Classification of Traditional Agroforestry Practices in Turkey

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Abstract

The word as agroforestry was accepted as a new concept in late 1970s, whereas it was an old practice in which many culture experienced it in different ecological region of the world. At the beginning, though some practices, especially in tropics and developing countries called agroforestry applications, it was recognized by most of the developing countries as well as industrialized countries. It is clear that agroforestry is a new scientific discipline now as agriculture and forestry fields. However, agroforestry is still a new concept for academical and institutional level in Turkey. But, many people living in rural areas in Turkey have been experiencing it for a long time. In this study, traditional agroforestry practices were observed, determined, and classified. In this connection, most of agroforestry production patterns are being observed as similar as to all other traditional practices in the country. Results showed that, agroforestry application could be put into major agroforestry practices in the country such as agrisilvicultural systems; alley cropping, multilayer tree gardens, multipurpose trees on crop lands, homegardens, trees in soil conservation and reclamation, shelterbelts and windbreaks, silvopastoral systems; trees on rangelands or pastures, protein banks, plantation crop with animals, agrosilvopastoral systems; homegarden involving animals, multipurpose woody hedgerows, apiculture with trees, aquaforestry, multipurpose woodlots. These practices are also suitable for agroforestry patterns to solve the problems related to deterioration of family farms in Turkey. As agroforestry practices, shifting cultivation and taungya are determined in the country; however, both practices are causing forest degradation.

Key words: Agroforestry, Traditional Agroforestry Practices, Classification, Turkey

INTRODUCTION

In the 1970's, the restrictions and typical problems of developing countries gave birth to the production technique known as agroforestry. Thereby an intermediate production technique takes place between agriculture and forestry [1]. These developments were noticed in the 1980's and the first study on agroforestry was carried out in Turkey by Geray and Görcelioğlu [2]. In this study, agroforestry was analyzed as an integrated system for the utilization of agricultural and forestry land.

In Turkey, agroforestry was studied by some research scientists of Poplar and Fast Growing Forest Trees Research Institute in İzmit. The first project was authored by Alanay [3], titled "The Researches on the Economics of Black Poplar Forestation and Agricultural Intercropping". In this connection, following this study a few studies have been carried out by the specialists of the same institute. These are; "The Definition and Importance of Agroforestry, Examples of Practices and Research" [4], "The Investigation on the Applications of Agroforestry Techniques in Some Forestation Areas and Coppice Forests" [5], and "The Investigation on Agroforestry Techniques in Hybrid and Black Poplar Plantations" [6]. In these studies, various agricultural products such as beans, corn, beets, soy beans, chickpeas, watermelons, carrots, cotton, were grown under the canopy of poplar plantation trees, planted by different spacing and the yield data were analyzed over the years. In addition, technical and biological studies were conducted to find out the possibilities how to grow poplar together with various plant species, and evaluation related to the economic aspect of the studies was also realized. According to a research study completed by Diner and Koçar [7], entitled "The Effect of Agricultural Intercropping on I-214 Poplar Plantation Economics" is the first one that including an economic dimension. Another study is realized by research scientists of Eastern Mediterranean Forestry Research Institute comprises eucalyptus in stead of poplar [8].

In addition, Şefik [9] has prepared a basic handbook for agroforestry. The handbook covers theoretical items related to definitions and classification of production systems in agroforestry. The author has continued to another study including the regional analyses and evaluations of some agroforestry practices [10].

Research on agroforestry which has been mainly carried out in the Marmara Region has also repeated in the Black Sea Region of the country. The study, titled "The Place and Importance of Rural Household Gardens of the Eastern Black Sea Region in Agroforestry Practices" is an important one from stand point of comprising different agroforestry production techniques. From the studies carried out up to day showed that, concentrated on poplar growing and various agricultural produce [11]. In another study, the agroforestry production potential of the Eastern Black Sea Region has been analyzed [12].

The results provided by these two studies, together with the findings provided by means of two other research projects carried out in Mediterranean Sea Region, justified that agroforestry concept has clearly been understood. These studies are; "Determination of the Agroforestry Potential of the West Mediterranean Region" and "Suitable Species for Agroforestry Practices in the West Mediterranean Region" [13, 14]. However, a study connecting with the classification of agroforestry techniques based on country level has been not studied yet. In recognition of this fact, this study has aimed at findings out the necessary information for agroforestry practices. Thus, it has been possible for us to determine and test production potential of agroforestry in Turkey.

GENERAL CHARACTERISTICS OF RURAL AREAS IN TURKEY

Turkey covers an area of about 76,960,000 hectares. Population is nearly to 72 million inhabitants and has a density of 90-95 people per km² [15]. It has a temperate climate. The forest area is about 20.7 million hectares. This area consists of 27% of the country [16]. 35% of populations live in rural areas. 7.7 million of this live in 20 293 villages in forest or adjacent to forests [17].

In general, each forest village, approximately has two thousand households, between 6-7 people each, private-owned agricultural land comprise less than 5 hectare. In general, in each village has elementary school, mosque and village administrative office. Electricity is available in the villages. The majority of houses are made of bricks and the roofs are covered by tiles. Besides, there are postal and telecommunication facilities in some villages. These facilities are provided by the village administrators. In some of the villages, the inhabitants are being lived in old settlements, but some of them have been still living in new established settlements. The elder people are usually illiterate. The majority of villagers deal with agricultural work. In addition, as second income of the villagers is forestry employment and most of households have a homegarden around their houses. The garden crops obtained from homegarden are used for their own consumption. On the other hand, the villagers breed livestock for commercial purposes. Nomadic people played an important role in the settlement process. Most of the young villagers have been migrating from the rural areas to the big cities in order to have employment facilities for years. Migrants coming from the rural areas continue to live their traditional customs and usage gained in their villages.

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, firewood for cooking and warming, grazing land for livestock. Forest villagers; sometimes meet their basic needs by illegal way from the forests. They graze their animals, and collect secondary forest products from the forests. They open up forest land by land clearing for agricultural purpose, and cut down trees for timber and fuel wood needs.

The general problems faced by forest villagers are the deficiency of agricultural land and shortage of water resources. These two main factors are playing an important role in decreasing forest yield, and soil fertility, while accelerating soil erosion and migration to cities.

MATERIAL AND METHOD

This study was carried out into two stages. In the first stage theoretical analysis of literature related to the study was investigated. In this connection, classify traditional agroforestry practices, the classification system developed by Nair [1], the data on demographic, climatic, social, cultural, and economic were obtained from government and private agency archives, and traditional agroforestry practices that realized by forest villagers in the country were scrutinized.

In order to define the plant species grown in the study area, sample of plants were collected. In addition, altitudes, inclinations, aspects were determined by using altimeter, clinometer, and tape.

The second stage of this study was a case study. In this connection, Diagnosis and Design Methodology (D & D) was used for determination, definition, and classification of traditional agroforestry practices. D&D approach is a scale-neutrality, which enables methodology to be applied at different levels in the hierarchy of land-use systems. Thus, the procedure could be applied by means of minor modifications at the micro level such as household management unit, and meso level concerning local community, village or watershed or macro level connected with a region, country, or ecozone [1, 18].

The basic procedures of D&D consists of five stages such as; Prediagnostic, Diagnostic, Design and Evaluation, Planning, Implementation [18]. In this study, the prediagnostic stage was used (Table 1).

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

The D&D team's fieldwork involved in direct observations of the areas' general conditions, crop and residential patterns, collection of firewood and forest products. The team also observed the current status of forest and agricultural crops.

Table 1. Prediagnostic Stage of Diagnosis and Design (D&D) Methodology (Raintree, 1987)

D&D Stages	Basic questions to answer	Key factors to consider	Mode of inquiry
Prediagnostic	Definition of the land use system and site selection (which system to focus on?)	Distinctive combinations of resources, technology and land user objectives	Seeing and comparing the different land use systems
	How does the system work? (How is it organized, how does it function to achieve its objectives?)	Production objectives and strategies, arrangement of components	Analyzing and describing the system

There are various landscape zones within natural boundary of Turkey. These landscape zones create different land use systems. In order to examine the differences between the landuse systems in the country, a mezzo-level D&D was used. At this connection, different regional landuse methods achieved through traditional agroforestry techniques, which were identified through the micro-level D&D study, were defined. By this means, macro-level D&D procedures were utilized throughout the entire research area.

The data obtained from small-scaled preliminary studies, "Determination of the Agroforestry Potential of the West Mediterranean Region, Adequate Species for Agroforestry Practices in the Western Mediterranean Region [13]", and "Classification of Traditional Agroforestry Practices in West Mediterranean Region of Turkey [14]"-carried out between the years of 2000-2006, provided a great contribution to this study.

In this contex, the experinces and knowledge gained from past application of some projects, titled "The Research and Implementation Project on Edible Mushroom Species in Unproductive Forest Areas in Various Ecologies 1987-1991", "The Turkish-German Forestry Project Social Forestry Applications 1987-1997", "The Poplar Improvement Project in Turkey 1987-1992", "The Social Forestry Concept Training Project in Turkey 1992-1993", "The Development of Appropriate Methods for Community Forestry in Turkey 1992-1998", "The Forestry and Food Safety Project 1993- 1995", "The Eastern Anatolia Water Basins Rehabilitation Project 1993-Ongoing" and traditional agroforestry application connected with rural development and social forestry contributed to the classification of production tecniques [19].

RESULTS

Basic of Classification

In this study, it is determined that it is a priority to decide which classification system to be used in defining agroforestry production techniques identified in Turkey. In order to determine agroforestry production potential of the region, several classification systems [20, 21, 22, 23, 24, and 25] were evaluated. However, it became evident that, rather than evaluating agroforestry production techniques based on land studies and classifying in a way that aids analysis, some of these classification systems involved research aimed at a conceptual development of agroforestry production techniques. These particular studies established their classification based upon a single criterion, such as the function of trees, shrubs, agricultural crops or grass-like plants which form a component of the production system [21] or based only upon the time period (for instance, annual or multi-annual) that components of the production system have spent within the production system. In addition to these classification methods, simple [25] or more complex [20, 26] classifications were established by taking into account some of these criteria. With respect to the classification of agroforestry production systems involving a more complex structure according to agricultural and forestry systems, a classification established by taking into account a single criterion proves to be insufficient. In particular, such a classification loses its usefulness with regard to the identification of traditional agroforestry systems. Therefore, it has become evident that the classification developed by Nair [1] based upon several criteria (structural, functional, ecological and socioeconomic) is the best classification. Nair [1] divides agroforestry systems into three main systems, namely: agrisilvicultural systems (crops including shrubs/vine/tree crops and trees), silvopastoral systems (trees + pasture and/or animals) and agrosilvopastoral systems (trees+crops+pasture/animals). Subsequently, the author includes within these main production systems agroforestry production techniques, in terms of their attributes and characteristics, are similar to the main production systems and, which need to take place within the system. Since the classification is not established by taking a particular region or country as its basis, it is a general classification. Therefore, it is appropriate to be used in the identification and description of traditional agroforestry practices.

Major Agroforestry Practices in Turkey

Just as in numerous areas of the world, it is possible to see some examples of traditional agroforestry practices in Turkey

Table 2. Major Agroforestry Practices in Turkey

Agroforestry Systems	Agroforestry Practices
Agrisilvicultural systems: combination of crops and trees	• alley cropping • multilayer tree gardens • multipurpose trees and shrubs on farmlands • homegardens • trees in soil conservation and reclamation • shelterbelts and windbreaks
Silvopastoral systems: combinations of pastures and/or animals and trees	• trees on rangeland or pastures • protein banks • plantation crops with pastures and animals
Agrosilvopastoral systems: combinations of crops, pastures and/or animals and trees	• homegardens involving animals • multipurpose woody hedgerows • apiculture with trees • aquaforestry • multipurpose woodlots.

as well. These examples have emerged through the experiences of people living in rural areas.

Individuals living in rural areas 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 Turkey are listed in Table 2 and explanations regarding each example are given below.

Agrisilvicultural Systems

Agrisilvicultural systems involve a combination of crops and trees. They include alley cropping, multilayer tree gardens, multipurpose trees and shrubs on farmlands, homegardens, trees in soil conservation and reclamation, shelterbelts and windbreaks.

Alley cropping

Woody species such as trees, shrubs, bushes, etc. are planted at regular space intervals. Agricultural crops could be grown among the woody species which are planted and grown in the area, forming a regularly spaced line or live fence. The practice involves woody species which could be formed into alleys or fences and which could be grown fast. The agricultural plants to be used involve various field or garden plants and 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.

Multilayer 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 multilayer tree garden. Woody species that have varying growth rates, development forms and light sensitivities, which are tolerant to life in a multilayer 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 established by planting 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 multilayer tree gardens in small areas. Some species on top layer that could be used for this purpose (e.g. *Juglans regia* L., *Castanea sativa* Mill.).

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 kind of practice 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 species used are *poplar*, *willow, oleaster, almond,* and so forth. The trees grown in such kind of lands provide wood for fuel and building material, various shelled fruits, border specification and shade.

Homegardens

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 for meeting the nutritional needs of the residents, the woody species are used for providing the other needs 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. The examples given for home-gardening could frequently be encountered in all residential units of the region's rural areas. Fruit trees are the preferred choice for woody species in gardens. The seasonal vegetables production mainly serves to meet the needs of the residents. Excess crops are sold in local markets.

Trees in soil conservation and reclamation

This practice involves plantation of trees, shrubs, bushes road side and its inclines, sloped terrains and platform borders in order to prevent landslides and soil erosion. For this purpose, woody species, such as *Robinia pseudoacacia* L., *Acacia cyanophylla* Lindl., and deep-rooted bushes, offering multiple uses as well as fruit trees are grown. This method is widely used in upper basins, in areas that are vulnerable to soil erosion.

Shelterbelts 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-related damage. Woody species used for this purpose are wind-resistant with good establishment ability to grow in height and branches. Agricultural plants that are adequate to the country are used. In the flat plateau terrains of the country, Italian poplar (*Populus nigra* L. var. *pyramidalis* Spach.) and, along the edges of agricultural terrains in the coastal areas of the country, oleaster (*Elaeagnus angustifolia* var.orientalis (L.)), True Cypress (*Cupressus sempervirens* L.) are widely used.

Silvopastoral Systems

Silvopastoral systems are combinations of pastures and/or animals and woody tree species. The systems include trees on rangeland or pastures, feed 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 (for providing building material, fuel wood, feed leaves, shade) 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 produce. Various herbaceous plants are used to provide nutritional value and feed the animals. In addition, this production technique also includes cattle as well sheep and goat raised for their milk

and meat. In the summer, upper basins of the region are used as mountain pastures. Beside almost all springs/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. Fodder leaf utilization is a kind of substation for animal breeding in Southeastern Anatolia of Turkey. Some species that can be used for this purpose include: *Platanus spp., Morus spp., Quercus spp.*

Animal husbandry is widespread in the upper plains of the country. 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.

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, under woody species herbaceous plants with feed value could 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 methods where corn (*Zea mays* L.), common oat (*Avena sativa* L.), garden vetch (*Vicia sativa* L.) and so forth are cultivated. This production technique also includes cattle and goat and sheep livestock raised for their meat and milk. Furthermore, alfalfa, clover, garden vetch and some corn varieties are dried so that the winter time for using as animal feed.

Plantation crops with pastures and animals

This system involves grazing of cattle and goat and sheep livestock on plantation land. Brutian pine (*Pinus brutia* Ten.), Anatolian black pine (*Pinus nigra* Arnold. supsp. *pallasiana* (Lamb.) Holmboe) and Taurus cedar (*Cedrus libani* A. Rich.) are widespread used for afforestation in the country. 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 Egean region is animal grazing under the stone pine (*Pinus pinea* L.) forests.

Agrosilvopastoral Systems

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

Homegardens involving animals

It is possible to see some 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, woody 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. Besides, this production technique includes the husbandry of cattle and sheep and goat 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 material, grazing for animals and protection of land. This production system includes woody species varieties with predominance of fruit trees and seasonal vegetable plants geared towards 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 some samples of honey production where bee hives could be placed in areas with tree varieties that providing flowers or pollen for honey production and are suitable for use in apiculture. This production technique involves woody plant species, including trees, shrubs, bushes which are preferred by bees and produce flowers or pollen, herbaceous plant varieties that providing feed value and using in apiculture and bee colonies as animal element. It is frequently possible to encounter samples of this implementation in the upper basins of the region with the arrival of spring. Bee hives are placed, in particular, in forest areas where the brutian pine (*Pinus brutia* Ten.) is natural found. In addition to these areas, upper basins where flowery plants grow as well as locations where the black locust (*Robinia pseudoacacia* L.) grows are preferred for apiculture.

Aquaforestry

This technique involves samples in the region geared towards the cultivation of various water products in water resources as *lakes, brooks, creeks, pools,* etc. present in forest 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 them as food. In terms of herbaceous plants, the technique includes subaquatic plants that support the aquatic environment. Fish and other water creatures join the system as the animal element. Furthermore, various dam lakes are used for this purpose. In addition, edges of rivers and brooks located within forests are used for cultivation of carp and trout.

Multipurpose woodlots

Examples/samples 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 services. This production technique is preferred for cultivation of multipurpose woody species to 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 cattle and sheep and goats 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

This study identifies the agroforesty techniques used in Turkey and classification system to be carried into effect determining for agroforestry production potential of country. On the other hand, in this study, various classification systems used by Combe and Budowski, [20] King [21], Graigner [22], Vergara [23], Huxley [24], Torres [25] have been examined. However, it has been found that the classification system developed by Nair [1], which is based on several criteria (structural, functional, ecological and socioeconomic), is determined as the most appropriate and efficient one. The studies conducted in the field, which based on this classification system alley cropping, multilayer tree gardens, multipurpose trees and shrubs on farmlands, homegardens, trees in soil conservation and reclamation and shelterbelts and windbreaks have been identified as affective and beneficial production techniques within the agrisilvicultural system, all of which are prevalently employed in the country. In Nair's [1] classification, production techniques within the agrisilvicultural 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 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), this area is once again used for forestry production purposes. This is similar to the method employed during the irregular tree cut-down or rotation-age of period in forestry of Europe. During that specific period, forests were regarded as resources freely and irregularly available. Another word, collective ownership of forests was in question. During this period in Europe, a slash-and-burn method called brandwirtschaft was employed so as to gain 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 burned. However, this productivity only allows for sufficient agricultural yield to be obtained in the first few years. In course of time, as the land loses its productivity, more area is cleared in new forest areas. Throughout the Middle Ages, the brandwirtschaft method was employed in order to obtain 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. Upon the discovery of America, the first immigrants that migrated to this continent applied the brandwirtschaft method until the 18th century [27]. Brandwirtschaft is a different version of shifting cultivation. Its application can be considered to be normal in the Asia-Pacific Region and regions like Latin America, because there was a need for agricultural land in these geographical regions. In order to supply nutrition to 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 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 [28].

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 different 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 kind of people that can live under these conditions on this land. Therefore, "Anatolian People" have become such that they reflect this specific physical environment [28].

The civilizations that flourished on Anatolian lands used the forests during 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 history back to the Ottoman Empire mainly. Similar to many other civilizations, the excess and irregular utilization of forests continued throughout the Ottoman era [29]. 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 [30]. 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 utilisation 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 in which they felt safe. Accordingly, the development of forest villages which has now reached to a number of 20,293 first began [31]. The people who had to migrate into the woods due to the Celali 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 get their living. Undoubtedly, clearing is done for the same reason as brandwirtschaft was in

* *Cibal-i Mubaha:* This is an Ottoman legal term which means mountains over which no one has ownership.

Europe and the timelines coincide. In Turkey, because forest settlements have been penetrated and because the lands suitable for agriculture have been cleared by forest peasants and turned into agricultural areas, the areas that remain must be used as forests. Areas that are stripped of forests cannot regain its former structure. Accordingly, neither in the any 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 effect the rejuvenation. Besides, towards 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 practices are not suitable for the Turkey in general.

CONCLUSIONS AND RECOMMENDATIONS

Development, a process whereby a country's social, political and economic indicators undergo change in a positive way, involves distinct research areas. Majority of people in developing countries live in rural areas and earns their living from agricultural production. Therefore, rural development in these countries is a significant research field that to be explored [32]. In the past, considerable emphasis was placed on agricultural development among the topics involving rural development and classic agricultural development policies were carried out. These policies were not able to resolve the rural development problems faced by underdeveloped countries. In fact, agricultural development has been transformed into a monoculturally-based production method, relying principally upon intensive use of agricultural pharmaceuticals and chemical fertilizers. This situation has created hardships for inhabitants of rural areas who are financially ill-equipped to be able to purchase agricultural implements.

Similar to the classic agricultural practices that were attempted to be sold to inhabitants of rural areas, classic forestry practices have not been able to resolve problems either. Instead of having inhabitants of rural areas benefit from the services provided by forests, forestry was practiced with an emphasis placed on forests and trees, excluding the human factor.

These inadequacies have steered rural development experts into a search for alternatives. Thus, land use experiments, developed and shaped in accordance with the desires of rural area inhabitants, started to be examined. In fact, rural area residents have learned how to use the land they own in a way that fulfills the production of materials and services that they need. These land use methods which have been traditionally practiced for years were examined, evaluated and, consequently, a new land use method referred to as agroforestry evolved.

Promotion of agroforestry in Turkey will help the country address various problems such as environmental degradation, lack of food security, and deforestation. There is a great potential and justification to start with implementing agroforestry. Interventions need to focus on the following topics:

- Starting to build up a scientific knowledge base on agroforestry,
- Establishing a network for flow of data both nationally and internationally,
- Analyze the different traditional agroforestry systems,
- Sensitize the government on policy problem areas and work for the development of a conducive policy environment,
- Further work on the provenance screening and breeding on local species,
- Publicize information obtained both nationally and internationally.

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