BENEFITS AND USES: more than wood

Forests and woodlands are important to people for many reasons. At a minimum, they yield wood for furniture, construction and firewood, but they also harbour hundreds of thousands of animal species that are valuable components of the natural environment. Many of these also provide food, pleasure and other resources to people. And in places where forest and woodland growth is luxuriant and dense, trees absorb large quantities of carbon dioxide thereby helping to keep the earth cool. There are countless other examples of the value and use of trees, many of which will be explored and assessed in the pages ahead.

Two principles are important in any assessment of the value of woodlands. The first is that the nature of use or value varies. Some resources are harvested or used *directly*, for instance firewood and fruit. Other resources have *indirect* benefits, for example the value of a forest in providing places for bees to produce honey, in adding nutrients to the soil, or in attracting tourism revenue that develops the national economy. Direct or indirect values are thus two major dimensions, and much of the material in this chapter is presented with this division in mind.

Almost two-thirds of all households use wood to cook their food, but how long will this tree last before it too is reduced to a pile of fuel?

Other dimensions concern whether woodland products are used in local homes (for domestic functions) or sold (for commercial purposes). Woodland products also have *option* values, which reflect potential benefits in deriving valuable products from trees at some time in the future. Such options relate to, but differ from *existence* values, which reflect the wish for people to see that forests and woodlands continue to exist. Many international donors and other philanthropists are prepared to contribute funds for the conservation of African woodlands, but they may never see or directly benefit from those habitats. Another dimension is between wood products and non-timber forest products (NTFP). The concept of non-timber forest products is a relatively new one, which helps emphasize the great variety of different values and uses of woodlands. The concept adds support to the development of community forests (see Chapter 4) in promoting possible commercial uses of non-timber forest products to improve the livelihoods of rural communities

The other principle is that values and uses depend much on context or setting. A grove of Mopane trees in one place may hardly be used because people build their homes or cook their food with other materials. But Mopanes elsewhere could have great value in supplying several such resources for domestic and commercial uses, for example. Likewise, the value of a single tree might not be high in well-wooded areas, but each of the few trees scattered across a desert landscape has extremely high value in providing shade, places for birds to nest, or fuel wood. The same tree species often has multiple uses. For example, Kiaat provides high quality wood for furniture, crafts and domestic implements, its latex yields red dye for basketry, while its powdered heartwood is used for stomach and eye ailments and as cosmetics by Jul'hoansi women.[1]

The approach taken in this chapter is to focus on benefits clearly derived from trees and to leave

aside uses that result more from an association with trees. The division between such uses is often blurred, and it is a matter of opinion as to what to include or exclude. However, we have chosen to exclude such other uses of plants and animals that occur in or are dependent on woodland habitats. Thatching grass and the hunting of wildlife are cases in point. It is simply beyond the scope of this book to describe all these other resources in any detail. This does not detract from their value, and we argue elsewhere (see page 78) that the potential of these resources should be recognized fully in assessing how woodland habitats are maintained.

People and their pre-human ancestors have been using woody plants for millions of years, and have therefore had lots of time to discover many benefits: food, fuel, cosmetics, construction materials, medicines, and others. And more uses of plants are being discovered as time goes by, to the extent that the majority of tree species in Namibia are put to some or other direct use. This is quite different from animal species, most of which are not used in the same utilitarian ways by people.

FUEL WOOD

More wood is used for fuel than for any other purpose in Namibia, as shown in the table below. To that conclusion can be added three others: most fuel wood is collected locally close to rural homes, largely for domestic cooking, and mostly from dead wood. By implication, little wood is used as industrial fuel and it is only around densely populated areas that living trees are killed and harvested for fuel. Energy from wood fuel makes up roughly 20% of all energy (which includes electricity, petrol and diesel) consumed per year in Namibia. This is slightly higher than the 14% of all energy that wood is estimated to provide worldwide.[2]

The Population and Housing Census held in 2001 provides much useful information on the use of wood, since it recorded the main fuels used for cooking, heating and lighting in all homes. Wood was used for cooking by over 213,000 or 62% of all households in Namibia. Many (42%) homes also use wood for heating, while 13% report using wood for lighting. However, the quantities of wood used for heating and lighting are much smaller than those used for cooking, and wood used for cooking often provides heating and lighting as well. Multiplying the total number of households using wood for cooking with an estimated daily consumption of 8 kilograms[3] means that Namibia uses about 1,700 tons of wood for cooking every day, equivalent to a pile of wood measuring 1 x 1 metre and over 2 kilometres metres high!

Over three-quarters of the 213,000 homes that reported using wood for cooking in 2001 were in Caprivi, Kavango, Ohangwena, Oshikoto, Oshana, Omusati and Kunene, and over 80% of households in these regions use wood for cooking (Figure 21).

Approximate quantities of indigenous wood (in cubic metres) used in Namibia each year.[4]

Use or product	Domestic, non-cash consumption	Commercial production
Fuel wood	983,000	100,000
Charcoal[a]	0	240,000
Household construction and fencing (local production)	316,000	0
Carvings	0	440
Mopane roots		1,000

[a] About five kilograms of wood are required to produce each kilogram of charcoal, and so 240,000 cubic metres generate about 48,000 cubic metres of charcoal per year.

Percentages of all homes using different fuels for cooking during 2001, in the whole country and in rural and urban areas.[5]

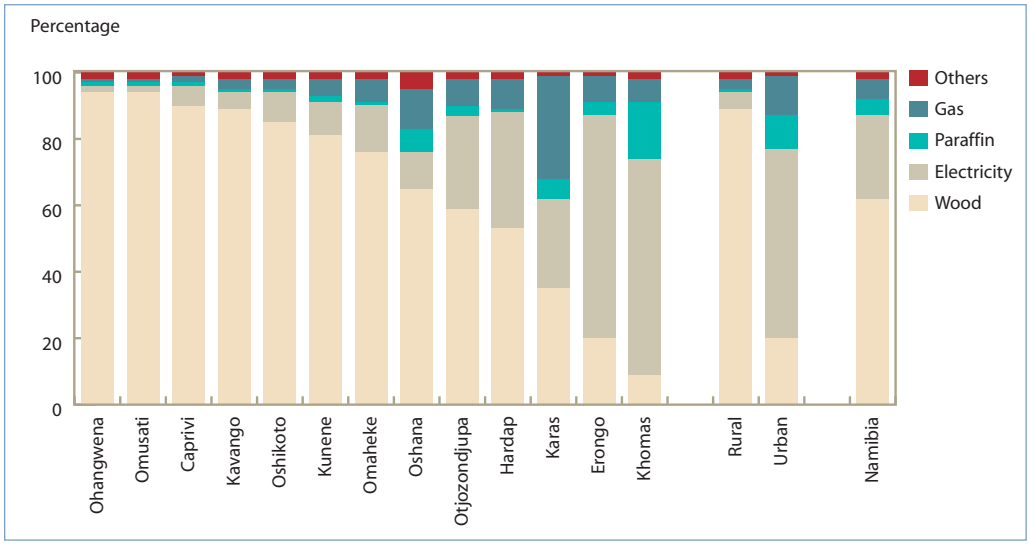
	Wood	Electricity	Paraffin	Gas	Other
Namibia (% of households)	62%	25%	5%	6%	2%
Namibia (number households)	213,526	86,187	17,105	22,344	7,293
Rural	89%	5%	1%	3%	2%
Urban	20%	56%	10%	12%	1%

These are all northern regions where wood is more available than further south (see page 49). But the high percentages also reflect the fact that the great majority of households in these areas are rural ones, in which many people are relatively poor and less able to afford alternative fuels. Indeed, wood is used for cooking by nine out of every 10 rural homes (89%), whereas only 20% of urban households use wood as the main cooking fuel.

Urban residents tend to be wealthier than rural people, and alternative fuels are more available and at lower cost than in more remote areas. Over half (57%) of all homes in towns use electricity for cooking, while about one tenth of households use gas or paraffin (kerosene) as a cooking fuel. About two-thirds of all houses in Khomas and Erongo use electricity for cooking, largely because most people that live in these regions live in Windhoek, Swakopmund, Walvis Bay, Usakos, Omaruru and Karibib. The availability of electricity in the larger towns of Oshakati and Ondangwa also explains why higher proportions of homes in Oshana (12%) cook with electricity than in Omusati and Ohangwena (2%). Both gas and paraffin are little used for cooking in the country as a whole, but gas is about equally as important as electricity and wood in Karas. The main fuels included in the category "Other" in the table above and Figure 21 are charcoal, dry livestock dung and solar power.

Changes in the use of wood for cooking can be assessed by comparing information from the 1991 and 2001 censuses. The number of homes using wood for cooking rose by about 26,000 between 1991 and 2001, an annual rate of increase of 1.3%.

Figure 21. The use of different fuels for cooking in 2001, showing the percentages of households in each region using each fuel as their main source of energy for cooking.[6]



The escalation is due to population growth, since the proportion of households using wood in fact dropped substantially from 73% in 1991 to 62% in 2001. Much of the decline can directly be attributed to the increased use of electricity and paraffin: respectively, about 40,000 and 15,000 more houses used these fuels in 2001 compared with 1991. More indirectly, the decline in wood use and increased use of modern fuels was due to urbanization. Town populations grew by about 5% per year over the past decade, and people now living in towns have better access to electricity and paraffin, and higher incomes to pay for these fuels. In addition, wood resources are scarce around most urban areas.

Another way of looking at changing energy uses is to consider what motivates people to change from wood to electricity use. One can assume that most people who have electricity also use electrical cookers or stoves. However, of all homes that had electrical lighting in 2001, only 75% used electricity for cooking. The remaining 25% was split between wood (12%), gas (10%) and paraf-

Most wood can be used for cooking and heating, but Camel Thorn, Mopane and Leadwood are often preferred because they are hard and burn for a long time. Both Camel Thorn and Leadwood are protected species (see page 99).

Percentages and numbers of households using wood for cooking in 1991 and 2001.[7]

Fuel	1991	2001	1991	2001
Wood	73%	62%	187,047	213,526
Electricity	18%	25%	46,648	86,187
Paraffin	1%	5%	2,096	17,105
Gas	7%	6%	18,139	22,344

Energy can be transported more easily as charcoal than as raw wood. About five kilograms of wood produce one kilogram of charcoal, and so most of the energy provided by a cumbersome bundle of wood is contained in a small load of charcoal.

fin (2%). Those who use gas are probably in a similar economic bracket to those using electricity, whereas households that still cook on wood are perhaps too poor to buy modern cookers or pay for electricity.

The region with the greatest use of paraffin is Khomas, largely because it is used by the majority of homes in the informal settlements or townships on the northern edge of Windhoek. The total number of households using paraffin in those areas rose from less than 100 in 1991 to about 9,700 in 2001. By contrast, the proportion of homes using wood for cooking in the whole city dropped from 7% in 1991 to 5% in 2001, again largely as a result of better access to other fuels and perhaps the reduced availability of wood around Windhoek.[8]

One might expect entrepreneurs to import and sell firewood to low-income groups in Windhoek. However, this appears to be happening to a very limited extent, perhaps because of the high costs of transporting wood from sources far to the north or east. Transport costs in northern Namibia would be lower, and there are indeed fairly large wood markets in many northern towns, which are surrounded by more abundant supplies of wood within 50 kilometers. One study found that households in Oshakati and Ongwediva bought and used about 26 bundles of wood per month, each bundle weighing an average of 7 kilograms and costing between N$6 and N$7.[9] This was in 2003, when prices had more than doubled from those charged in 1997. As more and more people settle in towns, especially in low-income housing, a greater trade in wood to towns might develop. Alternatively, more people might start to use paraffin, a possibility requiring research to investigate what factors encourage households to adopt alternative cooking methods. It is often argued that low-income households do not use charcoal because they prefer traditional wood fires and because they cannot afford stoves on which they can cook on charcoal. Both arguments are perhaps contradicted by the growing use of paraffin in Windhoek.

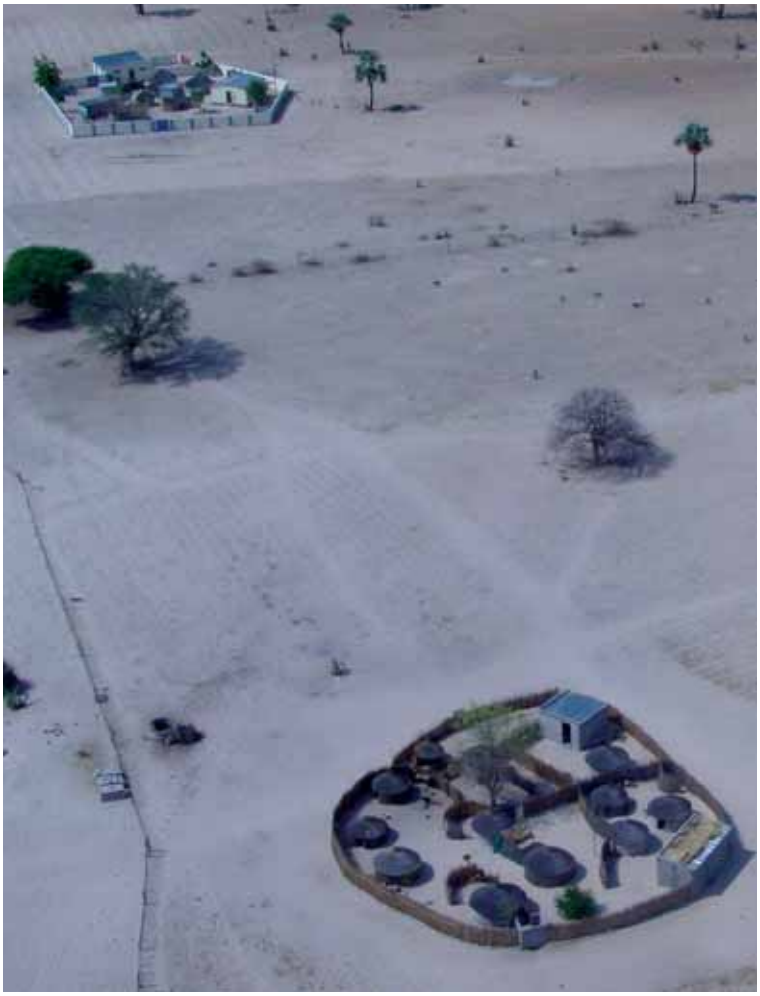
Namibia's annual production of charcoal in recent years has varied between about 40,000 and 50,000 tons. A few hundred tons are sold in Namibia, mainly for the barbeque or locally known *braaivleis* market, while the rest is exported, roughly three-quarters being sold in South Africa and one-quarter in the United Kingdom. The total value of the industry, which has grown rapidly over the past 15 years, was estimated to be

about between N$75 and N$100 million in 2004. However, charcoal sales to Europe have dropped in recent years, especially to Germany where 40% of Namibia's charcoal exports were sold in the mid 1990s. The loss was largely due to poor quality control by producers, the stronger South African Rand and competition from other charcoal producing countries such as Argentina and Poland.[10]

Charcoal is largely produced from so-called invader bush, particularly those species – Black Thorn, Purple-pod Terminalia and Sickle-bush – that cause most bush encroachment (see page 112). The charcoal industry is thus often seen as an anwer to the problem of bush thickening. However, this solution only applies to a few small areas because the number of suitably large bushes harvested for charcoal is low compared to the extent of the bush encroachment problem. In addition, the roots of bushes and small trees cut for charcoal are often not killed and the plants then coppice again into bush. There are between 100 and 120 active charcoal producers in Namibia, most of whom are freehold farmers. In total, between 2,500 and 3,000 people are employed in the industry, which operates largely on freehold farms lying between the veterinary cordon fence in the north and Windhoek in the south. About 20 of the farms on which charcoal is produced carry Forest Stewardship Council (FSC) certification, one provision of which means that the bush is harvested on a sustainable basis.

CONSTRUCTION AND FENCING

Together with fuel wood, the other major use of indigenous wood in Namibia is for building homes and fencing. One estimate suggests that about 316,000 cubic metres of wood may be used each year for fencing and construction (see page 61). Most of this is in northern Namibia, while the majority of homes in the southern regions are structures of bricks, cement and corrugated iron. Wire fences supported by steel fence posts and droppers, or treated, imported droppers, also predominate in the south.



The use of wood for construction has dropped significantly as increasing numbers and proportions of rural households in the northern, communal areas are built of bricks, corrugated iron and other modern materials.

Building styles vary a great deal in the northern areas, where increasing numbers of modern homes are being constructed. Wealth is a major factor. Amongst traditional homes, it is the wealthiest households that have the biggest structures and that consist of the greatest amounts of wood. Poor homes, by contrast, are small and more often built from grass, reeds and long sticks. Housing styles also vary in relation to the availability of wood and traditional or cultural practice. The most impressive wooden homes are the large, traditional complexes of rooms and palisade walls built in former Owambo. Many of those homes are comprised of between 4,000 and 6,000 sizeable poles, mainly

Percentages of houses built using various materials for their outer walls in 1991 and 2001, and in urban and rural areas in 2001.[11]

Outer wall material	Namibia 1991	Namibia 2001	Urban 2001	Rural 2001
Wood poles and grass	40%	21%	3%	33%
Sticks, mud and cow dung	12%	8%	2%	12%
Cement blocks/bricks	34%	38%	66%	20%
Burnt bricks/face bricks	2%	15%	4%	22%
Corrugated iron sheets	9%	15%	21%	11%
Prefabricated materials	1%	2%	3%	1%
Other	1%	2%	2%	2%

of Mopane and Silver-leaf Terminalia because this wood is hard, resistant to pests and thus long-lasting. Large areas of woodland were deforested in north-central Namibia as a result.[12]

From the 2001 Population and Housing Census, about 21% of all homes in Namibia have outer walls constructed of wood, while another 8% are built of much thinner sticks that are often woven or platted and then plastered with mud and dung. The great majority of these traditional structures are in rural areas, whereas there are few such homes in urban areas. Thus, about 45% of rural households have outer walls of wood or sticks, plastered with mud and cow dung compared to only 5% in towns.

Housing construction has changed very substantially since 1991, as indicated by the figures in the table above. Far smaller proportions and numbers of homes are now built of traditional materials, while many more have been built using bricks, cement blocks or corrugated iron. For example, 52% of all houses had outer walls of poles, sticks, and mud and cow dung in 1991, compared to only 29% in 2001. The total number of these houses dropped from 132,105 in 1991 to 99,339 in 2001.

Much of this change is due to urbanization, people moving to towns replacing their traditional houses with ones built using modern materials. However, many rural homes in communal areas

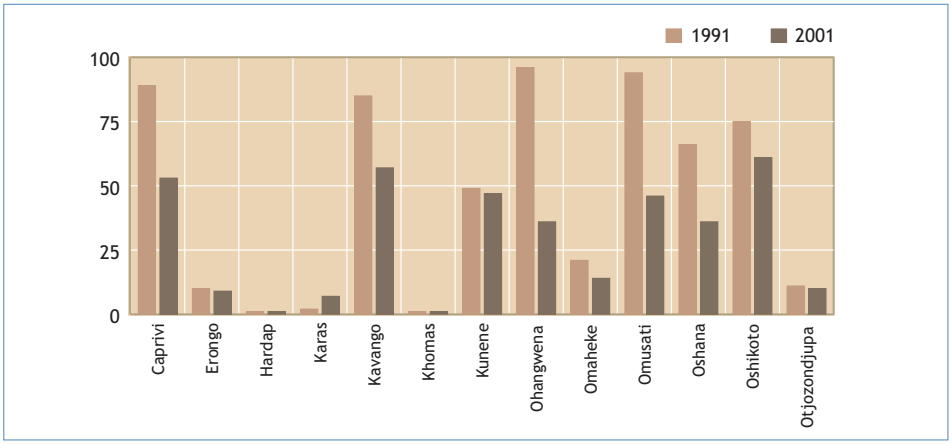
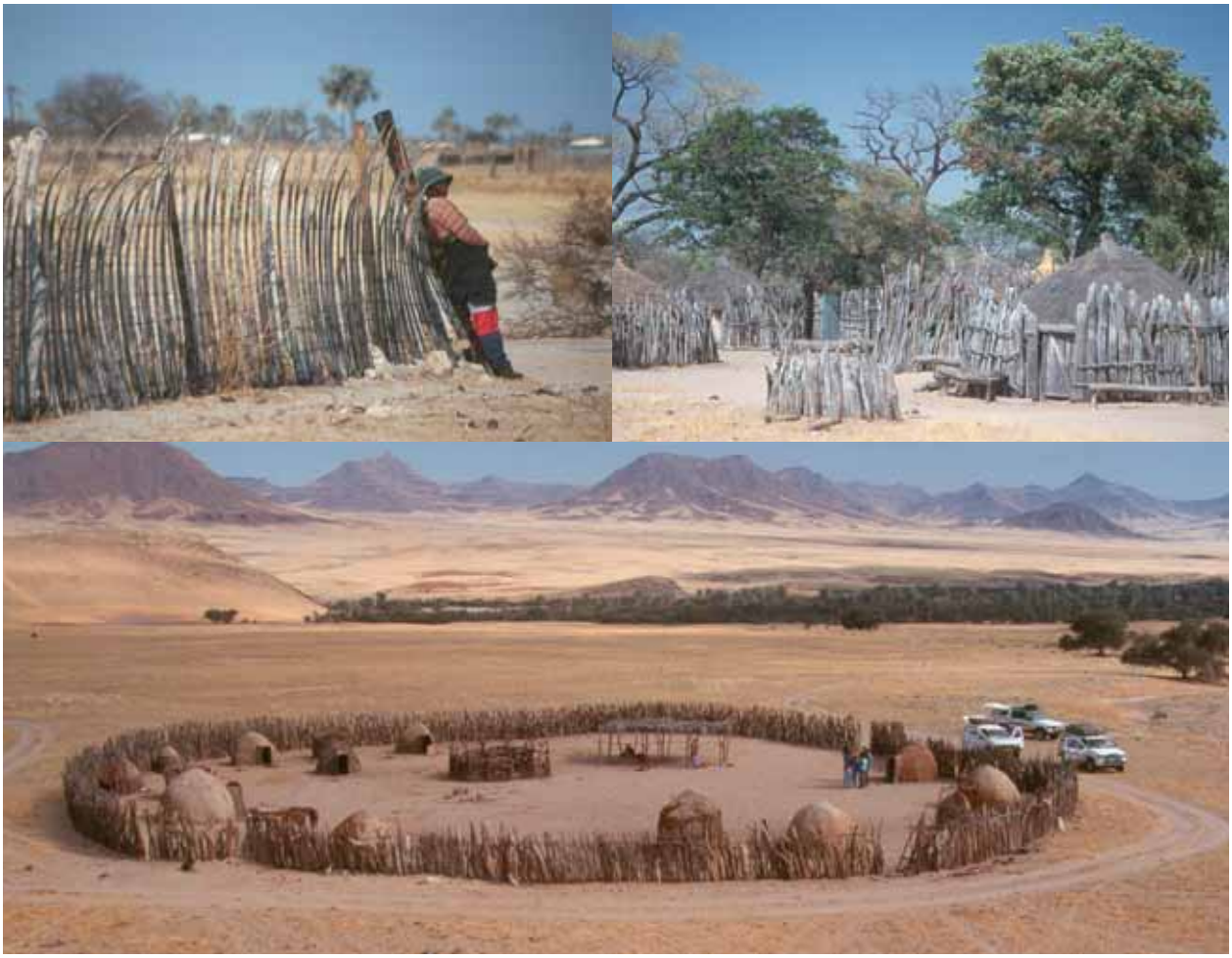


Figure 22. Percentages of houses built using poles, sticks, and mud and cow dung for the outer walls in 1991 compared with 2001.



All manner of wood is used for fencing, ranging from thick poles cut from Camel Thorns and Mopanes, to Makalani Palm fronds, and waste, such as old car doors. Because Mopane coppices and quite rapidly produces branches or trunks suitable for fencing, it is regularly harvested from vast areas of shrubland in northern Namibia. Some farmers around Tsumeb now harvest and sell Purple-pod Terminalia for fence droppers.

are now also being built of bricks and other purchased materials. This is particularly the case in Oshana, Ohangwena, Oshikoto and Omusati where, for example, the percentage of houses with outer walls of poles dropped in Ohangwena from 88% in 1991 to 34% in 2001, and in Omusati from 92% to 34%, a decline of more than half in both areas (Figure 22). Several factors appear to have driven this change. First, many households in these areas now have reasonable – often very substantial incomes – which can be used to build improved homes. Second, and in parallel, lifestyles have changed. Western clothes are the vogue, many people carry cell phones, and having a modern home forms an integral part of a new style of living. Third, it is now difficult to replace old poles because of the scarcity of Mopane, Silver-leaf Terminalia and other suitable trees nearby. Harvesting and transporting such poles from more distant sources is furthermore an expensive undertaking. Fourth, permits required to harvest and transport poles have helped limit the cutting of trees. The introduction of the permit system was accompanied by extension campaigns, often broadcasted through public radio services, urging that the use of wood be reduced and that trees were not to be cut down. Finally, modern building materials are now readily available from building suppliers that have opened shops in many of the northern towns.

Kiaat dominated the timber industry because it provided the best wood for furniture (top). The wood is hard and attractive, sizeable and straight planks can be harvested, and it has fewer knots and warps less than other indigenous woods. Following Kiaat, and in order of quality and preference, Zambezi Teak, Ushivi, Pod Mahogany, and Burkea (bottom) also produce useful timber.

Large quantities of wood are used for fencing but little information is available on the extent of this use. However, the use of wooden fencing poles is almost certainly declining as farmers increasingly use wire fencing and steel fence poles. Many wire fences on freehold farms in central and southern Namibia were erected using Camel Thorn and other hardwood fence posts. Some of the posts still stand, but steel pipes are normally used for new and replacement fence posts. Fencing in the communal areas generally uses more wood, the entire fence often consisting only of hundreds of thin poles erected and held in place with thin plaited sticks to create a dense lattice that keeps goats out of fields. Many fences around fields and livestock stockades in the north-central regions consist of thousands of Mopane poles. As in the case of housing, wealthy farmers tend to have bigger fields that are securely fenced, while poorer farmers use less wood because they have smaller fields, which are often not fenced at all. However, many richer farmers in communal areas now also erect wire fencing strung between steel poles supported with steel droppers.

TIMBER

Namibia's arid environment and sparse tree cover is only one of several reasons that the country's timber resources are small (see page 51). Most trees are not suited to timber production because they are small or the wood is too knotted or distorted, and this is also true for most trees in the north-eastern woodlands. Any tree with a diameter of less than 45 centimetres at breast height is usually not worth harvesting because it would yield only a few narrow planks. The wood of trees such as Zambezi Teak and Ushivi is also very hard, making the timber expensive to cut and plane. Additionally, most sizeable timber trees are scattered widely, often far from roads. Finding and reaching them, and then transporting the logs to sawmills is thus expensive. Finally, the Namibian market is small, and the cost of exporting small loads of timber to foreign destinations is high. As a result of these constraints, almost all timber used to build and furnish modern houses is now imported, mainly from South Africa. Much of this is pine or processed chip wood, which is much cheaper than indigenous timber. Namibia imported about 25,210 tons of wood products in 2003.[13]

Although timber production has always been rather limited, quite large volumes have been harvested at various times. For example, some 42,000 cubic metres were cut in 1926, and 28,000 cubic metres were harvested during the first nine months of 1972.[14] While much of the logging and timber production that occurred in northern Namibia happened legally and under permit, it is also often

Each mokoro *boat is produced from the trunk of a single, large tree.*

claimed that large-scale illegal harvesting occurred, and that Namibia's stocks of Kiaat and Zambezi Teak were severely depleted as a result. How true this is remains unknown to us.

Timber production evidently declined over the past 60 years to the extent that only small quantities were cut by the early 1990s. For example, only 3,100 cubic metres were cut in 1990, of which 1,200 cubic metres was exported. Three sawmills operated during the early in 1990's, one each at Rundu, Katima Mulilo and near Tsumkwe, and it was only in these north-eastern areas that any logging took place. The Ministry of Environment & Tourism stopped the cutting of timber for exports in 1996 and then stopped all timber production in Namibia in 2003. The main reason for these bans was to enable the country to take stock of its timber resources and to ensure that timber resources would remain in community forests (see page 93).

CRAFT AND DOMESTIC IMPLEMENTS

Although Namibia has a conspicuous and popular woodcraft industry, little solid information about it appears to be available. Items carved from wood form part of a rich array of craft which includes baskets, pottery, wire sculptures and plastic bangles. Relatively large numbers of people make their livelihoods, directly or indirectly, from harvesting, carving and selling craft, and most of these people are in, or originally lived in Kavango. This is also the region that supplies the Kiaat and Ushivi wood used for most carvings. Carvers pay N$400 per annum for a permit to harvest wood for commercial craft production. Other than roadside stalls between Rundu and Mururani gate, most woodcraft is sold at street markets in Swakopmund, Okahandja and Windhoek. The markets are aimed largely at tourists, and craft from Zimbabwe, Zambia, and East and West Africa is also sold there.

The only estimate – as far as we know – of wood volumes used for craft indicates an annual consumption of 440 tons.[15] The economic value of the whole industry has not been assessed but because of the value added to raw wood, it probably provides the highest returns of all uses in Namibia. It also provides more jobs per cubic metre than any other use of wood. These aspects should be born in

The massive and spectacular grain storage baskets made by Oshiwambo-speakers are largely fashioned from thin Mopane branches bound together with rope made from Mopane bark.

mind if the impact of the carving industry on Kiaat and Ushivi populations is evaluated. Additionally, far greater numbers of these trees are killed every year by fires (see page 107) than are cut for craft production.

Two other uses of wood are included here: implements for domestic and farming use, and the export of Mopane roots as ornaments. A variety of wooden objects are used in rural homes for preparing and storing food, and for eating (for example, bowls, mortars and pestles) and as farm implements (sleighs, yokes, axe handles and rope from bark, for instance).

There is also the use of trees for dug-out boats, usually known locally as *mokoros*, but relatively few boats appear to be made these days. Again, no information is available on the quantities or values of all these items.

FOOD, OILS AND BEVERAGES

People have been eating indigenous fruits, nuts and tubers for millennia, and these foods still form a high proportion of the diet of some people, especially in poorer households. These are people who have small fields, few or no livestock and little or no cash income. Much of what we now know of plant foods is based on traditional uses, and it is on this foundation that new efforts are being built to increase and market the value of indigenous plant foods.

Plant foods are amongst the most important non-timber forest products. There is, however, considerable variation in the abundance, availability and use of food plants, both from place to place and from time to time. Some foods are so important that they are collected, carried home and then eaten, stored, sold or further processed.

These are usually from plants bearing large fruits, whereas those with smaller, or less nutritious or tasty fruits are eaten in passing as snacks, such as the berries of several species of Raisin Bushes. More plant foods are available in northern and north-eastern Namibia, mainly because this is where most species that bear large fruit occur. Trees in more arid areas further south and west generally have small, inedible seeds. Of all tree species in Namibia, 157 species (35%) have been recorded as being used for food in one form or another.[16] This is across the country, but between 30 and 40 tree species normally provide food in any one area in north-eastern Namibia. Of those, there would be only a handful that supply food regularly and in substantial quantities, the most important of which are: Marula, Mangetti, three species of Monkey-oranges, Baobab, Bird Plum, Jackal Berry, Ushivi, Kalahari Podberry, Mobola Plum and Blue Sourplum.

Many indigenous fruits have very high nutritional value and thus provide more than just energy. For example, Baobab and Marula are particularly rich in protein and vitamins, Marula having four times more Vitamin C than oranges. Blue Sourplum fruits also contain Vitamin C in high concentrations, as well as potassium. The only species to be sold regularly in traditional markets are Monkey-oranges and dried Bird Plum fruit. Most other fruit does not remain fresh for long or is less abundant. Several tree species are being investigated as having potential for commercial production of nuts, fruit, jams and relishes, as listed in the table overleaf. There is a well-developed Marula jam industry in South Africa.

Oil from the seed kernels of Marula has long been used traditionally for cooking and cosmetic purposes. The oil is particularly stable, and thus does not oxidize as rapidly as many other oils used in cosmetics or for cooking. Both Marula oil and soap are now being sold, while products from several other species have the potential to be developed as commercial products. Many of these oils have special chemical properties that make them attractive as components in cosmetics, especially for skin and hair care and in make-up. The oils also have high nutritional values, mainly because of their high concentrations of unsaturated fatty acids. Essential oils extracted from leaves and flowers can be used as ingredients in perfumes.

Traditionally, men were not allowed to carry weapons during the Marula season because it was assumed that they would consume too much omaongo *wine and then engage in fights.*

The fruits of several trees are used for the production of juice, wine or spirits. Most are prepared for consumption at home, but some are sold sporadically at local informal markets. The main species from which beverages are produced are: Marula (juice called *oshinwa* and a wine known as *omaongo*), Baobab (spirits) Bird Plum (wine and spirits), Makalani Palm (spirits called *olambika* and a wine), Monkey-oranges (spirits), Jackal Berry (spirits and liqueur, Velvet Wild Medlars (spirits), Raisin Bushes (spirits), Buffalo Thorn (spirits) and Mangetti (spirits known as *kashipembe*). Marula has gained international fame as a component in a liqueur branded as Amarula and produced in South Africa, but Namibian Marula fruit are not used in its production. Monkey-oranges harvested in Kavango have been used to produce a liqueur which has been exported to South Africa. Other

Tree species and products being considered or investigated as having potential commercial uses. Only Marula oil and Monkey-orange liqueur has been developed to the point that it can be formally marketed.[17]

Species	Food	Beverages	Cosmetics or medicinal uses
Marula fruit and kernels	Jam	Fruit pulp/juice	Oils
Mangetti fruit and kernels		Spirits	Oils
Makalani Palm sap		Spirits	
Baobab fruit and kernels	Flavourant	Fruit juice	Oils
Blue Sourplum fruit and kernels	Fruit		Oils
Sausage Tree fruit			Cancer treatment
Mopane leaves			Perfume oils
Bird Plum fruit and kernels	Jam	Wine, spirits, liqueur	Oils
Monkey-orange fruit and kernels	Fruit	Liqueur	Oils
Jackal Berry fruit		Wine, spirits, liqueur	
Velvet Wild Medlar fruit		Liqueur	
Raisin Bush fruit		Spirits	
Buffalo Thorn fruit		Spirits	
Kalahari Podberry fruit	Fruit		
Ushivi kernels	Relish		Oils
Lekkerbreek kernels			Oils
Laventelbos leaves			Perfume oils
Silver-leaf Terminalia root bark			Anti-inflammatory agent
Commiphora species resin			Perfume fragrance

Oils extracted from Marula kernels collected in north-central Namibia are now bottled and also processed into soap for sale.

species being studied to see if they might produce beverages of commercial and export value are shown in the table above.

MEDICINAL PRODUCTS

Nearly a third (29%) of tree species in Namibia are recorded as having medicinal uses, and some are used to treat several different conditions. Almost all the uses are as traditional medicines, largely in rural households. More use is made of roots for medicines than leaves, fruits, flowers and bark. Unlike many more densely populated areas in Africa, Namibia does not have an extensive trade in medicinal tree products. The African White Protea is probably extinct in Namibia, perhaps as a result of the use of its roots for medicinal purposes. Potential commercial uses of plant products as components of modern medicines

are being investigated for the roots of Silver-leaf Terminalia, as an anti-inflammatory agent in cosmetics, and Sausage Trees, as a treatment for skin cancer. About a quarter (23%) of Namibian trees are also said to have spiritual or symbolic values.

BROWSE

Trees provide many animals with much (and sometimes all) of their food and water. The focus here is on large mammals that eat leaves, fruit and pods, but it should be recalled that very large numbers of other animals (birds, small mammals, insects, etc) feed on trees as well. A total of 130 tree species have been recorded as being browsed by large mammals, this being 29% of all tree species in Namibia. Broadly speaking, large mammals can be divided into browsers that obtain all their food from woody plants – such as goats, giraffe, black rhino and kudu – and grazers. However, many grazers turn to leaves and flowers when pastures are depleted and when trees offer fresh, succulent leaves and flower buds. Browse is especially important in early summer when some trees produce fresh growth before the onset of the rains and growth of fresh grass, and during drought years.

Most large herbivores in the driest areas depend heavily on riverine woodlands growing along the ephemeral rivers. Pods of Camel Thorns and Ana Trees are particularly important sources of fodder along these rivers. No information is available on the economic value of browse for the Namibian livestock industry. Of course, goats obtain almost all their food from leaves and twigs nibbled off shrubs and smaller trees.

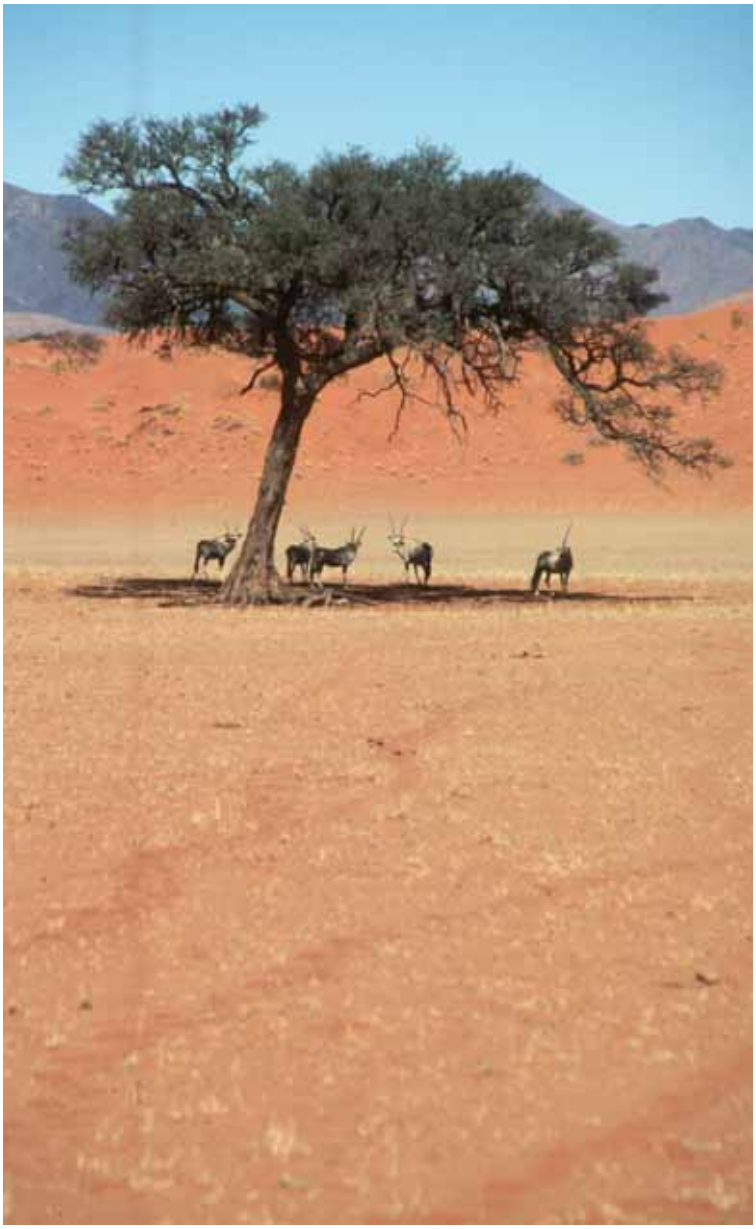
INDIRECT USES

Much of this chapter has dealt with benefits obtained directly from trees, largely by harvesting their wood, fruit, bark or roots. The section that follows explores less direct benefits. Some of these are obvious while others might be more surprising or less conspicuous. Of the several indirect benefits, two stand out as being far more valuable to Namibia than the others: the habitats that woodlands provide for so many other living organisms, and shade.

Pods of Camel Thorn and Sweet Thorn trees collected by women around Windhoek are offered for sale to livestock farmers along the road north of the city (top). Leaves and pods of trees are generally more nutritious than grass because of their high content of protein (bottom)

A habitat is a place in which organisms live: where they find water, food, places to nest, sleep or hide, for example. Quite simply, woodlands habitats provide just these kinds of resources – or services – to myriad animals and other plants. Perhaps the best way of visualizing the value of trees is to recognize that most organisms that depend on trees would simply disappear if they were removed. This is what has happened to many areas cleared for farming in northern Namibia. In modern jargon, forests and woodlands are said to be major contributors to biodiversity. The woody plants themselves add a diversity of species and then create conditions that enable diverse other species to live there as well. Birds provide a good example of this effect, and so many more bird species are found in areas with a high diversity of trees.

A small selection of tree users and uses (top left to bottom right): Namibia's famous Gobabis prawn or koringkriek; tree squirrel; Acacia silk moth from which silk now sells for about N$1,000 per kilogram; a makeshift garage mechanic; monkey-oranges; mopane worm; elephant; and sociable weaver nests.



Shade is literally a vital resource when it is hot, the air is dry and drinking water hard to find.

This is a general principle of ecology, and there are sound ecological reasons for conserving woodlands and forests, some of which are elaborated upon below. But the health and integrity of these habitats has direct socio-economic value for many Namibians as well. It is on these habitats that much of our wildlife depends. In turn, wildlife is a cornerstone of the tourism industry that employs many people and on which a sizeable part of the economy depends. Likewise, these are the habitats for many of the animals that we harvest for meat and trophies.

Shade is one of those obvious ecological resources or services that woodland habitats provide, but it is a feature worth highlighting in the context of the hot conditions that often occur in Namibia, which are often accompanied by very low humidity. In the absence of shade, many animals would either be altogether absent or would be much less productive. The cooler conditions provided by shade allow animals to use less water to cool themselves, and to expend less energy in producing metabolic water and panting. Many animals would also die if they were exposed to high temperatures for extended periods because proteins break down under conditions of extreme heat. The few animals that do not need shade all have special adaptations to keep them cool.

Shade is a major component of a whole suite of the decorative and aesthetic properties we value trees for. Indigenous woodlands and forests are attractive places, appealing to tourists and local Namibians alike. They add value to the experience of visiting game parks and provide pleasant settings for picnics or camps. Canopies of trees soften stark or harsh landscapes. Increasing numbers of people plant ornamental and shade trees in their gardens, and there is a growing demand on nurseries in rural areas to supply such trees. Exotic Neem trees are proving to be popular shade trees in north-central Namibia.

Forests and woodlands have several major effects on soils. First, roots help to stabilize the ground by holding and binding soil particles. This reduces erosion, especially on sloping ground. Second, by reducing surface flows, plants help retain rainwater in the soil, making more water available for plant growth over longer periods. This stabilizes river catchments. Third, trees help in the formation of soils. Most soil particles were originally part of rocks, and tiny rootlets help to break off rock crystals which then become soil particles. Fourth, trees add considerable quantities of nutrients to soil,

The root system of a Black Thorn spreads over a large area, giving the tree access to nutrients but also helping to concentrate nutrients beneath the tree which other plants can use.

most usually in the form of compost or humus. Many trees that are legumes are so-called nitrogen fixers. Acacias are the best-known example in Namibia, but other prominent nitrogen fixers are Zambezi Teak, Burkea, Kiaat, Ana Tree and Ushivi. Bacteria living on the roots enable the trees to obtain, or fix, nitrogen from the atmosphere. Although the nitrogen is at first used by trees, much of it later finds its way into the soil through decomposition. Finally, many trees have roots that extend outwards up to seven times beyond the diameters of their crowns. Their roots thus draw in, and concentrate nutrients from surrounding areas. The effect of concentrating nutrients, together with the higher levels of soil moisture and shade under trees, creates microclimates in which other plants can grow. This is why many trees have a fairly dense growth of grasses, herbs and shrubs beneath them.

Plants require carbon dioxide during photosynthesis, the chemical process used to convert solar energy into metabolic energy for growth and reproduction. The carbon dioxide is absorbed from the atmosphere in big enough quantities that plants are said to be carbon 'sinks'. Atmospheric carbon dioxide is essentially sunk and stored in a process called carbon sequestration. Most carbon dioxide is eventually returned to the air through respiration and decomposition. The fraction that is retained is held in different places: in wood, in the bodies of animals that eat plant material, and as carbon in the soil, for example. While this has been known for many years, it is only recently that we have started to pay more attention to the value of plants as sinks. This is because of global warming, which has largely been caused by the increasing quantities of carbon dioxide produced by human activities. Carbon dioxide is one of several greenhouse gases,

and it is thought to contribute to about 60% of global warming. Other significant greenhouse gases are methane, nitrous oxide, halocarbons, and soot particles from fires. Rising emissions of carbon dioxide and these other gases are estimated to have caused about half of the rise in global temperatures. The other half is due to a reduction of plant cover – and thus carbon sequestration – as a result of land being cleared for farming.

Carbon dioxide is absorbed in direct proportion to growth, and so areas with dense, tall plant growth are the most effective carbon sinks. Similarly, more carbon dioxide is absorbed during the summer growing period than in the dry winter months. Compared with many other places in the world, especially the tropical rainforests, Namibian trees absorb very little of all carbon dioxide surrounding the earth. But every little bit helps! Whatever the costs and disadvantages of bush encroachment (see page 112), it is likely that the additional plant biomass caused by bush thickening has led to an increase in quantities of carbon dioxide withdrawn each year from the global atmosphere. It is also possible that bush encroachment has been enhanced by the higher temperatures and greater carbon dioxide levels, both being conditions that promote growth.[18]

Finally, forests and woodlands offer options, much like investments and savings that give people more opportunities than those who have nothing to fall back on. Trees are just such investments, which will provide new kinds of foods, medicines and other benefits in the years to come. In short, the more forests and woodlands Namibia manages to preserve, the greater its options in the future.

PROMOTING BENEFITS

It is clear that forests and woodlands provide a whole package of uses and benefits, and much of this chapter has attempted to disentangle the parcel by describing the most important ones individually. Many of these benefits were only recognized and exploited during the past 15 years, and more people than before now see greater value in woodlands than simple trees. In addition, it should be clear that the healthier and more diverse the package is, the greater the range of benefits. Namibia faces two challenges: looking after the package – a topic addressed on page 98 – and getting more value out of forests and woodlands, a subject which we now address.

First, more should be done to recognize, promote and market indigenous plant products. Namibia has made good progress in these endeavours: the table on page 72 lists products from 19 tree species now being investigated for their potential in providing marketable medicines, cosmetics and food. Products from some other plants are also being developed, for example from Devil's Claw, Hoodia, Kalahari Melons and !Nara. All these developments are coordinated through the Indigenous Plant Task Team, a grouping of people and organizations working to promote supplies and demands for plant products. There are several challenges that members of this group seek to overcome. Namibia must do more to compete with others who may develop similar products. For example, Marula is being cultivated in Israel, and South Africa has already done much to market Marula products. Competing will not be easy, given the remoteness of many areas in Namibia in which useful plants can be harvested, the lack of experience in this kind of business, and the rather high costs of labour in Namibia.

Better connections between suppliers and consumers need to be created. Most potential consumers live in fairly demanding societies in Europe, North America and South Africa, far away from the suppliers in rural areas, who are often poorly educated and lack organizational systems to compete with suppliers elsewhere. Suppliers are also often ignorant of consumers' needs for high quality and reliable deliveries of raw materials that are competitively priced. Most connections between suppliers and markets are now created and run by organizations, such as the development agency CRIAA-SADC in Windhoek, but these need to be taken over by Namibian entrepreneurs and communities in the longer term.

Implied in all of this is the need to build better supply systems. One way of doing this is to culti-

vate and harvest plants growing in more controlled environments. All products now being developed are reaped from wild stocks, which are often dispersed and subject to variable growing conditions, pests and predators. Cultivation would also help increase populations of indigenous species, thus complementing (and perhaps later replacing) the current large-scale focus on growing exotic shade and fruit trees. Areas cleared for farming and now abandoned could be reforested with Marula, Bird Plum, Mangetti and other useful trees.

There is a need for more research, both to discover new uses and to broaden the range of products. Several key characteristics are needed for a product to be successful: it should have a long shelf life, be harvested easily, have characteristics that are exotic to consumers, high value, and a competitive advantage. These are not easy features to find, and so every effort should be made to make the search urgent and effective.

Several other aspects need to be enhanced in the quest to profit from indigenous plant products. Markets for the products need to be cultivated through aggressive advertising, negotiation and promotion. The maximum possible value should be added before products are exported, for example through local processing and packaging. Suppliers must be given appropriate tenure and ownership – and thus security – over the areas in which they harvest. Likewise, policies should encourage the harvesting and sale of indigenous plants, of course within sustainable limits. Efforts should be made to ease barriers to exports from Namibia and imports into other countries. Appropriate certification for plant products should be obtained, both to guarantee the quality to customers and to promote the special or unusual qualities of the plants. At least three different kinds of certification are now available: Forest Stewardship Council, Organic, and Fair Trade Certificates.

While more focus on individual plant products is necessary, there is also a need to broaden our overall perspectives on the values of forests and woodlands. Most people now promote direct uses of plants, but many of the indirect values are perhaps more important and profitable. Substantial income can be generated quickly, as has been shown in the example of conservancies (see page 96). Tourism and wildlife have been the main money-spinners for conservancies and, as indirect products of woodland habitats, they are high-value, non-timber forest commodities. High returns are also likely to encourage communities to manage woodlands more effectively than smaller incomes obtained, for example, from selling a few poles or bundles of firewood.

This is not to argue one resource against another, but the suite of resources and benefits inherent in woodlands should be widened beyond that which is usually granted by plant ecologists, botanists and foresters. People should benefit from all timber and non-timber forest products, selecting those in each patch of woodland that provide the greatest returns. These might be timber in some areas, elsewhere they may be honey, medicines, thatching grass or grazing. In other areas they will be wildlife to hunt, sell and attract tourists. And in places with few of these kinds of resources, it will be the whole environment: the rugged landscapes, rare and interesting plants and animals, scenery and solitude that help make the world a better place.

Finally, the implementation of policies and practices should be encouraged to limit the use of raw wood for fuel, building and fencing. This might counter the idea that the more resources are used, the more they are protected. However, these conservation measures probably only apply to trees that have very high values, for instance the Marula, Bird Plum and Mangetti trees that are protected and propagated because of their valuable fruit. One way to reduce the use of wood is to raise prices, which some people argue are too cheap in Namibia. This would also help stimulate the use of alternatives. Almost all charcoal, which is now harvested from unwelcome invader bush, is exported. This industry could surely expand to provide charcoal to low-income settlements in urban areas. The large number of people now using paraffin as a cooking fuel in squatter townships north of Windhoek shows that new technologies

and fuels can be adopted. The use of paraffin for cooking is, itself, rather limited to these townships and a programme to encourage its use elsewhere as an alternative to firewood is to be recommended.

THE ECONOMICS OF WOODLANDS

Natural resources have economic values which derive from the kinds of uses described earlier. Values for resources used directly, such as for fuel and construction, are easier to estimate than those with indirect benefits, for example, shade and the provision of habitats for wildlife. However, even values for direct uses have not been well studied in Namibia, and much of the information that follows is thus preliminary. The Environmental Economics Unit of the Directorate of Environmental Affairs developed the estimates for this book using standard resource accounting methods.[19] The Unit is responsible for the compilation of accounts for natural assets (such as fish, forests, wildlife, water and minerals) that are consistent with conventional national economic accounts. These resources are not generally included in standard accounts since they are not man-made or owned. A consequence of their exclusion is that sound planning for sustainable development is not taken seriously.

What then is the value of woodlands and forests to the Namibian economy each year? Accounting figures in the table below begin to answer this by providing estimates for the use of fuel wood, poles for housing and fencing, and the use of such non-timber forest products (NTFPs) as craft, foods, medicines and cosmetics, and grass for thatch. An important point is that these are partial accounts because they do not include values for other values, such as livestock grazing and browse, shade, or the use of wild fauna in woodlands and savannas.

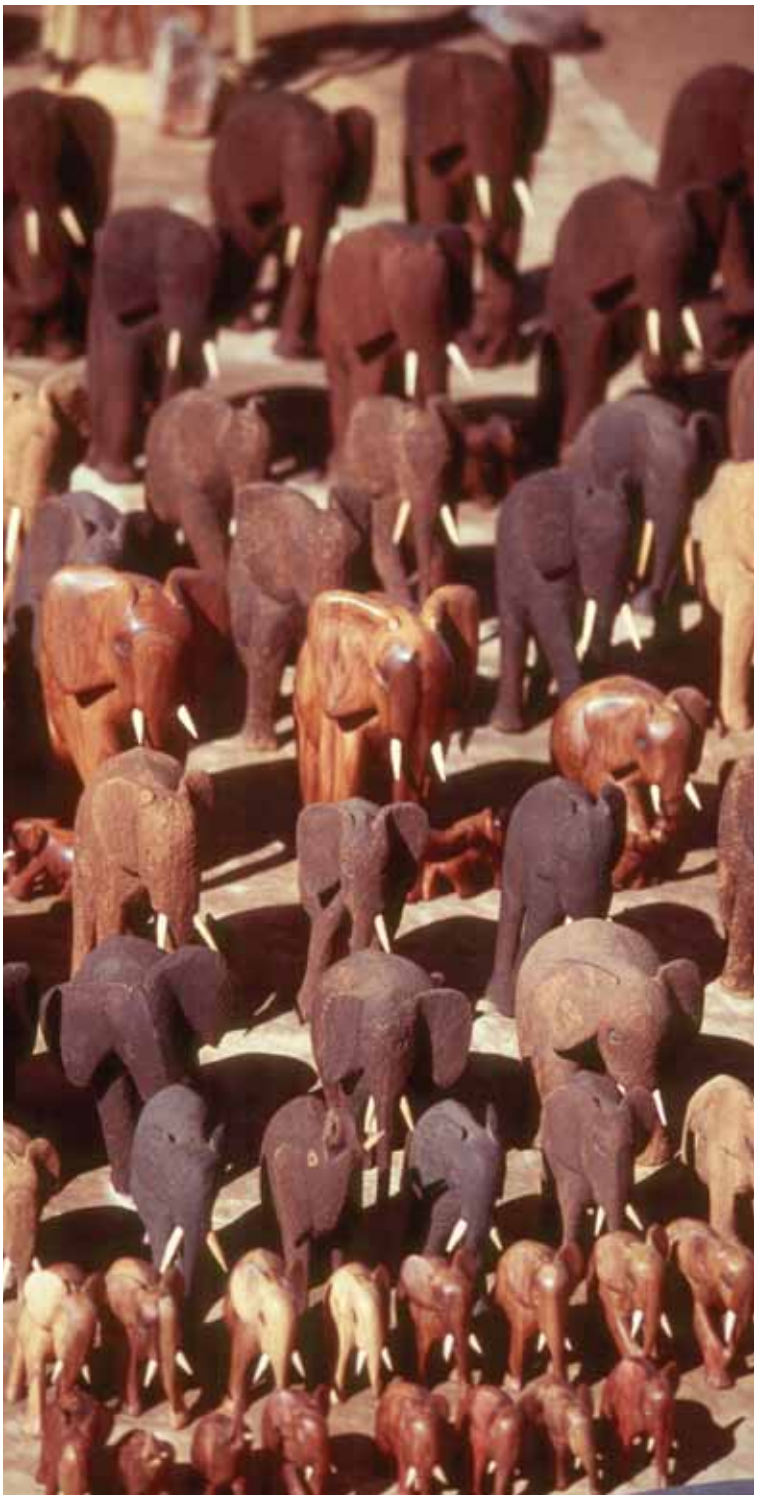
The use of fuel wood (previous page) and harvesting of non-timber forest products, such as Marula nuts (top), directly and respectively contribute about N$600 and N$300 million to the national economy each year.

Wood fuel, construction and NTFP products directly add a total of just over N$1 billion to the national economy each year. The highest values come from wood fuel (N$610 million), followed by NTFPs (N$283 million) and poles for housing and fencing (N$157 million). Regions contributing the greatest proportions to these figures are Omusati, Ohangwena, Kavango, Oshikoto and Oshana because they have the greatest numbers of rural households that make most use of wood for fuel and construction.

The direct contribution of about N$1 billion represents approximately 3% of the gross national product (GNP), a figure comparable to 4.6% for agriculture, 5% for fishing and some on

Estimated annual contributions of the use of fuel wood, construction and fencing poles and non-timber forest products (NTFPs) to the Namibian economy in 2004.

	Fuel wood	Building and fencing poles	Non-timber forest products (NTFPs)	Total
Direct contribution to national product	$609,416,700	$157,440,900	$282,706,100	$1,049,563,800
Direct and indirect contribution to national economy	$965,990,300	$263,580,900	$619,459,000	$1,849,030,200



board fish processing, 6.8% for mining and 6% for tourism.[20] However, this direct contribution creates further activity in the broader economy through indirect multiplier and linkage effects.[21] For example, a woodcutting activity generates added value through income received for its labour and capital. The enterprise might also use inputs such as transport, and this generates further value in the transport sector, which might, in turn, buy inputs from other sectors, such as fuel, generating further value, and so on. These additional linkage effects amount to about N$0.8 for each N$1 generated directly. As a result, the total impact of fuel wood, construction and NTFPs rises to about N$1.8 billion in 2004, shown as the total direct and indirect contribution in the table. These figures are impressive but would be very much higher if we could add such other values as those derived from pollination, the effects of carbon sinks, contributions to animal and plant diversity, nutrient cycling, tourism, and livestock farming. Forests and woodlands are indeed rich assets.

One of the best ways to conserve woodlands and forests is to add as much value as possible to the resources they provide. Indeed, elephants are now much more abundant than before (see page 116) because so many people appreciate their commercial and aesthetic value.

Key points:

- The many benefits of forests and woodlands are broadly divided into direct (fuel wood, timber, food *et cetera*) and indirect uses (shade, wildlife habitats, and the absorption of carbon dioxide, for example).
- More wood is used for fuel than for any other purpose, most of it for domestic cooking, and collected locally from dead trees close to rural homes.
- The use of wood for the construction of houses has declined substantially in recent decades, as increasing numbers of people have built homes from brick and cement, particularly in towns.
- The economic value of the woodcraft has not been assessed, but it is likely to provide amongst the highest returns of all wood uses in Namibia.
- Of all tree species in Namibia, 35% have been recorded as being used for food, 29% have medicinal uses, and 29% are known to be browsed by large mammals.
- Work is underway to develop medicines, foods, cosmetics and beverages from 19 tree species as potential commercial products.
- Among the most important indirect benefits of forests and woodlands are shade, habitats for wildlife, tourism, the formation and nutrification of soils, and absorption of carbon dioxide.
- There is a need to broaden perspectives on the value or woodland resources, especially in developing more commercial values and the importance of indirect benefits. The more Namibia does to preserve forests and woodlands, the greater its options in the years to come.