

The status and trends of forests and forestry in West Asia

Subregional report of the Forestry Outlook Study
for West and Central Asia



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FOREWORD

Forests and forestry all over the world are being affected directly and indirectly by larger social, economic, policy, institutional and environmental changes. Understanding the broad direction of future developments in the forest sector is critical with a view to improving the responses, and especially dealing with emerging opportunities and challenges. It is in this context that FAO, in partnership with the countries of West and Central Asia, undertook the Forestry Outlook Study for West and Central Asia (FOWECA). The main report outlining the long-term outlook for the sector was published in March 2007. Although substantial information on forest and tree resources and their management was provided in the country outlook papers, it could not all be incorporated into the main report. In view of the usefulness of making the information available to everybody, it was decided to prepare two separate reports for the West Asia and the Central Asia and Caucasus subregions, and the present report thus provides an overview of the current status and trends in the forest sector in the 15 West Asian countries.

The report focuses on some of the key forest issues in West Asia, for example the features and management of forest and tree resources, the interaction between arable land, rangeland and forests, and forest services and products and their contribution to the rural economy. It also outlines the current state of forest policies and institutions, identifying strengths and weaknesses. It has brought together information from a range of sources, especially that provided by the countries in question. By providing a larger picture of forests and forestry in the subregion, it is hoped that it will be helpful in terms of sharing information and experience, especially among policy-makers and planners dealing with the forest sector in the countries of West Asia.

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LIST OF ABBREVIATIONS

CBD	United Nations Convention on Biological Diversity
CCD	United Nations Convention to Combat Desertification
CDM	Clean Development Mechanizm
FCCC	United Nations Framework Convention on Climate Change
FRA 2005	<i>Global Forest Resources Assessment 2005</i> . FAO, 2006
GDP	Gross Domestic Product
IUCN	International Union for Conservation of Nature and Natural Resources
MDF	Medium-Density Fibreboard
NGO	Non-governmental Organization
NWFP	Non-Wood Forest Product
UAE	United Arab Emirates
UNEP	United Nations Environment Programme

EXECUTIVE SUMMARY

The subregional report on the status and trends of forests and forestry in West Asia provides more detailed information and in-depth analysis on this subject in the context of the overall social, economic, environmental and institutional background. Together with the regional report for West and Central Asia and the subregional report for Central Asia and the Caucasus, it is the main output of the Forestry Outlook Study for West and Central Asia. The West Asia subregion covers 15 countries – Afghanistan, Bahrain, Cyprus, Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, the United Arab Emirates and Yemen – lying in mainly tropical and subtropical zones and encompassing subtropical humid forest, dry forest, steppe, desert and mountain systems. More than half the subregion is covered by tropical and subtropical desert.

West Asia has a total forest area of only 4 percent of the subregion's land area, accounting for only 1 percent of the world's forests, with an average of 0.12 ha per capita. The forest area is also unevenly distributed, with Turkey, Iran, Saudi Arabia, Afghanistan and Iraq together accounting for 88 percent of the subregion's forests. Moreover, West Asia has more "other wooded land" than "forests" – 54.2 million ha as against 27.4 million ha – and accounts for 7 percent of the world's total wooded land. The unfavourable environmental conditions and the resulting composition in terms of species have contributed to the low productivity of forests and wooded land. The average growing stock is estimated at 42 m³ per hectare, or less than half the world average of 110 m³. Wood supplies are therefore extremely limited. Forest cover has been relatively stable, increasing slightly, while wooded land decreased slightly between 1990 and 2005. The increase in forest area mainly reflects afforestation and reforestation activities, and forest plantations account for about 14 percent of the total forests.

The main forest issues in West Asia can be summarized as below:

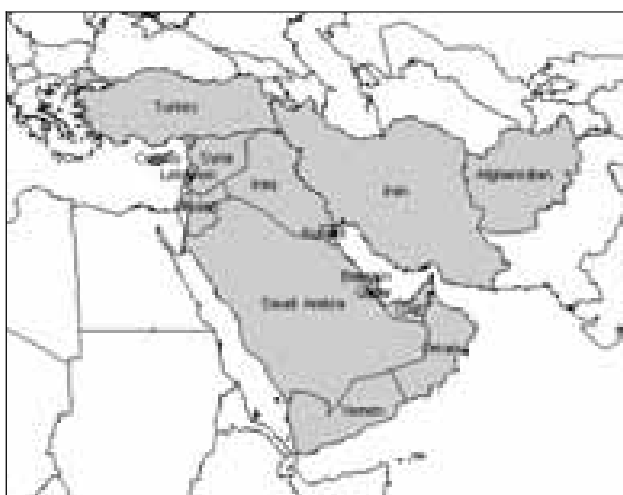
- Land degradation and desertification are widespread and are the most critical challenges facing West Asian countries. Apart from extreme climate conditions, land degradation and desertification are mainly caused by human intervention regarding land use and the poor management of agricultural land and rangelands.
- West Asia's generally low forest cover and low forest productivity limit its production of industrial roundwood and wood products. West Asia has shown increasing dependence on imports of wood products driven by a rising demand.
- Environmental improvement is a major objective of reforestation and afforestation programmes in most countries. However, the dry climate and sandy soil limit any significant progress in increasing the scale of reforestation and afforestation.
- Agroforestry, mostly managed by private farmers, is practised widely in many countries in the subregion. Its main form is as green shelterbelts to protect crops from desiccating winds and as fruit orchards to produce fruit and provide environmental services. Agroforestry also contributes to domestic wood supplies.
- Urban forestry has received increasing attention in many countries with the process of urbanization. Urban and peri-urban forests are playing an important role in protecting cities from sand and dust storms and for recreational and other amenities.
- Increased attention is being given to the development of forest-based ecotourism in many countries in the subregion, combined with increasing stress on managing protected areas and national parks. It is considered to have great potential in many countries.

- Fuelwood and charcoal are mainly used by rural people for cooking and heating. NWFPs are another important source of rural livelihoods and income.
- Forest policies and legislative frameworks are not in general comprehensive and systematic, since forest issues have been addressed within agricultural or environmental policies and laws in many countries. The lack of a coherent policy framework, appropriate, complementary legislation and a well-defined institutional structure are recognized as the most important factors leading to forest degradation.
- The administration and management of the forest sector in West Asia is considered to be centralized, with top-down approach to planning and decision-making processes. The private sector's involvement in forest management is very limited, largely because of the predominantly public ownership of forests and the economic unfeasibility of forest management.
- The participation of NGOs and rural communities in forest management and activities is increasing in West Asia, driven by growing concern for environmental protection and rural development.

INTRODUCTION

Within the general framework of the Forestry Outlook Study for West and Central Asia, the present subregional report provides more detailed information and in-depth analysis on the status and trends of forests and forestry in West Asia within an overall social, economic, environmental and institutional context. The West Asian subregion covers a vast area, stretching from Turkey in the northwest to Yemen in the south and Afghanistan in the east, and encompassing 15 countries: Afghanistan, Bahrain, Cyprus, the Islamic Republic of Iran, Iraq, Jordan, Kuwait, Lebanon, Oman, Qatar, Saudi Arabia, Syria, Turkey, the United Arab Emirates and Yemen (Figure 1).

Figure 1 West Asian countries



This subregional report includes eight chapters. Chapter 1 describes the characteristics of the forest and tree resources, including the ecological characteristics and the extent and changes of forests and woodlands. The management and its trend in forests and trees development, including forest tenure and forestry activities, are provided in Chapter 2. Chapter 3 discusses the inter-relationship between agriculture, rangeland and forests. Chapter 4 and Chapter 5 describe the significant services and products that forests and trees provide. The contribution of forests and trees to rural people and rural development has been assessed in Chapter 6. Chapter 7 discusses status and trends of forest policies and institutions, including developments of governmental forestry institutions, NGOs, local communities and the private sector. Chapter 8 summarizes the key forestry issues in the subregion.

Demographic and economic background

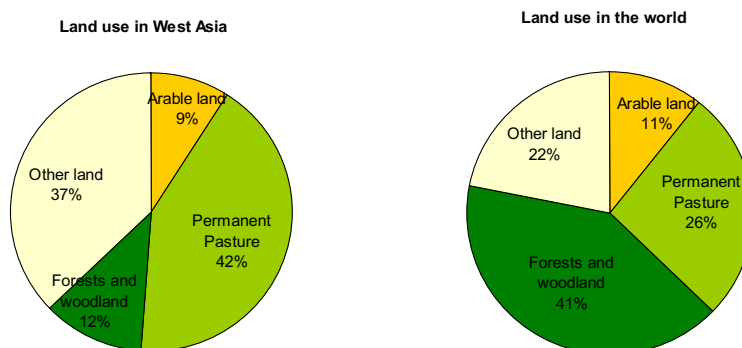
The combined population of West Asia was about 287 million in 2005, accounting for 4.4 percent of the world population. National population size varies greatly, with just seven countries having populations of 20 million or over and accounting for 266 million of the total. West Asia has the fastest growing population in the world, with an average annual growth rate of 3.8 percent in the period 1980-2004, although population increases have varied considerably depending on country. The subregion has become highly urbanized. Of the 15 countries, 13 have urban populations of over 50 percent.

West Asia encompasses most of the developing oil producing and exporting nations in the world, with 10 of the 15 countries being oil exporters. Fluctuating economic growth mainly reflects movements in the oil market. The various national economies ¹ have been following similar growth patterns, with agriculture slowly declining in importance over the past 15 years. The service sector now accounts for the largest share of GDP and grew from 45 to 49 percent over the period 1990–2004. The boom in oil prices in recent years accelerated GDP growth among oil exporters. There have also been positive spillovers in the form of tourism revenue, with Gulf visitors taking advantages of tourism opportunities. Meanwhile, the slow-down in GDP growth of many oil-importing countries can be attributed to the subsidizing of petroleum prices (notably in Jordan), the reduced demand in Europe, which is the main destination of non-oil exports from West Asia, and a loss of competitiveness on world commodity markets.

Combined GDP of the 15 West Asian countries was US\$869.2 billion in 2003, accounting for 2.4 percent of world GDP. Over the period 1990-2004, West Asia achieved a real annual growth of 3.9 percent, slightly higher than the world average of 2.8 percent. However, annual population growth in the same period was 2.2 percent, much higher than the world average of 1.4 percent, so that real per capita income grew very slowly – by about 1 percent per year – indicating a relative deterioration in the average standard of living in the subregion compared with the rest of the world (1.3 percent). Subregional averages mask sharp differences among countries, with per capita annual income ranging from more than US\$8 000 to less than US\$1 000.

Land use

The West Asian subregion covers an area of 689 million ha, encompassing a wide range of environments. However, arid and semiarid environments with low and variable rainfall predominate, which has resulted in vast expanses of desert. Land suitable for agriculture and forests is below the world average, although the per capita land area is slightly above the average. The proportion of forests and woodlands is less than one-third of the world average, although permanent pastures account for 42 percent of the land area, which is much higher than the world average. The long history of human settlement and increasing urbanization has led to serious degradation of land and forest resources in much of the subregion.



Source: FAO STAT 2006, FRA 2005.

¹ Afghanistan, Bahrain, Cyprus, Iraq, Lebanon, Kuwait and Qatar are excluded here for lack of data.

Pastoral farming

Pastoralism is practised in most of the countries in the subregion, with annual rainfall of less than 150 mm limiting potential. Pastoralists keep mainly sheep, cattle, goats and camels, and the system is based on the mobility of herds and flocks, which move with the availability of water and rainfall-related seasonal grazing. In the past, water was only obtainable from fixed water storage systems, but the use of mobile water tankers has enabled livestock owners to travel larger distances seasonally.

Pastoral systems will remain important because of the constantly increasing demand for meat, primarily in urban areas. Desertification is the main long-term problem for pastoralists throughout the subregion, and resource degradation is causing a steady decline in pastoral incomes. Rainfall, or its lack, is the main limiting factor in dry rangelands. Drought diminishes rangeland productivity and adversely affects feed quality and species diversity. However, heavy grazing by livestock is believed to be the most widespread cause of vegetation and land degradation throughout the subregion. In arid and semiarid zones, livestock density is above the carrying capacity for most of the year, and these are the areas where most of the desertification takes place.

Rain-fed farming

Rain-fed farming is the most widespread agricultural system in the subregion and is dominated by cereals and legumes, with tree crops, fruit, olives and vines on terraces. Natural resource degradation is a serious problem in this system. For example, inadequate maintenance of terraces has led to increasing water erosion, in turn reducing productivity. Where livestock are present, overgrazing close to settlements and water points has further contributed to soil degradation. The development of higher-value crops, such as fruit and vegetables, is limited by low rainfall. Often the integration of cropping and livestock systems has been inadequate.

Irrigated farming

Irrigated farming is found throughout the subregion. Given the predominantly arid or semiarid environment, this system has always been crucial in generating much of its agricultural output. The system encompasses large-scale irrigation schemes, common in Iraq, Syria and Turkey, and small-scale schemes, found scattered throughout Yemen, Oman, Syria and Turkey. Large-scale schemes are usually found along the major river systems, downstream of dams. The system is dominated by intensive year-round cropping by owner-occupiers or tenants, and cash crops, vegetables and other high-value crops and fodder are all common, while some areas support significant numbers of livestock. Many areas suffer from poor water management, resulting in salinity, sodicity, water logging, and consequent decline in productivity. Small-scale schemes are often found in isolated areas and provide food and other products primarily for local markets. Holdings usually contain fruit trees and intensively grown vegetables. Fluctuating and uncertain water supplies remain a major problem for small scale cultivators.

Overall, much of the stress in agricultural development in West Asia has been on improving irrigation by exploiting underground water and building reservoirs, while most of the larger river systems have been harnessed to support agricultural development. Meanwhile, livestock production has expanded enormously, driven by the increasing demand for meat and other

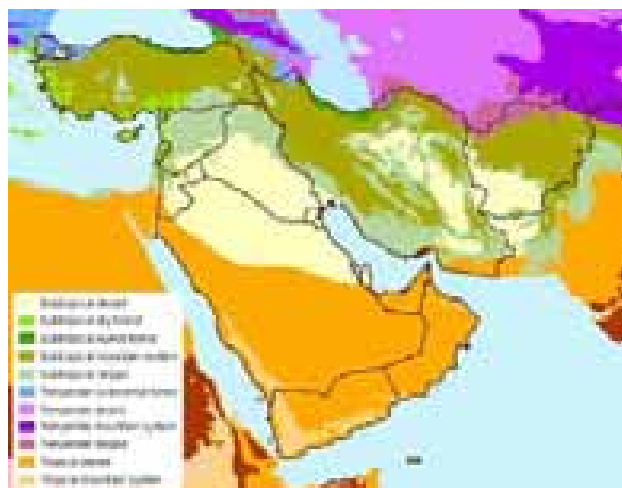
live stock products. Unsustainable agricultural practices and overgrazing combined with unfavourable natural factors have exacerbated land degradation and desertification.

1 CHARACTERISTICS OF FOREST AND TREE RESOURCES

1.1 Ecological characteristics and forest distribution

The main ecological feature of West Asia is the large extent of dry zones, both desert and subdesert, with sparse or no vegetation. Mountains are also extensive and most forests in the subregion are confined to such areas. Steppe vegetation dominated by grass and shrubs covers the drier mountain zones.

The subregion covers mainly tropical and subtropical zones, encompassing subtropical humid forest, dry forest, steppe, desert and mountain systems (Figure on the right). More than half the subregion is covered by tropical and subtropical deserts, with climates characterized by very low rainfall (less than 200 mm annually), hot summers and cool winters. Vegetation is dominated by low, thorny shrubs, providing sparse coverage, but large areas are bare sand with no vegetation.



Source: FRA 2000, FAO

1.1.1 Subtropical humid forests

The climate of the coastal plains and lowlands bordering the south of the Black Sea and the Caspian Sea is warm-temperate with an average annual temperature of about 15°C and rainfall of between 1 500 and 2 000 mm, and altitudes ranging up to 600 m. Although this zone accounts for less than 1 percent of the total land area of West Asia, and despite the relatively small extent of these forests (only about 15 percent of the total forest area of the subregion), they are highly significant inasmuch as they present the most diverse and productive forests in the subregion.

The vegetation consists of mixed deciduous broad-leaved species with varying composition and structure, sometimes with an evergreen under-storey. These forests are rich in endemic and tertiary relic species. The forest canopy consists of various species of oak (*Quercus aegilops*, *Q. castaneifolia*, *Q. infectoria*, *Q. libani* and, in the Caucasus lowlands, endemic species such as *Q. imeretina* and *Q. hartwissiana*), together with *Castanea sativa*, *Pterocarya pterocarpa*, *Diospyros lotus* and *Fagus sylvatica* subsp. *orientalis*, while *Zelkova carpinifolia*, *Carpinus betulus* and some *Acer* species are present in the subcanopy layer. At higher altitudes mixed hornbeam and oak forests (*Quercus iberica*, *Carpinus orientalis*, *Fagus sylvatica* subsp. *orientalis* and *Castanea sativa*) replace this vegetation. Small areas of swamp and fen forests (*Alnus barbata*, *A. subcordata* and *Pterocarya pterocarpa*) occur along riverbanks and estuaries.

1.1.2 Subtropical dry forests

The zone comprising the coastal plain along the Mediterranean Sea and low hills running parallel to the coast has a Mediterranean climate, with mild, humid winters and dry, moderately hot summers. Annual rainfall ranges from 400 to 800 mm. Although it covers

only about 2 percent of the total land area, its forests account for about 25 percent of the forest area of the subregion.

Various types of pine forest are found, with *Pinus pinea* and various species of pine from the *Pinus halepensis* group such as *P. brutia* and *P. eldarica* as the dominant species. Otherwise, Mediterranean woody maquis vegetation predominates in this zone: *Ceratonia* and *Pistacia lentiscus* maquis is predominant in coastal plains up to about 200 m, while *Quercus calliprinos*, *Pistacia palaestina* and *P. terebinthus* maquis is the main vegetation from 200 to 1 200 m. Important tree species include *Quercus infectoria*, *Q. ithaburensis*, *Q. coccifera*, *Laurus nobilis*, *Arbutus andrachne*, *Cercis siliquastrum*, *Juniperus phoenicea*, *Myrtus communis*, *Olea europea*, *Phillyrea spp.* and *Pinus brutia*.

1.1.3 Subtropical steppes

The climate of the subtropical steppes is semiarid, with annual rainfall ranging from 200 to 500 mm. The vegetation consists mainly of low shrubs and grasses, interspersed with sparse trees, particularly in more humid locations. Forest steppes, with trees such as *Amygdalus korsuhinskii*, *A. arabica*, *Acer monspessulanum*, *Pistacia atlantica*, *Pyrus bovei*, *Rhamnus palaestina* and *Crataegus aronia*, are found in higher and more humid areas.

1.1.4 Subtropical mountain systems

The climate in the West Asian mountain systems is extremely varied, both in temperature and rainfall. Winter rainfall is predominant, ranging from 500 to 1 400 mm, while summers are dry and hot. Subtropical mountain systems account for about 25 percent of the total area of the subregion, while their forests represent about 50 percent of the total forest area.

Mediterranean mountain vegetation varies widely, encompassing dense humid forest, shrubland, forest steppe and treeless grass steppe. Forests may be either deciduous broad-leaved or coniferous. In Lebanon and Syria a deciduous oak forest is found between 1 000 and 1 600 m. The forest climax is *Quercus cerris*, accompanied by *Q. boissieri* and fragments of *Q. libani*. In western Turkey, black pine (*Pinus nigra*) dominates this belt. From 1 500 to 2 200 m, there is a subalpine coniferous forest with cedar (*Cedrus libani*), fir (*Abies cilicica*) and juniper (*Juniperus excelsa*), while juniper forest occupies drier areas. Above 2 200 m, alpine dwarf shrubs and meadows occur.

Forest steppe and steppe vegetation occupies large parts of the central highlands and plateaus of Turkey and Iran. Deciduous oak forests are found in humid locations, dominated by *Quercus persica* or other oak species, often in combination with juniper (*Juniperus spp.*), while *Fraxinus oxycarpa*, *Platanus orientalis*, *Ulmus campestris* and various species of *Populus*, *Salix*, *Tamarix* etc. are found in the valleys. Tree steppe with pistachio, almond and juniper occurs in sub-dry locations.

Well-developed forests grow on the higher slopes of mountains bordering the Black Sea and the Caspian Sea, with deciduous dense forests occurring between 800 and 2 000 m. The *Hyrceanian montane* forest is *Fagetea hyrcanica* with *Fagus orientalis*, accompanied by *Carpinus betulus*, *Acer insigne* and *Quercus castaneifolia*, while the *Euxinian montane* forest is composed of deciduous broad-leaved trees and conifers with species of oak, fir and pine.

In Afghanistan, various types of west Himalayan evergreen sclerophyllous forest and woodland are found. *Quercus baloot* woodlands are the most extensive, occurring between 1 300 and 2 000 m. *Quercus dilatata*, *Q. semecarpifolia* and *Cedrus deodara* communities are confined to the higher parts of wet mountains.

1.1.5 Mangrove forests

Mangrove ecosystems are unique and highly productive, and they constitute a critical element in the coastal hydrosphere, with important functions in conserving biodiversity and providing wood and non-wood forest products. They protect coasts and provide habitats, spawning grounds and nutrients for a variety of fish and shellfish, including many commercial species. Mangrove forests are found on the sea coasts of Bahrain, Iran, Oman, Qatar, Saudi Arabia, the United Arab Emirates and Yemen, although Saudi Arabia and Iran account for the majority. The dominant species is *Avicennia marina*, which reaches heights of 2 to 6 m. *Rhizophora mucronata* also occurs occasionally in Saudi Arabia, Iran and Yemen.

Although information is scarce, population pressure in coastal areas has led to the conversion of many mangrove areas to other uses. However, countries have made some effort to protect mangroves. In the United Arab Emirates, some mangrove forests have been protected by fencing the area. This along with regeneration efforts have increased the area from 3 600 ha in 1990 to 4 000 ha in 2000.

1.2 Extent of forests and woodlands

The arid and semiarid climate limits forestry potential and the subregion has never been heavily forested because of its harsh climatic conditions. The total forest area accounts for only 4 percent of the subregion's land area and only 1 percent of the world's forests, corresponding to an average of 0.12 ha per capita. (Average world forest cover is 30 percent, corresponding to an average of 0.65 ha per capita.) The unfavourable climate not only causes low productivity in the subregion's forests, but also makes it hard to re-establish forest vegetation once destroyed.

Of the existing 27.4 million ha of forests in West Asia, five countries account for 88 percent (Turkey 38 percent, Iran 35 percent, Saudi Arabia 9 percent, Afghanistan 3 percent and Iraq 3 percent). Forest cover is over 10 percent in only three countries (19 percent in Cyprus, 13 percent in Turkey and 13 percent in Lebanon), while five countries (Bahrain, Kuwait, Oman, Qatar and the United Arab Emirates) have little or even no natural forest at all.

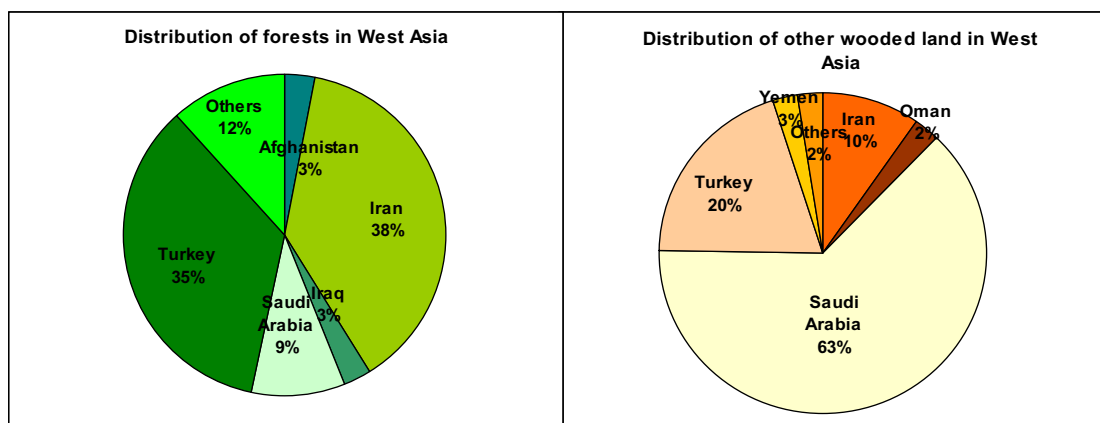
Figure 2 *West Asia Forest and other wooded land*



Source: FRA 2005, FAO

West Asia has more “other wooded land” than “forests”, with a total area of 54.2 million ha, or twice that of forests, representing 7 percent of the world total for wooded land. Saudi Arabia has the largest amount of other wooded land, accounting for 63 percent of the subregional total. Turkey, Iran, Yemen and Oman account for 20, 10, 3, 2 and 2 percent respectively, while the remaining ten countries together account for only 2 percent (Figure 3).

Figure 3 *Forests and wooded land*



Source: FRA 2005, FAO

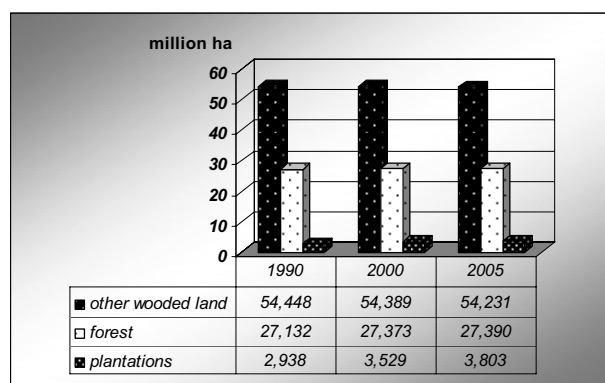
Juniperus is the most widespread genus and is found in almost all the countries of West Asia. *Acacia* is another common genus and is found in all the countries except Iran and Turkey. *Pistacia* is an important genus that is found in Iran, Afghanistan, Turkey, Cyprus, Iraq, Syria, Lebanon and Jordan. *Quercus* is also found in Turkey, Cyprus, Syria, Lebanon, Jordan, Iran and Afghanistan. *Cedrus* is biologically valuable in Lebanon and is also found in Turkey, Syria, Cyprus and Afghanistan. The largest *Pinus* forests are found in Turkey, with growing stock of nearly 700 million m³, and also in smaller quantities in Cyprus, Syria, Lebanon and Jordan. In addition, significant amounts of *Carpinus*, *Fagus* and *Acer* forests are found in Iran and Turkey. The evergreen broad-leaved *Olea europaea* grows in such countries as Jordan,

Lebanon, Syria, Turkey, Saudi Arabia, Yemen and Cyprus. The potential for timber production is negligible except in Turkey.

1.3 Changes in forest cover

Forest cover has been relatively stable over the past 15 years, increasing very slightly, while wooded land has decreased very slightly. However, there is a fundamental problem with the availability and reliability of information. The countries have only limited capacities for regular monitoring and reporting of changes in forest cover and the state of tree growth. Moreover, area figures seldom provide an indication of degradation, which is often a slow and less obvious process.

The slight increase in forest area reflects both afforestation and tree-planting efforts, even if the scale of the latter is limited, and also the natural expansion of forests (for example forest succession on abandoned agricultural land in Cyprus and Lebanon on account of migration to urban areas). Forest plantations account for about 14 percent of the total forests of West Asia, with Turkey having the largest share. Afghanistan is the only country where the forest cover has decreased quite significantly.

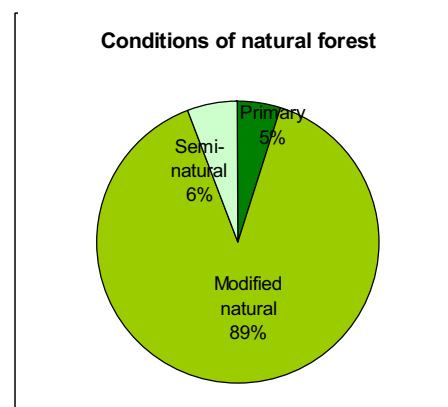


Source: FRA 2005, FAO

country has seen an increase. Subsidized agricultural production for food self-sufficiency has resulted in large-scale agricultural expansion at the expense of rangelands, forests and woodlands.

1.4 Conditions of natural forests and wooded land

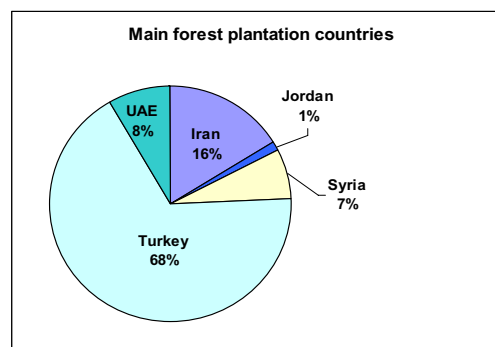
Natural forests can be divided into primary forest, seminatural forest and modified natural forest. Only 5 percent of natural forests in West Asia belong to the primary forest category. Most natural forests and all wooded lands are “modified”. These are forests and wooded land with naturally regenerated native species, where there are clear indications of human activities, such as areas that have been selectively logged-over, areas of natural regeneration following agricultural use or areas recovering from human-induced fires. Semi-natural forests, which are established through planting, seeding or assisted natural regeneration with native species, account for 6 percent.



Source: FRA 2005, FAO

1.5 Extent and functions of forest plantations

Many West Asian countries have made substantial efforts to develop forest plantations. The main species used are eucalyptus, pines (*Pinus brutia*, *P. pinea* and *P. halepensis*), acacias, cypresses, poplars, *Salix spp.*, *Cedrus libani*, *Cupressus sempervirens*, *Quercus calliprinos* and *Pistacia palaestina*. Turkey has also established significant areas of poplar plantations. In most of the Gulf countries, large numbers of date palms can be found in blocks, on cropland and along roads.



Source: FRA 2005, FRA

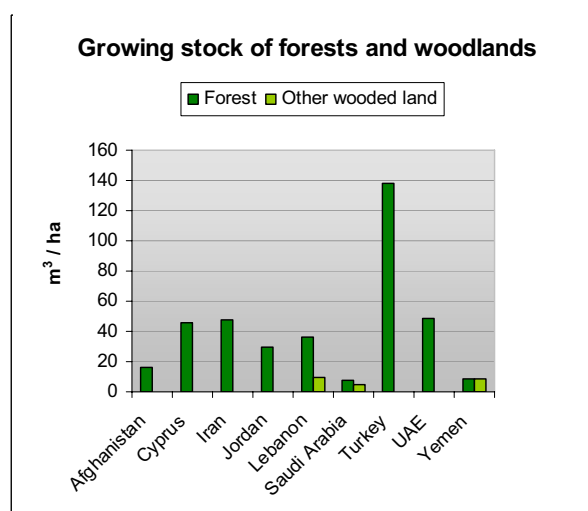
According to FRA 2005 data, West Asian countries have established about 3.8 million ha of forest plantations, representing nearly 14 percent of their total forests. Turkey, Iran, the United Arab Emirates, Syria and Jordan are the top five countries in terms of plantation areas. Plantations represent the entire national forest areas of Bahrain, Kuwait, Oman and the United Arab Emirates, while they account for about half the total forests of Syria and Jordan, and 25 percent of the forest area in Turkey.

Turkey and Iran have the largest areas of forest plantations, and most of these are for timber production. On the other hand, all the forest plantations in the countries with smaller areas of such plantations are used for protection purposes (Annex 8), except in the case of Lebanon, where they are composed mainly of *Pinus pinea* for pine-nut production.

It should be noted that information regarding forest plantations is incomplete. For example, Yemen has a number of forest plantations, but no data on them.

1.6 Productivity of forests and wooded land

The unfavourable environmental conditions and related species composition have contributed to the low productivity of forests and wooded land in West Asia. The productivity of forests and trees can be assessed on the basis of growing stock and increment. Data on growing stock cover only nine countries in the subregion (Figure on the right), but the average growing stock of forests is estimated at 42 m³ per hectare, or less than half the world average of 110 m³. Turkey is the only country in the subregion whose growing stock, estimated at about 138 m³ per hectare, is slightly higher than the world average. Only Lebanon, Saudi Arabia and Yemen have data on woodlands, and growing stock in these areas is less than 10 m³ per hectare.



Source: FRA 2005, FAO

Increment is also low. Turkey is considered to have the most productive forests in the subregion, and the average increment of its forests is 3.15 m³ per hectare, while the average increment of other wooded land is only 0.22 m³ per hectare. The main commercial species in Cyprus is *Pinus brutia*, which constitutes about 60 percent of State forests and 90 percent of growing stock. However, the average annual growth rate is only about 1 m³ per hectare, although *Pinus brutia* can reach large sizes and produce good-quality timber.

Based on the very low growing stock and increment figures, wood supplies are extremely limited in West Asia.

1.7 Fire

Although fire, insects and disease are the main destructive factors threatening the forests and woodlands of West Asia, data on these elements are generally sparse. Fire is the main cause of forest destruction in most of the countries, a situation determined to a large degree by the predominant climatic conditions. Low rainfall, prolonged summers with high temperatures and wind enhances the fire hazard significantly. The forests of the Mediterranean countries of West Asia have been heavily affected by forest fires. Although there is no concrete information on the causes of such fires, it is clear that most of them are of human origin. Forest fires are a recurring phenomenon and have always had a major impact on forests. Between 1995 and 2004, the average area burnt each year in Turkey was about 9 000 ha, or 0.09 percent of the country's total forests. Forest fires are even more severe in Cyprus, with an average of about 1 955 ha burnt each year, or about 1.1 percent of the country's total forests over the same period.

1.8 Insects and disease

The range of forest types in the subregion make it hard to make any general statement on the health of the forests, and some countries produce no reports on the ill-health of trees.

Some of the countries share common tree species and may therefore share pest problems. For example, the European gypsy moth *Lymantria dispar* is a problem in broad-leaved forests in Afghanistan, Iran, Iraq, Syria, Turkey (on *Quercus spp.*, particularly *Q. cerris* and *Q. petraea*) and Lebanon (on *Quercus calliprinos* and *Q. infectoria*), while the brown-tail moth *Euproctis melania* is one of the most destructive defoliators of oak and fruit trees in northern Iraq and southwestern Iran, and is also reported in Turkey. Several species of the pine processionary caterpillar, *Thaumetopoea spp.*, can be a serious pest in pine forests in Cyprus and Lebanon (on *P. brutia* and *P. halepensis*), and in Turkey (on *P. brutia*, *P. pinaster* and *P. radiata*).

In the past few years forest pests have caused extensive damage to forests in Lebanon, and a previously unknown insect (*Cephalcia tannourinensis*, named after the forest where it was first identified) infested and devastated one of the largest cedar forests in Lebanon. The risk of its spreading further was prevented by an intensive and successful control programme.

Pines sometimes become infested with bark beetles, which may result in the death of the trees or branch dieback and reduced productivity. *Pinus pinea* stands in Lebanon are currently

suffering a serious infestation, leading to the death of trees in all the stands. The pest has not yet been identified, but could be a species of *Tomicus*.

Decline and dieback have occurred so extensively in the subregion that a proposal to create an information network is being considered. In 1996, *Juniperus polycarpos* was observed with dieback symptoms in the northern mountains of Oman, and juniper diseases (as yet unidentified) and dieback are currently widespread in the northern border areas between Yemen and Saudi Arabia. In Saudi Arabia, the overall health of *Juniperus procera* woodlands in the Sarawat Mountains is generally considered to be poor, with extensive decline and dieback. In Lebanon, the health of *Juniperus excelsa* and *Abies cilicica* stands is generally considered to be poor, with various forms of dieback and loss of vigour.