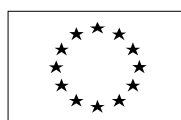


FORESTRY OUTLOOK STUDY FOR AFRICA

SUBREGIONAL REPORT NORTH AFRICA



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**AFRICAN DEVELOPMENT BANK
EUROPEAN COMMISSION
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS**

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Foreword

An in-depth understanding of the evolving relationship between society and nature is a key requirement to identify the current and emerging problems and to devise appropriate responses to address them. It is in this context that FAO in collaboration with other partners and under the guidance of the African Forestry and Wildlife Commission and the Near East Forestry Commission initiated the Forestry Outlook Study for Africa (FOSA). This report on the North Africa subregion is one of the five subregional reports prepared within the framework of FOSA.

This report brings out some of the specific opportunities and challenges confronting the North Africa subregion, especially in view of the low forest cover situation in most of the countries. Fortunately, there is widespread realisation of the importance of forests and trees resulting in concerted action to improve the situation. The effectiveness of these efforts could be enhanced considerably through a better understanding of wide-ranging changes at the global, regional and national levels. This is one of the main areas of enquiry of FOSA. While the demand for wood and wood products will increase in the North Africa subregion resulting in increased imports, the provision of environmental services, especially arresting desertification and improving watershed values, will remain a high priority. The report outlines the critical issues in the next two decades taking into account the various anticipated changes and the priorities and strategies that countries may adopt to enhance forestry's contribution to sustainable development.

While FOSA provides a broad indication of the potentials and challenges and outlines some options, it should be seen as a process of raising the appropriate questions on the future of forests and forestry, and seeking the answers based on a critical analysis of the current and emerging situation. FAO in partnership with the countries and other organizations will continue to strive to support this process taking advantage of the insights provided by FOSA.



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H. Sidhoum, FOSA subregional consultant for North Africa played a key role in compiling and collating information and preparing the draft subregional report. The FOSA Expert Advisory Group has been instrumental in guiding the study in all its stages. In particular H.O. Abdel Nour provided substantial support in guiding the preparation of the North Africa subregional report, including through his involvement in the various meetings and reviewing the draft reports. Comments and suggestions on the draft report provided by M. El Aichouni, A. Aziz, M. Ben M'Hamed, H. Daly, A. Al Fares, Z. El Abdine Ould and M. Saket helped to considerably improve the quality of the report. FAO is grateful to all of the above.

The African Development Bank has been the key partner of FAO in undertaking the study. The subregional thematic studies on driving forces and key issues in forestry in North Africa commissioned by the African Development Bank with financial support from the Swedish Trust Funds formed an important input in preparing this report. The FAO representations in North African countries played an important role in facilitating the preparation of the country outlook papers.

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Abbreviations

ADB	African Development Bank
CBD	Convention on Biological Diversity
CCD	Convention to Combat Desertification
COMESA	Common Market for Eastern and Southern Africa
FAO	Food and Agriculture Organization of the United Nations
ECA	Economic Commission for Africa
EMFTZ	Euro-Mediterranean Free Trade Zone
FNC	Forests National Corporation
FOSA	Forestry Outlook Study for Africa
GDP	Gross Domestic Product
IGAD	Intergovernmental Authority on Development
ILO	International Labour Organization
LPG	Liquefied Petroleum Gas
NWFP	Non-Wood Forest Product
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organization
UNDP	United Nations Development Programme
UNFCCC	United Nations Framework Convention on Climate Change

Executive summary

This report provides an overview of emerging trends in forestry in North Africa in the context of current and probable future economic, social, institutional and technological changes in the subregion. Notwithstanding certain differences, the countries of the North Africa subregion have a number of common features. Almost all of them come under the broad category of low forest-cover countries, and the ecological conditions are such that biomass productivity is very low. In a way this has made the subregion highly dependent on imports to meet the demand for most wood products. Except for Mauritania and the Sudan, the overall economic conditions in the subregion in terms of per capita income and poverty are far better than in other African subregions.

CURRENT SITUATION

In view of the extremely arid conditions of North Africa, the forest resource situation is precarious. Most countries have very limited forest cover and several have less than 1 percent of their land area under forests or woodlands. Furthermore, most forests are open and of low productivity. The major chunk of productive forest is located in the central and southern Sudan and has been subjected to heavy deforestation in the past ten years. Indeed, the Sudan had one of the highest rates of deforestation in Africa, accounting for almost 18 percent of Africa's forest-cover loss between 1990 and 2000.

Considerable efforts, however, are being made to improve the situation, especially by establishing plantations and increasing tree planting efforts outside forests. Most countries have also established a network of protected areas to conserve biological diversity.

In view of the limited productive capacity of its forests and woodlands, the subregion is highly dependent on imports of wood products. Some of the characteristic features of North African consumption are as follows:

- the per capita consumption of roundwood is about 0.38 m³, as against 0.88 m³ for Africa as a whole. Per capita consumption varies between countries, largely reflecting the resource situation;
- woodfuel still accounts for a high proportion of roundwood consumption (about 93 percent). This too varies between countries and reflects the resource situation, and accessibility;
- North Africa imports most of its requirements of sawnwood, panel products, and paper and paper products. The per capita consumption of most of these products is significantly higher than in the rest of Africa, largely reflecting the higher demand stemming from higher income.

North Africa produces a number of non-wood forest products, some of which have been traded on the world market for a long time. However, there have been no significant technological advances to facilitate value addition and develop new products.

The subregion faces very serious environmental problems, especially desertification and increasing water stress. With rising incomes and the resulting possibility of importing wood and wood products, environmental protection will become a key concern for most countries in the subregion.

DRIVING FORCES

The last two decades have seen major demographic, economic, technological, environmental, political and institutional changes in North Africa, and these have affected forests and forestry directly and indirectly and are expected to bring about further changes during the next two decades. While posing new challenges, these changes also open up new opportunities. The main driving forces that need to be taken into account with a view to defining future strategies and actions in the forest sector include the following factors:

- there will be an additional population of 69 million increasing the total to 239 million by 2020, with the majority living in urban centres and increasing the demand for water, construction materials and a better urban environment. More important, governments will be under tremendous pressure to improve employment opportunities, especially as educated unemployment becomes a critical problem;
- there will also be continued pressure on forests, especially in areas where there is still potential for

agricultural expansion. The central clay plains of the Sudan and the Mediterranean coastal uplands will be subject to intense pressure from agriculture and animal husbandry;

- North Africa is economically a very vibrant subregion, characterized by relatively high per capita incomes and high GDP growth rates. This has enabled most of the countries to import forest products and overcome the inherent supply limitations imposed by the arid conditions;
- the extent of poverty is much less than in other African subregions. Most of the economies have diversified, taking advantage of petroleum resources as well as manufacturing opportunities. Their openness has also increased their vulnerability to external shocks, especially changes in oil prices and fluctuations in the global demand for manufactured products. With various regional and global trade agreements becoming effective in the next few years, there could be substantial changes in comparative advantages, which could in turn have a substantial impact on agriculture and rural industries;
- environmental issues, especially water stress and desertification, are expected to become more critical. Degradation of watersheds in the uplands will accentuate the adverse downstream effects as siltation, affecting domestic and agricultural use of water;
- policy and institutional changes are taking place, and there is an increasing recognition of the importance of participatory approaches. The private sector is well established in manufacturing and trade, but less so in forest management. There is also an increasing involvement of civil society in sustainable development in general and forestry and the environment in particular. Public sector forest agencies have also initiated a process of review and change in order to adapt to the changing environment.

All the indications are that these changes may accelerate during the next two decades, creating new challenges and opportunities for the forest sector.

IMPLICATIONS

On account of its low forest cover, the subregion is highly dependent on imports of forest products. Some of the key trends with regard to forests and forestry in the subregion are as follows:

- with forests becoming a less important source of

income and livelihood and with alternative sources of income growing in importance, the rate of deforestation, which was high between 1990 and 2000, is expected to decrease significantly during the next two decades;

- there will be increasing efforts to take up environmental planting, especially in the form of shelterbelts and windbreaks, and to improve the environment in rapidly growing urban areas;
- most forest products, except woodfuel, will be imported. This may be a cheaper option, especially in view of the low productivity and high costs of establishing plantations;
- the dependence on woodfuel is already low because of the availability of alternative sources of energy, especially oil and natural gas. However, wood is likely to remain as an important source of energy, especially for those whose access to commercial fuels is limited;
- rapid urbanization in the subregion means that the construction sector is expected to grow considerably, which will increase the demand for sawnwood;
- the North Africa subregion is a highly water-stressed area, and conserving and improving water supplies will be the most critical issue in the next two decades.

PRIORITIES

Key priorities of the forest sector for the next two decades would be:

- environmental protection; and
- poverty alleviation.

There is an urgent need to step up efforts to:

- protect catchments in the uplands in order to ensure improvement in the quality and quantity of water supplies (in Algeria, Morocco, Tunisia and the Sudan);
- arrest desertification and consequent land degradation, such action to include the protection of agricultural areas and human settlements; and
- improve the productivity of degraded agricultural areas, including those affected by salinity and waterlogging.

Poverty alleviation should particularly focus on increasing the supply of basic-needs goods such as woodfuel and fodder, as well as enhancing employment opportunities through skill-intensive small and medium enterprises, especially furniture-making and the processing of non-wood forest products.



Much of the emphasis in accomplishing the above will be directed at providing an effective policy and legal framework, and improving institutional arrangements. Forestry needs to be integrated into the activities of all other land-using sectors. Institutional improvements should focus on defining and increasing the space available for action to the various stakeholders. The roles and responsibilities of the various actors - public sector, private sector, community organizations and civil society - should be clearly defined and recognized, focusing specifically on:

- revitalization and strengthening of the public sector to play an effective regulatory role and guide policy development;
- support for the development of a vibrant private sector by creating a favourable competitive environment and, more important, ensuring transparency in the market place;

- empowerment of community organizations to undertake grassroots action to fulfil the needs and aspirations of the people, in collaboration with other actors; and
- strengthening of civil society organizations to play a proactive role so that transparency and public accountability become integrated into the functioning of all institutions.

In pursuing the various objectives and strategies, there are immense opportunities for:

- improving regional and subregional collaboration, especially in research and technology development and in the form of joint programmes in such areas as watershed protection and desertification control; and
- wider adoption of developments in information and communication technology, especially in order to improve access to knowledge and thus enhance opportunities for the disadvantaged.

Introduction

BACKGROUND

The Forestry Outlook Study for Africa (FOSA) is a long term assessment of the forestry situation in Africa initiated by the African Forestry and Wildlife Commission and the Near East Forestry Commission to identify emerging opportunities and constraints in enhancing the contribution of forestry to sustainable development. As globalization results in increased economic integration, it is essential to develop appropriate responses to the rapidly changing context. Against this background, the Food and Agriculture Organization of the United Nations (FAO) was called upon to support and coordinate the present study. This report on North Africa is one of six reports produced as part of FOSA.

OBJECTIVES OF THE STUDY

The overall objective of FOSA is to examine the status and trends in forests and forest management, evaluate likely changes, taking into account important factors affecting forests, and assess what the forest sector will look like by 2020. The main outputs of FOSA include one regional overview report and five subregional reports providing an in depth assessment of the outlook for forestry in each of the five subregions. The focus of the reports is to identify the likely impact of various factors on forests and forestry, and to assess the ability of the forest sector to provide the goods and services that society requires in the next two decades. The present report, covering the North Africa subregion, examines current trends in forests and forestry and the outlook for the sector in the context of the wide ranging changes taking place within and outside the subregion.

SCOPE AND COVERAGE

The present report covers seven North African countries (see Box 1), which form one block and have a number of common features, despite certain differences.

FOSA PROCESS

FOSA is a highly participatory initiative, involving all the countries and key organizations in the subregion.

BOX 1

NORTH AFRICA SUB REGION

For the purposes of FOSA, the following countries constitute the North Africa Sub region: Algeria, Egypt, Libyan Arab Jamahiriya, Mauritania, Morocco, the Sudan and Tunisia.



To facilitate input from countries, each one nominated a national focal point, who, with the help of a working group, produced a country FOSA paper. A baseline study on population, income and forest resources provided the background. Subregional meetings were held at the outset to plan the FOSA process and later to review the main findings of the country reports¹. Most of the coordination and preparation of the draft subregional report was undertaken by a consulting expert from the subregion². In support of this effort, the African Development Bank, through the Swedish Trust Fund, contracted ORGUT Consulting AB of Sweden to prepare two thematic papers, one on factors affecting the forest sector and the other on key

¹ The FOSA planning meeting for North Africa was held in Hammamet, Tunisia (23-25 November 1999), and the subregional technical review meeting in Carthage, Tunisia (18-20 October 2000).

² Efforts in the North Africa subregion were coordinated by Hayeth Benramdane Sidhoum, whose report forms the basis of this subregional report.

issues in forestry. The drafts of these reports were presented and discussed during a regional technical review meeting held in Addis Ababa from 17 to 19 September 2001. A revised version of the North African subregional report was presented to the Near East Forestry Commission during its fifteenth session held at Khartoum, Sudan in January 2002. The present report incorporates the comments received from the members of the commission and other reviewers.

Technical guidance for the FOSA process was provided by an advisory group consisting of experts from Africa. An internal advisory committee coordinated FAO in house support for the study.

STRUCTURE OF THE REPORT

Chapter 1 describes the background, objectives, scope and overall approach to the study, while chapter 2 provides an overview of the forestry situation in the subregion, focusing on the state of forests and the flow of goods and services. Chapter 3 discusses the main factors stimulating change and how they could alter the path of development in the forest sector. Chapter 4 explores alternative scenarios, specifically focusing on how the various actors respond to changing opportunities. Chapter 5 discusses forestry issues in the subregion, on the assumption of continuation of the business-as-usual situation. Priorities and strategies to be adopted in order to enhance the contribution of forestry to sustainable development are given in chapter 6. Chapter 7 summarizes the main findings and conclusions.

Forests and forestry in North Africa: trends and current situation

A key feature of North Africa is its extreme aridity and attendant low biological productivity. In comparison with other subregions, it faces considerable ecological limitations on account of its arid and semi-arid conditions. Except for the central and southern provinces of the Sudan and the uplands of the Atlas Mountains along the Mediterranean coast, most of the subregion is dry and desertic. Human habitation and agriculture are critically dependent on water availability, especially from the rivers Nile (for the Sudan and Egypt) and Senegal (for the southern part of Mauritania). The extensive Sahara Desert is the most conspicuous geographical feature of the subregion. The Nile, the Mediterranean coast and the Sahara Desert together form the key determinants of life, linking the history, culture and economic and social development of the countries in the subregion.

FOREST AND TREE RESOURCES IN NORTH AFRICA

Severe ecological conditions limit the extent of forests in the North Africa subregion, although scattered trees and bushes occur widely. Forests and woodlands are primarily found in two distinct zones, one along the Mediterranean coast and the other in the central and southern Sudan. The Mediterranean forests are dominated by species such as *Quercus suber*, *Q. faginea*, *Q. ilex* and *Pinus pinaster*. Further inland, the main species are *Tetraclinis articulata*, *Quercus ilex* and *Pinus halepensis*. In many places, these forests are replaced by scrubland characterized by the same species. *Cedrus atlantica* forests take over above 1600 m. In the drier areas of the south, a pseudo-steppe shrubland of *Juniperus phoenicea* is gradually replaced by *Juniperus thurifera* forest at higher elevations. These vegetation types gradually give way to barren land. Ninety four percent of the 6 million km² area of Algeria, Egypt, Libyan Arab Jamahiriya, Morocco and Tunisia is desert.

Desert landscape also covers a large part of Mauritania and the northern part of the Sudan. Below the desert zone, scattered woodland appears in the central Sudan, becoming increasingly denser and

more varied in the south under the effects of higher rainfall. In the southern Sudan, shrubland and wooded savannah, dominated by *Acacia spp.*, *Sclerocarya birrea*, *Terminalia laxiflora* or *Prosopis africana* and *Tamarindus indica*, gradually take over, eventually giving way to forests in mountainous or tropical zones.

The natural vegetation of North Africa is sparse with limited species diversity. Periodic drought affects ecosystem stability and the regeneration of trees and shrubs. Human pressure on natural resources also affects forest cover. The potential for timber production is limited, except in a few areas. Woodfuel, non-wood forest products and fodder are the main products of the subregion's forests and woodlands.

Forest cover

A key feature of the subregion is its very low forest cover, accounting for only 7 percent of the total land area, as is shown in Table 1.

The figures in Table 1 have been adjusted to take into account variations in the definitions used in the different countries and are therefore not exactly the same as those in the country databases (see Box 2). As may be seen from Table 1, there is considerable variation in forest cover between the different countries. Almost 90 percent of the forests and

TABLE 1
Forest resources in North Africa in 2000

Country	Total land area	Natural forest	Forest plantation	Total forest	
	(000ha)	(000ha)	(000ha)	(000ha)	(%)
Algeria	238 174	1 427	718	2 145	0.9
Egypt	99 545	0	72	72	0.1
Libya	175 954	190	168	358	0.2
Mauritania	102 522	293	25	317	0.3
Morocco	44 630	2 491	534	3 025	6.8
Sudan	237 600	60 986	641	61 627	25.9
Tunisia	16 362	308	202	510	3.1
Total North Africa	941 387	65 695	2 512	68 206	7.2

Source: FAO, 2001a.

BOX 2

FOREST COVER IN NORTH AFRICA

“These findings (relating to forest cover under FRA 2000) are based on FAO definitions on forests and trees. At the national level, however, other vegetation components are reported as forest cover. Shrub formations of garrigue and maquis, without a tree layer, are widespread. They consist of two main groups of species. The first includes shrubby species that, under all edaphic and climatic conditions, remain below tree size when mature The second group consists of species that are dwarfed because of soil and climatic unsuitability.

The area of garrigue and maquis is estimated at 1 249 640 ha in Morocco, 1 662 000 in Algeria and 328 000 ha in Tunisia.”

(FAO, 2001a)

woodlands resources in the subregion are found in the Sudan, which has nearly 26 percent of its land area under forests, whereas forest cover is less than 10 percent in all the other countries. In Algeria, Egypt, Libya and Mauritania, which together account for about 65 percent of the subregion's land area and support a population of over 108 million, forest cover is less than 1 percent. This low forest cover has important consequences for the strategies to meet the growing demand for forest products and environmental services.

Most North African forests are categorized as open forests³, while the extent of closed forests⁴ is about 20 million ha. About 85 percent of the closed forests are found in the Sudan, particularly the south, but even in the case of the Sudan, most formations in the more populated central and northern regions are open forests. The unbalanced distribution of population in terms of forest resources has important consequences for the future strategy of forestry development.

Forest cover changes

Although the forest cover in North Africa is low, the subregion as a whole has a very high rate of deforestation. Table 2 indicates the forest cover change in the various countries and where the subregion stands in the regional context.

³ An open forest is defined as a formation with a discontinuous tree layer, with canopy coverage of 10 to 40 percent.

⁴ A closed forest is defined as a formation where trees in the various storeys and the undergrowth cover a high proportion (> 40 percent of the ground) and there is no continuous dense grassy layer.

TABLE 2
Forest cover change in North Africa 1990 – 2000

Country	Forest cover in 1990 (000 ha)	Forest cover in 2000 (000 ha)	Annual change (000 ha)	Annual change Rate (%)
Algeria	1 879	2 145	27	1.3
Egypt	52	72	2	3.3
Libya	311	358	5	1.4
Mauritania	415	317	-10	-2.7
Morocco	3 037	3 025	-1	ns
Sudan	71 216	61 627	-959	-1.4
Tunisia	499	510	1	0.2
Total North Africa	77 515	68 140	-937	-0.94
Africa	702 502	649 866	-5 262	-0.80

Source: FAO, 2001a.

Although North Africa has only about 10 percent of the continent's forest cover, it accounts for about 18 percent of its net forest-cover loss, most of the deforestation being in one country, the Sudan, which has the highest deforestation rate in Africa.

A comparison of forest-cover changes provides some interesting features. A reversal of the trend in deforestation is seen in Algeria, Libya, Egypt and Tunisia, while Mauritania, Morocco and the Sudan continue to lose forests. Most of the countries where deforestation has been reversed are those whose dependence on land has fallen on account of diversification of their economies. This is not the case with countries still experiencing deforestation. Most critical is the situation in the Sudan, which has most of the forests in the subregion but has very extensive deforestation on account of the following factors:

- almost all the forests are found in the country's central and southern regions, where the better climatic conditions facilitate alternative uses;
- agriculture remains the mainstay of the economy. During the 1980s and 1990s there was a rapid expansion of rain-fed mechanized cultivation with the aim of attaining self-sufficiency in food production. Large scale mechanized farming has been the main factor contributing to deforestation.

In all the countries forest cover has decreased to such an extent that there is now widespread awareness of the need to prevent further deforestation as well as to undertake reforestation. However, it has to be borne in mind that some of the forests on the Mediterranean coast are in densely populated areas where the local communities are still dependent on land. This makes protection of the forests rather difficult, especially in areas adjoining habitations.



Management of natural woodlands

While enhancement of the environmental benefits has been one of the primary objectives of forest management in most North African countries, considerable experience also exists in managing forests sustainably for their productive functions. In some countries, such as the Sudan, initiatives for the systematic management of forests are almost a century old. The sunit (*Acacia nilotica*) forests along the banks of the Nile in the Sudan have been under management for a long time, mainly to produce sawnwood, including railway sleepers. Most other woodlands are managed for the production of firewood and charcoal. The increasing domestic availability of commercial fuels, such as LPG and kerosene, is altering the situation, so that the objectives of management may need to be reviewed. Another major objective of management, especially in woodland dominated by *Acacia senegal*, is the production of gum arabic. Forests in the southern Sudan had a long history of management, including reforestation with valuable species such as teak. Forestry was a key sector for economic development and an integrated approach was adopted in several areas, as in the case of the Imatong Mountains. Unfortunately, civil war has disrupted all forestry activities in the southern Sudan.

The extent of forests and woodlands under management varies in the Mediterranean countries. In Algeria about 28 percent of the forest area (or about 597 000 ha) is under management. The proportion reportedly under management plans in Tunisia and Morocco is 78 percent and 80 percent respectively, although more precise information is unavailable on the qualitative aspects of management plans and issues like long term sustainability. Almost all these

forests are under public sector management. Some efforts are under way to facilitate community involvement, but government control is seen as important in view of their protective functions. Conflicts between meeting local needs and fulfilling wider national needs therefore persist and much of the effort to date has focused on the enforcement of legal stipulations. Grazing, fire and illegal harvesting are the most important problems affecting forests and woodlands in North Africa (see Box 3).

Reforestation and afforestation

The fact that most countries in the subregion have very low natural forest cover has encouraged considerable reforestation and afforestation efforts, mostly focusing on the protective functions of forests and trees. National reforestation policies have been instituted to address soil erosion and reduce human pressure on tree resources in North Africa. In Tunisia, a decree encouraging tree planting dates back to 1886; reforestation has been in full swing since 1956, and 202 000 ha of trees have so far been planted. Algeria has planted the largest area, with 718 000 ha, of which 40 000 ha are eucalyptus and 48 000 ha are pine. The Green Barrier is a testimony to these efforts (see Box 4).

Almost two-thirds of the total planted area of 2.3 million ha in the Maghreb region consist of

BOX 3

FOREST FIRES IN NORTH AFRICA

Forest fires are a great threat to forest resources despite efforts to limit their negative impact. In Algeria, the number of fires recorded in the forest domain varies from year to year. The lowest number recorded during the past 15 years was 562 fires and the largest 2 322 with an average of 256. The average area affected by fire each year over the same period was estimated at 37 917 ha or 1.8 percent of the national forest cover. Over the same period Tunisia recorded 134 fires with an average impact of 1 763 ha per year, which accounts for 0.4 percent of the nation's forest cover.

(FAO, 2001a)

BOX 4

THE GREEN BARRIER, ALGERIA

The Green Barrier, located in the Saharan Atlas in Algeria, is an example of a North African afforestation programme. This programme established 86 909 ha of plantations to act as a screen against the advancing desert. Unfortunately, many errors were made in the tree planting process. In particular, young, unmotivated and unskilled workers were involved in the planting, often under difficult conditions, including intense heat. Local people were not consulted regarding the project and land was confiscated from livestock breeders, leading to many acts of vandalism. Monocultures of Aleppo pine (*Pinus halepensis*) were planted, sometimes in extremely arid conditions, and vast areas were decimated by insect attack.

Today, various forest services have assumed management responsibilities for the Green Barrier. The project will gradually be integrated into broader rural development schemes (Goussanem, 2001). The essential objectives will be to conserve natural resources while restoring balance to the vast areas involved.

(Sidhoum, 2001)

Eucalyptus spp., pines and *Thuja spp.* Additional species are also planted to produce raw material for local industries and construction material. Fairly large areas in Algeria are planted with *Quercus suber*, which produces cork to supply raw material for the country's industries. *Thuja* accounts for almost half the total plantation area in Morocco. In the Sudan, *Acacia senegal*, the source of gum arabic, is one of the main species planted.

By and large, all forest plantations in North Africa, except those on farmlands, were established by the public sector. In spite of substantial investment, these plantations have not always yielded the results expected, often as a result of poorly adapted techniques, lack of maintenance or unfavourable soil or climatic conditions. In recent years, efforts have been made to increase community participation in tree planting schemes. Environmental planting is often undertaken as a collaborative effort involving various agencies (see Box 5). As yet, there are no real incentives to attract private sector interest in establishing commercial plantations, on account of the high costs and the inherent low productivity. An exception to this general trend, however, can be seen in the Sudan, where conditions are more favourable for growing trees. Undertakings such as the Kenana Sugar Company have already raised nearly 3 000 ha of irrigated eucalypt plantations, and there are plans to

expand the area in order to produce raw material for fibreboard production.

Trees outside forests

In the Mediterranean area of North Africa, substantial tree resources exist outside forests, especially olive and fruit trees in agricultural fields. In the arid areas of the Maghreb region, olive trees are an integral part of agroforestry systems, providing economic benefits and environmental services. These benefits are recognized by farmers and society as a whole. In some countries each olive tree is identified and registered and in some cases prior permission is required to cut down old trees and to prune the branches.

Establishment of windbreaks and shelterbelts around farmlands is a standard farming practice in most areas of North Africa. The importance of windbreaks and shelterbelts in protecting croplands against desiccating winds and sand deposition is well understood. Multiple use trees such as date palm and doum palm are cultivated extensively in many countries. There are several policy and legal provisions stipulating the integration of trees into agricultural areas. For example, legislation in the Sudan requires that trees be retained on at least 10 percent of areas under rainfed cultivation. This is to prevent the total clearance of woodland in the process of expanding mechanized farming. The Sudanese Forest Act also stipulates the setting aside of at least 5 percent of the area of irrigated farms for tree cultivation. Most agricultural schemes have established plantations partly in response to this legal requirement. The main species raised in these schemes are *Eucalyptus spp.*, primarily to meet the growing demand for poles and construction material.

Municipal planting to improve the urban environment has gained considerable emphasis in recent years (see Box 6). Much attention has been given to establishing green belts around urban centres, although there are also instances of encroachment on these belts (for example in some parts of the Khartoum green belt) to accommodate rapid and often unplanned urban expansion.

Apart from such government-sponsored efforts, there are also significant community-level initiatives in terms of tree planting, especially to improve the local environment. Many villages in North Africa have extensive areas of trees that provide shade, fodder and woodfuel. Some tribes such as the Housa,

BOX 5

EGYPT - AFFORESTATION AND FORESTRY ACTION PLAN

A national afforestation and forestry action plan has been developed in Egypt to assist in preventing soil erosion, re-establishing the natural balance between soil and vegetation cover, curbing air pollution, protecting cultivable land and human settlements from floods, and combating desertification. The plan is carried out mainly by the Ministry of Agriculture, the Ministry of Irrigation, the General Authority for Roads and Bridges, the Ministry of the Environment and local administrative authorities. The general programme includes:

- planting trees along freshwater and drainage canals, highways and streets;
- expanding man-made forests in newly reclaimed areas;
- establishing protective green belts around large cities and ring roads;
- stabilizing sand dunes in coastal and inland areas; and
- improving environmental conditions and ultimately combating desertification.

(Riad, 2000)

BOX 6

URBAN PLANTING IN NOUAKCHOTT, MAURITANIA

An arboretum was added to the 5th March Park of Nouakchott for the educational and recreational benefit of local citizens. The project was made possible by national agencies such as the Secretariat of State for Women and international organizations such as the United Nations Children's Fund. However, this initiative is one of few actions taken to raise awareness of local species and the environment, especially among students. Public parks are generally not maintained and most people do not care if they are preserved. Many urban stands of trees have thus been neglected, polluted and degraded by livestock.

This is the case with the SOCOGIM PC park (Ksar District, Nouakchott), where *Prosopis juliflora* trees were planted for shade and beauty. Stagnant water, bad smells and mosquitoes plague the area and have led local residents to clean it up by cutting down the trees.

(Selme, 1999)

long settled in the Sudan, have perfected the cultivation of neem on homesteads. All this indicates that communities are fully aware of the significance of trees and under appropriate conditions take the necessary initiative and leadership in planting and protecting trees.

People's participation in tree planting in Northern Africa has been significant. For example, approximately half of all the trees planted in Egypt belong to the individuals. Of all the trees under five years old, 13.2 million belong to private citizens, while 12.7 million are owned by government agencies. This does highlight the care that people, especially those who live in rural areas, give to increasing their potential wood supplies.

SUPPLY OF FOREST PRODUCTS

Considering the low forest cover and low productivity, it is not surprising that the subregion is on the whole a wood deficit area with a high dependence on imports. This is particularly the case for industrial roundwood and other processed items such as sawnwood, panel products, and paper and paper products. The overall situation as regards the production and consumption of various products is outlined below.

Woodfuel production and consumption

In 2000, the North Africa subregion consumed about 64.5 million m³ of roundwood or approximately

0.38 m³ per capita. Almost 93 percent of this was used as woodfuel, indicating the continuing significance of woodfuel in the subregion's forest sector. Table 3 gives an indication of the differences between the North African countries as regards roundwood consumption and the proportion that is used as woodfuel.

TABLE 3
Consumption of roundwood and woodfuel in North African countries – 2000

Country	Industrial roundwood (000 m ³)	Woodfuel (000 m ³)	Total roundwood (000 m ³)	Proportion of woodfuel (%)	Woodfuel consumption (per capita)
Algeria	490	8 444	8 934	94	0.278
Egypt	452	18 855	19 307	98	0.295
Libya	120	1 023	1 143	90	0.185
Morocco	970	7 683	8 653	89	0.268
Mauritania	6	1 865	1 871	100	0.698
Sudan	2 173	19 719	21 892	90	0.664
Tunisia	232	2 492	2 724	91	0.260
Total North Africa	4 443	60 081	64 524	93	0.352
Africa	63 655	635 116	698 771	91	0.796

Sources: FAO, 2002; Broadhead *et al.*, 2001.

Some major observations can be made regarding the overall pattern of wood consumption in North Africa:

- the overall consumption of roundwood in North Africa is far less than that of the rest of Africa. In 2000 the per capita consumption of roundwood in North Africa was about 0.379 m³, whereas for Africa as a whole it was about 0.876 m³, or 231 percent that of North Africa. While comparing industrial roundwood consumption, it must be noted that North Africa imports a large quantity of finished products, so that the consumption of roundwood per se tends to be lower;
- in both North Africa and Africa, most wood is used as woodfuel, but North Africa's per capita woodfuel consumption is about 44 percent that of the region as a whole;
- there are considerable differences in per capita woodfuel consumption between the countries in North Africa, largely reflecting the state of availability of woodfuel as against alternative fuels.

Dependence on woodfuel is falling in most countries because of the availability of commercial fuels such as kerosene, LPG and electricity. This is particularly the case with the oil-producing and oil-refining countries. In recent years, even the Sudan has been able to switch to commercial fuels,

to such an extent that the income of the Forests National Corporation from the sale of woodfuel has fallen. All the indications are that decreasing supplies and increasing opportunities for fuel switching are likely to reduce the demand for woodfuel. There is, however, some increase in the use of charcoal, especially as the type of cooking changes in response to changed social and economic status.

Most woodfuel production and use take place in the informal sector. In most countries there is a well-organized network of producers, transporters, wholesalers and retailers supplying woodfuel to urban consumers. Much of the charcoal production is undertaken by seasonal migrant labour. Given the conditions under which charcoal is produced, including the skills and technology available to the producers, the technique adopted is often cost-effective. The key concern, however, is the long-term sustainability of production in view of the rapid depletion of resources in the subregion.

Industrial roundwood

In 2000, the total consumption of industrial roundwood in North Africa was about 4.4 million m³, 60 percent of its production being accounted for by the Sudan.

Table 4 provides an indication of the overall pattern of industrial roundwood production and consumption within North Africa and Africa as a whole. Some of the salient features of consumption are as follows:

- North Africa accounts for about 7% of the total industrial roundwood consumption. In per capita terms, it is only about one third of the average African consumption;
- the gap between production and consumption is

TABLE 4
Production and consumption of industrial roundwood – 2000

Country	Production (000 m ³)	Consumption (000 m ³)	Consumption per capita (m ³)
Algeria	451	490	0.016
Egypt	268	452	0.007
Libya	116	120	0.023
Morocco	569	970	0.032
Mauritania	6	6	0.002
Sudan	2 173	2 173	0.070
Tunisia	214	232	0.025
Total North Africa	3 797	4 443	0.026
Africa	68 826	63 655	0.080

Source: FAO, 2002.

accounted for by imports, which are estimated at about 15 percent of consumption, although this does not account for the imports of finished products, which are quite substantial.

Increasing industrial roundwood supplies is a concern in several countries. A forest resource assessment in Tunisia indicates that plantations could satisfy a large part of its domestic demand for roundwood. However, inadequate forest management practices produce poor stands with generally small, cracked logs, as in *Pinus spp.* plantations in the Maghreb region. This material is unlikely to be used as sawnwood and may therefore be converted into chips and other items. The main source of imports has been Eastern Europe, and increasingly Central Africa is becoming an important source of supply.

Sawnwood and other products

The extent of North Africa's import dependence becomes evident with regard to value-added products. Table 5 provides an overview of the pattern of consumption of sawnwood and other forest products, the extent of import dependence and a comparison of North African and regional consumption.

Concerning the pattern of forest products importation, some key observations can be made:

- about 96 percent of the sawnwood consumed in North Africa is imported. Egypt, Algeria, Tunisia and Morocco account for most of the imports, with Egypt alone accounting for 54 percent of the subregion's sawnwood imports. Morocco and the Sudan are the largest sawnwood producers in the subregion;
- a substantial proportion of wood based panels, paper and paperboard, and printing and writing paper is also imported;

TABLE 5
North Africa – Production, importation and consumption of forest products in 2000

Product	Production	Imports	Exports	Consumption	Consumption (North Africa) per capita	Consumption (Africa) per capita
Sawnwood (000 m ³)	202	3 926	20	4 108	0.024 m ³	0.013 m ³
Wood-based panels (000 m ³)	321	501	20	802	0.005 m ³	0.003 m ³
Paper and paperboard (000 tonnes)	599	1 146	33	1 712	10.0 kg	5.0 kg
Printing and writing paper (000 tonnes)	113	380	4	489	2.9 kg	1.8 kg

Source: FAO, 2002.

- North Africa's per capita consumption of high value-added products such as wood based panels, paper and paperboard, and printing and writing paper is significantly higher than that of the rest of Africa.

Despite limited wood resources, North Africa has an active forest industry that includes both family-owned, small-scale private enterprises and large, state run complexes. Overall, the wood-processing industry is operating far below its potential capacity. For example, the particle-board industry operates at only about half its capacity, partly because of the high cost of raw materials in North African countries. Although plantations such as those in Tunisia and Morocco have helped to increase domestic raw material supplies, all the countries in the subregion must at present rely on imports to satisfy their demand for most forest products.

In Algeria the public sector runs about 50 processing plants, with more than 40 employees each, which can process approximately 1 million m³ of raw material per year. The residue from sawmills, which are largely supplied with imported wood, provides about 70 percent of the raw material used by the particle-board industry. Local wood supplies the remaining 30 percent. There are 13 pulpmills in Algeria, producing about 70 000 tonnes of pulp annually, using recycled paper as well as 10 000 tonnes of alfa grass per year. In Egypt, the furniture industry relies largely on imported wood.

As a result of a shortage of timber, the local boat-building industry is on the brink of closure in several countries. Apart from the shortage of raw materials, the long term potential of such enterprises is limited on account of the changing demand pattern. In general, the sector is characterized by small units and inefficient operations. However, no radical changes in the industry are expected, since such units are often sustained through direct and indirect support from governments in order to fulfil social objectives such as rural employment.

Furniture-making is another important industry that is well established in some of the countries in the subregion. There is a growing demand for quality wooden furniture in response to the growth of income and change in life-styles. With access to technology, design and markets, and relatively low wages, there is considerable potential for further expansion of furniture-making.

Non-wood forest products

North Africa has a long history of production and processing of a variety of non-wood forest products such as aromatic and medicinal oils, as well as ointments, fruits, flowers, honey, gums and bark. Some of them, such as gum arabic, are known to have been traded for centuries and form an important source of livelihood for local communities. Table 6 provides an overview of the major non-wood forest products of the subregion.

TABLE 6
Important non-wood forest products from North Africa

Country	Main non-wood forest products	Selected statistical data available
Algeria	Cork (<i>Quercus suber</i>)	Annual production of 6 000 tonnes extracted from 460 000 ha of cork forests
Egypt	Essential oils, medicinal plants, honey, fruits	Annual exports of 11 250 tonnes of medicinal plants worth US\$12.35 million in 1992-1995
Libya	n.a.	n.a.
Morocco	Cork, medicinal plants, aromatic plants	n.a.
Mauritania	Fruits, fodder, gums, medicinal plants	Exported 6 850 tonnes of medicinal plants worth US\$12.85 million in 1992-1995
Sudan	Gums, fodder, fruits, medicinal plants, honey, wax, bushmeat	Main producer of gum arabic (<i>Acacia senegal</i> and <i>A. seyal</i>) Exported 17 759 tonnes in 1996-1997
Tunisia	Fodder, aromatic plants, cork, alfa grass (<i>Stipa tenacissima</i>)	Annual production of 10 000 tonnes of <i>Pinus halepensis</i> seeds

Source: Walter, 2001.

Cork and gum arabic are the most important traded non-wood forest products. The Sudan is the largest producer and exporter of gum arabic, with annual production varying between 20 000 and 45 000 tonnes in the past ten years. The main source of gum arabic is the hashab tree or *Acacia senegal*. Gum is also produced from *Acacia seyal* (talh), but this is inferior to hashab gum. In the Sudan, gum arabic farming contributes both to local incomes and to the national budget on account of the export market⁵. Gum arabic cultivation is well integrated into the local farming system (see Box 7), although this is undergoing changes in response to changing markets and policy

⁵ Gum arabic was one of the most important export items, earning valuable foreign exchange for the Sudan, especially until 1999 when the country started exporting petroleum products. Gum arabic accounts for about 17 percent of the value of all Sudanese exports, and the Sudan produces over 80 percent of the world's gum arabic. Since there are no effective natural substitutes for gum arabic, a critical ingredient in soft drinks, the Coca-Cola company was forced to secure an exemption from US sanctions against the Sudan in 1997 in order to maintain access to this important product.

BOX 7

GUM ARABIC MANAGEMENT - THE SUDANESE EXPERIENCE

One of the best examples of gum arabic management is in the Kordofan region of the Sudan, where this crop has historically been cultivated. In the gum belt, the hashab bush fallow system of land management is based on a rotation cycle. The gum trees in this case replace the forest fallow and are part of the agricultural rotation, which includes 4 to 5 years of agricultural production (with millet, groundnut, sesame or peas) followed by 15 to 20 years of hashab cultivation during the fallow period.

At the beginning of the agricultural rotation, when the gum trees are 15 to 20 years old and gum production has decreased, the farmers cut back all the gum trees to 1.50 m. The ground is cleared and fire is sometimes used to destroy the woody vegetation to facilitate cultivation. At the end of the agricultural cycle, gum trees are re-established either through natural regeneration or seeding. After a few years, the farmers can start to collect the gum. This system relies on the fact that each farmer owns the trees and the land.

(Based on Sall, 1997)

and institutional environments. Gum arabic finds wide-ranging applications as a fixative in drinks, pharmaceuticals and a variety of other products. Notwithstanding the dominant role of the Sudan as a global leader in its production, there has been very little effort to undertake downstream processing, other than the production of spray-dried gum.

Cork is also a product in great demand on international markets. Algeria, Morocco and Tunisia have 33 percent of all cork forests. Morocco has 10 factories, with a capacity to produce up to 18 000 tonnes of cork per year. However, cork production is limited, because stands are degraded and prices are low. Other non-wood forest products of major socio-economic importance in North Africa are medicinal and aromatic plants such as *Thymus spp.*, *Laurus nobilis* and *Rosmarinus officinalis*. Egypt and Morocco are among the leading exporters of these species worldwide and also the foremost African exporting countries of medicinal plant material. Collection of these products has intensified and the traditional knowledge relating to their use is drawing greater attention.

Forests and woodlands also form an important source of fodder for the large numbers of livestock - cows, sheep, goats and camels - that are a vital component of the economy of North African

BOX 8

FORESTS, FODDER AND SURVIVAL OF LIVESTOCK IN MOROCCO

During periods of drought, national livestock suffers heavy losses in number, but a study revealed that in the vicinity of forests mortality is reduced by two-thirds compared to that in unforested areas. Forests through NWFP - here fodder - relieve hunger and save livestock. In Morocco, after a drought period, about 50 percent of surviving animals are saved due to forest stands, which meet 40 percent of fodder needs per year.

(Ellatifi, 2000)

countries. The importance of forests and woodlands is particularly critical during periods of drought, and availability of and access to fodder from woodlands determine the survival of livestock at such times (see Box 8). In Morocco, woody vegetation provides 17 percent of the food consumed by livestock. However, the livestock woodland interaction is under severe strain for a number of reasons. Conflicts between settled cultivation and nomadic grazing have increased pressure on the remaining woodlands. Intense grazing and browsing pressure has affected the regeneration of woodlands, resulting in degradation. Increased opportunities, especially for the trade in meat, have resulted in an increase in livestock numbers far beyond carrying capacities.

Non-wood forest products are generally sold in unprocessed form today, and even in the case of products such as gum arabic, processing is limited to spray drying. Issues such as food-safety regulations become critical in developing markets for processed products, especially in view of the fact that domestic demand is limited on account of low purchasing power.

Ecotourism, especially that based on wildlife and desert landscapes, could offer additional benefits if appropriate investments were made. The Government of the Sudan has encouraged the private sector to initiate activities in this regard. Establishment of game farms is another area of interest for the private sector, and 40 licences have already been granted in the Sudan to establish such farms.

SERVICE FUNCTIONS OF FORESTS AND WOODLANDS

In the North African context the two most critical environmental issues are desertification and increasing water stress.



Desertification is a key issue affecting almost all countries especially as it reduces land productivity. This is particularly so in areas close to the desert, where shifting sand dunes affect agricultural production and sand intrusion is a problem in villages and towns. More frequent droughts have aggravated the process.

The role of trees and forests in controlling desertification is clearly understood. Shelterbelts and windbreaks are critical in reducing the impact of desiccating winds and preventing sand intrusion. There have been several studies indicating the beneficial effects of shelterbelts and windbreaks, and there has been extensive planting around farms, villages and towns to reduce the impact of desertification.

Another key environmental issue concerns increasing water stress in the subregion, so that water conservation has become a critical concern in all land uses. In the forestry context the key issues will be:

- the role of trees and woodland in regulating the flow of water, especially in the uplands; and
- the use of water by trees, including plantations.

The two major international river systems in North Africa are the Nile and the Senegal, and the issues of watershed protection and the sharing of costs and benefits have international ramifications. The Nile,

BOX 9

SILTATION PROBLEMS IN THE SUDAN

Although the importance of forests for watershed management is well known, deforestation has been carried out in riverine areas. The loss of tree cover in watershed areas is reflected in increased sedimentation and loss of storage in irrigation dams. The Sudan has experienced devastating floods and droughts during the past two decades. Climate change, population growth and deforestation are among the causes of more intense floods and droughts.

The 1999 Sudanese water policy addresses the care of water catchment areas. Measures to improve water yields and quality, such as reducing flood peaks and replenishing groundwater and watercourses, include introducing vegetation cover and controlling deforestation and overgrazing. The ecological stabilization functions of forests also contribute to orderly management of hydropower and irrigation schemes, including delaying siltation of dams and loss of storage capacity.

Watershed management in neighbouring countries is also a prerequisite for efficient water use.

(Awad, 2001)

BOX 10

WATERSHED DEGRADATION IN THE NILE BASIN

The high rate of deforestation and poor land management in the Nile catchments in Ethiopia, Eritrea and the Sudan is affecting the irrigation system and urban water supplies in the Sudan. The water supply system for Khartoum is designed to treat a sediment load up to 80 ppm, but in recent years the sediment load has gone up to 280 ppm, making the existing treatment facility ineffective. The Ministry of Water Resources and Irrigation in the Sudan spends more than 50 percent of its annual budget on removing the silt from the main canals. An equal amount is spent annually on desiltation of the subsidiary canals by the irrigation schemes. The Kashmal Girba reservoir commissioned in 1964 has lost almost 50 percent of the storage capacity due to siltation.

(Abdel Nour, personal communication)

the life-line of the Sudan and Egypt but with its catchment primarily in Ethiopia and Uganda, is particularly important. Increasing awareness of the adverse impact of watershed degradation (see Box 10) has led to the Nile Basin Initiative, but a comprehensive system for sharing costs and benefits equitably between all the countries in the Nile basin will eventually have to be developed.

The other issue concerns the use of water for establishing plantations. In view of extreme aridity, irrigation becomes a critical requirement for forest plantations, which are currently being established with the use of excess irrigation water. However, with increasing water shortages it will become difficult to obtain water for plantations. The rapid urbanization taking place in most countries will also increase the demand for water for domestic and industrial uses. This is most often met by reducing water use by agriculture and other land uses, making the prospects for irrigated forestry uncertain. There is, however, the possibility of using treated sewage water for urban and peri urban planting, and pioneering work has been done in Egypt. Forestry will in any case have to adapt by carefully considering the species mix in terms of water requirements and by taking advantage of opportunities to use treated sewage water for reforestation and afforestation.

Biodiversity protection

Most North African countries are signatories to the Convention on Biological Diversity, and considerable efforts are under way to conserve this diversity

BOX 11

PROTECTED AREAS IN SOME NORTH AFRICAN COUNTRIES

- Algeria's protected area system, excluding the desert parks of Ahagar and Tassili in the south, extends over an area of 250 000 ha, 113 000 ha of which are covered by various forest formations and 59 000 ha by maquis.
- Morocco's biodiversity is among the highest in the Mediterranean basin. To conserve this Morocco has established a network of protected areas composed of 10 national parks and 146 reserves.
- Tunisia has established eight national parks covering about 200 000 ha, 12 percent of which are composed of various forest formations.

(FAO, 2001a)

through a system of protected area networks. The number of protected areas in North Africa has increased in 1997 and totaled about 21 million ha, or 2.3 percent of the land area (UN, 2003). The Sudan has an extensive network of protected areas, mainly made up of national parks and game reserves, and approximately 11 percent of Sudanese forests are classified as protected. Despite their limited forest cover, all the other countries have made significant efforts to establish protected areas and conserve biodiversity (see Box 11). With tourism becoming as an important source of income for many North African countries, there is increasing interest in protecting terrestrial and marine ecosystems and in taking advantage of the rapid growth of ecotourism. However, institutional constraints limit the capacity to implement existing policies and legislation.

FORESTRY'S ECONOMIC SIGNIFICANCE

As in the case of most African countries, there are no reliable data to assess the contribution of forestry to North African economies. The limited data, however, indicate a low share of GDP attributable to forestry. In Tunisia, for example, forestry accounts for only 1 percent of total GDP. In the Sudan, it accounts for 3 percent of GDP. The real contribution of the sector however is far greater than these figures would suggest. A substantial proportion of people depend on forests and woodlands, especially for fodder, woodfuel, medicinal plants, perfumes, etc., and as many of these items fall within the informal sector and are not included in national statistics, it is hard to obtain a realistic estimate of forestry's contribution.

Apart from the lacunae in assessments of the actual

economic contribution of forests and woodlands, there has been no attempt to assess the value of the various services provided by them. In the dry desertic environment of North Africa, services such as shade and protection against desiccating winds are critical. There is also increasing recognition of the role of forests in the provision of global public goods, including carbon sequestration - although the high costs of reforestation or afforestation and the low productivity of North African forests mean that possibilities of taking advantage of financial support for carbon sequestration may be limited.

CONCLUSION

In view of the extremely arid conditions of North Africa, the forest resource situation is precarious. Most countries have very limited forest cover and several have less than 1 percent of their land area under forest or woodland. Furthermore, most forests are open and of low productivity.

Considerable efforts, however, are being made to improve the situation, especially by establishing plantations and increasing tree planting efforts outside forests. Most countries have also established a network of protected areas to conserve biological diversity.

In view of the limited productive capacity of its forests and woodlands, the subregion remains highly dependent on imports of wood products. The per capita consumption of roundwood is about 0.38 m³, as against 0.88 m³ for Africa as a whole. Per capita consumption varies between countries, largely reflecting the resource situation.

North Africa produces a number of non-wood forest products, some of which have been traded on the world market for a long time. However, there have been no significant technological advances to facilitate value addition and develop new products. Most value addition takes place outside Africa.

The subregion faces very serious environmental problems, especially desertification and increasing water stress. With rising incomes and the resulting possibility of importing wood and wood products, environmental protection will become a key concern for most countries in the subregion. The changes expected in forestry as a consequence of economic, social, environmental, technological and institutional changes are discussed in the next chapter.



Factors affecting forests and forestry in North Africa

Historical evidence indicates that forests and woodlands once occupied a large proportion of the land area of North African countries, and the current low extent of forest cover is largely an outcome of anthropogenic factors, compounded by unfavourable climatic conditions. A number of factors have contributed to the present situation. During the past twenty years the forestry situation in the subregion has undergone significant changes in response to demographic, economic, sociopolitical, technological and environmental changes. Understanding how these changes collectively affect forests and forestry is critical in defining future scenarios and identifying available options. A broad indication of factors affecting forestry is given below

DEMOGRAPHIC CHANGES

Demographic changes have an overwhelming direct and indirect impact on forest resources, in as much as they alter the supply and demand balance of products and services. Changes in population size, its rural-urban distribution, migration and other population movements, and a changing age structure all alter the society's demands on forests.

Population growth

The North Africa subregion currently has a population of about 170 million (see Table 7), or about 21 percent of Africa's total. Between 1980 and 2000 the population grew by nearly 62 million and a further increase of about 69 million is expected by 2020.

TABLE 7
Population in the various subregions of Africa

Subregion	1980	1990	2000	2010	2020
	(million)	(million)	(million)	(million)	(million)
North Africa	108.6	140.2	170.4	208.8	239.0
East Africa	104.5	141.2	182.1	230.0	289.0
Southern Africa	69.5	89.7	113.4	128.7	150.2
Central Africa	54.4	73.6	97.9	127.0	163.8
West Africa	132.2	177.8	234.0	277.6	344.0
Total Africa	469.2	622.5	797.8	972.1	1 186.0

Source: Figures for 1980, 1990 and 2000 from World Bank, 2002. Projections for 2010 and 2020 from African Development Bank, 2000.

What is significant is that this population occupies about 32 percent of the land area of Africa, most of which is unproductive and desertic.

While the overall population density is very low, in relation to arable land it is extremely high (see Table 8). There are also considerable differences between countries as to population density, as shown in Table 8.

TABLE 8
Population distribution and density in North Africa
(based on 2000 population estimates)

Country	Population (million)	Population growth as a percentage (1990 – 2000)	Density (number/km ²)	Density per km ² of arable land
Algeria	30.40	2.0	13	400
Egypt	63.82	2.0	68	2372
Libya	5.54	2.3	3	301
Morocco	28.71	1.8	62	328
Mauritania	2.67	2.8	2	532
Sudan	29.68	2.1	12	173
Tunisia	9.58	1.7	61	332
Total North Africa	170.40	2.0	19	421

Sources: World Bank; 2002, FAO, 2001b.

Egypt has the largest population, accounting for about 37 percent of the subregion's population. Even taking into account the entire land area, it also has the highest population density. Since vast expanses of the country are arid, most of the population is concentrated in the irrigated Nile valley and the delta, where population density is well over 2 300 per square kilometre. This has important consequences for the availability of land for forestry as well as the demand for wood and wood products. While the demand for forest products will be very high, very little land will be available for raising plantations. Among the North African countries, the Sudan is the best endowed with arable land and this would indicate the likelihood of further agricultural expansion, with its attendant effects on forest cover.

Urbanization

North Africa is the most urbanized subregion in Africa. This is partly a result of ecological conditions, especially water availability, with most of the

population living in coastal areas, along river banks or around oases. In 1980 the urban proportion of North Africa’s population was about 40 percent, which increased to about 51 percent by 2000. It is estimated that by 2020 the urban population of the subregion will increase to about 153 million or approximately 64 percent of the total (see Table 9).

TABLE 9
Urbanization in North Africa – Proportion of urban population (as a percentage)

Country	1980	2000	2020
Algeria	43.5	60.3	70.6
Egypt	43.8	45.2	56.4
Libya	69.3	87.6	NA
Mauritania	27.4	57.7	66.2
Morocco	41.1	56.1	68.6
Sudan	20.0	36.1	52.5
Tunisia	51.5	65.5	78.8
Total North Africa	40.1	50.9	64.0
Africa	27.1	37.9	49.1

Sources: World Bank, 2002; African Development Bank, 2000.

However, as indicated in Table 9, there are considerable differences between countries as regards urbanization, with their consequences for land use. A notable feature of urbanization will be the growth of large cities requiring substantial investment in order to address issues such as urban unemployment and the provision of essential services such as water, energy and transport⁶. Improving the urban environment will be a key concern for planners and policy-makers.

The impact of urbanization on forests and forestry will depend on policies in other sectors such as agriculture, energy and urban development, and on changes in the demand for forest products and services. North Africa’s urban population has better access to commercial fuels such as kerosene, gas and electricity, although there are sections of the population that may be unable to afford these fuels on account of low income and thus continue to depend on woodfuel. Urban areas in Algeria, Egypt, Libya, Morocco and Tunisia currently have much better access to commercial fuels. The emergence of the Sudan as a petroleum producer and ongoing efforts to promote the use of liquid petroleum gas by households and industries indicate a potential reduction in the urban demand for woodfuel. There will still be a sizeable section of the population – especially the large numbers of internally displaced

people – who will continue to depend on woodfuel, which will have consequences for urban and peri-urban tree resources. Demand for construction materials, especially sawnwood and panel products, is also expected to increase.

The significant increase in the urban population certainly means that special attention must be given to urban issues. However, problems relating to rural development are expected to persist. Although the proportion of the rural population is expected to decrease, its absolute number in 2020 will remain more or less the same as in 2000. With most of the young and skilled population moving to urban areas, there is likely to be a decline in rural economies, and strengthening these will remain critical in addressing the issue of rapid urbanization and the consequent social and environmental problems.

Changes in age structure

North Africa has a high proportion of its population below the age of 15, varying from 32 percent in Tunisia to almost 44 percent in Mauritania (World Bank, 2002). As this young population moves to adulthood in the next two decades, it will have a significant impact on society as a whole, especially considering the changing values and perceptions of a generation more exposed to the effects of globalization. With increased literacy and education, the nature of the employment sought will be different. The situation could be particularly critical in countries where unemployment rates are already very high. Traditional occupations in land-based activities will become less attractive, an important factor contributing to migration to urban areas as well as to other countries, especially Europe. There will be considerable pressure to invest in human resource development and to prepare people for rapidly changing skill requirements. All this will have direct and indirect consequences for land use in general and forestry in particular.

Migration and other population movements

As indicated earlier, there is already considerable rural-urban migration in North African countries. There is also considerable migration – often illegal – to other countries, especially in Western Europe, with the historical ties with France and Italy encouraging such migration. Considering the declining population growth rate in Europe and the consequent demand for labour, there is a likelihood of more migration from

⁶ For example, Cairo’s population is expected to grow from 10.6 million in 2000 to 13.8 million in 2015, with a consequent need to improve infrastructure and the urban environment.



some North African countries, despite the fortress stance adopted in some of the developed countries. While such emigration provides opportunities for employment and possibly for increased incomes, it also imposes limitations on the development of North African countries by depriving them of their most active and qualified people. Some countries, such as the Sudan, have lost highly qualified forestry professionals through emigration. To a large extent this also applies to other countries and sectors. The growing unemployment of professionals is a major concern for most countries in the subregion as it leads to an exodus to other countries (see Box 12) or in increased social conflict.

Some of the countries in the subregion have also had to face another kind of population movement on account of natural disasters such as droughts, but also of man-made problems such as civil wars and conflicts. The Sudan, for example, hosted more than 3 million refugees from Eritrea and Ethiopia for over twenty years. The impact of this on woodland resources as a result of the increased demand for woodfuel is widely recognized. In addition to refugees, substantial numbers of internally displaced people have fled from areas affected by civil war and settled in and around urban centres such as Khartoum. This has created additional pressure on limited urban and peri-urban wood resources.

Algeria, Mauritania, Morocco, the Sudan and Tunisia still have a significant number of nomadic pastoralists, who move seasonally with their cattle in order to take advantage of the changing availability of fodder and water. While this is an appropriate resource utilization strategy in the context of the arid

and semi-arid conditions of the subregion, its scope is declining on account of conflicts with settled farmers and the conversion of rangeland for other uses. Although nomadism may persist in the short and medium term, it is likely to fade out in the long term as more people adopt sedentary pursuits. However, this is likely to accentuate environmental problems, as discussed later in the present report.

Implications of demographic changes

Forests and forestry in North African countries will be significantly affected by demographic changes which, in combination with other factors, will bring about considerable changes in forest cover and the way forests are used. The following issues are of particular concern:

- although the rate of population growth is slowing, it is estimated that the absolute increase in the population over the next two decades will be more or less the same as in the previous two. The subregion will thus have to accommodate the needs of an additional 69 million people by 2020;
- considering the desertic conditions and water stress in most countries in the subregion, the opportunities for agricultural expansion are limited to a few countries. More of the population is therefore likely to be moving to urban areas, creating new types of demand for forest products;
- urban expansion will be further accentuated by the age structure, with a substantial proportion of inhabitants now below the age of 15. As these young people become adults during the next two decades there will be changes in values and perceptions, creating new demands;
- North Africa will also have to cope with the movement of people into and out of its countries. Forest resources in some of the countries have been degraded significantly because of the influx of refugees and displaced people resulting from civil wars and conflicts.

The impact of population growth on forests and forestry will largely depend on what happens in the economic sphere, and especially on economic and social development. These factors are discussed in the following sections.

ECONOMIC CHANGES

Gross domestic product (GDP) and its change

The economic situation in North Africa, as measured by GDP and its growth, is relatively better than in the

BOX 12

UNEMPLOYMENT AND EMIGRATION OF PROFESSIONALS

Recent data show that the number of unemployed university graduates is large and growing. For example, in 1995 Algeria had three times more unemployed university graduates than new graduates (ILO, 1999; UNESCO, 1998). As a result 32 557 new graduates of the class of 1995 entered a labour market with a pool of 96 830 unemployed university graduates of earlier years.

The exodus of doctors has been even more striking in the past two decades. In 1978 the Sudan lost 17 percent of its doctors, 20 percent of its university lecturers, 30 percent of its engineers and 45 percent of its surveyors (UNDP, 1998).

(ECA, 2001)

rest of Africa. Table 10 gives details of GDP and the change in per capita income for the subregion.

In 2000 North Africa accounted for about 39 percent of Africa’s GDP, although it has only about 21 percent of the continent’s population. In contrast to Southern Africa, the other subregion that accounts for a substantial proportion of the African GDP, GDP is distributed fairly evenly among North African countries. Most countries other than Mauritania and the Sudan have a per capita GNP of over US\$1 000. More important, there is a positive trend as regards GDP, in both aggregate and per capita terms. Although the Sudan’s per capita income decreased during the period 1990-2000, there are indications of an upward trend in the post-1999 period, largely as a result of income from petroleum exports.

Whether this positive high growth will continue during the next two decades or not depends on a number of factors, especially (a) the ability of countries in the subregion to take advantage of emerging opportunities and overcome disruptions caused by globalization, and (b) how effectively their

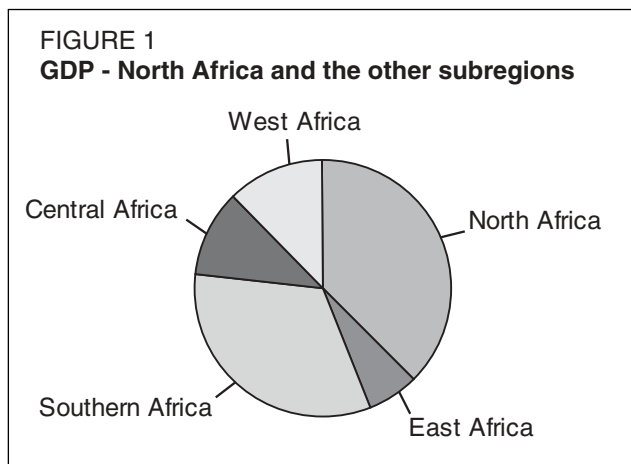


TABLE 10
North Africa – Gross domestic product

Country/Region	GDP 2000 (at 1995 constant prices) (million US\$)	Per capita GNP 1990 (US\$)	Per capita GNP 2000 (US\$)
Algeria	48 819	2 400	1 590
Egypt	78 422	810	1 490
Libya	35 716	n.a.	6 447
Mauritania	1 321	540	370
Morocco	39 324	1 030	1 180
Sudan	9 922	610	320
Tunisia	23 623	1 430	2 090
Total North Africa	237 147	1 242	1 335
Total Africa	595 002	707	671

Sources: World Bank, 2002; ECA 2001.

BOX 13

LONG-TERM GROWTH PROSPECTS FOR NORTH AFRICA AND THE MIDDLE EAST

Long-term prospects in the Middle East and North Africa are less positive than in most other developing regions. Growth for the oil exporters in the long term is expected to average 2.7 percent; in the diversified exporters growth is expected to average 4.3 percent. In each case, growth is only slightly higher than the average for the 1990s. Growth in 2004-10 for the region is expected to average 3.3 percent, similar to the average of the 1990s and lower than the average of 3.5 percent for 2000-03. The reasons for the lack of acceleration of growth in the forecast period include the real long-term decline in oil and other commodity prices expected in the next 10 years, the high level of vulnerability of countries in the region to commodity price and other external shocks and the low level of attractiveness of the region to foreign investment outside commodity sectors.

(World Bank, 2001)

human and natural resources are managed. Several of the countries are highly dependent on petroleum resources as their main source of income, and overall economic performance will depend on global demand and prices for petroleum products, which will in turn critically depend on the overall growth of the global economy, changes in energy supplies and particularly the outcome of ongoing efforts to develop and popularize renewable energy sources. A recent study (World Bank, 2001) predicts a decline in the long term GDP growth rate for North Africa and the Middle East (see Box 13)

The relatively higher income is a key factor determining the nature of the demand for forest products. Higher household incomes tend to lead to a preference for commercial fuels such as kerosene, LPG and electricity. Domestic production of fossil fuels has enabled several countries to increase the supply of LPG and kerosene, reducing woodfuel demand. On the other hand, higher incomes also lead to an increased demand for housing, and thus the need to increase the supply of sawnwood, panel products, etc., as well as printing and writing paper. Probable changes in the demand for forest products in the next two decades are discussed in chapter 5.

Income distribution and poverty

North African countries have on the whole made significant progress as regards poverty alleviation and enhancement of the quality of life. Income is



BOX 14

UNEMPLOYMENT - A MAJOR CHALLENGE

The World Employment Report of 2001 published by ILO identifies the unemployment situation in North Africa as a "formidable challenge". According to the ILO report, the unemployment rate in the late 1990s was estimated at 29 percent in Algeria, 22 percent in Morocco and 8 percent in Egypt. High birth rates and decreased government hiring are among the major factors behind this.

(ILO, 2001)

distributed more evenly than in other African subregions, although wide disparities still persist. The share of income of the richest 20 percent of the population varies from 39 percent in Egypt to over 46 percent in Morocco and Tunisia, while the poorest 20 percent of the population in these countries receives 9.8, 6.6 and 5.7 percent of the income in Egypt, Morocco and Tunisia respectively (World Bank, 2002). The percentage of the population living on under US\$1 per day varies from 8 percent in Egypt to 1 percent in Morocco, while the national poverty head-count (undertaken at different time points) puts the proportion of the population below the poverty line at 14 percent in Tunisia and 23 percent in Algeria and Egypt (World Bank, 2002). Poverty levels are much higher in the Sudan, partly as a result of successive droughts and conflicts that undermine the people's traditional means of livelihood.

In general the higher the level of rural poverty, the higher the dependence on natural resources such as forests and woodlands. This would imply that the pressure on forests will remain in the Sudan, unless there is significant pro-poor growth. There will also be continued pressure on forests and woodlands in Algeria.

Economic liberalization and the impact of globalization

As in the case of Southern Africa, North Africa is well integrated into the global economy and trade is well developed. In 2000 the North Africa subregion accounted for about 40 percent of African exports of goods and non-factor services. Its share of imported goods and non-factor services amounted to 36 percent of African imports. While petroleum products still account for a substantial share of exports, there has been a significant growth in manufactured exports. Between 1990 and 2000 manufactured exports from North African countries increased from US\$6.4 billion to US\$10.9 billion, which in 2000

represented 37 percent of the manufactured exports of the whole of Africa (World Bank, 2002). There are, however, considerable differences between North African countries as regards manufactured exports, and while Tunisia, Morocco and Egypt have made significant progress in this sector, other countries are still dependent on the export of oil and other primary products.

Almost all the countries have implemented wide-ranging economic reforms, liberalizing trade and investment and removing trade barriers. A notable feature is the various ongoing efforts to facilitate regional and subregional cooperation, although there is sometimes considerable overlap as regards membership of the various regional and subregional bodies. Algeria, Libya, Mauritania, Morocco and Tunisia are members of the Maghreb Arab Union, while Egypt and the Sudan are members of the Common Market for Eastern and Southern Africa. The Sudan is also a member of the Intergovernmental Authority on Development (IGAD). Mauritania is also a member of the Economic Community of Western African States. While these subregional groupings are expected to promote integration, there is uncertainty as to their effectiveness in increasing trade among the countries, especially considering the similarity of the basket of goods produced and traded. There is already concern that a zero tariff may increase imports and undermine local production.

Most of the North African Mediterranean countries have strong historical ties with Europe, and a substantial proportion of North African exports and imports is destined for or originates from European Union countries. The Barcelona process initiated in 1995 envisages the establishment of the Euro-Mediterranean Free Trade Zone (EMFTZ) by 2010, removing all trade barriers. Algeria, Egypt, Morocco and Tunisia are members of EMFTZ. There have already been efforts to strengthen bilateral trade between European Union and North African countries in pursuit of this process⁷. There has been considerable discussion of the economic, social and environmental consequences of EMFTZ.

Considering the changing comparative advantage of North Africa in the context of continued economic

⁷For example, Egypt has already signed an association agreement with the European Union to establish closer economic and political ties. This includes trade liberalization for manufactured goods, agricultural and fishery products, services, etc. The agreement also covers economic cooperation in the fields of tourism, transport, energy, telecommunications, research and development.

liberalization, the countries in the subregion will have to examine the long-term viability and economic efficiency of some of the industries such as particle-board, and pulp and paper. At least some of these have been supported by governments through subsidies to maintain employment levels, especially in rural areas. With cheaper imports, the viability of some of these units could be undermined.

External debt

While the North Africa subregion is economically the most vibrant in Africa, it is also one of the most indebted. As of 2000 the countries in the subregion had a debt of US\$102 billion, or approximately 34 percent of the total African external debt (World Bank, 2002). Some countries, for example the Sudan, have an external debt amounting to 138 percent of GDP. In the case of Mauritania the per capita debt is as high as US\$671. Interest repayment will be an important drain on the economy, limiting the investment capacity of governments. As long as exports grow rapidly, this will not be a major problem. However, in a globalized environment external shocks could significantly affect export income, with serious adverse effects on the economy as a whole, including repercussions for natural resource management. Persistence of some of the recent negative trends, especially the decrease in oil prices and the slowing down of global economic growth, would have a significant impact on income and hence the ability for debt-servicing and repayment.

SECTORAL SHIFTS AND LAND DEPENDENCY

A key feature to be taken into account in assessing economic growth is the structural shifts in the economy. As economies grow, the share of GDP contributed by agriculture and allied activities decreases, while that from the manufacturing and service sectors increases. The share of agriculture in GDP is less in North Africa than in other subregions, about 18 percent in 1999. However, there are considerable variations between countries as regards the proportion of agricultural GDP. In the oil-producing countries of Algeria and Libya the share of agriculture in GDP is 6 and 9 percent respectively, while in Mauritania and the Sudan it is 30 and 36 percent respectively (ECA, 2001). The key issue that will have a bearing on forests and forestry is the change in dependence on agriculture and the growth of other sectors to increase employment and income for the growing population.

While the share of agriculture remained more or less the same or slightly increased in some of the North African countries between 1980 and 1999, there was very little increase in the share contributed by industry. Much of the expansion took place in the service sector, which in 1999 accounted for almost 55 percent of the GDP of North African countries⁸. The consequences of this for the economy and forestry can be summarized as follows:

- unless there is rapid industrialization, some countries, such as the Sudan and Mauritania, will continue to depend on land, with consequences for forests and forestry;
- a number of countries, especially in the Maghreb region, have diversified their economies, especially through the exploitation of oil and natural gas resources, the expansion of manufacturing and the development of the tourism industry. While this has reduced the pressure on land and increased incomes, there are limits to the expansion. External shocks such as a reduction in oil prices and a decline in tourist arrivals on account of changes in perception relating to security are critical issues that will have an impact on North African economies.

Maintaining high growth rates in the industrial and service sectors in the face of intense competition will be the main concern for the relatively better-off countries in the subregion, while for countries such as the Sudan and Mauritania the emphasis will be on diversifying the economy and improving the productivity of agriculture. Mauritania has considerable potential for economic diversification by way of fishery development, although much of the benefits now accrue to foreign fishing companies.

AGRICULTURE-FORESTRY INTERFACE

Although there have been some structural shifts in the economies of North Africa, agriculture still plays a critical role in the rural economies of most countries. What happens to forests and forestry will thus be determined by agriculture-forestry interface issues. These interactions will depend on the nature of farming systems and, more particularly, on how these are likely

⁸ For Africa as whole, agriculture contributed 19.4 percent of GDP, while industry and the service sector contributed 31.9 percent and 48.7 percent respectively. Within the proportion contributed by industry, the manufacturing share was only 12.7 percent and the remainder was mostly by way of exports of minerals and other extractives such as oil (ECA, 2001).



to evolve over the next two decades. The major farming systems in the North Africa subregion are:

- irrigated farming, both small- and large-scale, especially in the Nile valley and delta (including large irrigation schemes such as the Gezira scheme in the Sudan and the Nile delta scheme in Egypt), Morocco, Libya (largely through tapping ground water) and along the banks of the Senegal River in Mauritania;
- rainfed and dry mixed farming systems especially in Morocco, Tunisia and Algeria, as well as in parts of the Sudan; and
- pastoral systems in Algeria, Mauritania, Morocco, the Sudan and Tunisia (see FAO & World Bank, 2001).

Each of the above systems faces a number of opportunities and constraints and all are undergoing changes with direct and indirect consequences for forests and tree growing, as indicated below.

Irrigated farming systems

- many of the large irrigation schemes face the problem of siltation, largely stemming from upland erosion. Substantial resources are devoted to maintaining canals and other irrigation infrastructures, and there is already an indication that this may not be sustainable unless significant efforts are made to improve management of upland watersheds. Large irrigation schemes also face other institutional and managerial problems, undermining the efficient use of water and other resources;
- large parts of irrigated areas are prone to desert encroachment and sand intrusion, undermining productivity. While individual farmers do establish windbreaks, there is a need for more concerted efforts to arrest the desertification process. Another problem for many large irrigated schemes is increasing salinity and sodicity and decreasing crop productivity. Here again there is an opportunity for land reclamation through reforestation;
- irrigated areas on the whole have very high population densities (and very limited areas of forests and woodlands), with a consequent high demand for wood, including woodfuel. The Sudan, for example, has made a legal stipulation requiring that at least 5 percent of irrigated schemes should be under tree cover. A balanced approach to integrating tree cropping into irrigated

areas needs to be developed, specifically considering the future demand for wood and wood products, and the environmental prerequisites of controlling desertification and ensuring an efficient use of water, the demand for which is expected to increase considerably.

Mixed farming systems

Mixed farming systems are found over extensive areas in the uplands of the Maghreb countries as well as in the central and southern plains of the Sudan. A typical household on an upland farm has a small area of cropped land in terraces and grows fruit trees and vegetables in addition to seasonal cereals. The key issues with regard to upland mixed farming systems are:

- watershed protection, especially taking into account the increasing demand from downstream users;
- improvement in land productivity and profitability, especially through diversification and improved access to inputs and markets; and
- sustainable management of pastures and woodlands by avoiding overstocking and improving communal management systems.

The other widespread type of farming system is rainfed farming in the plains, for example the central clay plains of the Sudan. Traditionally, smallholder cultivation, largely focused on subsistence consumption, was the most widespread system and, given the low population density, such cultivation combined with pastoralism formed the main livelihood of the population. However, extensive areas of the clay plains have been brought under mechanized farms with substantial government support, involving large-scale clearing of savannah woodlands⁹. These areas are particularly prone to drought and desertification as well as severe erosion during the rainy season. Large-scale mechanized farms are also in conflict with small-scale farming and pastoralism.

⁹ In the 1980s and 1990s the Sudan promoted large-scale mechanized farming to attain self-sufficiency in food production. A Mechanized Farming Corporation was established to provide technical and financial support to encourage farming initiatives. The corporation organized the supply of machinery, fuel, finance and other support. Such large-scale cultivation has ignored the long-term environmental impact, especially deforestation.

The corporation has since been closed down, especially in view of decentralization, the liberalization of imports of farm inputs and the increasing involvement of the private sector in their supply. The current policy of the government is not to open any more new areas for mechanized farming, while old farms have to put 10 percent of their area under forestry in the form of windbreaks and woodlots.

BOX 15

IMPACT OF SEDENTARIZATION

Intensive grazing around settlements is often related to the sedentarization of nomadic herders. The settlement of former nomads entails concentration of their herds on grazing land around their new homes. Under drought conditions, these herders are forced to graze their animals in areas where most drinking water is available. This eventually leads to the complete disappearance of the most palatable herbaceous cover, particularly around bore-holes that provide drinking water for humans and animals all year round.

(FAO & World Bank, 2001)

Pastoralism

Livestock plays a critical role in the economies of most of the countries in North Africa. For example in 1999, it accounted for 30 percent of the agricultural GDP in Morocco. It is also an essential element of subsistence for many rural people. There are an estimated 50 million sheep and goats in the Maghreb region. These figures are even higher in the Sudan, where there are approximately 35 million cattle and 80 million sheep and goats. Water and fodder are the critical requirements, and nomadic grazing involving seasonal cyclic movement is an integral part of the survival strategy. In recent years, however, technological advances have been altering the nature of pastoralism, as cattle and water can now be transported over long distances. This has resulted in a significant increase in the number of livestock, with a resulting impact on vegetation degradation. Although the nomadic proportion of the population is decreasing, partly on account of sedentarization (see Box 15), the cattle population is on the increase, especially in view of a growing demand for livestock products, and there is increasing investment by urban investors in livestock production. All the indications are that this is accentuating rangeland degradation and desertification.

Considering the characteristics of the various farming systems and their evolution in response to social, economic and environmental changes, the agriculture-forestry interaction is expected to change considerably, bringing new constraints and opportunities for a more integrated approach to land use.

ENVIRONMENTAL CHANGES

Growing environmental pressure

The arid and desertic conditions of North Africa increase the sensitivity of the ecosystem to climatic

and human-induced changes. This growing concern for the environment is reflected in various national, regional and global initiatives. Of particular interest is the Convention to Combat Desertification, the Convention on Biological Diversity and the United Nations Framework Convention on Climate Change. Although most governments are signatories to these conventions, the ability to comply with them varies. The commitment to comply with the conventions will increasingly require appropriate changes in the forest sector. There has been a clear recognition of the interconnectedness of poverty and environmental degradation. All this will have an important impact on the forest sector during the next two decades.

In general there has been wider recognition of the negative environmental changes taking place in the various countries, particularly:

- degradation of watersheds and changes in waterflow as a result of a rapid growth in the demand for water;
- desertification and land degradation; and
- loss of biodiversity.

Details of ongoing efforts to conserve biodiversity through the establishment of protected areas were discussed in chapter 2, and some of the issues relating to watershed degradation and desertification were outlined in earlier subsections. The risk of sedimentation and desertification is a major concern in North Africa. In Algeria, 20 million ha of land in the north, out of a total of 38 million ha, are prone to desertification, mainly because of overgrazing. In Mauritania, the most arid Sahelian country, vegetation has decreased as a result of excessive grazing, low rains and increasing sedentarization.

Water is scarce in the subregion. Renewable and non-renewable water reserves are overexploited and diminishing at an alarming rate. In the Mediterranean area in 1995, consumption was estimated at 89 km³ per year, 82 percent of which was used by the agricultural sector, 8 percent for domestic use and the rest by industry. Given the demographic and development pressures, water scarcity is expected to become more acute in the next two decades. Specifically this will require a thorough assessment of:

- sharing of water between various sectors and ensuring of increased efficiency through modern practices such as drip irrigation and the adoption of cropping systems that are less water-demanding;
- integrated land use to protect watersheds in order to increase infiltration and reduce soil erosion.

Environmental concerns, especially relating to desertification and the management of water resources, are expected to play a dominant role in the North Africa subregion during the next two decades.

TECHNOLOGICAL CHANGES

General situation with regard to technological changes

The long history of irrigated agriculture and the recent efforts towards industrialization have helped to develop a strong science and technology base in most of the North African Mediterranean countries. There are several universities and research organizations with considerable capacity to undertake research and technology development. Increased investment in manufacturing has also helped to upgrade technology through external collaboration. The availability of skilled workers, technicians and professionals is also satisfactory in most countries, although often, as indicated earlier, the problem of growing unemployment of professionals is a major concern. Communication technology has grown fairly rapidly in most countries, enabling wider dissemination of information on technology, markets, etc.

Certain sectors and subsectors, however, have not benefited significantly from the overall improvements in science and technology. On the whole, the percolation of technology to rural sectors has been slow. Technological changes have been faster in the commercialized sectors of agriculture, animal husbandry and forestry, and slower in subsistence sectors. Even in the case of non-wood products, which have a long history of international trade, processing technology in the producing countries has not moved beyond preliminary processing and packaging.

Potential areas for wider application of science and technology in the forest sector

There are several areas in forestry where the potential for technological change is substantial. These include:

- improvements in resource monitoring technologies that will help towards the regular assessment of changes in forest cover and land degradation, as well as changes in growing stock; monitoring the outbreak of pest attacks and disease, forest fires, etc., is another area that is expected to change considerably in response to technological advances;
- biotechnology applications that could significantly improve afforestation in degraded arid areas, especially to overcome severe water stress and improve the growth of trees;
- improving water use efficiency in afforestation and reforestation; as the water crisis worsens, it will be critical to improve management practices in order to minimize the use of fresh water; technology such as drip irrigation and the use of treated wastewater already exists, but needs further refinement and improvement to facilitate wider adoption;
- technology for processing non-wood forest products such as gum arabic and some of the medicinal and aromatic plants; and
- improved technology for small-scale wood industries such as joinery and furniture-making, specifically in response to the increasing demand from urban centres as well as European markets; this will be particularly important in view of the predominance of small and medium industries in the subregion and the need to increase employment opportunities; much of the wood produced locally will be of small dimension necessitating use of improved utilization technologies, especially to increase recovery.

Although the potential exists for technological improvement, this will largely depend on increased investment, especially by the private sector and government. There is a distinct possibility that technological development may be confined to a small segment of the forest sector, leaving out a substantial proportion of forest and woodland dependent people. With decreasing financial and human resources, even the technological capacity of the public sector may remain limited.

POLICY AND INSTITUTIONAL CHANGES

North African countries are also witnessing far-reaching political and institutional changes that will have a direct and indirect impact on forestry in the subregion. Democratic institutions are emerging, although at varied paces, and political power is increasingly percolating to the grassroots. The main political and social changes affecting forests and forestry include:

- decentralization and devolution of administrative responsibilities to subnational entities;
- increasing emphasis on participatory approaches and the involvement of rural communities in resource-use decision-making;
- recognition of the role of the private sector in forestry, especially in undertaking productive and commercial functions;

- increased involvement of civil society, including NGOs, in public policy issues such as sustainable development, poverty alleviation and environmental protection; and
- redefinition of public sector responsibilities.

Institutional transformation has meant that forest policies and codes have had to be rewritten. Morocco and Tunisia revised theirs recently, while the Sudan prepared a new draft forest policy in 1997, emphasizing the privileges and rights of local people with respect to forest resources. These processes reflect the need to integrate forestry into rural land management. Some of the main trends with regard to institutional changes are indicated below.

Decentralization

Decentralization and devolution of administration is the basic tenet of public policy in most countries. They are particularly relevant in some of the large countries with dispersed population and resources. For example, the constitution of the Sudan stipulates a substantial role for the provinces in resource management, and there is increasing pressure to devolve all the responsibilities for forest management to the provincial governments. Some of the initial experience of decentralization of administrative responsibilities has been somewhat negative. Especially in view of limited resources, the state and provincial governments see forests and woodlands as sources of revenue, exploiting them unsustainably. In some countries, for example the Sudan, there is increasing concern that national and international commitments to environmental protection require a more

coordinated national approach, which is beyond the capacity of provincial organizations. Decentralization efforts are also under way in Algeria and Tunisia.

Community participation

Participatory approaches have gained importance in most countries and efforts to date have enabled communities to establish and manage reserves and woodlots. The concept of community reserves has been accepted in some of the legislation, enabling communities to establish and manage forests as legally recognized reserves. Most of the forestry organizations in North Africa were developed as centralized hierarchical systems, focusing on the enforcement of forest laws and much less on development activities. However, there have been significant changes in this regard, starting with the establishment of forestry extension units (which initially focused on creating awareness and extending technical knowledge in a “one-way” approach) and later evolving into broad participatory approaches, with emphasis on a two-way learning process. The latter approach is yet to find wider application.

BOX 16

DECENTRALIZATION IN THE SUDAN

One of the most recent determining factors in natural resource management in the Sudan has been the newly introduced federal system of government, which divided the country into 26 states The division resulted in imbalances in the distribution of natural resources. Where some states have abundant resources, others lack them. The state governments have jurisdiction over state land, forests, livestock and wildlife management. The states tend to consider forests as a revenue-generating sector. The creation of the federal system has brought the vital question of division of authority and resources between the federal government and the states. The debate on division has not been settled.

(Awad, 2001)

BOX 17

THE LONG-STANDING PROBLEM OF TENURE

Forest land largely belongs to the State, as defined during the colonial era. Since that time, forest services have strictly controlled access to forests. This has made it difficult for rural people to collect woodfuel and non-wood forest products, as well as to graze their livestock. At the same time, poverty and the lack of employment opportunities have forced people to engage in illegal logging and charcoal-making. These activities and the extension of farming within forest reserves have caused natural forest degradation and deforestation. These circumstances have created animosity and strained relations to the point that constructive discussions on multiple-use and joint management of land have become impossible.

To sort out this situation and improve natural-resource management, governments are now considering a variety of options. Through the establishment of a participatory approach, local communities may gain the rights to forest products, but formal recognition and legal support for this plan is still uncertain. Through forest concessions, such as those in Tunisia or Algeria, some privatization has begun. However, the confusing situation created by questions of land tenure and poor productivity does not paint an attractive picture for private investment in forest land.



Private sector involvement

Another key development in the institutional sphere is the increasing involvement of the private sector in forestry, including the establishment of plantations. Traditionally, the private sector has played a key role in the harvesting, transport and processing of wood and wood products. Farmers have been involved in tree growing for a long time, as in the case of hashab cultivation in the Sudan. Large-scale commercial cultivation of trees has, however, been absent for a variety of reasons, mostly related to land ownership, markets and prices, and the low productivity of plantations. This situation is changing because of increasing investment by foreign investors, especially in areas that are seen to be commercially viable. For example, the Malaysian African Agriculture Company (formerly Gandil Agricultural Company), has already established 33 000 ha of hashab plantations in the Blue Nile state of the Sudan and expects to become a major supplier of gum arabic through intensive management. The implications of this are discussed later in this report.

There are also considerable private sector initiatives in farm forestry in most of the countries of the subregion, especially by farmers. Woodlots and boundary plantings of *Eucalyptus spp.* have been established by farmers, first as windbreaks but also to produce poles, which are in great demand, especially in urban areas.

Civil society involvement

An important institutional development in recent years is the increasing involvement of civil society – especially national and international NGOs – in forestry issues. In all the countries civil society organizations are being involved in issues relating to environmental protection and sustainable development. With the increasing involvement of professionals in the activities of NGOs, there has been an increase in their overall technical capacity. The involvement of international NGOs such as SOS Sahel has also helped to catalyse and strengthen participatory approaches.

All the indications are that civil society will continue to play an increasingly important role in forestry and environmental issues, thus providing a unique opportunity to strengthen ongoing efforts to promote a more broadly based forestry.

Changes in public sector forestry organizations

The public sector, especially the government forest departments, is the primary agency responsible for

forest management in most North African countries. In certain cases (for example the Sudan) public sector management has a history of over 100 years. In most cases, forestry has received a low priority in resource allocation, and this has considerably hampered the performance of public sector agencies. In recent years, there have been some efforts to remedy this situation. Changes in the public sector have been largely in the following directions:

- involvement of the private sector or communities in the management of forests and woodlands resources, including the establishment of plantations and woodlots; and
- restructuring of forest administrations as parastatal organizations, providing more autonomy and flexibility in their functioning.

Both these options have their advantages and disadvantages, especially in view of the low productivity of resources, but also on account of the poor resource situation. The situation is such that public sector forestry organizations have to keep adapting to rapid changes, reorganizing themselves in order to shape the future course of forestry development, while taking full advantage of emerging opportunities. Increasingly, the emphasis is on having a public sector agency that focuses on its regulatory functions, while many of the traditional functions of production are undertaken by other actors. In many countries, however, there are serious limitations to this approach, especially in view of the priority need to give to the environmental and social functions of forests and woodlands.

Crises: conflicts and natural disasters

North Africa is largely free from internal conflicts and strifes, except in the case of Algeria and the Sudan. The direct and indirect effects of these conflicts on forestry are varied. An improvement in the situation could have a significant impact on forests and forestry in that it may help the adoption of sustainable forest management in the southern Sudan, the largest forested area in the North Africa subregion. No sustainable forestry is feasible in conflict-affected areas. Further, as discussed earlier, those displaced from such areas tend to increase pressure on the natural resources in areas adjoining their settlements. The total number of displaced people in the Sudan is estimated at 2.6 million, with nearly 1.8 million concentrated in Khartoum alone.

The main natural disaster being faced by the subregion is drought, although in recent years flooding

has also become frequent and extremely damaging, as happened in Algiers recently. The frequency of drought has increased considerably, especially in the Horn of Africa, undermining food security.

AN OVERVIEW OF CHANGE DRIVERS

The last two decades have seen major demographic, economic, technological, environmental, political and institutional changes in North Africa, and these have affected forests and forestry directly and indirectly and are expected to bring about further changes during the next two decades. While posing new challenges, these changes also open up new opportunities. The main driving forces that need to be taken into account with a view to defining future strategies and actions in the forest sector include the following factors:

- there will be an additional population of 69 million by 2020, with the majority living in urban centres and increasing the demand for water, construction materials and a better urban environment. More important, governments will be under tremendous pressure to improve employment opportunities, especially as urban educated unemployment becomes a critical problem;
- there will also be continued pressure on forests, especially in areas where there is still potential for agricultural expansion. The central clay plains of the Sudan and the Mediterranean coastal uplands will be subject to intense pressure from agriculture and animal husbandry;
- North Africa is economically a very vibrant subregion, characterized by relatively high per capita incomes and high GDP growth rates. This has enabled most of the countries to import forest products and overcome inherent supply limitations imposed by the arid conditions;

- the extent of poverty is much less than in other African subregions. Most of the economies have diversified, taking advantage of petroleum resources as well as manufacturing opportunities. Their openness has also increased their vulnerability to external shocks, especially changes in oil prices and fluctuations in the global demand for manufactured products. With various regional and global trade agreements becoming effective in the next few years, there could be substantial changes in comparative advantages, which could in turn have a substantial impact on agriculture and rural industries;
- environmental issues, especially water stress and desertification, are expected to become more critical, particularly the degradation of watersheds in the uplands with such adverse downstream effects as siltation, affecting domestic and agricultural use of water;
- policy and institutional changes are taking place, and there is an increasing recognition of the importance of participatory approaches. The private sector is well established in manufacturing and trade, but less so in forest management. There is also an increasing involvement of civil society in sustainable development in general and forestry and the environment in particular. Public sector forest agencies have also initiated a process of review and change in order to adapt to the changing environment.

All the indications are that these changes may accelerate during the next two decades, creating new challenges and opportunities for the forest sector. There will be more broad-based empowerment of the various actors, resulting in the emergence of a range of possibilities, as discussed in the next chapter.



Chapter 4

Alternative Scenarios

As is evident from the previous chapters, most North African countries except the Sudan have limited forest resources. And even in the case of the Sudan, most forests are in the southern states, where the current situation imposes certain limitations on their sustainable management. The service functions of forests are becoming more important, although for most rural communities the supply of goods from forests – woodfuel, fodder, poles, construction timber, etc. – will remain important. Considering the general trends in population, income, technological change, and policy and institutional developments, it is important to identify the likely scenarios and how key actors may respond to different situations.

APPROACH TO DEFINING SCENARIOS

A scenario is a chain of events and outcomes linking driving forces and actors. One approach to defining a scenario is to trace the sequence of plausible events at different time points stretching to the time horizon and to provide a descriptive account of how the situation may look under different assumptions. Alternatively, the more traditional approach is to provide estimates of key indicators at different points – an approach typically adopted in forecasting production and consumption on the basis of historical data. Scenarios based entirely on such quantitative data seldom provide a picture of the totality of the situation and are unable to take significant qualitative shifts into account.

As indicated earlier, what happens in the future will be decided by the actions of a whole range of actors, and the institutional environment therefore becomes a primary determinant of the scenarios. This is particularly so in view of the varying paces of the policy and institutional changes under way in most countries in the subregion.

For the purposes of FOSA, the following five scenarios have been identified:

- public sector dominance;
- market forces;
- informal sector;
- fortress scenario; and
- the Great Transition.

A general description of each of these scenarios and its broad implications has been given in the regional report, which also explains the rationale behind defining scenarios and the ongoing efforts in scenario planning relevant to forestry. With a wide range of possibilities, it is important to understand that scenarios are not dead ends and continuously evolve over time depending upon the nature of interventions, or lack thereof. Furthermore, elements of different scenarios can co-exist and their impact over time may change.

The basis for defining the various scenarios and how each of them could evolve in response to the various driving forces, as well as their likely impact on forestry in the North Africa subregion, are discussed below.

PUBLIC SECTOR DOMINANCE

The public sector's role has varied in North African countries depending on the forest resource situation and the overall priority the governments have assigned to the sector. In most countries, the governments continue to be the main player as regards forestry, fulfilling both regulatory and managerial functions. Government policies and supporting legislation determine the role of all other actors – private sector, farmers, communities, etc. The implementation of policies and legislation is primarily through a forest department under the ministry of agriculture, or sometimes under a separate environment and forest ministry. In some cases (for example the Sudan) a separate wildlife administration under the ministry of the environment and tourism is responsible for managing protected areas¹⁰. All these departments are organized hierarchically, and operational funds for protection and development are provided through the annual budget. In most low forest-cover countries, the emphasis has been on protecting existing resources and undertaking afforestation and reforestation, including the

¹⁰ In the case of the Sudan, the wildlife administration is part of the police force and thus comes under the overall control of the Ministry of Internal Affairs. Wildlife research, however, falls under the Animal Resources Research Corporation.

establishment of shelterbelts, soil conservation and forest legislation enforcement. In general most decisions are taken centrally and implemented in a top-down fashion.

Changes in the public sector dominance situation will depend largely on overall changes in government, especially the democratization process. Changes could take place for a variety of reasons, such as a decreasing budget allocation from government – which in a way reflects the importance assigned to forestry – or the realization that some of the actors, such as the private sector and community-based organizations, are in a better position to accomplish the tasks. Where decentralization has been accepted as an integral part of public policy, the responsibility for forest management is being transferred to subnational levels – states and provinces – and this would significantly reduce the role of central administration. Public sector forest agencies have most often been downsized as a part of structural adjustment programmes to reduce budget deficit. The overall trend as regards public sector involvement in the North African countries could be summarized as follows:

- continuation of existing organizational arrangements with no major structural changes;
- restructuring of the public sector to provide functional flexibility, especially to undertake commercial functions; and
- redefinition of the role of the public sector, enabling it to focus on regulatory functions and the provision of public goods, while all productive and commercial functions are transferred to the private sector and communities.

The likelihood of each of the above situations and their implications are discussed below:

- in general there is a strong tendency to maintain the status quo in the structure and functioning of forestry organizations, or at best to make marginal changes. Much of the emphasis in such a situation will be on increasing the resources available to forest agencies. Although forestry is not generating any surpluses, the relatively high income of some of the countries may permit the availability of funds to the sector without major structural changes. This, however, is entirely dependent on the perception of the importance of the forest sector in the various countries. Since forest productivity is low and most wood requirements are met by imports, the attention that

public sector forest agencies can attract depends on how the government and people perceive the significance of the environmental functions of forests. While there is concern for issues such as desertification and watershed degradation, the resources that are likely to be available will depend on the overall resource situation of the government. Increasing emphasis on economic liberalization, including the transfer of productive functions to the private sector, may reduce resource availability and this may undermine the role of public sector forest agencies, possibly leading to the following situation:

- (i) an inability to fulfil their mandate on account of a shortage of financial and human resources;
- (ii) a lack of capacity to facilitate the resolution of resource-use conflicts;
- (iii) poor investment in public goods research, with consequences for science and technology development; and
- (iv) the private sector and other players operating in an environment without any ground rules and often taking advantage of the absence of a regulatory framework.

- the second path of development involves restructuring government agencies through the establishment of parastatal bodies (as in the case of the Forests National Corporation in the Sudan) to overcome the financial and operational inflexibility characteristic of government departments. Financial flexibility is provided by allowing the organization to retain income and reinvest it in sustainable management. The long-term viability of this depends on the productivity of the resource that is managed, the prices and the ability of the organization to capture the full benefits. Changes in any of the above could alter the economic viability of the organization, as is being experienced by the Forests National Corporation of the Sudan (see Box 18);
- the third possible path is to streamline the organization, limiting its responsibility to fulfilling policy and regulatory functions, especially the provision of the policy and legal framework for other actors to function effectively, and providing goods and services, particularly public goods, that are unlikely to be provided by other actors. Increasingly, most public sector forestry organizations are expected to move in this direction; There are already some indications of a trend towards a reduction in the responsibility of public sector



BOX 18

FORESTS NATIONAL CORPORATION OF SUDAN

The Forests National Corporation of the Sudan (FNC) was established in 1989 as a major institutional innovation, replacing the erstwhile Central Forest Administration, to strengthen the forest sector. Since its establishment, FNC has done a commendable job by streamlining various activities and creating necessary awareness. The area under gazetted forests has increased, extension has been strengthened and the overall human resource capacity has been improved. Its concerted efforts have brought forestry into the mainstream of the policy process.

Interestingly, FNC is now facing new challenges. As alternative energy becomes widely available, demand for woodfuel is declining, significantly reducing FNC's income and consequently its overall operational capability. Changes in the gum arabic trade, especially removal of the Gum Arabic Company's monopoly, would also affect the income of FNC. Furthermore, under the federal system of government, the states are becoming more assertive about their right to decide how the resources should be managed. All these factors would necessitate a detailed assessment of the future options available, including possible restructuring.

agencies and the assignment of many of their traditional functions to the private sector and other agencies. However, downsizing the public sector is most often undertaken in the context of curtailing government expenditure, and not necessarily as a systematic long-term strategy. The future role of the public sector will depend on how the overall reform process is pursued.

MARKET FORCES

Under the market forces scenario resource use decisions are largely guided by the interaction of demand and supply and private sector becomes the most dominant player. The market mechanism affects all sectors directly and indirectly, altering the opportunities and potentials. Trade liberalization policies implemented in North African countries during the past twenty years have promoted the development of a vibrant private sector in agriculture, animal husbandry, industry and services. Governments have also promoted the development of small and medium enterprises through a variety of support programmes. On the whole, the private sector, especially small and medium enterprises, is better developed in North Africa than in other subregions of Africa.

Within the forest sector, the private sector is active in wood processing and tree growing, although involvement in the latter is much less. Both small and large enterprises are involved in the processing of forest products as well as the cultivation and management of trees. The future paths of development need to take into account the ongoing economic liberalization process. The general direction that development could take is described below.

Processing enterprises

- With further liberalization of imports (in pursuit of the various free trade arrangements), there is likely to be an increase in the importation of most forest products such as sawnwood, panel products, paper and paper products. Growing demand from the subregion could easily be met by imports, especially in view of the large capacity that already exists at the global level. North Africa may continue to rely on the overall increase in global wood supplies, especially from Eastern Europe and Africa. While such imports would help to meet the growing demand, they could have adverse effects on existing industries, especially large enterprises such as the pulp and paper industry, if the latter fail to enhance their competitiveness through improvement of processing technologies;
- with improved access to markets, there is an opportunity for the growth of small and medium enterprises in certain areas such as joinery and furniture. Improved availability of imported wood and access to technology and markets, coupled with the relatively low cost of skilled and unskilled labour, are already supporting the growth of small and medium enterprises. Such enterprises may need continued support, especially in terms of understanding the long-term market potential of various products, changes in processing technology and the development of new designs;
- the other major area of opportunity for North Africa may be as regards non-traditional products, especially the further processing of non-wood forest products such as gum arabic, medicinal plants and forest-derived fruits;

The general trend in the development of trade would suggest that the scope for large-scale enterprises to meet the demand for conventional products may be limited, while the opportunities may be there for small and medium enterprises to produce for niche markets.

Tree growing

Tree growing by the private sector comprises two distinct segments, one of large investors and the other of small growers, including farmers and urban investors. The objectives of the various producers and the situations they are likely to face over time are different, as indicated below.

Large-scale private investment

Large-scale private investment in forest plantations could be considered in three broad areas:

- the production of fibre to meet the growing demand for pulp, paper, fibreboard and other reconstituted wood;
- high-quality industrial wood for construction, joinery, furniture, etc.; and
- non-wood forest products with established markets, such as gum arabic and cork.

The strengths and weaknesses of each of these are discussed below:

- large-scale industrial plantations require productive land, and will also require irrigation in view of the limited rainfall in most of North Africa. The opportunity cost of land and water will be very high, especially in view of the profitability of other competing alternatives. Even when such areas can be found (at present largely confined to the central and southern states of the Sudan), the long-term viability of these plantations will be critically dependent on changing markets and technology, especially at regional and global levels. Considering the overall global trends in plantations, the long-term competitiveness of plantations in North Africa depends on enhancing productivity and reducing costs. Factors such as distance from markets and the increasing cost of water are likely to become major constraints. In areas closer to markets, the availability of suitable land and water supplies will be major constraints. Areas where land and water are not constraints are a long way from markets, entailing high transport costs¹¹. This would suggest that expansion of short-rotation commercial plantations may not be a long-term viable proposition in North African countries;
- the production of high-quality wood is another area that may be of interest to the private sector. Involvement of the private sector in a number of countries in growing species such as teak and mahogany indicates such a potential. However, the

¹¹ This will be one of the major limiting factors for large-scale plantations in the more productive areas of the central and southern Sudan.

BOX 19

PRIVATE SECTOR INVOLVEMENT IN GUM ARABIC PLANTATIONS IN SUDAN

Gum arabic cultivation has been almost entirely undertaken by farmers as an integral component of long-fallow agriculture, especially in Darfur and Kordofan states, traditionally regarded as the "gum belt".

A major development in recent years is the involvement of large agricultural companies in the cultivation of Hashab (*Acacia senegal*). The Malaysian-African Agricultural Company (formerly the Gandil Agricultural Company) has already planted about 34 000 ha of hashab in Blue Nile and Kordofan states and will emerge as a major producer of gum arabic in competition with the traditional producers. While this may result in increased output and a broadening of the market, its consequences for long-term prices and stability of income for the traditional producers are yet to be assessed. If the experience of other cash crops is any indication, a significant price decrease can be expected, particularly affecting traditional producers. A reduction in rural income, especially in some of the poorest areas in the country, may undermine the incentive for further reforestation and the management of existing hashab trees.

scarcity of suitable land and, more important, the long gestation period are key limiting factors;

- the production of non-wood forest products such as gum arabic is another area that is increasingly being privatized. There is already strong private sector involvement in the cultivation of *Acacia senegal*, as in the case of the Malaysian-African Agriculture Company in the Sudan (see Box 19). Traditionally, gum arabic cultivation has been undertaken entirely by farmers on a small scale under long-fallow agriculture. With the involvement of large agricultural companies, this situation is expected to change significantly. While large-scale cultivators may be able to capture some of the markets and create new ones, it is important to consider the long-term global demand for products such as gum arabic.

Small-scale cultivation

Small-scale cultivation of trees in woodlots and along field boundaries is expanding considerably and seems to have further scope, especially in view of the increasing local demand for construction materials, poles and wood for handicrafts. Such expansion is likely to take place on irrigated farms with a potential for using excess irrigation water as well as in areas



with problems such as waterlogging and on saline soils unsuitable for agriculture. Considering the nearness to markets and the nature of end uses, returns from this could be attractive. In most cases, as in the case of gum arabic, cultivation of trees is an integral component of land use. Under the market forces scenario, there is every likelihood that the small-scale cultivation of trees will expand, for the following reasons:

- land and other resource requirements for growing trees as an integral component of the farming system are unlikely to be high;
- small-scale tree cultivation is usually carried out as part of land use diversification in order to reduce risks, as well as to fulfil other objectives such as environmental protection. For example, hashab cultivation by farmers undertaken as part of long-fallow farming helps to improve the productivity of land. Trees along boundaries also fulfil the function of windbreaks as well as being a source of income during emergencies.

The long-term prospects of small-farmer cultivation will depend on policies on land tenure, as well as transport and marketing regulations. While small farmers may initially need technical advice and possibly the supply of planting material, much of this could eventually be provided by private entrepreneurs. Increasing numbers of urban dwellers are using their land in rural and peri-urban areas for growing trees. With the rapid growth in information and communication technology, there is likely to be a considerable improvement in access to information on the choice of species, sources of supply of planting material and other inputs, markets, prices, etc., thus facilitating the expansion of tree growing by small-scale investors.

There may, however, be emerging conflicts, especially when large- and small-scale producers cater to the same market, as is happening with gum arabic production. In such a situation a free play of market mechanism could have significant social and environmental impacts. Absorbing the social and environmental costs would require the provision of a strong policy and legal framework for the operation of market forces and the definition of how conflicts are to be resolved. In the case of traded products such a framework would have to stipulate health and safety requirements, as well as the means for compliance with them.

INFORMAL SECTOR

Not all forestry activities fall under the public sector or market forces. A substantial proportion of activities is undertaken in the informal sector and it is therefore important to assess their long-term prospects separately. This is particularly the case with woodfuel collection, the production of non-wood forest products and the grazing of livestock in forests. However, very little information is available on the overall role of the informal sector in providing goods and services and in generating income. As in the case of other sectors, activities under the informal sector may be broadly grouped under (a) the extraction of products and their processing and trade, and (b) resource management. Informal sector activities are often more focused on the former, with much less effort being devoted to resource management. This stems primarily from the fact that those involved in resource exploitation seldom own the resources. Unsustainability is thus a major problem in the informal sector.

The informal sector is in general less significant in the North Africa subregion than the rest of Africa, the main reasons being as follows:

- the higher levels of income in most of the countries and the lower levels of poverty indicate a decreasing dependence on the low-income, informal sector activities in the forest sector;
- the level of education and skill development in most of the countries in North Africa tends to be higher. With further progress in education, the emphasis will shift to higher-income occupations in the formal sector. Although there is unemployment, low-income activities in the informal sector may not be attractive to most people.

However, informal activities may persist in low-income areas and among those with poor access to education and opportunities for earning a higher income. Firewood collection, charcoal production, the collection of non-wood forest products, etc. will continue to be major informal sector activities. Such activities are often undertaken as a means of providing income during the slack season in agriculture, as in the case of charcoal production by migrant workers in the Sudan. The future course of development of informal sector activities will depend on economic and social development in rural areas and on the state of forest resources. To some extent, “formalization” may take place in respect of some of the informal activities, especially as markets expand

and spread to rural areas. Others may fade away as a result of overexploitation and resource depletion.

FORTRESS SCENARIO

In most countries of North Africa, a combination of the three scenarios described above is encountered, with market forces and the public sector being the most prevalent and the informal sector declining in importance. In many situations where there is expansion of all three, conflicts can become serious. In some cases this may result in responses that emphasize the high-cost protection of resources, with priority being given to policing.

Although policing has been the traditional focus of most forest agencies, this is on the decline, the main reasons being as follows:

- forest resources in most of North Africa are commercially less valuable, so that there is less economic justification for incurring very high costs in order to protect them – especially as the emergence of other more valuable resources reduces the economic importance of forests. Much of the focus is shifting to the protection of forests and other land critical for the provision of services such as watershed protection;
- most countries have an effective and widely accepted legal framework and this helps to reduce resource-use conflicts, thus preventing the emergence of conditions that necessitate the adoption of a fortress approach;
- there is widespread recognition of the inadequacy of the fortress approach, and increasing efforts are being made to involve local communities, giving due attention to their genuine needs.

The situation that exists in most North African countries is on the whole less likely to lead to a fortress situation. Traditional social systems encourage considerable sharing of income and wealth. There may, however, be isolated cases where a fortress situation emerges or becomes necessary in order to protect environmentally critical resources such as watersheds and protected areas. Such situations are in the making in densely populated pockets, especially in the uplands. While strict protection and enforcement of forest legislation may help in the short term, these measures are ineffective in view of a growing population and continued pressure on land. Realization of this is resulting in the wider adoption of participatory approaches to resource management.

THE GREAT TRANSITION

The Great Transition envisages a qualitative change, involving a redefinition of the overall strategy for social and economic development, which will incorporate cultural and spiritual dimensions. This enables all segments of society to be active participants in the overall development of society and thus avoid the alienation characteristic of some narrowly focused present approaches. In fact the Great Transition builds on the positive aspects of the public sector, market forces and informal sector and helps to empower all the actors by providing a common vision. The quest for such an all-encompassing approach is already evident from some recent initiatives such as the New Partnership for Africa's Development (NEPAD), the New African Initiative or its earlier versions such as the OMEGA Plan and the Millennium Partnership for the African Recovery Programme. These initiatives seek to pursue all-round social development as an African-led effort. Fundamental to them are a strengthening of the basic foundations of development by deepening the democratic process, upholding human rights, improving governance and public accountability, and addressing critical issues such as human resource development, especially education and health, and protection of the environment. Another key element of NEPAD is the high priority given to faster regional and subregional integration in order to overcome the difficulties of fragmentation of markets and facilitate the pooling of resources.

While the Great Transition is a long-term vision, it is important that FOSA takes into account its implications and identify the opportunities and constraints for translating it into the forest sector. North Africa is in a relatively better position to move into the Great Transition. Much of the effort in accomplishing the Great Transition involves addressing the shortcomings or negative tendencies of the scenarios that are at present dominant. The Great Transition would specifically involve the strengthening of institutional framework comprising of:

- an active civil society able to articulate the larger social, environmental, economic and cultural issues relating to forests and forestry and to influence decisions at all levels, and especially to ensure transparency and accountability in a broader sense;
- policy and legal stipulations that enable wider participation of all the key actors, especially the rural communities; the necessary mechanisms have to be



in place to resolve all resource-use conflicts, ensuring that the needs of the neediest get precedence;

- an active private sector that operates on a level playing field, contributing to the larger goals of social and economic development; and
- a revitalized public sector, which focuses largely on facilitating other actors and undertaking those tasks that are of larger public interest.

Although some start has been made in a number of countries, accomplishing the Great Transition requires sustained and committed effort. If pursued vigorously, some of the likely outcomes by 2020 could be as follows:

- the conservation and management of forest and tree resources would become well integrated into the overall policies of economic development and this would be fully reflected in the formulation and implementation of policies in other sectors;
- although markets would continue to play an important role in resource-use decisions, corrective measures would be built into the system, incorporating environmental and equity considerations;
- local initiatives and innovation would be encouraged, improving traditional knowledge and enabling the development of appropriate management practices; those undertaking or supporting such initiatives would be able to visualize the break and branch points and pursue developments that do not pre-empt future options;
- civil society and local community organizations would play a lead role in managing resources and improving systems for conflict resolution. Community management would become more widespread and involve strengthening the capacity of communities to manage resources in a sustainable way;
- the ground rules for sustainable management would be well understood, and at all levels there would be adequate checks and balances to ensure compliance;
- the role of the informal sector, which has been neglected in the past, would be fully recognized. Rather than being suppressed as illegal, efforts would be initiated to improve its effectiveness. Support to improve technology and skills would help to make them more efficient as well as improving the livelihood of those who depend on them. Eventually most informal activities would be brought under more transparent and formal systems;
- through concerted action by governments, NGOs,

the private sector, community groups and civil society, information technology would develop in such a way as to respond to the needs of the poorer sections of society, thus enabling them to take resource management along a more sustainable path. With improved access to information, individuals and communities would be able to take advantage of emerging opportunities and avoid some of the possible negative outcomes.

Understandably, there are a number of obstacles to accomplishing the Great Transition, especially because of opposition from those benefiting from current inequitable arrangements. However, as countries strengthen democratic institutions and civil society comes to play a lead role in facilitating the changes, the transition becomes attainable.

SCENARIOS – THE EMERGING SHIFTS

In the real-world situation, we may see a development scenario that combines some of the elements of all five scenarios. The market forces scenario is emerging as the most dominant in North Africa, partly because of the policies pursued by governments, as well as the very limited resources in the subregion, necessitating high dependence on imports. Equally important will be the role of the public sector, especially in view of the need to enhance environmental values. Most environmental services are public goods and their provision by the private sector is limited. Considering the critical importance of water, the role of forests and trees will be largely considered from the viewpoint of their impact on sustainable water supplies. The other key environmental role will be in combating desertification. The provision of these services will have to be coordinated at the national and subregional levels, and this will be a major function of public sector agencies.

For the purpose of FOSA, especially for examining the future of forests and forestry, we consider the following developments:

- the persistence of “business-as-usual” scenario, which will be a mix of the positive and negative tendencies under the three core scenarios namely (a) public sector dominance, (b) market forces and (c) informal sector;
- developments that strengthen the positive tendencies of the core scenarios resulting in a move towards the Great Transition.

The implications of the “business-as-usual” scenario are described in the next chapter.



Chapter 5

Forestry issues in the next two decades

As discussed in previous chapters, North African forestry faces some challenges and opportunities that make it unique among African subregions. In general the subregion has very limited forest resources, largely because of the extremely arid conditions. On the other hand, population growth and relatively high incomes result in a high demand for wood and wood products, making the subregion dependent on imports of forest products. With extreme water stress and problems of desertification, the environmental functions of forests and trees are often more important than their productive functions. The public-goods character of these functions poses challenges in mobilizing resources to arrest desertification and improve watershed management. Moreover, some of the problems faced by the countries of the subregion are transnational in nature, for example the siltation of reservoirs and irrigation canals in the Sudan and Egypt. All these issues have to be addressed in the context of the changing social and economic situation in the various countries, especially as they become more integrated into the global economy.

Considering the current state of forests, the driving forces and the range of scenarios discussed in earlier chapters, a number of interrelated questions may be raised to identify the emerging forestry situation. Some of the major questions pertinent to the North Africa subregion are as follows:

- North Africa as a whole has a very high rate of forest-cover loss, partly because of the particular situation in some countries. Is this trend likely to persist or is a reduction in the rate of deforestation likely ?
- What are the prospects for expanding afforestation and reforestation programmes to meet the increasing demand for products and services ?
- Wood still remains an important source of household energy in many countries in the subregion. What are the prospects for wood energy, taking into account the scope for wider access to alternative energy sources ?
- What are the trends in the supply and demand of wood and wood products? Will the dependence on imports persist during the next two decades ?
- There are several non-wood forest products in the subregion that have a long record of global trade. What are the future prospects for these products in the context of changing demand ?
- Environmental services such as improving the supply and quality of water and arresting desertification have become key issues in the subregion. What will the role of forests and trees be in increasing the future flow of environmental services ?
- What is the role of forestry and forest industries in poverty alleviation in the subregion ?

An effort is made below to answer these questions, with a view to discerning long-term trends in the development of the sector over the next two decades.

Changes in forest cover

Forest-cover reduction is a cumulative effect of the actions of various actors operating in the context of the various driving forces and scenarios. Between 1990 and 2000, North Africa witnessed one of the highest rates of deforestation, with an annual cover reduction of 937 000 ha. The Sudan recorded an annual loss of 959 000 ha, the highest in Africa, while net increases in Algeria, Egypt, Libya and Tunisia, although small, helped to reduce the aggregate cover reduction. Apart from the Sudan, Mauritania and Morocco also witnessed a net decrease in forest cover during the period 1990–2000. Since Sudan has most of the forests in the subregion, overall deforestation during the next two decades will be decided by what happens there. The growth of the Sudanese economy, its policies relating to agricultural development and the overall dependence of people on land-based activities are expected to be the key determinants. Considering the long time-horizon and the attendant uncertainties, it is not easy to give a precise indication of changes. However, a decrease in deforestation is expected for the following reasons:

- with income from oil exports, the Sudanese economy seems to be on the path to recovery and growth in comparison with the situation during the 1990s. The economy has been liberalized and

import/export restrictions have been removed, facilitating the growth of industry and trade and reducing dependence on land;

- the large-scale expansion of mechanized farming, aimed at attaining self-sufficiency in food-grain production, has been a key factor contributing to high deforestation in the past ten years. Substantial government support by way of subsidized inputs was provided for rainfed mechanized farming, and a Mechanized Farming Corporation was set up specifically to foster large-scale cultivation. With the overall improvement in the economic situation and the availability of food grains, the government has decided not to expand mechanized farming any further, and the Mechanized Farming Corporation has recently been closed down. This indicates that there will be no further officially supported clearing of woodlands for rainfed cultivation. Moreover, all existing farms are required to set aside 10 percent of their area for forestry and to establish shelterbelts and windbreaks;
- more important, the removal of subsidies for farm inputs and the reduction in the prices of food grains on account of liberalized imports have made mechanized rainfed farming less profitable. This will be a major disincentive for expansion of large-scale cultivation at the cost of forests and woodlands. Emphasis on agricultural expansion is also shifting to improving productivity in irrigated areas, the potential of which is at present underutilized;
- another factor that has contributed to deforestation is the urban demand for woodfuel. With the increasing availability of LPG and other energy sources, there are indications of a decreasing demand for charcoal and firewood. This trend is expected to persist as long as commercial fuels are available and accessible, removing one of the major causes of deforestation.

While deforestation resulting from mechanized farming and urban woodfuel demand may decrease, there may still be forest loss on account of the following factors:

- the continued expansion of small-scale subsistence farming, especially in the central and southern states of the Sudan;
- the unsustainable collection of woodfuel to meet part of the demand from urban centres, especially from people without access to commercial fuels;

- the expansion of animal husbandry in response to the growing demand for meat: meat exports have grown rapidly over the past 10 years and are expected to grow further, while domestic demand is also expected to grow with increased income; this is already resulting in an increase in livestock numbers, with additional direct and indirect pressure on the woodlands; much of the profitability of meat exports stems from free grazing, and with increased concern over health, naturally produced meat may also command a premium; all this may lead to an expansion of livestock numbers, with a resulting impact on forest cover.

While small-scale farming, the collection of woodfuel and the increase in livestock numbers may continue to reduce forest cover, the withdrawal of support for mechanized farming will be a major inhibiting factor on further forest clearing. All the indications are that in the absence of any major unpredictable changes, the rate of deforestation in the Sudan (and therefore the subregion as a whole) is expected to decrease during the next twenty years. However, it is hard to give an indication of the extent of this change on account of several uncertainties.

Afforestation and reforestation likely developments

The objective of afforestation and reforestation depends on the main actors involved and their aims. Most afforestation and reforestation is undertaken by the public sector. With changed perceptions, other stakeholders are also being involved, and commercially significant afforestation and reforestation is being guided by market forces. Afforestation and reforestation programmes in North Africa are aimed at meeting a number of objectives, including protection of the environment (especially as windbreaks and shelterbelts), production of non-wood forest products (for example gum arabic and cork) and production of construction materials such as poles, and also to a limited extent the meeting of industrial timber requirements. The annual planting rate is estimated at about 93 000 ha (FAO, 2001b) and it should be noted that “reported data on forest plantations are sometimes misleading” since “they often include enrichment planting in naturally regenerated stands or shrubby species such as *Artiplex spp*, *Acacia spp*, *Calligonum comosum*, *Prosopis juliflora*, *Opuntia ficus-indica* and *Parkinsonia aculeata* used as fodder, for dune fixation or for soil stabilization” (FAO, 2001b).



Considering the diversity of actors and their varied responses to changing conditions, afforestation and reforestation efforts are expected to develop as follows:

- since the private sector will be the main actor responsible for industrial plantations, the economic viability of investment will be an important consideration. As discussed in chapter 4, the scope for the expansion of large industrial plantations is somewhat limited by the constraints of land and water availability. Some limited expansion may take place as is envisaged by the Kenana Sugar Company, or under agricultural schemes where excess irrigation water and fertile land are available. With economic liberalization, plantations aimed at producing fibrous raw material may become less competitive on account of cheaper imports. There are some indications that Eastern Europe may emerge as an important source of supplies for a number of countries in North Africa, largely because of the latter's nearness to Eastern European wood resources;
- one of the main end uses of wood is as a source of household energy and although a significant increase in the supply of alternative fuels is expected, wood is likely to continue to remain an important source of energy in rural areas. Considering the low prices (especially since most of the wood will be collected from woodland and other seasonal growth), the establishment of plantations to supply woodfuel is unlikely to be a commercially viable option. If woodfuel plantations are to be established at all, substantial government support will be required;
- there may, however, be some expansion of plantations to produce poles and other construction materials for local use as well as to meet the growing demand for wood for high-quality furniture. A significant proportion of this will be cultivated by smallholders on farms, especially in irrigated areas;
- as is already evident, the cultivation of non-wood forest products, such as gum arabic, is increasingly likely to be undertaken by large companies, which would control most of the production, processing and trade. Much of the emphasis under private sector management is on consolidating the market share, and the emphasis may shift to enhancing productivity through investment in tree improvement and better management of sites. Unless there is a rapid expansion of end uses, the

demand for products such as gum arabic is unlikely to increase substantially. No significant increase in the annual rate of planting is thus foreseen in the near future;

- with increasing awareness of issues such as desertification and watershed degradation, much of the focus will be on afforestation to increase environmental benefits. While public sector agencies may play the lead role, individuals, especially farmers and village communities, may also be involved if benefits from such investment can be perceived by the stakeholders (for example, a reduction in crop loss attributable to windbreaks and shelterbelts);
- in view of the public-goods nature of environmental benefits, the public sector – including governments and local bodies – will have to play the lead role in afforestation and reforestation. While there is considerable awareness of the environmental benefits, the scale of efforts will be dependent on resource availability, which will largely depend on the overall economic performance of each country and the priorities in government expenditure. If some of the environmental problems such as watershed degradation are to be addressed, a comprehensive approach will be needed, including substantial resource transfers to improve economic conditions in the uplands. It would appear that the scale of intervention required is far beyond the resources now available. Efforts are therefore most likely to focus on some of the more visible problems such as desert encroachment on highly productive agricultural land and urban settlements.

To summarize, if current trends persist, the scale of afforestation and reforestation may not be adequate to address the critical problems. While this may not have a significant impact on wood consumption, environmental problems such as desertification and watershed degradation are likely to worsen.

Woodfuel: the emerging situation

As indicated in Table 3 (chapter 2), in 2000 woodfuel still accounted for about 93 percent of roundwood consumption. However, the per capita consumption in North African countries is much lower than the average for Africa, largely because of the poor resource base and the greater availability of commercial fuels. The main factors that will affect

woodfuel consumption are:

- population changes, including urbanization;
- changes in the income of consumers, enabling them to switch to improved fuels; and
- the availability of alternative fuels.

As discussed in chapter 3, North Africa is undergoing rapid urbanization and there is a concentration of population in the coastal belt, along river valleys and in delta areas. This entails limited accessibility to woodfuel and high transport costs from the sources of supplies. More important, most countries have better access to commercial fuels. The Sudan, one of the major consumers of woodfuel, is making a significant effort to popularize the use of commercial fuels such as LPG, taking advantage of the substantial domestic supplies now available.

Table 11 gives an indication of the estimated future consumption of woodfuel in North African countries. In general the growth rate in consumption is much lower than that of Africa as a whole, and per capita consumption is in fact expected to decrease from about 0.352 m³ in 2000 to about 0.302 m³ by 2020.

TABLE 11
Woodfuel consumption in North Africa

Country	2000 (000 m ³)	2010 (000 m ³)	2020 (000 m ³)
Algeria	8 444	9 885	10 714
Egypt	18 855	20 539	21 185
Libya	1 023	1 186	1 324
Mauritania	1 865	2 456	3 042
Morocco	7 683	7 633	7 514
Sudan	19 719	22 971	25 793
Tunisia	2 492	2 619	2 648
Total North Africa	60 081	67 288	72 220
Per capita consumption (m³)	0.352	0.322	0.302

Source: Broadhead, J. *et al.*, 2001.

The estimates given in Table 11, however, do not take into account the kind of shifts indicated earlier and may hence be treated as upper limits. On the whole, the conclusions that can be drawn on the basis of available information are as follows:

- woodfuel will continue to be an important source of household energy, but there is unlikely to be any significant increase in consumption, largely because of current efforts towards a shift to alternative energy sources;
- the importance of charcoal as a source of energy will depend on the access and availability of alternative energy sources. In most cases charcoal

consumption increases with increasing urbanization and income. It is precisely the urban high-income groups that are likely to shift to other more convenient fuels such as LPG when it is available;

- although there will be substantial technological progress with regard to other renewable energy sources such as solar and wind power, the scale of their adoption will remain limited and they are unlikely to make a significant impact on woodfuel consumption. Since most of the countries have fossil fuel resources that are being tapped, much of the emphasis will be on using these rather than on introducing renewable energy technologies.

While most countries have the potential to replace woodfuel with commercial fuels, the woodfuel problem may not completely disappear. The accessibility of alternative fuels will be a major concern, especially to those in rural areas. This will be the case particularly in the context of the private sector playing the dominant role in the supply of fuels such as LPG. Particularly in the Sudan, which has a scattered population, transport costs could be substantial, and this may limit the scope of private sector involvement. Thus, although overall consumption may decrease and there may be a significant shift to alternative fuels in urban areas, the rural wood energy problem is unlikely to disappear in the next two decades.

BOX 20

URBAN CONSUMPTION OF WOODFUEL - THE SUDAN

A detailed survey of forest product consumption in the Sudan in 1994 found that urban households accounted for almost 50 percent of total household woodfuel use. This was in a situation when commercial fuels were almost unavailable. With the changed situation of the Sudan's becoming an oil producer, targeting urban consumers could reduce woodfuel consumption drastically within a very short time.

Traditional industries such as bakeries, brick-making and other cottage industries and service sectors account for about 11.5 percent of woodfuel consumption. This is another segment that offers considerable opportunities for a shift to commercial fuels.

Considerable efforts are already being made to make liquefied petroleum gas widely available and to facilitate fuel-switching by traditional industries, and there is already a decrease in the demand for woodfuel.

Industrial wood and wood products

The relatively high income, its anticipated positive growth rate and the large population of North Africa would suggest an increase in the consumption of wood and wood products during the next two decades. However, the poor resource situation and the limited availability of productive land would limit the scope for increasing indigenous supplies. Estimates of consumption and production based on the global forest products model are given in Tables 12 and 13.

TABLE 12

Estimated consumption of wood and wood products¹² (North African share in African consumption given in parentheses)

Product	2000	2010	2020
Industrial roundwood (000 m ³)	4 108 (6.4%)	5 494 (6.9%)	6 390 (7.2%)
Sawnwood (000 m ³)	4 129 (39.4%)	4 679 (36.5%)	5 295 (37.2%)
Panel products (000 m ³)	759 (33.7%)	932 (33.3%)	1 149 (32.8%)
Paper and paper board (000 tonnes)	1 712 (39.2%)	1 929 (36.2%)	2 353 (33.6%)
Printing and writing paper (000 tonnes)	488 (34.5%)	550 (34.2%)	644 (29.3%)
Newsprint (000 tonnes)	163 (35.8%)	274 (31.7%)	384 (29.7%)

Sources: FAO, 2002; Rytkönen, 2001.

The following conclusions may be drawn from Table 12:

- consumption of all major products is expected to increase substantially during the next two decades. The growth rate will be particularly high in the case of high value-added products such as paper and paperboard (especially newsprint) and panel products. There will also be an increase in sawnwood consumption, although the growth rate will be less than for other wood products;
- North Africa will continue to be a larger consumer of forest products than the other African subregions. Although its share in African consumption of industrial roundwood is low, as regards other value-added products North Africa accounts for more than a third of the regional consumption. In the next two decades, this situation is expected to persist, although some slight decline in the subregional consumption is noted.

The main issue is how this demand will be met during the next two decades. Estimates based on the global forest products model provide a general indication of the supplies that may be available from within the subregion, as indicated in Table 13.

¹² The consumption figures for 2000 are based on what is actually reported by the countries and published in FAO, 2002, whereas the projected consumption is from Rytkönen, 2001.

TABLE 13
Trends in the production of wood and wood products¹³

Product	2000	2010	2020
Industrial roundwood (000 m ³)	3 797	5 222	6 172
Sawnwood (000 m ³)	202	197	151
Panel products (000 m ³)	321	375	438
Paper and paper board (000 tonnes)	599	583	920
Printing and writing paper (000 tonnes)	113	248	323
Newsprint (000 tonnes)	0	0	0

Source: FAO, 2002; Rytkönen, 2001.

A comparison of Tables 12 and 13 provides an indication of the extent of the shortfall and consequent dependence on imports. Import dependence is already high for high value-added items such as sawnwood, panel products, paper and paperboard, and such dependence is expected to persist over the next twenty years. For example, sawnwood production in 2000 is estimated at only 5 percent of consumption and in 2020 this will be only about 3 percent. In the case of panel products, supply is estimated at about 36 and 38 percent of consumption in 2000 and 2020 respectively. Virtually all newsprint will continue to be imported in 2020, as it is today.

An assessment of long-term global wood supplies indicates that meeting the deficit in North Africa may not be a problem in view of the large increase in supplies from other regions, especially Eastern Europe, South America and, most important, Central and Southern Africa. There is a unique opportunity to strengthen intraregional trade in Africa, although transport will remain a major bottleneck, making imports from Eastern Europe more attractive.

Non-wood forest products

Although North Africa is not a forest-rich subregion, there are a number of non-wood forest products specific to the subregion that make a significant social and economic contribution. Cork and gum arabic are the best-known traded non-wood forest products from the subregion. In addition, there are several medicinal plants that are collected, used and processed. Egypt and Morocco are among the most important exporters of medicinal and aromatic plants in the world. There are several items that are of local importance, but very little quantitative information is available.

¹³ As in the case of consumption estimates, for 2000 the data are based on FAO, 2002, whereas estimated production in 2010 and 2020 are based on projections.

A range of institutional scenarios can be seen with regard to non-wood forest products and their future significance is expected to change in response to the changing institutional environment. Some of the possible directions of change can be summarized as follows:

- since many products are found only in government-owned forests, the public sector perception dominates the cultivation and management of these non-wood forest products. In view of the limited resources, most forest management (including that of non-wood forest products) tends to adopt a low-intensity regime. A typical example of this is the cork forests in Algeria, Morocco and Tunisia. Although these three countries account for about one-third of global cork forests, they produce only about 9 percent of global cork production. While there may be cultural issues involved, the most important factor seems to be low investment by governments and inherent limitations of the public sector in responding to a rapidly growing market¹⁴;
- the other major traded product from North Africa is gum arabic, and a brief indication of the issues involved in the future development of gum production was given earlier. Until recently most of the gum production was from trees on farms or in government-owned forests. In some of the major producing areas farmers received substantial technical support, especially in view of decreasing production as a result of drought and desertification (see Box 21). While the public and informal sectors have dominated gum production, the overall policy of privatization is having its impact. In recent years, there has been a significant increase in private sector involvement in gum arabic cultivation and trade, especially by large agricultural companies. This is expected to bring about changes in production technology and in arrangements for tapping, processing and trading. While prices may fall and the supply will increase, there could be several social and economic problems when large-scale commercial cultivation replaces smallholder cultivation;
- in the case of most other non-wood forest

¹⁴ The annual revenue generated by the cork industry is estimated at about US\$1.5 billion, of which wine stoppers account for approximately US\$1.0 billion, while floor and wall coverings, expanded agglomerated cork and other cork products account for the rest. The annual demand for wine stoppers is estimated at 13 billion.

BOX 21

REHABILITATION OF THE GUM BELT IN SUDAN

The gum belt in Sudan extends across the northern Darfur and Kordofan provinces and is a natural buffer between the desert in the north and the agricultural areas in the south. The prolonged droughts in the 1970s and 1980s led to considerable impoverishment and depopulation, and this prompted a very extensive afforestation programme aimed at improving ecological conditions, enhancing people's livelihood and arresting desertification. Hashab (*Acacia senegal*) is an integral part of the ecology of the area and is widely cultivated under the bush fallow system of farming used there. By promoting the planting of *Acacia senegal*, the project for the rehabilitation of the gum belt in the northern Darfur and northern Kordofan provinces contributed to rehabilitation of the environment, including stabilization of sand dunes, reduction of erosion, improvement in soil fertility and enhancement of the microclimate.

The project, initiated in 1981, continued for about 12 years and provided a range of support services to farmers in rehabilitation of the area, including the provision of seed and seedlings, extension services and the development of appropriate marketing services.

products, the informal sector is the most dominant and very little effort is being made to manage these resources, resulting in their depletion. At this stage, entrepreneurs may step in to undertake domestication and large-scale cultivation – a likely scenario with regard to some of the more valuable medicinal and aromatic plants. However, this could mean replacing one kind of problem (that of declining supply) with another (a boom and bust cycle), typical of the domestication and cultivation of products with a limited demand in the context of a free market environment.

In short, a wide range of situations is expected to emerge in the non-wood forest product sphere in North Africa. The private sector is expected to emerge as the key player in the production and trade of the most important and internationally traded non-wood forest products, while informal collection and trade will dominate in the case of various products that are available under natural conditions. Resource depletion is inevitable in the case of the latter, unless measures are taken to regulate harvesting and implement sustainable management. This will have to be done by public sector agencies, the capacity of which remains far from adequate, especially in view of shrinking resources.



A general issue relevant to most non-wood forest products is the very limited efforts towards value addition. Most products are exported in the unprocessed form, limiting the benefits in the form of local employment and income generation, since most of the value addition takes place outside the producing countries. A change in this situation would require significant investments to develop processing technology and, more important, to assess the long-term market potential. This would in turn require a strong partnership between the various players, in particular the private sector, governments and communities.

Forests and water

North Africa is one of the most water-stressed areas in the world and the future development of the subregion will depend on how rationally and sustainably the limited water supplies are used. Currently most water is used for irrigation (accounting for about 80 percent) and the rest for domestic and industrial uses. With the growth of the urban population and the need to increase the supply of water to industry, there will be increased pressure on the limited supplies. For forestry, the consequences of this overriding concern are twofold, (a) the role of forests and trees in conserving water and regulating its flow, including arresting soil erosion and its consequences such as siltation of reservoirs and canals, affecting the quality of water for domestic use, and (b) forests and trees as users of water and the consequences for water supplies to other priority areas. These issues are discussed below.

- a key concern of water management is certainly the degradation of upland watersheds. In the case of the Nile, the catchments in Ethiopia and the Sudan require particular attention. Watershed degradation is also a critical problem in countries such as Algeria, Morocco and Tunisia. Much will depend on the resolution of land-use conflicts in the watershed areas. Intervention has traditionally tended to focus on technical recipes, including afforestation. There is a need to move towards a system under which the necessary conditions, including a legal framework and incentives (encompassing security of tenure and even compensation for refraining from certain land uses that tend to result in high downstream costs) are created for the adoption of more balanced land uses;

- considering the arid conditions, afforestation and reforestation efforts will require a substantial quantity of water, and this is likely to compete with other uses. Growing urbanization and the need to increase water supplies to meet domestic and industrial uses would compel a reduction in the supply of water to the agricultural sector as a whole. All the indications are that irrigated forestry will become increasingly expensive as the opportunity cost of water increases, so that the traditional type of irrigated forestry will not be a viable proposition. Emphasis will have to shift to new technology that will help to conserve water, including the use of species that are less water-demanding, wider application of techniques such as drip irrigation and the use of treated sewage water. Much of the tree planting in North Africa is expected to focus on improving the environment and options could therefore be pursued that give less priority to high water-input and high volume production options. The other option is to reuse water, as is being done in Egypt, where treated sewage water is used to establish plantations (see Box 22).

Since some of the critical watersheds are spread across national borders, managing the limited water supplies involves substantial collaboration between countries to ensure that costs and benefits are equitably shared. Systems for the payment of compensation for protecting watersheds need to be worked out and implemented. Opportunities exist to coordinate national and regional efforts and to share the experience of countries within and outside the region.

BOX 22

EGYPT - USE OF TREATED SEWAGE WATER FOR THE ESTABLISHMENT OF PLANTATIONS

There are several benefits offered by the use of waste water for irrigation purposes, including the safe and low-cost treatment and disposal of waste water; the conservation of water and recharge of groundwater reserves; and the use of nutrients in the waste water for productive purposes. The first tree plantation using treated waste water in Egypt was established in 1911 in the El-Gabal El-Asfar farm. Some communities already use sewage or drainage water after primary treatment to irrigate woodlots, mainly comprising of *Casuarina glauca*, *Eucalyptus camaldulensis* and *Tamarix aphylla*. The Ministry of Agriculture and Land Reclamation is taking an active role in the establishment of tree plantations irrigated with treated waste water around cities for greening the urban areas and producing timber.

Desertification control

Desertification is a major environmental issue now and is expected to remain so in the next 20 years. All the countries in North Africa are signatories to the Convention to Combat Desertification (CCD). Like watershed protection, desertification control cuts across all land uses, especially rainfed farming and animal husbandry. Within the forest sector, much of the emphasis has been on afforestation and more particularly establishing shelterbelts and windbreaks in critical areas as well as on improving the urban environment by creating green belts. The establishment of windbreaks around farms is a widely adopted approach, and the economic benefits of this are well understood. However, the scale of effort required to control desertification is very large, far beyond the capability of individual farmers and communities. Private sector involvement is also unlikely or at best minimal, especially in view of the limited direct benefits that can be expected. This would indicate the need for a significant increase in public sector involvement.

Public sector intervention could focus on creating the necessary conditions for other actors to implement appropriate land-use practices and on direct intervention through specific programmes. With decreasing resources, the direct-intervention option is likely to become less feasible, except in very critical areas. In other areas much of the emphasis may be given to creating the necessary conditions for other actors to undertake the task. This would, however, require significant capacity-building for the public sector, especially to resolve conflicts, work on cross-disciplinary issues and undertake technology improvement.

Forestry and poverty alleviation

Although the North African countries are relatively prosperous and poverty is much less widespread than in other African subregions, pockets of poverty still exist, especially in rural areas. Adverse ecological conditions, with consequent low productivity, have been major factors contributing to low income and poverty. Considering the low forest cover and low productivity, the role of forests and forestry in alleviating poverty is more indirect, but would include such actions as:

- augmenting the productivity of other land uses – agriculture, animal husbandry, etc. – through improved watershed management and desertification control;

- improving the supply of products such as woodfuel and fodder that are critical to the economy of rural households; and
- enhancing employment and income opportunities, especially for those living in rural areas.

Despite rapid urbanization, access to markets will continue to be limited for a large proportion of those living in rural areas. Large countries, particularly the Sudan and Algeria, may face such problems. The rural population in some of these countries is particularly vulnerable to drought and famine and the loss of agricultural production. Poverty alleviation will continue to be a priority in some of these countries, with an emphasis on minimizing vulnerability to problems such as drought. The long-term strategy would be to improve land productivity, while the short-term approach (in the event of drought or other adverse factors) would be to increase the availability of goods such as fodder, woodfuel, poles and non-wood forest products.

Improving employment opportunities in rural areas will be another key element in poverty alleviation in North Africa. In this regard the stress will have to shift from capital-intensive large-scale enterprises to skill-intensive small-scale enterprises. The processing of non-wood forest products and furniture-making are two of the potential areas that may have some comparative advantages.

SUMMARY OF IMPLICATIONS

As can be seen, the driving forces and the responses of the various actors will have a significant effect on forests and forestry in the next two decades. The most important of the emerging trends are as follows:

- the rate of deforestation in North Africa is likely to decrease and is expected to be lower than that of the previous decade. This largely stems from significant policy changes that will arrest agricultural expansion and from the emphasis on reforestation of areas that were cleared earlier. Decreasing dependence on land and improved access to alternative energy sources are also likely to reduce the pressure on woodlands;
- North Africa will continue to rely on imports to meet most of its demand for wood and wood products. With increases in global supplies of all important wood products, it may be advantageous for most North African countries to rely on imports and concentrate attention on the processing of non-wood



- forest products, furniture-making, etc., which may offer some comparative advantages;
- with the substantial availability of fossil fuels in most countries and ongoing efforts to popularize their use, demand for woodfuel may fall, especially in urban areas. However, wood is likely to continue to be an important source of energy for many rural communities;
 - increasing water scarcity and desertification will remain the most important environmental issue for most countries in North Africa. Forestry will have a key role to play in watershed protection and desertification control, through the adoption of an integrated approach that takes cross-sectoral links into account;
 - although income levels are higher and the extent of poverty much less than in other subregions of Africa, poverty does exist in pockets and is likely to persist. Periodic droughts will increase people's

vulnerability. Forestry's role in alleviating poverty will be more indirect, by stabilizing water supplies and arresting desertification. The provision of basic-needs goods such as woodfuel and fodder and the increasing of income through rural forestry enterprises will continue to be important.

In short, the productive functions of forests will become less and less important as the economies of North Africa diversify and grow during the next two decades. Much of the emphasis will be on the protective functions of forests, especially in dealing with the problems of decreasing water supplies and desertification. A questionnaire survey undertaken to elicit the public perception on forests in the sub-region also emphasized the growing importance of the services functions of forests and woodlands (see Box 23). However, meeting rural needs for woodfuel, construction timber and fodder will continue to be equally important.

BOX 23
NORTH AFRICANS' VIEW OF THEIR FORESTS

A survey was conducted within the framework of the FOSA exercise to collect information on the views of a wide range of players (government agencies, universities, various institutions, international agencies, non-governmental organizations and the general public) with interests in the forest sector. A questionnaire was drawn up, with 318 copies being distributed in the North Africa subregion. The response rate was 10 percent, mostly from national institutions (government services and universities), basically giving views from four countries (Algeria, Morocco, the Sudan and Tunisia). The following summarises the perception of the respondents.

FORESTS TODAY

The main responsibility for the management of forests lies with governments, with other actors (such as farmers or the private sector) being involved only in a limited way. Judgments are mixed with regard to the adequacy of provision of goods and services, although about 50 percent is dissatisfied. While the Maghreb countries are concerned over the shortage of timber, pulp and paper, Tunisia and the Sudan are fairly confident over woodfuel supplies. Most people are dissatisfied with efforts to protect watersheds or conserve biodiversity, but this perception is contradicted by Tunisian responses, which also indicate progress on the issues of wildlife protection and ecotourism. Nevertheless, general attention is still focused on desertification control.

With regard to the state of forests, deforestation is commonly reported, as seen in a loss of forest area and cover, and an overexploitation of forest products. Other effects identified in some countries (for example Algeria and Morocco) are a loss of biodiversity, soil erosion, desertification and the inefficiency of reforestation activities.

The main causes are given as wood cutting (for timber and woodfuel), the lack of sustainable forest management, pastoralism and overgrazing, forest and woodland fires, and climatic constraints (especially water availability).

The critical factors affecting the state of forests are widely recognized as being population growth, urbanization, poverty (with a high level of rural unemployment) and energy needs. Several respondents indicated the inefficiency of national institutions in addressing the problems.

THE FUTURE OF THE FOREST SECTOR

According to the majority (76 percent), problems of a lack of means and management will affect the forest sector, and the reduction and degradation of forests will therefore continue. The main concerns are seen as biodiversity loss, degradation of environmental ecosystems, water shortage and advancing desertification. Depletion of forest resources will affect living conditions and local wood industry activities.

Unlike people in other countries, respondents from Tunisia believe that their forest situation is going to improve because of current efforts regarding reforestation, adoption of the participatory approaches and integrated silvipastoral management. Ongoing efforts on sustainable management and planting programmes will increase the ecological and economic values of forests, helping the development of ecotourism and the wood industry.

For the whole subregion, an improvement or stabilization of forest status is considered possible, but would require:

- sustainable management, adopting participatory approaches;
- intensification of forest plantation (through community action and farmers' commitment); and
- extension work on environmental issues, as well as technical training.

Substantial efforts are also needed to:

- increase institutional effectiveness;
- strengthen decentralization and the participatory processes;
- increase investments;
- protect soil;
- ensure food security; and
- develop activities and markets for non-wood forest products.

In conclusion, the value of North African forests is seen as lying mostly in the provision of environmental services.



Strategies and actions

The discussion in the earlier chapter suggests the worsening of the problems, especially land degradation and water stress, if the business-as-usual scenario persists. However, most North African countries have a tremendous opportunity to reverse and improve the situation. This chapter discusses the key priorities and strategies that may be pursued to move towards the scenario of Great Transition

DEVELOPMENT PRIORITIES

All the five Mediterranean countries – Algeria, Egypt, Libya, Morocco and Tunisia – have made considerable economic progress, largely through diversification of their economies and taking advantage of such resources as oil, as well as through more liberal economic policies. A strong manufacturing sector has developed, with petroleum refinement, petrochemicals, and agroprocessing. In addition, tourism is well developed, particularly in Tunisia, Morocco and Egypt. Much of the emphasis in these countries will focus on maintaining living standards and more particularly on providing employment opportunities for the increasing young population. Integration of the Mediterranean countries into the global economy (especially when the Euro-Mediterranean Free Trade Zone becomes operative) will provide new opportunities as well as challenges. Changes in the demand for oil, a decrease in income from tourism and the poor growth of exports because of a reduction in global demand could have significant negative effects. Growing unemployment, especially of educated young people, is already a major issue in most countries.

The Sudan is better endowed in terms of agricultural land, water and recently such resources as petroleum. It has immense potential to develop a strong agricultural sector as well as to become an important link country between resource-rich sub-Saharan Africa and the economically better-off North Africa. This potential, and the growing interest in agricultural and industrial investment in the Sudan could significantly change the future of the country in the next two decades, provided the pervasive problem of internal conflict is resolved. The main challenge will

be to ensure that economic development is more widespread and less concentrated. Poverty alleviation, especially in areas that are vulnerable to drought, will remain a major concern.

Mauritania is currently handicapped by unfavourable ecological conditions, the absence of alternative resources, a low level of skill development, etc. However, there are opportunities for diversification because of the country's fishery potential. While fishing is likely to develop during the next two decades, with its potential for significant economic improvement, underdevelopment may persist. This situation will require more attention to enhance productivity and arresting land degradation. Improved management of resources would also benefit animal husbandry. Many economic activities are characterized by low investment – by government, the private sector and households.

Thus, although there may be some differences between countries, the overall thrust of development in the subregion will remain:

- protection of the environment and prevention of land degradation, including desertification control and the enhancement of watershed values; and
- poverty alleviation, especially in areas with a high incidence of poverty with particular attention to enhance employment and to reduce vulnerability to droughts and famines.

The broad strategies and actions in the forest sector in the context of the above development priorities are indicated below.

FORESTRY PRIORITIES

Experience in several countries suggests that low forest cover or low natural productivity are in themselves not insurmountable problems in developing a vibrant forest-based industry. However, what is important is to consider the long-term comparative advantages, taking social priorities into account. With the worsening water crisis, all land uses including forestry will need to be reviewed in terms of their impact on water supplies. This is also important in view of vulnerability to natural disasters, especially drought.

Improving the environment, especially by stabilizing waterflow and arresting desertification, is

directly linked to the objective of poverty alleviation. Further, addressing poverty alleviation in forestry may focus on improving access to essential items such as woodfuel, non-wood forest products and fodder, and more important enhancing employment opportunities to increase income and thus giving access to essential goods and services. Some of the areas of action under the broad objectives of environmental protection and poverty alleviation are indicated below.

Environmental protection

The most important areas of action in improving environmental conditions in North Africa are:

- watershed management to regulate waterflow in such river systems as the Nile and the Senegal and more particularly to reduce siltation so as to improve the quality of water used for domestic, agricultural and industrial purposes;
- improvement in the productivity of agricultural land, especially in irrigated areas, by establishing windbreaks and shelterbelts to prevent sand intrusion and minimize the adverse impact of desiccating winds;
- integration of environmental safeguards into any future expansion of agriculture, particularly to prevent land degradation, so that the long-term productivity of land is maintained;
- reclamation of agricultural land that has been degraded by waterlogging, salinization, etc., and improvement in its productivity; and
- improvement in the urban and rural environment by establishing green spaces and trees to improve the quality of life, including the provision of shade.

Forestry and poverty alleviation

Much of the poverty in North African countries will be urban poverty, especially as more people migrate from rural areas in search of better opportunities. And part of the poverty will be relative poverty arising from widening gaps in income, rather than absolute poverty. Although the countries of the subregion will have made substantial progress on the economic front, pockets of deprivation are to be expected, especially in remote rural areas that may remain economically outside the mainstream of development. Most of the people in such areas will continue to depend on forests and woodlands resources for wood, fodder, non-wood forest products, etc. In many areas animal

husbandry is the most important source of livelihood. Continuing conflicts in some of the countries could undermine development prospects and there will be increased dependence on natural forests and woodlands. This will be the case particularly in some of the southern states of the Sudan. Poverty alleviation efforts should focus particularly on:

- improvement in the availability of basic-needs goods, especially fodder, woodfuel, construction material and non-wood forest products;
- reduction in vulnerability to periodic droughts and other environmental problems, which are a feature of some areas in most countries, through improved opportunities for diversification; and
- enhancement of opportunities for income generation by promoting local industries, focusing particularly on increased production and productivity, and greater access to markets and improved technology.

The subregion has no comparative advantage in any of the traditional large-scale forest industries, in view of the shortage of wood raw material – except possibly in some of the moister zones of the southern Sudan – and efforts should therefore focus on small-scale enterprises, especially furniture-making, the processing of non-wood forest products, etc. In the case of the Sudan, there is a potential in the southern states for the development of a viable wood-based industry to cater to the growing demand from other North African countries, but this option depends on the return of political stability. Distance from markets and the inaccessibility of areas that are potentially suitable for growing wood will act as significant constraints.

POLICIES AND STRATEGIES

Integrated approaches

One of the most important steps towards accomplishing the objectives indicated above is to create the conditions allowing adequate empowerment of the various actors so that they can play their appropriate roles. Forestry and related activities cannot be undertaken without the full participation of all the stakeholders. Policies and strategies therefore need to consider all the factors that empower the various actors to play their respective roles. Fulfilling the objectives of environmental improvement and poverty alleviation requires action by all the key actors and encompasses all sectors. The following require specific attention:



- integration of tree-growing into other land uses, taking due account of the impact on water availability and watershed protection;
- ensuring that expansion of agriculture and animal husbandry does not result in land degradation; and
- support the development of processing, focusing especially on non-wood forest products.

Conservation of forest and tree resources has largely been the responsibility of forest agencies. Much land degradation has been a consequence of the short-term, compartmentalized approach to resource management. Forestry policies tend to be effective only when conservation and sustainable management of forest and tree resources are integrated into the activities of all land-using sectors such as agriculture, animal husbandry and urban development. An example of this is the stipulation in the Sudan that a certain minimum proportion of land in agricultural schemes is to be set aside for forestry purposes. Similar approaches need to be adopted in the case of animal husbandry, urban planning, industrial development, etc.

Institutional arrangements

The vision of accomplishing the Great Transition requires significant institutional re-engineering. Fundamental to this is the strengthening of pluralistic institutional arrangements as well as the coordination of efforts at all levels. The necessary space needs to be created and improved for all the key actors, including government agencies, the private sector, community groups and civil society, to play their respective roles. In the context of North Africa, if some of the critical problems are to be addressed, collaboration will be needed between countries, and this requires a clear definition of the roles and responsibilities of existing regional and subregional institutions. Some of the priority areas of action to facilitate change are discussed below.

A revitalized public sector

Revitalizing the public sector would specifically require:

- redefinition of its responsibilities, focusing specifically on policy-making, monitoring and regulatory functions in order to operate as an effective arbitrator to resolve conflicts;
- strengthening of the capacity of forestry institutions, especially to manage the policy process and weaning it away particularly from the traditional policing approach;

- improving its ability to function in partnership with other actors, especially the private sector, NGOs and community groups;
- strengthening of its capacity to play the lead role in providing public goods (especially environmental services and social goods, including research) that are unlikely to be provided through market mechanisms; and
- improved transparency and accountability, especially greater sensitivity to the perceptions of other stakeholders.

A vibrant private sector

North Africa has a relatively better developed private sector than other African subregions in almost all spheres except forestry. The situation for forestry is partly a consequence of limited opportunities, especially in forest resource management, although there is scope for nurturing and strengthening its role. This would require:

- creation of a policy and legal framework encouraging private sector initiatives and laying down and enforcing ground rules to facilitate the development of a transparent and competitive environment;
- development of strategic partnership arrangements between the private and public sectors so that they can benefit fully from each other's relative strengths; and
- incorporation of appropriate preventive and corrective measures to ensure that the social and environmental impacts of private sector initiatives are taken into account.

Empowered community organizations

There is considerable experience in the subregion in involving community organizations, in forestry. The main strengths of community organizations stem from their ability to address local concerns and issues. However, like any other institutional arrangements, they also have limitations. The strengthening of community organizations needs to focus on the following aspects:

- provision of a policy and legal framework, and recognition for the functioning of community organizations, clearly indicating their spheres of operation and the functions they are to perform;
- assistance in developing a transparent and democratic framework for the functioning of community organizations; and

- support to community initiatives through partnership arrangements, including the provision of technical assistance and enhanced access to information and knowledge.

An effective civil society

The effectiveness of all institutional arrangements depends on the existence of checks and balances in the system, and in this regard civil society organizations have a crucial role to play. In most countries in North Africa such organizations are active in forestry and environmental issues, with varying degrees of effectiveness. Efforts need to be focused particularly on:

- involvement of civil society organizations in the formulation of national forest programmes and strategic planning initiatives;
- recognition of the freedom of information, ensuring that all relevant information is accessible to civil society organizations; and
- due representation in the bodies responsible for reviewing and monitoring the performance of the various institutions involved in forestry and related matters.

Regional and subregional collaboration

A striking feature of the subregion is the broad similarity of the problems, many of which are transfrontier in nature. Key environmental problems such as watershed degradation and desertification are common to all the countries. Increasing economic integration through various trade and economic cooperation arrangements is expected to raise new problems requiring collaborative efforts. There are definite economies of scale in dealing with some of the problems regionally or subregionally rather than

at the national level. Some of the specific areas requiring particular attention are:

- research and technology development: there is considerable scope for integrating ongoing science and technology efforts, especially on some of the environmental problems such as desertification control; existing research networks could be strengthened in order to facilitate the sharing of available expertise and facilities;
- collaborative efforts: some efforts, such as watershed protection, arresting desert encroachment and biodiversity protection, become more effective only if efforts in different countries (especially adjoining ones) are closely integrated; this is the case particularly where ecological zones overlap political boundaries; mechanisms are needed to coordinate efforts in different countries and ensure effective synergy.

Improving access to information

As discussed in chapter 3, one of the most important developments in recent years is the rapid development of information and communication technology. Although its growth in the North Africa subregion has been rapid, its wider adoption in the forest sector has remained slow. Increased access to information, especially for those working in the field, is critical in bringing about changes in the way resources are managed. The following points are particularly important:

- enhanced access to technology, especially assistance in learning from experience elsewhere; and
- information on markets – emerging opportunities and constraints – in order to facilitate appropriate responses from the various actors.



Summary and conclusions

Based on an analysis of the current situation, the factors influencing the forest sector and the emerging institutional scenarios, this report provides a broad indication of the forestry situation in North Africa. Some of the main findings and conclusions are summarized below.

FORESTRY SITUATION

The subregion is characterised by low forest cover and the most forested country, namely the Sudan, has witnessed a very high rate of deforestation during the decade 1990-2000. Most of those with very low forest cover are on the path to recovery, although the extent of reforestation and afforestation remains small. The overall consumption of wood and wood products is high in comparison with other African subregions, largely reflecting the high income. The consumption of woodfuel and industrial roundwood is low, whereas the consumption of panel products, paper and paper products is high as a result of high incomes.

Much of the consumption is met by imports, and North Africa will continue to be one of the main importing subregions for wood products, with most of its supplies coming from Europe, especially Eastern Europe, and to a limited extent from Africa. Imports have increased on account of economic liberalization policies. Most countries have diversified their economies, largely through the development of extractive sectors (especially petroleum production) or sectors such as tourism and manufacturing. Rapid urbanization is generating new problems, such as urban unemployment and deterioration of the urban environment. At the same time, many of the traditional rural problems such as general underdevelopment persist. These have a direct bearing on larger environmental issues such as land degradation, increasing water stress and desertification. While there will be overall progress on the economic front, marginalization of certain sections of the population may persist. Growing unemployment of the young and of educated people will continue to be a major issue.

PRIORITIES

Given the above situation, forestry's primary role will be in environmental protection and poverty alleviation. These two objectives are interlinked in as much as environmental protection is critical to improving land productivity and reducing vulnerability to droughts and famines. The main focuses of environmental protection will be on:

- protecting watersheds to regulate waterflow and reduce siltation and related problems; and
- arresting desertification and land degradation (especially through the establishment of shelterbelts and windbreaks) and improving the urban environment by creating green spaces and belts to enhance the microclimate.

The main focus of poverty alleviation will be on:

- increasing the availability of essential items such as woodfuel and fodder for local communities;
- improving the production and processing of non-wood forest products to ensure increased employment and value addition; and
- encouraging the development of competitive and efficient small and medium industries catering to niche markets.

In view of the resource situation in North Africa (especially the inherent low productivity of land and the growing water stress) and the increasing supply of wood and wood products at the global level, the scope for expansion of any large-scale forest industry in the subregion seems to be limited, at least for the immediate future. It may be advantageous for North Africa to concentrate on the areas of its comparative advantage in skill-intensive small and medium industries, such as furniture-making and the processing of non-wood forest products including medicinal plants.

APPROACHES

Efforts to move in the direction indicated above require significant policy and institutional changes. From the experience of most countries, it is evident that what happens in forestry is largely decided by what happens outside the sector. It is therefore

imperative that an integrated approach be adopted for the conservation and management of forest and tree resources. Forestry should thus be integrated into the activities of all the land-using sectors.

Institutional improvements should focus on defining and increasing the space available for action to the various stakeholders. The roles and responsibilities of the various actors – public sector, private sector, community organizations and civil society – should be clearly defined and recognized, focusing specifically on:

- revitalization and strengthening of the public sector to play an effective regulatory role and guide policy development;
- supporting the development of a vibrant private sector by creating a favourable competitive environment and, more important, ensuring transparency in the market place;
- empowerment of community organizations to undertake grassroots action to fulfil the needs and aspirations of the people, in collaboration with other actors; and
- strengthening of civil society organizations to play a proactive role so that transparency and public accountability are incorporated into the functioning of all institutions.

In pursuing the various objectives and strategies, there are immense opportunities for:

- regional and subregional collaboration, especially in research and technology development and in the form of joint programmes in such areas as

watershed protection and desertification control; and

- wider adoption of developments in information and communication technology, especially in order to improve access to knowledge and thus enhance opportunities for the disadvantaged.

FUTURE

Considering the diversity of the situation in the subregion, and the long time horizon of FOSA, it is difficult to provide a more precise indication of how the future will be. As indicated political and institutional changes are critical impacting factors, but less predictable. What has been attempted provides a broad framework indicating a) what is likely to happen if the “business-as-usual” situation persists, and b) what measures are to be taken to move towards the Great Transition.

While an outlook study provides an indication of the future situation, events unfold in an unpredictable manner requiring the periodic updating. The value of any outlook depends on how it is used and improved. In the case of FOSA, the most important follow up would be:

- mainstreaming FOSA findings into the national forest programmes,
- enhancing capacity of the countries to undertake long term strategic planning,
- updating the outlook periodically to take in account the various changes.



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