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## **Definition and Classification of Traditional Agroforestry Practices in the West Mediterranean Region of Turkey\***

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**Abstract:** In this study, traditional agroforestry practices were observed and determined. West Mediterranean Region of Turkey was selected for this purpose. Diagnosis and Design Methodology (D and D) was applied in the study. Each agroforestry practice was determined and classified in the agroforestry systems. Many of the agroforestry production patterns are being seen as a traditionally in the entire region. Results showed that, agroforestry application in the region studied can be put in major agroforestry practices like, agricultural systems; alley cropping, multi layer tree gardens, multipurpose trees on crop lands, home gardens, trees in soil conservation and reclamation, shelter belts and windbreaks, silvopastoral systems; trees on range land or pastures, protein banks, plantation crop with animals, agrosilvopastoral systems; home garden involving animals, multipurpose woody hedgerows, apiculture with trees, aquaforestry, multipurpose woodlots. As an agroforestry practice, shifting cultivation and taungya are determined in the region; however, both practices are not applicable, because of causing forest degradation.

**Key words:** Agroforestry systems, classification of traditional agroforestry practices, West Mediterranean region, Turkey

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### **Introduction**

Turkey has 20.7 million has forests areas. Twenty seven percent of the country is covered by forests. But, like most of developing countries in the World, Turkey has been experiencing a dramatic rate of forest denudation. According to present statistics, 52% of the total forest land is in a degraded and unproductive status (Konukçu, 2001). Since, nearly all forests areas are belong to the government, forestry organizations of the country are trying to apply classic forestry activities which mainly includes production of forest crops, regeneration and protection of forest areas. However, some characteristics of forestry problems of Turkey are shown that the achievement of forestry applications is depending on participation of the people. Because, 35% of population are living in rural areas of the country (DIE, 2002). 7.7 million Rural people are living in and around the forests in 20 293 forest villages (Orkoy, 2002). Forest villages in Turkey; typically have up to 200 households, each with 6-7 people and small areas (less than 5 ha) of private land divided into 5-10 scattered parcels.

People who are mainly living in forest villages in Turkey feel the necessity of agricultural land for raising foods and crops, construction material for make a house, fire wood for cooking and warming, grazing land for livestock. Forest villagers; sometimes meet their basic needs from the forests illegal way. They are grazing their animals and collecting secondary forest products in the forest. They are also opening up forest land for agricultural purpose and cutting down trees for timber and fuelwood.

Although new forestry policies and approaches have been developed and applied in the country during the last decades, the socio-economic problems of the forest villagers, especially those depend

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on the forests for their livelihood always remain as a problem in forestry activities. Under the existing strenuous socio-economic conditions of forest villagers, neither forest can not be protected, nor can forests areas be used productively. But, Turkey is a fertile country capable of food self-sufficiency. Rural poverty and under capacity of resource using in forest villages is intricately linked to the inequitable distribution control of resources. The solution to many forest villagers' problems lies in addressing the inequities to ensure that people gain access to resources and the means to manage them on sustainable basis, i.e., agroforestry. As a concept, agroforestry is a new word for Turkey. But there are many successful traditional applications done by villagers in nearly all part of country. On the other hand, the topics of agroforestry and data regarding agroforestry production systems have remained at a theoretical level. Theoretical information on agroforestry is impeding the development of country-specific practices. Therefore, initial studies on agroforestry to be conducted in Turkey must focus on examples of traditional agroforestry practices. A research with this aim in mind would be very costly and time-consuming if it subsumes the whole country of Turkey within its scope. Therefore, it is more appropriate to start off with smaller-scale studies. West Mediterranean region was selected for this purpose. The aim of this study is to determine and test the production potential of agroforestry in West Mediterranean region of Turkey.

## **Materials and Methods**

### *General Characteristics of Research Area*

West Mediterranean Region is a west part of the Mediterranean region which is one of Turkey's seven geographic regions, derives its name from its neighboring sea. It is generally rugged and mountainous. The Western Taurus Mountains covers a large portion of the region. The alignment of the mountains parallel to the seashore has resulted in significant erosion by waves and an abundance of steep cliffs. Occasional plateaus can be found in the West Mediterranean region. Lowlands in this region have been formed by an accumulation of alluvial deposits in areas of depression. The region of the climate, influenced by the Mediterranean and Aegean seas, is very hot and dry in the summer months, whereas it is warm and rainy during the winter months.

This region includes the provinces of Antalya, Burdur and Isparta. According to the census of 2000, the area has 2,496,689 inhabitants and 55% of this figure lives in cities and towns whereas 44% live in villages (DIE, 2002). A large portion of the population living in rural areas lives in settlement units within forest areas.

General characteristics of the area's rural villages can be summarized as follows: The villages have been settled in accommodating flat or lowlands of the region. Principal buildings in the villages are the elementary school, mosque and the village administrative office. Electricity is available in the village and each household uses electricity only for lighting. There are postal and telecommunication facilities in the villages. Households have telephones. Postal communication is provided by the village administrators. Some of the villages are old while others are recent settlements. Nomadic people played an important role in the settlement process. The number of households in a village varies between 10 and 400 while average household size is 6. Most of the young villagers migrated from the rural areas to the provinces of Burdur, Isparta and Antalya in order to work in factories. Young people do not want to stay in villages. Nearly all village houses are brick constructions. House roofs are covered by tile. Villagers observe the same customs as other Turkish citizens. Usually, it is only the elderly who are illiterate. The main occupation of the villagers is farming. In addition, forestry-related labor is the main source of income. Farm sizes vary between 0.5 and 50 decares. Most households have a home garden around their houses. Households use their home garden crops for their own personal consumption. Villagers raise livestock for commercial purposes. General problems encountered by villagers involve a shortage of agricultural land and water resources for irrigation, a decrease in forest yields, soil fertility and soil erosion and migration to cities.

## **Methods**

This study was carried out in two steps. One of them is theoretical analysis and the second one is a case study. In both steps, different research materials were used. Publications, data, statistical results on agroforestry were reviewed for theoretical analysis. In order to classify traditional agroforestry production, the classification system developed by Nair (1993) was selected and this method was mainly used to investigate within West Mediterranean region of Turkey. The data on demographic, climatic, social, cultural and economic data for Mediterranean Region were obtained from government and private agency archives. Traditional agroforestry practices that done by forest villages in the region were utilized as a research materiel. Plant samples were collected from the fields to find out the species and utilization properties were registered in to form that was developed during the research. Altitudes were obtained by using altimeter, slopes were determined by clinometer and the distance between the species was measured by using steel meters.

Diagnosis and Design Methodology (D and D) was used for determination, definition and classification of traditional agroforestry practices. The D and D methodology offers a possible set of procedures for a logical and step-wise approach to the evaluation of land-use systems, through a pre-diagnostic analysis, a rapid field appraisal of selected land-use systems and additional focused surveys of how a system works (Raintree, 1987; Nair, 1993).

D and D approach is its scale-neutrality, which enables it to be applied at different levels in the hierarchy of land-use systems. Thus, the procedure can be applied with minor modifications at the micro level ie. household management unit such as the family farm, meso level ie. local community, village or watershed , or macro level ie. a region, country, or ecozone (Raintree, 1987).

This study was conducted as team collaboration. The team conducting the research concurrently served as the D and D team as well. The D and D team consisted of three individuals employed at Süleyman Demirel University.

The study started with the micro-level D and D study. The micro level D and D investigation of traditional agroforestry methods involved the household unit. The D and D team discussed possible functions of traditional agroforestry patterns, how they are managed and carried out at the household level.

There are distinct landscape zones within the research area. Distinct landscape zones create distinct land use systems. In order to examine the differences among land use systems in the region, a meso-level D and D was used in the study. At this juncture, distinct regional land use methods achieved through traditional agroforestry techniques, which were identified through the micro-level D and D study, were revealed. And in conclusion, macro-level D and D procedures were utilized throughout the entire research area.

The D and D team's fieldwork involved direct observations of the areas, general conditions, crop and residential patterns, collection of firewood and forest products.

## **Results**

Just as in numerous areas of the world, it is possible to see examples of traditional agroforestry in Turkey as well. These examples have emerged through the experiences of people living in rural areas.

Individuals living in rural areas of the Western Mediterranean region in Turkey have developed their own version of traditional agroforestry practices. As a matter of fact, while examples of agroforestry identified in the region are not accepted as forestry practices by forestry engineers, they are not accepted as agricultural practices by agricultural engineers either. In the light of the results obtained from this research, examples of traditional agroforestry practiced by rural area residents in the Western Mediterranean region are listed in Table 1 and explanations regarding each example are provided below.

Table 1: Major agroforestry practices in Western Mediterranean region of Turkey

| <u>Agroforestry systems</u>   | <u>Agroforestry practices</u>  |
|---|--|
| Agrisilvicultural systems: Combination of crops and trees                           | Alley cropping<br>Multi layer tree gardens<br>Multipurpose trees and shrubs on farmlands<br>Home gardens<br>Trees in soil conservation and reclamation<br>Shelter belts and windbreaks |
| Silvopastoral systems: Combinations of pastures and/or animals and trees            | Trees on rangeland or pastures<br>Protein banks<br>Plantation crops with pastures and animals  |
| Agrosilvopastoral systems: Combinations of crops, pastures and/or animals and trees | Home gardens involving animals<br>Multipurpose woody hedgerows<br>Apiculture with trees<br>Aquaforestry<br>Multipurpose woodlots   |

#### *Agrisilvicultural Systems*

Agrisilvicultural systems involve a combination of crops and trees. They include alley cropping, multi-layer tree gardens, multipurpose trees and shrubs on farmlands, home garden, trees in soil conservation and reclamation, shelter belts and windbreaks.

#### *Alley Cropping*

Woody species such as trees, shrubs, bushes, etc. are planted at regular space intervals. Agricultural crops can be grown among the woody species which are planted and grown in the area, forming a regularly spaced line or living fence. The practice involves woody species which can be formed into alleys or fences and which can grow fast. Agricultural plants that are used involve various field or garden plants adequate for the growth conditions of the area. Examples of practices have been observed where fruit trees such as apple, cherry and walnut are used as alley trees and corn and various types of vegetables are used in the spatial intervals as agricultural crops.

#### *Multi layer Tree Garden*

This practice refers to a haphazard planting of woody species such as trees, shrubs, bushes, etc. without a particular pattern and the creation and management of a multi layer tree garden. Woody species that have varying growth rates, development forms and light sensitivities, which are tolerant to life in a multi layer environment, are used. Although agricultural plant species are generally not found in these environments, at times, it may be possible to include shade-resistant agricultural plants. In flat areas of the region, which are amenable to irrigation, fruit orchards have been created with fruit tree species, such as apple, cherry, walnut, peach, apricot and so forth. In addition to commercially intended, mono-species fruit orchards, it is possible to see multi layer tree gardens in small areas.

#### *Multipurpose Trees and Shrubs on Agricultural Lands*

This practice refers to the growing of trees, which bear fruit and fuel/building material, wood, within and around agricultural lands where agricultural crops are grown. The trees are grown in a sparse and scattered manner within agricultural lands and in regular rows around field borders. Among woody species, trees, shrubs, bushes and so forth, with multipurpose uses as well as various fruit trees are used. Among agricultural plant species, field plants with characteristics that are adequate to the area and that can be grown monoculturally are used. This practice example has frequently been observed in higher altitude basin areas where irrigation is not possible and dry farming (where crops such as wheat, barley and so forth are grown) is implemented. The woody tree types that are used include poplar, willow, olive tree, almond and so forth. The trees grown in these lands provide wood for fuel and building material, various shelled fruits, border specification and shade.

#### *Home gardens*

This practice refers to the production technique whereby land patches found in patios of homes in rural areas are used to cultivate fruit trees and vegetable plants in order to meet the feeding needs of the residents, woody species to meet other needs (such as wood for fuel and building material, shade and so forth) and various ornamental plants for aesthetic purposes. In terms of agricultural plants, seasonal vegetable plants geared towards nutritional purposes and, in terms of woody species, various fruit trees, forest tree varieties that provide hedging and shade and grape vines are used. Examples of home-gardening can frequently be encountered in all residential units of the region's rural areas. Fruit trees are the preferred choice of ligneous species in gardens. Seasonal vegetables are planted. Production mainly serves the needs of the residents. Excess yield are sold in local markets.

#### *Trees in Soil Conservation and Reclamation*

This practice involves plantation of trees, shrubs, bushes and so forth on road inclines, sloped terrains and platform borders in order to prevent landslides and soil erosion. Ligneous species, such as trees, shrubs and bushes, offering multiple uses as well as fruit trees are grown. This practice system is widely used in upper basins, in areas that are vulnerable to soil erosion.

#### *Shelter belts and Windbreaks*

This practice refers to the plantation of tree varieties that serve as screens at appropriate areas on agricultural lands or along field edges in order to prevent wind-blown damage. Woody species used for this purpose include tree varieties that are wind-resistant and have a good ability to grow in height and branches. Agricultural plants that are adequate to the region are used. In the flat plateau terrains of the provinces of Isparta and Burdur, Italian poplar (*Populus nigra* L. var. *pyramidalis* Spach) and along the edges of agricultural terrains in the coastal areas of the province of Antalya, True Cypress (*Cupressus sempervirens* L.) is widely used.

#### *Silvipastoral Systems*

Silvipastoral systems are combinations of pastures and/or animals and trees. They include trees on rangeland or pastures, protein bank and plantation crops with pastures and animals.

#### *Trees on Rangeland or Pastures*

This practice refers to the plantation of tree species with multipurpose uses in a random manner or according to a specific pattern on pastures and rangelands, grazing of animals on rangelands and gathering of herbaceous plants for feed production. Woody species with multi-purpose uses, such as those providing building material and fuel, feed leaves and shade, are used. Various herbaceous plants that provide nutritional value and can be eaten by animals are used. In addition, this production technique also includes large as well as small livestock raised for their milk and meat. In the summer, upper basins of the region are used as mountain pastures. Beside almost all drinking fountains in these areas where animals can quench their thirst, tree species such as sycamore, poplar and mulberry have been planted. These trees provide shade to the animals.

Animal husbandry is widespread in the upper flats of the region. In particular, all areas where the vegetation consists of Mediterranean oak (*Quercus coccifera* L.) and Holm oak (*Quercus ilex* L.) are feeding grounds for the woolly goats. Terrains with this characteristic are frequently seen around the Davraz and Kapýcak Mountain of the Province of Isparta.

#### *Protein Banks*

This refers to implementations involving the cultivation of plants with nutritional feed value. This practice technique may also be referred to as feed banks. In this implementation, woody species under

which herbaceous plants with feed value can be cultivated and herbaceous plants with high feed value are grown. In particular, in areas with irrigable flat plateau terrains, alfalfa (*Medicago sativa* L.) is grown on a rotational basis. In addition, there are production practices where corn (*Zea mays* L.), common oat (*Avena sativa* L.), garden vetch (*Vicia sativa* L.) and so forth are used. This production technique also includes small and large livestock raised for their meat and milk. In addition, alfalfa, clover, garden vetch and corn varieties are dried so that during winter they can be used as animal feed.

#### *Plantation Crops with Pastures and Animals*

This system involves the grazing of small and large livestock on plantation land. Afforestation using brutian pine (*Pinus brutia* Ten.), black pine (*Pinus nigra* Arnold.) and cedar of Lebanon (*Cedrus libani* A. Rich.) is widespread in this region. In these forested areas, it is possible to start animal grazing 10-15 years following the planting of trees. The most common example in the region is animal grazing under the umbrella pine (*Pinus pinea* L.).

#### *Agrosilvopastoral Systems*

Agrosilvopastoral systems are combinations of crops, pastures and/or animals and trees. They include home gardens involving animals, multipurpose woody hedgerows and apiculture with trees, aquaforestry and multipurpose woodlots.

#### *Home gardens Involving Animals*

It is possible to see examples of cultivation of various woody species such as trees, shrubs, bushes, etc. and agricultural crops as well as livestock husbandry in or around dwellings in rural areas. In terms of woody species, ligneous species with predominance of fruit trees are cultivated. In terms of agricultural plants, preference is given to seasonal vegetable plants geared towards nutritional consumption. In terms of herbaceous plant species, herbaceous plant varieties with feed value and edible by animals are cultivated. In addition, this production technique includes the husbandry of small and large livestock for dairy and meat production.

#### *Multipurpose Woody Hedgerows*

Woody hedgerows have been planted on agricultural terrains in order to provide branches and leaves as feed, grazing for animals and protection of land. This production system includes ligneous species varieties with predominance of fruit trees and seasonal vegetable plants geared toward nutritional production. In addition, it includes herbaceous plants with feed value and edible by animals. Another element of this production system includes domesticated small and large livestock raised for meat and milk production.

#### *Apiculture with Trees*

It is possible to see the examples of honey production where bee hives can be placed in areas with tree varieties that provide flowers or pollen for honey production and are suitable for use in apiculture. This production technique involves woody plant species, such as trees, shrubs, bushes which are preferred by bees and produce flowers or pollen, herbaceous plant varieties that provide feed value and use in apiculture and bee colonies as the animal. It is possible to frequently encounter examples of this implementation in the upper basins of the region with the arrival of spring. Bee hives are placed, in particular, in forested areas where the brutian pine (*Pinus brutia* Ten.) is found. In addition to these areas, upper basins where flowery plants grow as well as locations where the locust acacia (*Robinia pseudoacacia* L.) grows are preferred for apiculture.

#### *Aquaforestry*

This technique involves examples in the region geared toward the cultivation of various water products in water resources such as lakes, brooks, creeks, pools, etc. in forest resources and agricultural

lands. This example includes woody varieties such as trees, shrubs, bushes and so forth, which produce leaves, flowers or fruits that fish prefer to eat as feed. In terms of herbaceous plants, the technique includes sub aquatic and super aquatic plants that support the aquatic environment. Fish and other water creatures join the system as the animal element. The provinces of Isparta and Burdur, also known as the Lakes Region, have an abundance of lake and stream resources. Fishing and cultivation of water products are widespread in lakes such as Eğirdir, Hoyran and Kovada. Furthermore, various dam lakes are used for this purpose. In addition, creeks and brooks located within the forests are used in the cultivation of carp and trout.

#### *Multipurpose Woodlots*

Examples of this technique include woodlots, village parks, school woodlots, aimed at providing various needs such as wood, feed, land protection, land gain, etc. and particularly at providing outdoor recreational uses. This production technique prefers the cultivation of multipurpose woody species that provide wood for building material and fuel, feed leaves and shade. It involves herbaceous plant varieties that have feed value and are edible by animals. The other element of the cultivation system involves domesticated small and large livestock raised for their milk and meat. Furthermore, this example includes woodlots cultivated particularly towards their use as outdoor recreational areas in the vicinity of provinces, counties, villages and towns.

#### **Discussion**

As it is known, there are two main productions in land-based productions. The first is 'agricultural production' and the second is forestry production. For both production branches, land constitutes an important production factor and resource. Furthermore, there are similarities in the production resources that both branches use. However, there are some technical differences between them, such as the property of cultivated products, manner and period of production and so forth. For example, forestry production requires the implementation of silvicultural procedures from the stands with natural or artificial regeneration or afforestation processes up until the end of the specified management period and the cultivation of a forest product requires a longer production period compared to agricultural production. Agricultural production periods are shorter in comparison with forestry production. In fact, there are production techniques which render it possible to reap more than one agricultural product within the same year.

Just as in underdeveloped or developing countries, Turkey also experiences various limitations and problems with regard to agricultural and forestry productions. Since the same crop is constantly being cultivated on agricultural lands, the soil is getting depleted and impoverished. For instance, cultivating the same crop and applying the same production technique in agricultural production and using an ever-increasing rate of artificial fertilizers and agricultural chemicals is harming the structure of the soil and decreasing its agricultural fertility. Since, in rural areas, there is no sufficient capital to carry out these productions, a high rate of manpower is being used. This circumstance causes agricultural fertility to remain at low levels. Animal feed, which is an important component of livestock production, as well as grazing and ranch lands where feed is provided are few or limited in number. Therefore, forest lands are being used for grazing purposes. When forestry production becomes insufficient, individuals living in rural areas cannot meet their need for fuel and building wood and encounter hardships. Lands that could be utilized for agricultural as well as forestry production remain very limited. Particularly in rural areas, owners of limited land are getting difficulty in meeting their unlimited needs. In rural areas, individuals who earn their living from productions based on land have to constantly fulfill their basic needs. These limitations and problems relating to agricultural and forestry production in Turkey have led to the emergence of the production technique known as agroforestry. In other words, an intermediate production technique between agricultural and forestry production has been born.



This study identifies the agroforestry techniques used in the West Mediterranean region and which classification system should be employed in determining the region's agroforestry production potential. Various classification systems have been examined in this study (Combe and Budowski, 1979; King, 1979; Graigner, 1980, Vergara, 1981; Huxley, 1983; Torres, 1993; Nair, 1983). As a result of this study, it has been found that the classification system developed by Nair (1993), which is based on several criteria (structural, functional, ecological and socioeconomic), is the most appropriate and efficient one. In the field studies conducted based on this classification system alley cropping, multi layer tree gardens, multipurpose trees and shrubs on farmlands, home gardens, trees in soil conservation-reclamation and shelter belts-windbreaks have been identified as production techniques within the agrosilvicultural system, all of which are prevalently employed in the region. In Nair's (1993) classification, production techniques within the agrosilvicultural system referred to as shifting cultivation and taungya are also included. In the field studies, it has been identified that these production techniques are not applicable in the region and for forestry in Turkey and can therefore not be considered as a production technique. Shifting cultivation is based on the use of forest areas for agricultural production purposes. After having used the area for agricultural production (for 3-5 years), the area is once again used for forestry production purposes. This is similar to the method employed during the irregular tree cut-down period in forestry of Europe. During that specific period, forests were regarded as resources freely and irregularly available. That is, collective ownership of forests was in question. During this period in Europe, a slash-and-burn method called brandwirtschaft was employed so as to obtain agricultural land in forest areas. This method, which is difficult to apply in the broad-leaved forests of North Europe, has been easily applied in the Mediterranean Forests and thus the forests have been destroyed to be turned into agricultural areas. Forests that are burned by means of the brandwirtschaft method increase the productivity of the land to a certain degree due to the organic substances that burn. However, this productivity only allows for sufficient agricultural yield to be obtained in the first few years. In time, as the land loses its productivity, more new area is cleared in forest areas. Throughout the middle ages, the brandwirtschaft method was employed in order to obtain new agricultural areas and continued in Scandinavian Countries until the 19th century. During this period, with the influence of the physiographic thought, the expansion of agricultural areas versus forest areas was a generally accepted concept and it was in fact declared that a country's development is dependent on agricultural improvement. Upon the discovery of America, the first immigrants that migrated to this continent applied the brandwirtschaft method until the 18th century (Lowry, 1977). Brandwirtschaft is a different version of shifting cultivation. Its application can be considered to be normal in the regions such as Asia-Pacific and Latin America because there is a need for agricultural land in these geographical regions. In order to nutrition supply of such populations, agricultural production is imperative. For the first time ever, settlement in forested areas was observed.

Anatolia, on the other hand, has offered its land to mankind and his endeavors dating back to pre-historic times. Anatolia is one of the oldest settlements in terms of civilizations. Documents evidencing that several ethnic groups have lived at a social level in Anatolia also provide information on what these people were like as well as their lifestyles. Anatolia had been stripped of its vast forests all the way back in pre-historic times and, in those areas where forests once existed, seeds of herb-like plants, especially plants belonging to the wheat and pulse families, were cultivated. This way, agricultural production based on land cultivation emerged for the first time ever (Tunçdilek, 1978).

The sylvan steppes in Anatolia that were deforested offered an environment suitable for livestock raising which thus gave way to two types of agricultural production. This way, the ethnic groups living in Anatolia began to organize themselves into two different types of rural production systems, one being livestock raising based on animal production and the other, farming based on land cultivation. However, due to the natural structure differences in the Anatolian Lands, peoples living in different natural environments established various lifestyles. This gave way to the emergence of fairly different

lifestyles in Anatolia. Accordingly, while some preferred to lead an established life by dealing with agriculture, others preferred livestock raising thus becoming nomadic. Anatolia's geographical location, its land formations, climate types and plant species have brought about a natural synthesis as well as a specific type of people that can live under these conditions on this land. Therefore, Anatolian People have become such that they reflect this specific physical environment (Tunçdilek, 1978).

The civilizations that flourished on Anatolian lands used as forests for a long period of time for various purposes. In general, the land was used freely and casually. The first documents relating to the transition to the use of forest resources and regular forestry in Anatolia date back to the Ottoman Empire mainly. Similar to many other civilizations, the excess and irregular utilization of forests continued throughout the Ottoman era. The state's interest in forests emerged when the state needed to assure that the demands of shipyards, arsenals, the mint, the imperial palace and other state institutions were met. This way, the state prohibited the public from using certain forests irregularly (Evcimen, 1978). The forests that were not included in the state-restricted areas were allowed to be used freely in accordance with the Cibal-i Mubaha provision. Making use of forests in accordance with the Cibal-i Mubaha provision is similar to the utilization based on collective proprietorship in the middle Ages. Between 1550-1600 during the Ottoman Empire there were several revolts and uprisings in Anatolia. The public suffered from these revolts and uprisings and, under the conditions of those times, abandoned their villages and towns and migrated to the forested regions of Anatolia in which they felt safe. Accordingly, the development of forest villages which has now reached a number of 20, 293 first began (Anıl, 1974). The people who had to migrate into the woods due to the Celali's Uprisings, on the one hand, obtained timber so as to set up a shelter and, on the other hand, cleared new areas for agricultural purposes so as to make their living. Undoubtedly, clearing is done for the same reason as *brandwirtschaft* was in Europe and the timeliness coincide. In Turkey, because forest settlements have been cleared by forest peasants and turned into arable lands, the areas that remain must be used as forests. Areas that are stripped of forests cannot regain its former structure. Accordingly, neither in the West Mediterranean Region nor all over the Turkey, on a general scale, agroforestry can be employed as a production technique. The same holds true for Taungya. During the phase of natural or artificial rejuvenation of forests, allowing the production of various agricultural products on the same land will adversely affect the rejuvenation. Besides, toward the end of the 1980's, during the forestation efforts in various regions in Turkey, certain agricultural products as well as medicinal and aromatic plants were allowed to be cultivated on land treated manually or by machines. However, the expected yield was not able to be obtained and the forestation efforts also failed. Accordingly, the shifting cultivation and taungya production techniques are not suitable for this region and Turkey in general. On the other hand, plantation crop combination and fuelwood production, being production techniques within the agrosilvicultural systems, have been applied variedly. However, as they are fairly similar to the other production techniques, they have not been diagnosed and identified separately.

In the region, trees on rangeland or pastures, protein banks and plantation crops with pastures and animals have been identified as common silvopastoral systems. In addition, livestock raising is also frequently observed as a means of rural activity.

As for agrosilvopastoral systems, home gardens involving animals, multipurpose woody hedgerows, apiculture with trees, aquaforestry and multipurpose woodlots have been identified as production techniques.

The region has a high agroforestry production potential. The most prevalent agroforestry production systems within the region are silvopastoral production techniques.

## **Conclusions**

Agroforestry production techniques have emerged in underdeveloped countries as traditional methods and the initial classifications of production techniques were made taking these countries into

consideration. However, today, irrespective of the country being underdeveloped or developed, agroforestry applications are observed all over the world in different ecological and geographic regions. Whereas, it was impossible to observe such a situation 20 years ago because underdeveloped countries -out of necessity-attached particular importance to the application and development of agroforestry production techniques which plays an important role in meeting the needs of rural inhabitants. Whereas, developed countries had agricultural policies in place that allowed the production of industrial agricultural products (such as cotton, wheat, tobacco, sugar beet etc.) based on monoculture for commercial purposes. Today, it is observed that developed countries have moved away from such policies and have not grown an interest towards new production techniques that do not harm the natural balance and, in particular, produce agricultural products that do not contain substances hazardous to human health. Ecological-agricultural production is one of these approaches. These explanations indicate that all over the world there is a rapid transition from classic agriculture towards new production technique based on land, which is referred to as agroforestry. By means of agroforestry production techniques, land that has deteriorated or is on the verge of deterioration in terms of its structure and formation can be improved. It is possible to grow agricultural products and various forest tree species as well as meet various needs of the rural inhabitants (fuelwood, wood for construction material, food, fodder, etc.) using the same land. It is possible to employ farm forestry methods. For example, a family involved in agricultural production, whereby only agricultural products are obtained, can also become involved in the production of various forest and tree products by means of agroforestry applications. It is possible to protect and develop the land (such as live hedges, windbreaks, shelter belts curtains, nitrogen-fixing trees, etc.) by means of agroforestry production techniques. Taking into consideration the technical details and scientific know-how specific to agroforestry, it is possible to create and develop systems such as home gardens, plantation cropping systems, non-forestry trees and integrated production systems. That is why, day by day, new agroforestry production techniques are being added to the current production systems and earlier classifications are being reviewed. Despite the rapid developments and progress in the world, Turkey is amongst the virgin study areas to conduct research on agroforestry. Individuals and institutions working in various disciplines (agriculture and forestry) related to land-based production should show interest towards this study field.

On this study, on a regional scale, the West Mediterranean region was taken into consideration. The current traditional agroforestry production techniques in the region were examined and identified. Future studies should concentrate on the production techniques. In particular, studies aimed at determining the plant species, ecological requirements (such as climate, soil etc.), botanical characteristics (such as length, diameter, form etc.), utilization types (such as wood, food, services etc.), production and growth in nursery beds (such as planting, caring etc.) as well as the utilization characteristics in agroforestry applications should be conducted.

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