

A GLANCE AT TURKISH FORESTRY

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Summary

Turkey is predominantly an agrarian country possessing 20.2 million hectares as Forest land which is 26% of the total area of 77.97 million hectares. The average annual plantation programme is 133,000 hectares. Most important species in plantation are: Poplar, Willows, Eucalyptus, Alder and Pines. Natural geographical regions are Black sea, Marmara sea, Aegean sea, Mediterranean and Central Anatolia. Successful mechanical operations in the forests are carried out during all plantation campaigns.

Introduction

Turkey lies between $25^{\circ}40'$ to $44^{\circ}48'$ E. longitude and $35^{\circ}50'$ to $42^{\circ}60'$ N latitudes. It covers an area of 780,000 km² bridging the two continents of Asia and Europe on two important straits viz. Bosphorus and Daradanelles. The main land of Turkey is called Anatolia or Asia Minor constituting westward extension of the continent of Asia and it covers 75,568,800 hectares. The rest of the total area of the country is called Turkish Thrace and constitutes the south eastern corner of European continent (Balci, 1980).

Anatolian peninsula is surrounded by the Black sea in the north, the Mediterranean sea in the south and the Aegean Sea in the West. Most of the Anatolia consists of plateau rising steadily towards the east. The European part of Turkey (Thrace) which comprises about 3% of total area, is a land of rolling plain, except for the range of low mountains running from the Bulgarian border to the Black sea. The country is surrounded by sea along its three borders and connected to Iran in the East. In south east lies Iraq and in South, Syria.

There are more than twenty peaks as high as over 3,000 metres from sea level. The highest peak of the country lies in Ararat mountains with an elevation of 5,165 meters.

Turkey is predominantly an agricultural country, but is moving towards industrialization and urbanization. Within its more than 40 million population (Turkey, 1983) the rapid growth rate of about 2.5% exerts a great impact upon the use of natural resources thus increasing the necessity of urgent development and conservation of renewable natural resources. The rapid migration rate from rural areas into cities and industrial centres increased the urban population a great deal and created many social and environmental problems. From East to West, the major Anatolian rivers are Coruh, Yesilimak, Kizilirmak, Filyos, Yenice Cay, Sakarya, Tigris and Euphrates. These rivers have played important role in the country's economy.

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Kamal Atatürk, the Founder of the Modern Turkey, established the Republic in 1923 and initiated many changes, among them the legislation to preserve and develop the natural vegetational ecosystems. According to him "a country without forests can't be conceived (Ormansız bir memleket düşünmez)". A nation-wide survey completed in 1973 revealed that about 26% of the total area was under forests. Due to thick vegetation in different regions, the country is beautiful attracting many tourists from all over the world and thus earning a lot of foreign exchange every year.

Climate

The climatic conditions are greatly influenced by the topography which determine the various characteristics and distribution of plant communities in Turkey. The climatic pattern has also a bearing on the nature, extent and severity of the watershed problems.

Climatically, it varies from arid and semi-arid in central Southern and Eastern Anatolia to humid maritime climate in the Black Sea coasts which further extends to Southern and Western Mediterranean climatic conditions. The highest plateau of eastern Anatolia has a cold continental climate and receives approximately 400 mm of annual precipitation as snow which stays on the grounds for more than 6 months.

The annual average precipitation in some stations of arid zones, (Central and South Eastern Anatolia) varies from 220 mm at Rize in the Black Sea Coast. The overall annual average precipitation of 30 years in Turkey is 679 mm.

In contrast to the rest of Turkey, North Anatolia receives heavy rainfall throughout the year particularly in the East. The climate at Rize and Hope is so wet that tea is being successfully grown. The coastal climate is mild where citrus can be easily cultivated.

Temperatures tend to be high in South Anatolia than in the west where the Mediterranean climate is modified by lower temperatures and high rainfall of the North Anatolia. Cold winds blowing from the plateau retard the development of spring flora on the Mediterranean coast.

In the inner Anatolia, precipitation occurs predominantly in winter and spring. The climate of inner Anatolia is of continental type. In most areas, however, precipitation is less and much in the form of snow. In winter, the temperature falls very low, particularly in the high lands of East Anatolia, where almost the whole area is under snow from November to March/April. The plateau tends to be very windy and suffers from devastating hail storms. Precipitation is even more erratic than in Mediterranean belt.

In the highest mountains of Turkey (above 3,000 m) snow lies throughout the summer. A glacier exists in the North of Cilo dag in Hakkari and in Ararat (Davis, 1975).

Forest Strategy

Turkey, which in old times was almost entirely covered with forests, lost most of its valuable forest wealth in the course of the past centuries and has now only about 20.2 million hectares left, i.e. 26% of the total area. Out of forest area, only 8.8 million hectares are really productive forests and the rest is degraded forest because of the pressure on forest land, mainly for agricultural purposes. Other factors like indiscriminate grazing and lack of forest protection are also responsible for such degradation. At present 11.4 million hectares constitute degraded areas. Out of this 7.5 million hectares are planned to be afforested/reafforested. Plantation has been carried out by the Forest Department on 960,000 hectares. In Turkey, the total plantation area in 1983 was 78,608 hectares and in 1984 it was 118,670 hectares. The target for an average annual plantation programme is 133,000 hectares to be carried out during next five years (Tengiz, 1984).

Tree species in Turkey can be classified in two categories i.e. coniferous (54%) and broadleaf (46%). There are about 19 different coniferous and 74 broad leaved species. There are 119 private poplar nurseries distributed in various parts of the country. The Forest Department encourages private poplar nurseries in order to have better distribution in the country and as far as possible increase plant production.

Eucalyptus plantations established by the forestry service and private sector cover about 11,000 hectares. No inventory is available for alder and willow plantations but these have been extended to the farm lands and along stream banks and reclamation areas. Pine plantations cover about 1,600 hectares and these were established by farmers on unutilized and unproductive areas.

A. Natural Forests

The distribution of forests in Turkey differs widely from region to region. The country is a meeting ground of many phytogeographical regions. On the basis of the climate and topography, the forests possess different floristic composition in different regions. Some of the following forestry regions are recognized.

i. *The Black Sea Region*: It is also called Euro-Siberian region. It is a strip of 48 kilometer to 192 kilometer wide and comprises the Northern slopes of the Pontic Range and a very narrow coastal plain. The climate is humid and precipitation is abundant towards Black Sea, but declines rapidly inland. In Anatolia, the whole of the Euro-Siberian belt is referred as Euxine province, an area which covers much of the Georgia and the Caucasus. Excluding, the Crimea, the province falls into two distinct parts, an Eastern part comprising the Caucasasia, Colchis (Western Georgia), East Black Sea and Western generally drier part consisting of Paphlagonia; Bithynia and the Istranca range.

For European part of Turkey, lack of information and destruction of vegetation makes it very difficult to decide about its phytogeographical position. It seems quite possible that this area belonged to Euro-Siberian region.

Most of the Euxine province below the tree line is covered with forest or scrub where the forest has been destroyed. Some of the trees and shrubs are *Abies nordmanniana*, *Acer compestre*, *Alnus glutinosa*, *Buxus sempervirens*, *Carpinus betulus*, *Castanea sativa*, *Fagus orientalis*, *Daphne oleoides*, *Fraxinus excelsior*, *Pinus nigra* subsp. *pallasiana*, *P. sylvestris*, *Quercus petraea*, *Q. pedunculiflora* *Rhododendron luteum*, different herbs are *Cardamine bulbifera*, *Euphorbia amygdaloides*, *Galium odoratum*, *Salvia glutinosa*, *Valeriana alliarifolia* (Davis, 1975). *Abies bornmuelleriana* appears in the Western part of the Pontic Range forming pure stands near timber line. At low elevation beech gives way to hornbeam and oak. These forests are frequently maquis (a shrub type) and are being replaced by plantations of fast growing conifers (Harmann, 1976). Numerous trials on fast growing conifers are underway and *Pinus radiata* is most successful Coastal Douglas fir (*Pseudotsuga menziesii* war. *menziesii*) also holds promise. The Euxine province (Particularly the Eastern part) more closely resembles to Northern Iran.

Some important crops of the Euxine province are *Zea mays*, *Diospyros lotus*, *Camellia sinensis* and *Citrus*.

ii. *Marmara Sea Region* : It surrounds the sea on European and Asiatic side with continental cum Mediterranean climate. The open communities consist of *Fagus orientalis*, *Quercus* spp. and rarely *Pinus brutia*. Close to Istanbul is Belgrade forest which serves as picnic spot as well as, a watershed for the city and an outdoor laboratory for the Forestry Faculty at Istanbul University.

The main species present are *Quercus deschoro chensis*, *Q. polycarpus*, *Q. dala-champii*, *Q. frainetto*, *Q. pedunculiflora*, *Q. infectoria*, Beech (*Fagus crientalis*) Hornbeam (*Carpinus betulus*, chestnut (*Castanea sativa*) Alder (*Alnus glutinosa*) poplar (*Populus tremula*) lime tree (*Tilia tomentosa*) Maples (*Acer trautvettari*) and (*Acer campestre*) Elm (*Ulmus campestris*) Mountain ash (*Sorbus tormunalis*) etc. These species form pure, as well as mix stands. The most frequent species which occur in the maquis areas are *Erica arborea*, *E. verticillata*, *Phillyrea latifolia*, *Osyris alba*, *Spartium* etc., Some parts of the forests have been planted with conifers such as *Pinus nigra*, *P. radiata* and *P. maritima* (Ozhan, 1982).

iii. *Aegean Region* : This region experiences a Mediterranean climate. Beautiful forests of *Quercus macrolepis*, (famous for tanning material), *Pinus brutia*, *Pinus nigra*, *Pinus pinea* are found in this area. Many gardens of *Olea europea*, a main source of Olive oil, are also present (Haden Guest, 1956).

iv. *The Mediterranean Region* : The Mediterranean region belongs to the East Mediterranean Province including Amanus as well. This region possesses a typical Mediterranean climate. A large number of Geophytes, Therophytes, Chamaephytes with predominance of solerophyll machie vegetation exist in the region. In many places the machie has got degraded and is covered by *Cistus creticus*, *Poterium spinosum* as the leading dominant species.

Above 1,000 m this region is largely dominated by *Pinus nigra* sub sp. *pallasiana*. In Taurus, *Cedrus libani* (Lebanon cedar) whose wood was used for the construction of Solomon's

Tamle once was common in Lebanon but has disappeared. *Cedrus libani* also grows in mixture with *Abies cilicica*, *Pinus brutia*, *Juniperus feotidissima*, *J. excelsa*, *J. oxycedrus* and *Quercus libani*. Presently the cedar stands are managed on a rotation of 140–200 years. Cetik (1977) studied the flora of Ciglikara cedar forest ecosystem of Elmali in detail and found that there were 51 plant families consisting of 383 species, 42 sub spp. and 31 varieties, *Compositae* was the richest family with 23 genera (Cetik, 1985).

In the ecotonal zones between Irano-Turanian and Mediterranean region *Pinus nigra* is very abundant and constant species. *Quercus infectoria* subsp. *biossieri* is often found. Some species of *Rosaceae* like *Amygdalus orientalis*, *Prunus macrocarpa* are also found. Above tree line at 1700 m in the *Taurus*, cushion communities such as *Astragalus*, *Acantholimon* and *Onobrychis cornuta* resembling to our Ziarat *Juniperus* ecosystems vegetation are predominant (Khan, 1978).

Artificial vegetation in the Moditerranean region consists of *Olea europea*, *Vitia vinifera*. *Triticum* spp. citrus fruits, *Ficus carica*, *Musa* sp. different leegumes and *Gossypium* spp. The Mediterranean enclaves of the Black Sea contain species like *Arbutus andrachna*, *Pinus brutia*, *Quercus ilex*, *Pistacia terebinthus*, *Myrtus communis* and *Jasminum fruticens*.

v. *Central Anatolian the Irano-Turanian Region* : Due to biotic interference, much of the woodland has disappeared. The hills of Central Anatolia, are deprived of forests, Birand, (1970) studied that *Artemisia fragrans* is dominant species. Some characteristic species are *Euphorbia tinctoria* *Isatis glauca*, *Poa bulbosa*, *Peganum harmala*, *Phlomis armeniaca*, *Teucrium orientalis* and *Globularia oriantalis* (Cetik, 1985).

Near salt lake (Tuz Golu) species of *Ghenopodiaceae* are found. Khan (1976) determined some of the following plant communities near *Cumra* and *Karapiner* area in the Central Anatolia. *Alhagi camelorum*, *Centaurea pulchella* *Phlomis exaratum*, *Artemisia scopria*, *Astragalus micropterus*, *Salvia cryptantha*, *Thaymus squarrosus*, *Scabiosa ucranica* and *Stipa lagascae*. Akman and Ketenoglu (1976) determined the phytosociological and phytosociological investigations at Ayass mountains in the Central Anatolia and found out three new plant communities of *Astragalus lycium*, *Salvia techihatcheffii* and *Hypericum heterophyllum*.

The hills near Ankara possess excellent artificial ecosystem of *Pinus nigra* and *P. sylvestris* on a very vast area called Ataturk Forests. Most of the East Anatolia not covered by steppe or cushion communities, possess species like: *Juniperus excelsa*, *J. oxycedrus*, *J. foetidissima*, *Pistacia atlantica* and various *Rosaceae* e.g. *Crataegus orientalis*, *Prunus macrocarpa* etc.

A. Plantations

i. *Poplar*: *Populeta* were established for introducing new colnes in different regions of the country. The following clones have been tried in different regions.

Marmara and Thrace regions

(a)	72/58	<i>P. euramericana</i>	Italy	(I)
(b)	39/61	<i>P. euramericana</i>	Italy	(I)
(c)	293	<i>P. euramericana</i>	Italy	(I)
(d)	ECo-28	<i>P. euramericana</i>	Italy	(I)

Aegean Region

(a)	I-476	<i>P. euramericana</i>	Italy	(I)
(b)	F.11	<i>P. euramericana</i>	Italy	(I)

Central Anatolian region

(a)	62/154	<i>Populus nigra</i>	Turkey	(Tr)
(b)	63/10	—do—	"	
(c)	62/62	—do—	"	
(d)	45/51	<i>P. euramericana</i>	Italy	
(e)	64.H	—do—	Germany	

Black Sea Region

(a)	77/55	<i>Populus deltoides</i>	Italy	
(b)	45/51	<i>P. euramericana</i>	"	
(c)	S. 177—3	<i>Populus deltoides</i>	Belgium	
(d)	LW.42	<i>P. euramericana</i>	Italy	
(e)	Eco-14	<i>P. euramericana</i>	"	

Mediterranean Region

(a)	709	<i>Populus deltoides</i>	Yugoslavia	
(b)	45/51	<i>P. euramericana</i>	Italy	
(c)	58/1	<i>P. nigra</i>	Turkey	
(d)	56/84	<i>P. nigra</i>	Turkey	

East Anatolian Region

(a)	58/2	<i>Populus nigra</i>	Turkey	
(b)	62/168	<i>Populus nigra</i>	Turkey	

South East Anatolian Region

(a)	58/2	<i>Populus nigra</i>	Turkey	
(b)	56/84	<i>Populus nigra</i>	Turkey	
(c)	45/51	<i>P. euramericana</i>	Italy	

ii. Regular Plantations

The sites used for poplars are usually fertile, light and moist in summer or situated close to available water for irrigation. The ground is cultivated in summer or autumn with an agricultural tractor. Two species are mainly used, *Populus nigra* (Tr-56/52), Tr-56/75) and *P. x-euramericana* (cv. 1-214). Planting is carried out throughout the entire dormant season except during the spells of frost. The spacing depends on the conditions of the site and management goals of the owner. The pit method of planting is used.

iii. Row Plantations

Row plantations mainly serve protection or land-scaping purposes such as stabilization of river banks or providing shelter for crops. Sometimes these are raised for wood production purposes. Common species are: willow, eucalyptus and alder.

iv. Eucalyptus Plantations

The main species planted are *Eucalyptus camaldulensis*, *E. occidentalis* and the farmers are encouraged to use these species. The species thrive well on slightly salty soils. The species are widely planted in S. Anatolia along the Mediterranean coast.

v. Willow Plantation

Salix alba is widely distributed in Turkey where it is exploited along with poplar. First year coppice shoots after pruning are suitable for cuttings. It likes moisture and is resistant to wind.

vi. Alder Plantation

Alder grows on the sea coast. There are three main species in Turkey i.e. *Alnus glutinosa*, *A. barbata*, and *A. incana* and in some places *A. orientalis*. *Alnus* is fast growing-broad leaved tree which is planted on eroded hill sides. *Alnus glutinosa* is widely distributed in Turkey and is more tolerant on wet clay soil than poplar or willow. It is unsuitable on dry soils. It fixes nitrogen so it does not compete with crops for nutrients. It propagates by seed and cuttings. The plants are raised in nurseries along the Black Sea coast. Sets are obtained from branches or middle aged trees. It is extensively planted by farmers for wind-breaks, posts and fuel-wood.

vii. Pine Plantations

The pine plantations have been established in Turkey. They clearly represent a national resource with considerable potential which has so far not been realized. It is, however, very desirable to find ways of improving their use. The main benefits derived from trees are timber production, natural conservation, soil improvement, shelter and shade, landscape enhancement and amenity. Free seedlings are provided to the farmers for planting purposes. The species used is *Pinus brutia*. One year bare rooted seedlings are planted by the local population (Aydin, 1984).

Near Kocaeli *P. pinaster* was tried as dominant species (60%). Other species are *P. radiata* (20%), *P. taeda*, (10%) and douglas fir. Before clearance, the vegetation consisted of *Castanea*, *Quercus conferta*, *Laurus nobilis*, *Carpinus* and *Erica arborea*. Clearance is done partly by hand and partly mechanical. The equipment employed range from heavy duty crawler tractors to four wheel drive farm tractors with various attachments such as rakes, choppers, disc ploughs and harrows. Mean annual increment has been estimated at 7.9 m³/ha and 4.1 m³/ha for *Pinus pinaster* and *P. nigra* respectively. Spacing varies depending on the conditions of the site and the management objective of the owner of plantation. At present the government supports the landowner by providing technical assistance and planting stock free of charge, when necessary.

The land allocated for plantation is tax free. The Agricultural Bank also extends credit facilities at nominal interest rate for a period of 8–20 year to encourage plantations.

PROBLEMS

1. Forest destruction by villages

It is estimated that 7 to 10 million villagers reside in or adjacent to forests. Such villagers and rural communities totalling 20,000 villages are living inside the forest boundary. Their limited cultivation on steep slopes is the main factor forcing them to gain new fields from lands owned by the state. This occurs either by burning or clearing the forests land to enlarge the adjacent fields. It has been estimated that about two third of the total wood is consumed by villagers, residing near the forests. It is also reported that they consume about 68% of the total fuel wood. The annual average illegal felling of sawn logs is 209,000 m³ and about 80,000 m³ of fuel wood (Balci, 1968).

2. Forest Fires

Annual area loss is estimated to be about 32,000 hectares. This is decreasing generally due to the vigilance of the Forest Department. The amount of timber volume burned varies with the type of timber but is about 250,000 m³ every year (Balci, 1968).

Some major factors of the forest fire are: lightning and carelessness. The author saw good devices for fire control at Alemdag forests near Istanbul.

3. Forest Grazing

Next to human damage, the domestic animals particularly goats cause more damage to the forests than any other agent. Grazing is most commonly practised and is destructive to forests growing in the transition zone between the humid coastal region and arid central Turkey where timber stands are of low density and a considerable amount of grass can be found in the area. In summer, small villagers usually move with their animals to the high hills (Yaylas). It is estimated that 16.8 million animals graze in the forests. The animals compact the soil reduce infiltration of water, inhibit root growth and reduce aeration. Approximately 3.5 million hectares of area has been earmarked for livestock grazing, out of which about 0.6

million hectares are mountain meadows, where the Department exercises proper grazing practices. Soil conservation measures and proper grazing control on forest lands are immediate and urgent needs in the country.

Recommendations

1. Both Turkey and Pakistan can benefit from each other's experience in afforestation, rural forestry programmes and mechanization techniques for land clearing and soil preparation. Standard operations can be developed for the various types of vegetation cover, soil and terrain conditions aimed at increasing productivity and reducing costs.
2. Experience in tea plantations in the Black Sea region near Hopa and Rize can be benefited. Similarly experience in Olive plantation near the Aegean region can also be taken advantage of.
3. Possibility of exchange of students and experts can be explored. Turkey has a well established Faculty of Forestry at Istanbul University. The other organizations are: Trabzon Black Sea Technical University, Poplar Research Institute at Izmit, Forest Research Institute, Ankara, a National Seed Bank and regional wise research stations.
4. In the field of soil conservation and watershed management the experience of both the countries can be shared.
5. Pakistan's experience in successful establishment of irrigated, plantation can be beneficially used in raising such plantations in Cukurova plains. Similarly taking advantage of Turkey's experience in raising *Pinus pinea* (edible seed) Pakistan can introduce it in dry temperate regions.
6. Turkey's experience in the management of Parks, recreation and construction of cheap motels for tourism can also be shared.

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