the breeds mentioned above.

Table 6.8. Estimates of repeatability and heritability for different production traits of sheep breeds in Turkey.

Traits / Breed of sheep	Repeatability Estimate	S.E.	Heritability Estimate	S.E.	Source
Litter Size					
Awassi	0.09	0.04	0.33	0.18	Özsoy and Vanli (1984 a)
C. Anatolian Merino	0.15	0.03	0.16	0.08	Yalçin (1972 a)
Birth Weight					
Dağlic	0.15	0.03	0.08	0.04	Yalçin (1969 b)
Dağlic	0.10	0.04	0.11	0.05	Evrim (1979)
Awassi	-	-	0.08	0.01	Yarkin and Tuncel (1974)
Awassi	0.09	0.04	0.33	0.18	Özsoy and Vanln (1984 a)
Karakul	-	-	0.21	0.12	Özcan (1967)
Kivirnk	-	-	0,15	0.11	Özcan (1970 d)
C. Anatolian Merino	0.23	0.04	0.29	0.07	Yalçin et al.(1979 b)
Weaning Weight					
Dağlic	0.19	0.03	0.04	0.04	Yalçin (1969 b)
Dağlic	0.26	0.04	0.06	0.04	Evrim (1979)
Awassi	-	-	0.05	0.02	Yarkin and Tuncel (1974)
Awassi	0.07	0.04	0.30	0.17	Özsoy and Vanli (1984 a)
C. Anatolian Merino	0.19	0.04	0.13	0.05	Yalçin et al. (1979 b)
Body Weight					
White Karaman	-	-	0.63	-	Pekel (196P)
Red Karaman	0.64	0.05	0.27	0.16	Vanli (1983)
Awassi	-	-	0,13	0.02	Yarkin and Tuncel (1974)
Karacabey Merino	-	-	0.59	0.09	Öznacar (1973)
C. Anatolian Merino	0.66	0,02	0.13	0.05	Yalçin et al. (1979 b)
Merino	0.62	0.05	0.11	0.12	Özsoy (1974)
G. Fleece Weight					
White Karaman	-	-	0.61	-	Pekel (1968)
Red Karaman	0.53	0.05	0.30	0.17	Vanli (1983)
Dağlic	-	-	0.60	0.14	Aritürk et al .(1969)
Karacabey Merino	-	-	0.39	0.06	Öznacar (1973)
C. Anatolian Merino	0.49	0.03	0.35	0.09	Yalçin et al .(1979 b)
Merino	0.63	0.05	0.58	0.19	Özsoy (1974)
Staple Length					
Red Karaman	0.55	0.05	0.26	0.16	Vanli (1983)
Karacabey Merino	-	-	0.16	0.01	Öznacar (1973)
C. Anatolian Merino	0.56	0.02	0,44	0.10	Yalçin et al.(1979 b)
Merino	0.62	0.05	0.11	0.12	Özsoy (1974)
Fiber Diameter					
White Karaman	-	-	0.39	-	Pekel (1968)
Karacabey Merino	-	-	0.17	0.12	Dznacar (1973)

C. Anatolian Merino	0.51	0.02	0.31	0.08	Yalçin et al (1979 b)
Merino	0.31	0.07	0.13	0.11	Özsoy (1974)
Milk Production					
Red Karaman	0.73	0.04	0.29	0.18	Vanli (1983)
Awassi	-	-	0.50	0.12	Yarkin and Tuncel (1974)

Genetic relationships between various production traits have been studied in White Karaman, Red Karaman, Dağliç, Awassi and Turkish Merino breeds. Genetic correlations among production traits were in general either in the desired direction or non-significant, and showed no evidence of genetic antagonism among different production traits, except between fleece weight and fineness (Pekel, 1968; Öznacar, 1973; Yarkin and Tuncel, 1974; Özsoy, 1974; Evrim, 1979; Yalçin et al. , 1979 b; Vanli, 1983).

The effects of certain measurable environmental factors on various production traits were studied and their magnitudes were estimated in White Karaman (Akçapinar, 1983 b), Red Karaman (Müftüoğlu, 1974; Vanli, 1976; Akçapinar, 1983 b), Dağlic (Yalçin,1969 a; Evrim, 1978 b), Awassi (Özsoy and Vanli, 1984 a) and Merino breeds (Özsoy, 1974; Yalçin et al., 1979 a).

6.1.3. Improvement Through Crossbreeding

Several crossbreeding experiments involving exotic and native sheep breeds have been carried out during the past 50 years. The results of these experiments have already been reviewed (Yalçin, 1977 and 1979), but they are presented here again with some additional information.

Studies concerning the crossbreeding of native sheep breeds with foreign breeds date back to the 1930s; Mutton Merino x Kivircik and Mutton Merino x White Karaman crossbreeding , together with selection, led to the formation of two Turkish Merino types, i.e. Karacabey Merino and Central Anatolian Merino respectively (see Section 5,1.8) (Öznacar, 1973; Müftüoğlu, 1969; Yalçin et al., 1972; Yalçin et al., 1979 a). Crossbreeding between Mutton Merino and White Karaman was also carried out in order to develop a different type of sheep (Malya sheep) with good growth rate and semi-fine wool production (Düzgünes and Pekel, 1968).

One of the aims of this work was to have a productive fat-tailed breed whose rams could mate White Karaman ewes naturally and improvement work in the field could be made ease. This sheep has 35–40 percent Merino and 60–65 percent White Karaman genotype. At present, Malya sheep do not have a significant impact on the White Karaman population.

Experiments (Müftüoğlu, 1974; Yalçin and Müftüoğlu, 1969) carried out at Altindere State Farm, Van, have shown that crossing Red Karaman with Mutton Merino is not likely to produce any improvement in F_1 and backcross generations to Merino in lamb growth rate and adult body weight, and that a gradual increase in lamb mortality with increasing Merino genotype is likely; however, F_1, and backcross generations were superior to Red Karaman in twinning rate (by 8–10 percent), greasy fleece weight (by 0.5 – 0.6 kg) and wool quality. Better results from this cross-breeding were obtained at the Ataturk University Farm in Erzurum (Özsoy, 1983) ; F_1, F_2 and backcross generations to Merino (MB_1, and MB_2) were superior to Red Karaman in birth rate, litter size, and wool production, while lamb survival rate in these groups were slightly lower (Table -6.9.). other studies carried out on the same farm (Çakir et al., 1981; Vanli et al ., 1984) showed the superiority to the Morkaraman of the lambs of different generations in

fattening performance, and a heterosis effect in this respect at the F_1 generation. It was concluded that Merion genotype could be utilized at a proportion of 50–75 percent in improving different production traits of Red Karaman breed.

Table 6.9. Production performances of Merino (M), Red Karaman (RK) and their crossbreds (F_1 , F_2, MB_1, and MB_2)

Traits Studied	Genotypic groups M	F_1	F_2	MB_1	MB_2	RK
Lamb Survival						
to 60 days (percent)	85.5	93.7	92.4	90.6	88.4	95.2
to 120 days (percent)	78.2	90.4	90.7	86.5	85.4	91.8
Lamb Growth (L. S. Constants)						
Birth weight (kg)	4.6	4.8	4.7	4.9	4.7	4.4
Weaning weight (88days, kg)	21.0	23.5	23.9	22.5	22.1	23.5
12-month weight	40.8	42.0	42.0	41.3	41.9	40.6
Characteristics of ewes						
Birth rate (percent)	93	96	95	93	96	88
Litter size (at birth)	1.30	1.27	1.29	1.32	1.15	1.14
G. Fleece Wt (1st shearing, kg)	2.86	3.13	2.74	2.92	2.60	1.79

Source : Özsoy (1983).

In 1965, crossbreeding work was started at Ereğli Animal Breeding Research Institute, Konya to investigate the possibilities of using lie de France x White Karaman crossbreeding for commercial lamb production. The project has later been extended to obtain results on F_2 and backcross to lie de France (Yalçin and Aktaş, 1976). Table 6.10 summarizes the main results of this experiment. F_1 lambs, as well as lambs raised by F_2, ewes (F_1 and backcross lambs), were superior in growth rate to their purebred comtemporaries. F_1ewes showed significant increases in body and fleece weights, milk yield and conception rate over White Karaman. However, in view of the low twinning rate of White Karaman ewes and the inadequate feeding conditions in the region, development of a meat and semi-fine wool type sheep having 60 to 70 percent He de France and 30 to 40 percent White Karaman blood, seems to be more feasible than using commercial crossbreeding between these two breeds.

Table 6.10. Least squares means for production traits of He de France (IF), White Karaman (WK) and their crosses (F_1 F_2 and IFB_1,).

Traits Studied	Genotypic groups IF	F_1	F_2	IFB_1	WK
Lamb survival					
No. of lambs born alive	425	271	99	96	237
No. of lambs at 105 days (weaning)	398	262	93	91	226
Survival rate to 105 days (percent)	94	97	94	95	95
Lamb growth					
Birth weight (kg)	3.4	4.1	4.3	4.1	3.9
45-day weight (kg)	11.4	14.2	15.9	15.5	14.0
75-day weight (kg)	16.7	19.8	22.1	22.1	18.9
105-day weight (kg)	21.4	25.1	27.2	27.9	23.6
Characteristics of ewes					

Live weight after shearing (kg)	44.0	47.4	-	45.2	42.5
Greasy fleece weight (kg)	2.4	2.8	-	2.6	1.6
Lactation milk yield (kg)	-	87.7	-	-	53.5
Birth rate (percent)	85.1	93.1	-	-	85.4
Litter size	1.18	1.1	1	-	1.13

Source : Yalçin and Aktaş (1976)

The value of lie de France breed in producing crossbred slaughter lambs was also investigated in a study at Lalahan Animal Breeding Research Institute near Ankara, using the ewes of Karacabey Merino and Central Anatolian Merino as the dams of crossbred lambs (Akçapinar, 1974). These Merino types have an avarage litter size around 1.5. Compared with Merino control groups, Ile de France x Karacabey Merino and lie de France x Central Anatolian Merino F_1 lambs had significantly heavier liveweights and produced havier carcasses with higher dressing out percentages, higher proportions of meat and lower proportions of fat in the sample joint. Crossbreeding of this type appears to be useful for producing heavier and better quality lambs out of Merino ewes, maintaining at the same time a high level of wool production in the Merino ewe flocks.

Two crossbreeding studies involving the Dağliç breed have been carried out. One of them (Gönül , 1974) was primarily concerned with increasing lamb production by two-way and three-way crossing; the results of this experiment, carried out at Acipayam State Farm, Denizli, are mummarized in Table 6.11. It can be seen that using lie de France rams for terminal crossing has considerable advantage in respect of growth rate and carcass quality. Somewhat higher dressing out percentages of Dağliç, Malya x F_1 and Malya x Dağliç lambs are partly associated with extra fat in the tail. The lower survival rate of the lie de France x F_1 group was attributed partly to the higher proportion of triplets in this group. Crossing Dağliç sheep with Sakiz, a prolific and milky breed, incerased the twinning rate about, 30 percent in F_1 ewes. One difficulty was that, semi-fat-tailed Sakiz rams had difficulty in mating naturally with fat-tailed Dağliç ewes.

Table 6.11. Growth rate and carcass quality of lambs in two-way and three-way crossbreeding involving the Dağliç breed

Traits studied	Dağlic	F_1	M x F_1	IF x F_1	Max F_1	MaxDağlic
Birth weight (kg)	3.0	3.0	3.4	3.4	3,2	3.4
120-day weight (kg)	17.4	18.0	20.3	21 .9	20.0	19.0
180-day weight (kg)	22.0	22.6	28.7	29.5	27.4	23.9
Survival to 180 days (percent)	95	96	11	60	91	85
Carcass score (50 points)	34	-	40	46	40	40
Dressing percentage	50.9	-	47.4	49.4	50.7	49.8
MLD area (cm2)	6.4	-	8.4	9.4	9.1	8.4

F_1, : Sakiz x Dağliç, M: Merino, Ma: Malya (see p. 101), IF: Ile de France

Source : Günül (1974)

The aim of the second crossbreeding project was to investigate the possibility of improving meat and wool production of Dağliç sheep by crossing with the American Rambouillet (Yalçin et al, 1977; Yalçin and Ayabakan, 1977). The results of this study, carried out at. Çifteler State Farm, Eskişehir, are summarized in Table 6.12.

F_1 lambs and lambs out of F_1 ewes (i.e. F_1 and RB_1 lambs) had significantly better growth rate than the lambs of either parental breed. Survival rate of lambs was very high in Dağliç and all crossbred groups. Ewes of all crossbred groups had significantly higher liveweights and greasy fleece weights than Dağliç RB_1 ewes produced good quality apparel wool comparable to that in Ramboui1 let. All groups were raised extensively, and nutrition level was approximately equal to that generally provided in the field. These results have led to the conclusion that the productivity of the Dağliç breed could be successfully increased by crossbreeding with Rambouillet, and that this could be achieved most effectively by developing a meat-wool sheep which has 30 to 35 percent Dağliç and 65 to 70 percent Rambouillet blood. This new type has since been developed at Çifteler State Farm under the name of Ramliç (See Plates 22, 23, 24). Mean values for different production traits of Ramliç sheep were reported by Yalçin (1982 b) as follows: Body weight of ewes at mating 49.0 kg, lactation milk yield 72.6 kg, greasy fleece weight 3.01 kg, fiber diameter 22.1 micron, staple length 7.2 cm, birth rate 92.1 percent, twinning rate 10.8 percent, survival rate of lambs to weaning 93.3 percent, and weights of female lambs at birth, 4 months and 15 months 4.1, 26.2 and 39.4 kg, respectively. The rams of "amlic sheep have been included in the IA programmes for upgrading some Dağliç flocks in the region.

Table 6.12. Least squares means for production characteristics of American Rambouillet (R), Dağliç (D) and their crosses (F_1 F_2 and RB_1)

Traits studied	Genotypic groups				
	R	F_1	F_2	RB_1	D
Lamb survival					
No. of lambs born alive	50	225	465	706	342
No, of lambs at 120 days (weaning)	43	217	441	667	329
Survival rate to 120 days (percent)	86	96	95	96	96
Lamb growth					
Birth weight (kg)	4.1	3.7	4.0	4.1	3.5
60-day weight (kg)	15.2	14.5	15.2	15.6	13.6
120-day weight (kg)	24.1	25,1	26.5	26.7	23.0
180-day weight[1)] (kg)	25.9	28.1	29.0	290	25.1
Characteristics of ewes					
Live weight at mating (kg)	47.9	46,0	44.2	44.9	39.5
Greasy fleece weight (kg)	2.7	2.5	2,5	2.5	2.0
Fibre diameter (micron)	22.1	25.6	25,0	23.5	28.8
Staple length (cm)	6.7	9.1	8.5	7,8	20.4
Medullated fibres (percent)	0.18	2.70	0.69	0.30	4.61
Birth rate (percent)	76	88	80	86	88
Litter size	1.06	1.03	1 00	1.01	1 00

1) Female lambs only.

Source : Yalçin et. al. (1977); Yalçin and Ayabakan (1977).

Two European sheep breeds, East Friesian and Texel, have been used recently in experimental crossing with the Kivircik (see Tables 6.13 and 6.14). Results of

the East Friesian x Kivircik crossbreeding experiment have shown that milk production and litter size of East. Friesian x Kivircik F ewes were significantly higher than in Kivircik ewes. Increases in growth rate were somewhat lower (Sönmez et al., 1976). These results have been obtained in the very favourable feeding and management conditions of the Tahirova Turkish-German Farm at Gönen, Balikesir, Özcan (1970 c), working in a well-managed private farm, reported mature body weights of 38.1 kg. 50.1 kg 56.6 kg and 69.9 kg for Kivmik, EF x K, EFB-, and EFB? ewes, respectively. However, it is difficult to reach any conclusion as to the success of this crossbreeding under the general feeding and management conditions of the region. The general experience is that survival rate of lambs and ewes may be lowered markedly if East Friesian blood exceeds 50 percent. The work at Tahirova has been extended to develop a new type of sheep (Tahirova sheep) with better milk production and prolificacy than that in the Kivircik (Sönmez et al., 1981).

Table 6.13. Results of East Friesian x Kivircik crossbreeding

Traits studied	Genotypic group K	F_1	F_2	EFB_1
Lamb survival				
No. of lambs born alive	185	202	113	218
Survival rate to 75 days (percent)	94	96	91	88
Lamb growth				
Birth weight (kg)	3.7	4.3	3.9	4.2
60-day weight (kg)	19.1	21.2	20.8	20.7
Weaning weight (kg) (75 days)	22.7	23.8	23.1	24.8
180-day weight (kg)	30.0	34.2	32.8	33.6
Characteristics of ewes				
Live weight at shearing (kg)	49.7	55.5	48.3	56.3
Greasy fleece weight (kg)	2.2	3.0	3.0	3.2
Lactation milk yield (liter)	63	157	84	196
Lactation length (day)	140	204	165	246
Birth rate (percent)	85	86	79	79
Litter size	1.14	1.45	1.52	1.57

EFB_1: Backcross to East Friesian

Source : Sönmez et al . (1976)

The results of Texel x Kivircik crossbreeding, carried out at Inanli Animal Breeding Research Institute, are given in Table 6.14. The general outcome of this crossbreeding was a slight increase in lamb growth rate and considerable decreases in conception rate and lamb survival rate with increasing Texel blood (Özcan and Aki, 1973, 1974 a, 1974 b; Özcan, 1975). A parallel project carried out' at Türkgeldi State Production Farm (also in Thrace Region) gave similar results and showed some advantage in growth rate and carcass quality of crossbred lambs (Sancan et al. , 1973; Sönmez et al ., 1977); however, there was great difficulty in maintaining the pure Texel flock during the summer due to hot weather and blood parasites. All of the 50 ewes originally imported to Türkgeldi Farm were lost within two years of the importation. The Texel was also crossed with the Turkish Merino (Karacabey type) at Bandirma Merino

Breeding Farm in Balikesir to study the possibilities of improving growth rate, prolificacy and milk production of the latter; crossbred generations failed to show any significant superiority over Merino control groups in any of the traits studied (İmeryüz, 1979). The pure Texel flock on this farm had been maintained with great difficulty during the 6-year experimental period. In view of the above results it can be concluded that using the Texel breed has little to offer in the improvement of Kivircik sheep in Thrace Region and of Turkish Merino in southern Marmara Region under the existing conditions, and that there will be great health limitations in keeping pure Texel flocks in these regions.

Table 6.14. Results of Texel x Kivircik crossbreeding experiment

		Genotypic groups				
Traits studied	Year	K	F_1	F_2	KB_1	TB_1
Lamb survival:						
No. of lambs born alive	1973	171	124	34	91	35
	1974	172	74	64	106	73
Survival rate to 90 days	1973	99	97	91	94	94
(percent)	1974	97	99	98	99	99
Survival rate to 180 days	1973	97	94	82	88	86
(percent)	1974	93	80	83	89	82
Lamb growth:						
Birth weight (kg)	1973	4.0	4.6	4.4	4.2	4.7
	1974	3.9	4.2	3.8	3.8	4.3
90-day weight (kg)	1973	18.8	21.6	19.5	18.8	21.1
	1974	19.2	22.2	20.0	19.9	22.5
180-day weight (kg)	1973	24.1	27.2	25.0	24.9	26.7
	1974	25.2	27.8	26.3	25.9	27.2
Characteristics of ewes:						
Body weight at shearing (kg)						
18 months		32.0	34.7	31.4	32.7	31.3
30 months		40.1	46.2	42.8	41.0	41.2
Greasy fleece weight (kg)						
18 months		1.22	1.40	1.27	1.30	1.39
30 months		1.37	1.90	1.42	1.39	1.86
Fibre diameter (micron)		30.1	29.3	29.3	30.0	28.8
Staple length (cm)		8.6	7.7	8.4	8.0	7.3
Medullated fibres (percent)		0.39	0.32	0.60	0.35	0.37
Lactation milk yield (kg)						
1st Tact.		81.0	79.9	-	-	-
2nd Tact.		82.4	81.0	-	-	-
Conception rate (percent)		89	80	75	78	71
Litter size		1.07	1.09	1.06	1.07	1.09

K: Kivircik, KB_1: Backcross to Kivircik, TB_1 : Backcross to Texel

1) Female singles

Source: Özcan (1975)

Results of a study carried out at Ereğli Animal Breeding Research Intitute, Konya, showed that milk production of the White Karaman could be greatly increased by crossing this breed with the native Awassi; average milk yield of F_1 ewes was significantly higher than that of White Karaman (40 – 77 kg v. 79 – 124 kg) and even than that of Awassi contemporaries (75 – 117 kg) (Yalçin and Aktaş, 1971). Milk production of the native Awassi itself could not be improved by mating native Awassi ewes with the rams of Israeli Awassi, in an investigation carried out at Ceylanpinar State Farm, Urfa (Özcan, 1983). At the first two lactations in two years, average lactation milk yields varied from 142 kg to 180 kg for the first generation ewes and from 130 kg to 170 kg for the contemporary native Awassi ewes; average lactation lengths for the two groups were 168–173 days and 162–173 days, respectively. Differences between genotypic groups were not significant for both of the traits. The work is being continued to make these comparisons under better feeding and management conditions.

6.2. Research on Goat Production

6.2.1. Research on Angora Goats

Considerable volume of information is available on the production performance of Angora Goats in Turkey. In addition, phenotypic and genetic parameters for the important production traits have been estimated. A brief account of research work carried out on Angora goats in Turkey is presented in this section.

Reproduction : The reproductive performance of Angora goats have been studied on the flocks at Lalahan Animal Breeding Research Institute, near Ankara, and at Çifteler State Farm in Eskişehir. Percentage of does kidding, number of kids born per 100 does mated and number of kids raised per 100 does mated are respectively 89.8, 94.0 and 86.1 for mature does (2 1/2 years old and older) at Lalahan; corresponding figures for Çifteler flock are 85.2, 86.1 and 82.8. Reproductive performance in young does (1 1/2 years old) is low, the number of kids born per 100 does mated being 63.1 and 28.9 for Lalahan and Çifteler flocks, respectively (See Section 5.2.1). Young does also have higher kid mortalities (15.0 and 7.1 percent) than mature does (8.4 and 3.9 percent). Twinning rate in these flocks is 0–5 percent (Yalçin, 1982 a). A low level of twinning rate has been established under the generally poor feeding and management conditions of Central Anatolia; twin births are generally undesirable in the Angora goat flocks in this country. The above results, obtained under rather extensive conditions, show that reproductive performance is good in mature does but low in young does.

There is some evidence that the low reproductive performance of young does is associated with inadequate nutrition up to the first mating age (18 months) and with the low body weight at this age. İmeryüz and Köseoğlu (1980) studied the effect of the level of nutrition on the reproductive performance of young does (1 1/2 years old) at Çifteler in three groups raised with different levels of nutrition. All groups were grazed from April to Nowember. In addition, Group 1 received hay during grazing season and hay + concentrate during winter, Group 2 received hay 4-concentrates during winter, and Group 3 received hay only during winter. In Groups 1, 2 and 3 average body weights at the first mating (18 months) were 27.2, 19.1 and 18.9 kg, respectively; corresponding birth rates were 83.5, 20.0 and 18.0 percent, indicating the favourable effects of level of nutrition and higher body weight on the reproduction at 18 months of age.

Growth Rate : Growth rate of kids up to the yearling stage is important, because it is positively related to survival rate, adult body weight and subsequent performance. On the other hand a favourable adult size in does is desired for a good reproductive performance and for better growth and survival of the kids. On the average,

female kids weigh 2.3 kg, 14.7 kg and 18.8 kg at birth, weaning (4 1/2 months) and 12 months, respectively. Average body weight of does at shearing (April) is 29.1 kg (See Section 5.2.1). Although there are no data on the weights of Angora goats in producer flocks, they are likely to have lighter body weights, due to relatively lower level of nutrition in these flocks. For Angora goats in Texas, average 4-month, 12-month and adult body weights of females were reported to be 19.3 kg, 23.2 kg and 37.7 kg, respectively (Shelton, 1965; Shelton and Basset, 1970). These figures show that, Angora goats in Turkey have considerably slower growth rate and lighter adult body weight as compared to those in Texas.

Mohair Traits : The levels of the important fleece traits of Angora goats in Lalahan flock and in randomly selected flocks belonging to the producers in six provinces are presented in Section 5.2.1. Mean values for yearling females and breeding does at Lalahan are 1.49 kg and 2.96 kg for greasy fleece weight, 1.08 kg and 2.11 kg for clean fleece weight, 72.2 percent and 71.5 percent for mohair yield, 15.6 cm and 16.4 cm for staple length and 26.0 micron and 35.8 micron for fiber diameter, respectively. Fleeces of breeding does are approximately twice as heavy as those of yearling females. As compared to Lalahan flock, goats in producers flocks has much lower mean greasy fleece weight and staple length, mean values for these traits in the latter being 0.94 kg and 1.59 kg, and 12.4 cm and 13.8 cm, for yearling females and breeding does, respectively. However, average mohair yield is higher in the producers flocks (78.8 percent and 77.0 percent for the two respective groups).

The mean levels of fleece traits of yearling females and breeding does in the producers flocks in Texas were found as follows: greasy fleece weight 3.57 and 5.39 – 5.57 kg, clean fleece weight 2.66 and 4.17 – 4.21 kg, staple length 26.7 and 24.1 – 24.9 cm, fiber diameter 26.7 and 33.2 – 36.1 micron and mohair yield 78.0 and 76.0 – 78.0 percent, respectively (Basset, 1966).

The above mean values for greasy fleece weight, clean fleece weight and staple length are annual figures obtained by summing the mean values for two shearings in a year. Similar levels were reported for the same fleece traits of Angora goats in South Africa. It appears that much higher levels in fleece weight and staple length are realized in the U.S.A. and in South than in Turkey. There is some evidence that these higher levels are due to some extent to the practice of twice-a-year shearing in these two countries; İmeryüz and Sincer (1967) reported that mean levels of these fleece traits could be increased by 10 to 20 percent at different ages by shearing the goats twice instead of once in a year. Sincer (1962), in a preliminary study at Lalahan Animal Breeding Research Institute, Ankara, found mean greasy fleece weights of 3.31 kg and 2.62 kg, respectively, for the progeny groups of American and local Angora bucks, indicating that part of the apparent superiority of American goats to those in Turkey in respect of fleece weight is genetic. Nutritional, climatic and managemental factors may also be involved in causing these differences. At present, a comprehensive study (Horst and Yalçin, unpublished) is being carried out at Çifteler State farm for investigating the nature of the differences between American and Turkish stock in various production traits.

Possibilities of Improvement Through Selection : The amount of genetic progress expected from selecting for a set of traits in a livestock population depends on the levels of genetic and phenotypic parameters for these traits. Repeatabilities and heritabilities obtained for the various traits of Angora goats at Lalahan are presented in Table 6.15.

Table 6.15. Repeatabilities and heritabilities of various production traits of Angora goats.

Traits	Repeatability		Heritability	
Studied	Estimate	S.E.	Estimate	S.E.
Birth Weight	0.27	0.04	0.21	0.07
Weaning Weight	0.33	0.04	0.17	0.04
Body Weight	0.62	0.02	0.24	0.07
Greasy Fleece Weight	0.40	0.02	0.13	0.06
Clean Fleece Weight	0.49	0.02	0.12	0.06
Staple Length	0.35	0.02	0.12	0.06
Fiber Diameter	0.72	0.01	0.19	0.07
Mohair yield	0.64	0.02	0.43	0.10
n_p	-	-	0.24	0.17
n_s	-	-	0.38	0.17
n_{p+s}	-	-	0.34	0.18
$n_{s/p}$	-	-	0.52	0.18

Source : Yalçin et al.(1979).

Repeatability values for body weight, greasy and clean fleece weights, fiber diameter and yield are high (from 0.40 to 0.72), and those for birth weight, veaning weight and staple length are of moderate sizes (from 0.27 to 0.35), They indicate that first-year record, particularly for the first group of traits, is a good measure for the future performance; therefore, keeping the animals with high performance in their first year is likely to improve the performance of the flock in the subsequent years. They also indicate that selection for fleece and body traits can be based on the yearling record. On the other hand, with the exception of mohair yield, heritability estimates for the same traits are low (from 0.12 to 0.24), indicating that improving them with direct indivudual selection is likely to be a slow process in Lalahan flock and similarly managed flocks. However, these low heritability values also indicate that the major body and fleece traits may respond to the improvements in the environment, especially in feeding and management.

Phenotypic correlations among the important traits of Angora goats are, with few exceptions, positive and statistically significant; however, only a small number of them are high enough to be of any practical significance (Table 6.16). Greasy fleece weight is strongly correlated with clean fleece weight (r = 0.84); its relationship with fiber diameter and staple length is low (r = 0.14 and 0.34, respectively). The phenotypic correlations in Table 6.16 indicate that phenotypic superiority of the replacement females for any one of the traits studied will be accompanied with higher levels for the most of the other tr aits in the flock; any increase in the level of the fiber diameter of course means a loss of fiber fineness.

Table 6.16. Phenotypic and genotypic correlations among various production traits of Angora goats.

Pairs of Traits Studied	Phenotypic Correlation	Genotypic Correlation
Body Weight		
- Greasy Fleece Weight	0.19**	0.17
- Clean Fleece Weight	0.22**	0.25
- Mohair Yiled	0.07*	0.33
- Fiber Diameter	0.26**	0.14
- Staple Length	0.05	0.24
Greasy Fleece Weight		
- Clean Fleece Weight	0.84**	0.68*
- Mohair Yield	-0.18**	-0.33
- Fiber Length	0.14**	-0.28
- Staple Length	0.34**	0.39
Clean Fleece Weight		
- Mohair Yield	0.20**	0.43*
- Fiber Diameter	0.20**	-0.05
- Staple Length	0.43**	0.96**
Mohair Yield		
- Fiber Diameter	0.14**	0.27
- Staple Length	0.22**	0.68**
Fiber Diameter		
- Staple Length	0.20**	0.01

Source :Yalçin et al. (1979). * /- 0.05, ** p/-0.01.

Genotypic correlations between the yearling body weight and important fleece traits of Angora goats at Lalahan were found between the positive but non-significant values of 0.14 and 0.33. Significant and strong genotypic relationships were found to exist between greasy and clean fleece weights (r = 0.68), between clean fleece weight and yield (r = 0.43), between staple length and yield (r = 0.68) and between clean fleece weight and staple length (r z 0.96). The genetic correlations among the various traits of Angora goats at Lalahan are in general in the desired direction, this indicating that selecting for any one of these traits either will increase or will not affect significantly the levels of the other traits.

The possibility of improving fleece traits of Angora goats by selecting on skin follicle characteristics was studied in Lalahan flock (Yalçin, 1972; Yalçin et al., 1979). It was found that primary, secondary and total number of follicles per unit skin area ($n_p n_s$ and n_{p+s}) are positively but non-significantly associated with greasy and clean fleece weights, fiber diameter and mohair yield, genetic correlations varying from 0.05 to 0.33. Genetic correlations between follicle numbers per unit skin area and staple length were negative and statistically significant (-0.57 and -0.58 with n_s and n_{p+s}, respectively). The number of secondary follicles per primary follicle ($n_{s/p}$) had positive genetic relationship with clean fleece weight (r = 0.84) (Table 6.17). Heritability of n_s/p ratio was found to be higher (0.52) than those for clean fleece weight (0.12) and fiber diameter

(0.19) (Table 6.15). These results indicate that follicle numbers per unit skin area are of little value in overall fleece improvement, but $n_{s/p}$ ratio measured at 5 months of age may be used as a criterion for early and indirect selection for fiber fineness; such a selection is also expected to yield some genetic improvement in clean fleece weight.

Table 6.17. Phenotypic and genetic correlations between skin folicle characteristics and mohair traits

Fleece Traits	Follicle Characteristics			
	n_P	ns	n_{P+s}	$n_{Ps/p}$
	Phenotypic Correlations			
Greasy F. Weight	-0.05	-0.05	-0.04	0.02
Clean F. Weight	-0.04	-0.06	-0.06	-0.01
Mohair Yield	-0.04	-0.01	-0.01	-0.05
Fiber Diameter	-0.09	-0.20**	-0.20**	0.09
Staple Length	-0.09	-0.11*	-0.11*	-0.01
	Cenotypic Correlations			
Greasy F. Weight	0.22	0.13	0.09	0.11
Clean F. Weight	0.42	0.33	0.37	0.33
Mohair Yield	0.09	0.14	0.15	-0.10
Fiber Diameter	0.13	0.09	0.05	-0.84**
Staple Length	-0.52	-0.57*	-0.58*	-0.22

Source : Yalçin (1972), Yalçin et al.(1979). * P / 0.05,. ** P / 0.01.

Although the above discussion points to the small genetic variations and to slow genetic progress in the body and fleece traits of Angora goats on a within-flock basis, prospect for progress is better on a between-flock basis. Genetic superiority of the elite Angora goat flocks at the state farms may be disseminated through to the producers' flocks, in a stratification system involving the transfer of bucks from elite flocks to breeders' flocks and from these flocks to producers' flocks.

There is also some evidence that the efficiency of this system can be increased by improving further the production levels in elite flocks and breeders' flocks through the introduction of good quality bucks from other strains (i.e. from American and South African flocks). Such an introduction is also likely to increase the genetic variation in various production traits and the selection response in these traits. There points are being investigated in a study at çifteler State Farm.

6.2.2. Research Involving Hair Goats and Milk Breeds

The damage caused by the hair goats to forest growth is well known, and the need for reducing the goat numbers particularly in forest areas, is generally acknowledged. During the past 25 years, several measures have been taken by the government for realizing this. For socio-economic reasons however hair goats still constitute over 80 percent of the goat population in the country (i.e. 13.6 million heads in 1983). A significant proportion of the rural population in and around forests and woodlands depend for their livelihood on these goats. They provide meat, milk and hair to their owners at minimum cost.

One way of reducing hair goat numbers in some regions may be improving their productivity by crossing them with suitable milk breeds, so that the same amount of milk and meat can be obtained from smaller number of improved goats. Research work involving hair goats and milk breeds has recently been reviewed by Tuncel and Bayindir (1983). A brief account of research work on these goat breeds is given below.

Studies carried out at the Aegean University Farm have shown that, by crossing hair goats with Maltese and Saanen breeds, crossbred generations with high milk production and litter size can be obtained (Şengonca et al., 1970; Sönmez, 1974). In the study by Şengonca et al.(1970), average lactation milk yield was found to be 247 – 310 kg in Maltese x Hair F does and 298 – 317 kg in Saanen x Hair backcross generation ($SB\text{-}_1$,); average litter size at the first two kiddings were 1.33 – 2.11 and 1.41 – 1.71 in these groups, respectively.

Hair, Kilis and Saanen x Kills backcross ($SB\text{-}_1$) does were mated with $SB\text{-}_1$bucks at Çukurova University Farm in Adana (Özcan, 1977); mean values obtained for milk production traits in pure and crossbred groups are given in Table 6.18. Considering the above results together with body weight and reproduction data, it was concluded that SB_1x Kilis and SB_1x Hair cross goats could be used as base material for developing new goat types in Çukurova Region.

Table 6.18. Mean lactation milk yield and lactation length in pure and crossbred groups of goats

Genotypic		L. Milk Yield (kg)		Lactation Length (day)	
Groups	n	Mean	S.E.	Mean	S.E.
Hair	45	90.7	5.07	206.4	3.82
Kilis	50	176.8	6.79	227.4	2.64
$SB_1(SB_1 \times SB_1)$	19	335.1	22.75	222.3	6.34
$F_1(SB_1$ x Hair) ⚔	8	297.0	33.65	238.0	11.85
$F_1(SB_1$ x Kilis) ⚔	9	256.1	15.71	236.3	9.42

Source: Özcan (1977). ⚔. First lactation.

A crossbreeding experiment involving Saanen and native Kilis goats was initiated in 1961 at the Agricultural Faculty of Ankara. In Kilis, $F_1$and SB_1groups, survival of kids to 6 months were 92.4, 95.2 and 95.3 percent in that order (Eker and Tuncel , 1973), while mean lactation milk yields of Saanen x Kilis $F_1$and SB_1goats were respectively 710 kg and 718 kg in lactation periods of 293 days and 295 days (Eker et al ., 1977). The flock was closed at that stage and matings between SB_1bucks and $F_1$and SB_1does were carried out for the development of a new goat type (Akkeçi or White Goat). A flock of Akkeçi was also established at Dalaman State Farm in Muğla . Mean values for different production traits of Akkeçi at Dalaman over a period of four years were found as follows: pregnancy rate 98.3 percent, litter size 1.79, survival rate of kids to 5 months 97.5 percent, lactation milk yield 820–960 kg and lactation length 295–297 days. (Eker et al., 1975 b).

Purebred performances of native and imported milk goats have been tested in a limited number of studies. Mean values for lactation milk yield, lactation length, milk fat and body weight of Kilis does at Agricultural Faculty of Ankara were respectively 372 kg, 260 days, 4.4 percent and 40 kg (Eker et al., 1975 a; average

lactation milk yield, lactation length and litter size of Kilis goats at Regional Research Station in Antalya were 566 kg, 222 days and 1.54 in that order (Tuncel et al.,1976). The Saanen and improved German White goat appear to have good adaptation ability in the Aegean Region (Sönmez et al., 1970; Şengonca et al., 1974).

6.3. Problems and Future Resarch Requirements

With the mecanization of agriculture and the increased use of fertilizers since 1950's, large areas formerly used for grazing sheep and goats and part of the marginal lands have been brought under cultivation. During the same period animal numbers increased more than 50 percent. The heavy pressure on the grazing land resulted in lower output per animal and degradation of range forages. The problem is difficult to overcome, because the rangelands are generally common property. Legislative measures, such as controlling animal numbers and limiting grazing periods, are needed for a better rangeland management and for attempting to improve the quality of range forages.

The pressure on the rangelands may be relieved to some extent by transferring young slaughter animals to arable crop producing areas for fattening. The level of nutrition in sheep and goats in these areas can be improved by including in the rotation alfalfa, sainfoin and vetches. At present a project is being implemented by the government to encourrage farmers to grow forage crops during the fallow periods. Research may be useful for determining the most suitable forage crops to be grown in different regions.

In the western Anatolia and Thrace, the majority of lambs are weaned at as early as one and a half months of age and most of them are slaughtered at that age without further fattening. The chief reason for this is to milk mothers longer to obtain more marketable milk. In this way, meat production potential of these lambs is poorly utilized. The weight of the carcass from such lambs is about 6–8 kg. However, the cow milk production in these regions is increasing rapidly, and labour for milking sheep is becoming more expensive and difficult to obtain. Therefore, weaning the lambs at later ages and/or fattening them soon after they are weaned may be more economical in the near future. Further research is needed for providing information on the weight gains of lambs weaned at different ages, and on the fattening performances of lambs fed under different regimes and for differenet durations.

The great majority of the sheep population in Turkey consists of sheep of native breeds. Under the existing feeding and management conditions their production levels are generally low. At best, only a relatively small portion of this sheep population can be improved through crossbreeding with high-producing exotic breeds. In view of the inadequate feeding and management conditions prevailing in the country purebreeding in the greater portions of native sheep breeds is likely to continue in the future. The information given in the previous sections shows that substantial data are available on the performance of White Karaman, Kivircik, Awassi and Sakiz breeds. Such information is limited for the Karayaka, Red Karaman, Dağliç, Gökçeada and Tuj. Studies on the productivity of these breeds under improved conditions will be helpful for a better evaluation of their potentialities.

Although the information on the genetic parameters in different breeds is scanty, available estimates indicate that some improvement through selection can be expected in growth rate, and even more in body weight, milk production and wool production. Main limiting factors in this respect are the lack of stratification within the breeds, lack of recording in the field and number of characteristics to be considered.

Establishing nucleus flocks in the field, in addition to those at the state farms, may be useful in creating stratification in the breeds and in disseminating the genetic improvements gained in these nucleus flocks to other flocks by the sale of rams. Such an arrangement is particularly important for the Awassi, Kivircik and Merino breeds.

As far as crossbreeding is concerned, priority will be for the extension of Merino x White Karaman and Merino x Dağliç crossbreeding in the form of upgrading, and for the formation of new meat-wool types. Results of Rambouillet x Dağliç and He de France x White Karaman crossbreeding experiments are encouraging for the formation of more productive sheep types. Having a diversity of thin-tailed sheep in Central Anatolia can be useful also in meeting the future requirements of the market more effectively. Once the breeding of meat-wool types is well established in Central Anatolia, both in terms of number of sheep and level of production, some of the ewes of these types may be used as dams of crossbred slaughter lambs sired by rams of meat breeds. Studies with the Central Anatolian Merino show that litter size at birth of older ewes is about 1.6(Yalçin et al, 1972), and crossing these ewes with He de France rams results in lambs with better growth rate and carcass quality (Akçapinar, 1974). Such a scheme will permit the production of quality wool from the mother ewes and more and better quality meat from their crossbred progeny.

Although crossing White Karaman and Red Karaman ewes with Mutton Merino rams, White Karaman ewes with lie de France rams and Dağliç ewes with Rambouillet rams produced F_1lambs with better growth rate and carcass quality and F_1ewes with better lamb production as compared to parental breeds, exploitation of hybrid vigour in both cases is difficult in the field because of the following limitations: (1) twinning rate in White Karaman, Red Karaman and Dağliç ewes is low,(2) the use of A.I. is necessary as natural mating between exotic rams and native ewes is almost impossible because of the fat tail of the latter, and (3) feeding and management level in most native flocks is not sufficiently high to support a rapid growth and a good survival rate among crossbred lambs. In inland regions grading up and type fixation is therefore more feasible. In addition to Merino, other breeds for the improvement of Red Karaman in Eastern Anatolia will be worth trying; these may include breeds like He de France, Ramboui11et and Traghee.

The Kivircik breed is well adapted to the present feeding and management conditions in Thrace and Marmara Regions and, as mentioned earlier, lambs show, with better nutriton, a fairly rapid weight gain during the first 5–7 months of age. The quality of Kivircik meat is considered the best among local and imported breeds. However, the regions in which this breed is raised are among those best suited for crop production. Therefore, sheep in these regions have to compete with field crops. Success in this competition will largely depend on the intensification of sheep breeding. Studies to be undertaken in the near future in this breed should be directed to obtain more kilograms of lamb per ewe. Therefore, improving prolificacy and milk yield of Kivircik sheep by crossing with such breeds as Finnish, Romanov, East Friesian and Sakiz in different combinations may be an important research objective with this breed. According to the results of such studies part of the Kivircik population can be transformed into a fertile and milky female line, to be crossed in the future with terminal meat breeds to produce good quality slaughter lambs. For the time being two-way commercial cross-breeding between Kivircik and meat breeds, such as Ile de France, may also give satisfactory results, provided that prolificacy of Kivircik ewes can be improved by some management practices, such as flushing; these points deserve attention as short-term research objectives.

The Awassi is the milk breed of the semi-arid southeastern Anatolia; it has a high milkyield and good growth rate. There is evidence that higher levels can be reached by better nutrition. Therefore, improving milk production and growth rate of the breed by purebreeding and selection may be a sound approach in the future.

With their very small population sizes, the contribution of Gökçeada and Sakiz breeds to the milk and meat production of the country is negligible. The best breeding policy in these breeds in the future will be keeping their purity and improving their production characteristics through selection. The Sakiz breed, in particular, may play an important role in the sheep production of the country in producing prolific and milky crossbred dams through crossbreeding with other native breeds.

Available estimates of heritabilities for different production traits of Angora goats in Turkey are generally small, indicating small genetic variations in these traits and slow rates of improvement from selecting for them within the flocks. Greater genetic differences may be present between flocks and between strains. Such differences may be exploited for improving the productivity of the breed in a stratified breeding system. Therefore, studies aimed at comparing production levels of different flocks (elite flocks and field flocks) and of different strains (Turkish, American and South African) may yield valuable information. Genetic superiority of good quality bucks in the elite flocks may be disseminated to producers' flocks more extensively by the use of A.I.; this requires studies for successful freezing of Angora buck semen. Research is also needed for investigating the effect of level of nutrition during the first year of life or at critical periods (before mating and before kidding) on the subsequent fertility, and mohair production of the does and on the growth and survival rates of kids.

Production performances of the other goat breeds in the country have been investigated in a limited number of studies. They involved hair, Kilis, Malta and Saanen goats and their crosses, and were carried out under farm conditions. Little is known about the production levels of Gürcü and Abaza goats. Studies on the production performances of hair, Kilis, Gürcü and Abaza goats in their respective habitats will be useful for evaluating better the production potential and economic importance of these breeds.

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