

Forest Management in Refugee and Returnee Situations

A Handbook of Sound Practices



UNHCR

United Nations High Commissioner for Refugees

IUCN

The World Conservation Union

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Glossary

Afforestation – The establishment of a more-or-less continuous tree cover, normally by planting, in areas which have previously been without trees.

Agroforestry – Land-use system in which woody perennials are maintained or planted, in some form of spatial arrangement or temporal sequence, on the same land as agricultural crops and/or livestock.

Biodiversity – The variety of life on Earth. In practical terms, biodiversity comprises genes, species and ecosystems. **Genetic diversity** refers to variations within or between populations of the same species; **species diversity** refers to the number of different species (plants, animals or micro-organisms) in a site habitat; **ecosystem diversity** refers to the variety of ecosystems, habitats, forest types or communities, each of which is composed of a distinctive set of genes and species, and of distinctive elements of soil and climate.

Carbon fixation – The conversion by plants, through photosynthesis, of atmospheric carbon dioxide into organic compounds.

Carrying capacity – Capacity of an ecosystem to support healthy organisms while maintaining its productivity, adaptability and capability of renewal.

Community forestry – A generic term for forestry where people as user groups, communities and individuals are the main actors. It includes village woodlot establishment, farm forestry, tree planting in private fields and joint management of public forests by communities and governments.

Coppicing – Traditional method of forest management in which shoots are allowed to grow up from the base of a felled tree.

Deforestation – The depletion of tree crown cover to less than 10 per cent.

Desertification – Land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities – total removal of vegetation cover by agriculture or overgrazing, for example.

Ecosystem – Complex of plants, animals and micro-organisms which interact with each other. Ecosystem services include recycling nutrients, regulating climate, maintaining hydrological cycles, creating soil and balancing atmospheric gases.

Exotic species – Species introduced from another ecological zone; usually the opposite of ‘indigenous’.

Forest – An ecosystem with a minimum of 10 per cent crown cover of trees.

Forest degradation – The change of forest class (from closed to open forest) which negatively affects the stand or site and lowers production capacity.

Forest fallow – All types of woody vegetation derived from the clearing of natural forest for shifting agriculture. It consists of a mosaic of various succession phases and includes patches of uncleared forest and agriculture fields which cannot realistically be segregated and accounted for, especially when using satellite imagery.

Forest management – Development and implementation of plans to protect, enrich, manipulate and exploit wood and non-wood products from natural or plantation forest resources.

Forest products – Also known as non-wood/non-timber forest products. Examples: fruits, nuts, edible greens, bushmeat, fuel, fodder, green manure, fibre, medicinal products, seeds, mushrooms, ornamental species and resins. Previously, often referred to as ‘minor forest products’.

Harvesting – Involves all activities required in the removal of both timber and non-timber forest products from the forest, including on-site treatments to prepare the products for transport to primary processing sites.

Multiple use forestry – Management of forests to obtain multiple products and benefits (e.g. production forest, protection forest and conservation forest). Multiple use forestry takes an integrated approach towards the different categories of forests and encompasses the scientific, cultural, recreational, historical and amenity values of forest resources.

Multipurpose tree species – Species providing several different products and benefits, such as timber, fuelwood, fodder, shelter and soil improvement.

Plantation forests – Forests established artificially, either by afforestation on land which has not carried forest within living memory or by reforestation of land which carried forest before but where the indigenous species are replaced with a new species or genetic variety.

Poles – Small-diameter wood used in an unprocessed form for construction, fence posts and other purposes.

Protected area – An area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means.

Reforestation – The restoration of tree cover, to areas from which trees have recently been removed, by planting, encouragement of natural regeneration, or a combination of these methods.

Rehabilitation – The return of a degraded ecosystem to an undegraded condition, but which may also be different from its original condition. See also forest landscape restoration

Shifting cultivation – A farming system in which land is periodically cleared, farmed and then returned to fallow. Synonymous with slash-and-burn and swidden agriculture.

Social forestry – Farm, community and rural development forestry.

Stere – A stere is a universal measuring unit for wood. It is the quantity of cut and stacked wood contained in 1m^3 . Because of the gaps in between the logs, the amount of wood is less than 1m^3 . Depending on the size and the shape of the logs (stacking co-efficient), one stere is equivalent to $0.4\text{--}0.7\text{m}^3$ of solid wood. Regarding its weight, one stere contains $400\text{--}700\text{kg}$ of green wood and between 250 and 450kg if the wood is dry.

Sustainable forest management – The management and use of forests and wooded lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality and their potential to fulfil, now and in the future, relevant ecological, economic and social functions, at local, national, and global levels, without causing any damage to other ecosystems.

Sustainable use – Use of an organism, ecosystem or other renewable resource at a rate commensurate with its capacity for renewal.

Sustained yield – The production of forest products in a way that an approximate annual balance between the net growth and the harvesting of the forest resource is achieved.

Watershed – A watershed or catchment is an area of land with common drainage. It is considered both as a physical-biological unit and as a socio-economic-political unit for planning and management of natural resources.

Watershed management – Planning and implementation of natural resource utilisation in a catchment area, without adversely affecting the soil and water resources.

Woodland – Open stand of trees up to approximately 18 metres in height in which tree crowns cover at least 30 per cent of the land area but are, generally, not overlapping.

Acronyms

FAO	Food and Agriculture Organisation of the United Nations
GPS	Global positioning system
ha	Hectare
km	Kilometre
IUCN	World Conservation Union
m	metre
m³	cubic metre
NGO	Non-governmental organisation
NTFP	Non-Timber Forest Product
QIPS	Quick Impact Projects
RRA	Rapid Rural Appraisal
UNHCR	United Nations High Commissioner for Refugees
WFP	World Food Programme

Executive Summary

People all over the world depend on forests and woodlands for a broad range of tangible goods, as well as the often less perceived services such as soil stabilisation and ground water regulation they provide. Refugees and returnees are no exception to this. Many past and current refugee communities are known for their close respect for nature and understanding of natural resource management. Others are less aware, possibly because their lifestyle may have depended on seasonal movements so they never felt much direct association with nurturing a particular tree or forest. Yet, when populations are forced to live in crowded and possible unfamiliar situations – not of their own making or choice – they are often left with no option but to depend on natural resources as a means of survival. At such times, the environment is often placed under some degree of threat.

Few occasions rival the circumstances experienced in a refugee situation – when it comes to an urgent need for building materials to support a shelter against the elements, when people need dry wood or other materials to serve as a source of cooking or heating fuel, when some require food or natural remedies for sickness, or when livestock keepers need food for precious flocks. All of these, and more, activities have direct consequences for the environment in general, but on forests and woodlands in particular. If such activities are not restricted or alternative solutions not found, what might start out as a low level resource gathering exercise can quickly turn into widescale and, often, irrevocable degradation. The “no action” scenario is not an option in such situations.

Some degree of forest degradation and deforestation is inevitable in a refugee and often returnee context. This not only results in a reduced availability of forest products, but may

also cause additional environmental damage such as accelerated soil erosion (with associated features such as landslides and siltation of surface water resources), unfavourable changes in the local climate, disturbance of the local water balance, loss of wildlife, desertification and loss of well-being and livelihood security among communities living near the affected area.

Working with a wide range of partners around the world, over the past few decades in particular, UNHCR has amassed considerable information on the interactions between refugees and returnees with forests and forest-based resources. This information has in turn permitted UNHCR to extract a large number of lessons learned from these experiences, information which are now presented in this revised booklet, **Forest Management in Refugee and Returnee Situations – A Handbook of Sound Practices**. This Handbook takes a deliberate stance in advocating greater involvement of refugees and local communities in decision making and management roles in relation to forest management. That is not to say that local government and other agencies have no role to play at such times – quite the opposite.

What has been noted time and time again, however, is that while each refugee/returnee situation is different, there are some common threads in humanitarian operations which, if recognised and addressed in time, could help save scarce resources and help improve the plight of refugees, in particular. Timely action, for example, during an emergency can help prevent or at least contain the level of habitat destruction or degradation. This will later mean that costly, and sometimes impractical, rehabilitation will not be needed. Equally important, timely actions as described in this Handbook can prevent conflicts from arising with host communities who may easily be affected by the actions of refugees, among which might be the cutting of trees, entry into

sacred forests, or killing of wildlife. Involving communities in decision-making at such times can – from experience – help improve the situation.

While drawing attention to the overarching need to protect broad forest ecosystems, and not just clusters of often isolated forests and woodlands, this Handbook offers a range of practical actions for users to consider and apply in different situations and at different phases of operations. Key, basic elements to successful forest management are:

- ▶ knowing the needs and demands from refugees as well as local communities, if common resources are to be exploited;
- ▶ assessing what can be supplied, and from where;
- ▶ carefully controlling the level of resources extracted, while at the same time renewing or replanting others; and, in particular

- ▶ ensuring that forest-related activities are not carried out in isolation from activities which are planned or already underway in other related sectors.

To assist with this co-ordination, it is strongly recommended that a Forest Management Plan is drawn up for each situation, addressing these and other needs. Such a plan, which would include a broad range of stakeholders, would also include a strong element of monitoring to ensure that the activities being undertaken respond in an appropriate manner to the perceived needs of the affected people.

By reviewing the examples and guidance outlined in the following pages, and adapting these to suit a particular situation and needs, it is hoped that users of this Handbook will benefit from the experiences of colleagues from other operations and will further engage in promoting and ensuring more sustainable management of forests in refugee-related situations.

1

Introduction

1.1 Forest Management During Refugee and Returnee Operations

The physical impacts of refugees or returnees on the environment can be immediate, visible and long lasting. Nowhere is this more critical than in relation to forested or heavily vegetated lands. During a humanitarian operation, land is often cleared of vegetation to make way for the physical infrastructure of a new camp or settlement. Urgently required building materials may be sourced from local forests or plantations, while wood is commonly cut or gathered for cooking, heating and – usually later in the operation – conversion to charcoal. Livestock herders may have no option but to graze their animals in open forests or gather necessary forage from these regions. All of these activities, and more, have the potential of causing significant and lasting environmental, social and economic impacts on a community and/or region.

While it is important to recognise the broad range of actions that commonly take

place during a refugee or returnee operation, it is perhaps even more important that these concerns are addressed collectively through a well considered, planned and co-ordinated response mechanism, rather than being answered on an individual or *ad hoc* basis. Planting fast-growing *Eucalyptus* trees may at first seem like a good response to wood shortages, but the longer term impact of these trees is damaging for the soil and, quite often, the water table. Other, native tree species might in many instances be more appropriate, being equally useful for people and better overall for the environment. Understanding the conditions as well as people's needs is therefore as important as determining the most appropriate species of trees to plant in any situation.

The environment is not alone in bearing the added pressure of sustaining refugees or returnee populations in an often confined area. Experience shows that accompanying such impacts are often far more subtle – yet equally damaging – social and economic consequences. There can, however, also be many positive aspects associated with hosting refugees or with accommodating returnees, an aspect which is often overlooked at these times.

Engaging people in sound forest management practices is seen by UNHCR and IUCN-The World Conservation Union as being an opportunity to protect the local environment for the goods and services it provides. At the same time, experience shows that embarking upon sound forestry practices offers greater prospects for at least part of the population to improve their well-being and livelihood security.



Degraded camp site



Well managed green camp

Sustainable forest management aims to ensure that the goods and services derived from a forest meet present-day needs, while at the same time secures their continued availability and contribution to long-term development. In its broadest sense, forest management encompasses the administrative, legal, technical, economic, social and environmental aspects of the conservation and use of forests. It implies various degrees of deliberate human intervention, ranging from actions aimed at safeguarding and maintaining the forest ecosystem and its functions, to favouring specific socially or economically valuable species or groups of species for the improved production of goods and services.

1.2 Why UNHCR Cares for the Environment

Over the past decade, in particular, public and institutional awareness has grown for the need to protect the environment – and the many services it provides – from refugee influxes and associated humanitarian operations. The need to establish and maintain environmental quality is also becoming more evident in newly planned returnee operations. Despite this, some people might still question whether given the high demands of an emergency, for example, consideration should even be given to looking after the environment, let alone ‘a few trees’. Many developing countries already have inadequate funding and human resources for the preparation, implementation and monitoring of established forest management plans. They also often lack mechanisms to ensure the participation and involvement of all stakeholders in forest planning and development. Given this, and the often competing pressures under which UNHCR and its partner agencies operate, is it fair to even consider taking action to protect the

environment at a time of competing needs and pressures and, if action is taken, what is the likelihood of anything actually being achieved?

Experience shows that even with limited resources, much can in fact be achieved during the emergency, care and maintenance and return operations, for the benefit of all those concerned through sound environmental planning and management. The use of fuel-efficient stoves, for example, can reduce the time people spend gathering firewood, reduce the risk of attack by being outside the camp, and reduce the amount of expenditure that may be required if people are obliged to buy wood. Drying and splitting wood – activities routinely encouraged in refugee situations – cuts down on cooking times and can reduce the amount of damaging smoke in confined housing. Growing trees can also ensure multiple benefits, from providing shade and shelter, to allowing people to harvest an assemblage of fruits, cut fodder for livestock, or pick medicinal leaves for traditional healing purposes.

A green refugee camp – Household tree planting provides shade and protects the institution of asylum



Sound planning and management are therefore of key importance and should be an integral component during all phases of refugee and returnee operations. In the global context of increasing awareness for environmental issues, UNHCR has prepared this Handbook, providing a framework within which its staff and other organisations are able to address specific forestry-related issues and concerns as an integrated part of refugee assistance programmes.

One of the purposes of this new Handbook is to try and ensure that selected best practices from the field are made known and become more widely used. Another is to

help ensure greater co-ordination in planning and when taking action. A simple – yet commonly overlooked – example of this is the active engagement of local forestry services as well as affected communities in any forest-related activity being considered or implemented in or around refugee camps/settlements. Their advice on a wide range of issues, from tree species selection to locally adapted planting techniques, will often be relevant and useful.

2

Purpose and Use of this Handbook

2.1 Introduction

This Handbook is concerned with forestry issues in refugee and returnee operations. Although refugee situations and large-scale movements of displaced people occur throughout the world, this Handbook has been elaborated with a clear focus on humid and dry tropical regions. There are two main reasons for this: first, because the highest concentrations of refugees are currently found in the tropics and, second, tropical forests are far more threatened than forests in temperate zones because of their easily disturbed ecological balance and hence the difficulty in replacing such complex habitats. In the tropics, degraded forest lands are generally more susceptible to erosion and subsequent desertification. In addition, a significant proportion of rural populations in the tropics depend on forest resources for their livelihoods, while these ecosystems also harbour some of the highest concentrations of biological diversity on Earth. Much is therefore at risk if these regions are impacted by humanitarian relief operations.

With a growing appreciation of the importance of sound forest management in refugee-related operations – but also realisation of the considerable and often lasting impacts which no action or inappropriate actions can have – this Handbook proposes that a new focus is placed on forest management. This approach advocates for the strong involvement of refugees, returnees and members of local communities in being able to make conscious decisions about what actions are taken in managing

local forest ecosystems, and being made more responsible for these. A simple example concerns the choice of tree a family might plant around their shelter – whether for shade, animal fodder, fruit or a multipurpose tree species that might provide all of these and more. Formerly, the choice of which tree to plant, and where, was often taken by UNHCR, one of its implementing partners or perhaps a state forestry service – without questioning what sort of trees were being planted. Experience, however, has shown that not only are refugees more likely to care for trees if they can see benefit from this practice, but also that they are likely to do so if they have clear and unequivocal access to such resources, both now and as long as they remain at that location.

Tree species for reforestation must be selected according to the needs of the end users.

For reforestation programmes to be sustainable and meet the needs of intended beneficiaries, the most appropriate species for planting must be identified with input from the local community. Multi-purpose tree species, suitable for the local environment, should be given priority. In cases of land shortage, tree species that can be integrated within agricultural systems should be favoured.

UNHCR. 2002a.

This Handbook has been prepared to help develop a better understanding of what needs to be considered when dealing with forestry issues – from growing and planting trees to fuelwood provision – in a refugee or returnee operation. Based on an existing guideline (UNHCR, 1998), it takes a fresh look at some of the main recurring issues experienced with planning for and managing forest-related activities, describes some recent experiences in this arena and outlines a number of possible actions which might be considered in a particular situation – all with a view towards enhancing management systems and reducing the negative environmental and

social impacts often associated with refuge and returnee operations.

In presenting this information, the Handbook examines a range of specific issues related to forest management, explores opportunities to minimise environmental impacts and provides guidelines for developing locally appropriate initiatives. It is written with a focus on:

- ▶ improving current forest management practices in refugee and related operations through, *inter alia*, better planning and creating linkages with other sectors and environmental activities that might be planned or already underway;
- ▶ minimising environmental problems frequently associated with forest exploitation in refugee-related settings;
- ▶ the needs and rights of refugees, returnees and the communities among whom they are living, to use forest resources as a possible means of improving their livelihoods;
- ▶ identifying opportunities which might arise allowing these affected communities to engage more openly and effectively in the forestry sector; and
- ▶ providing practical guidance, hints and experiences for agencies and communities engaged in forest management (a substantially revised bibliography is given in Section 7).

2.2 Using this Handbook

As with other titles in this series, this Handbook is designed for programme and technical staff of UNHCR, both in the field and Headquarters, and its implementing partners. The Handbook is intended to be relevant to different situations, ranging from pre-emergency/ preparedness planning to an emergency,

but will most commonly be of use during the care and maintenance phase, longer-term resettlement arrangements and in returnee situations. In particular it is intended for project managers, planners and trainers (who may not be specialists in forestry or natural resource management). The Handbook will also be relevant to individual refugees and local people who practise some form and scale of forestry, but it cannot be expected to reach this level in every case. The manual can be used in its entirety or specific sections be referenced depending on the needs of the end user.

Background information on forests and their role in ecosystem functioning and management is provided in Section 3, **Forests and Ecosystem Management**. This is intended to help heighten the awareness of users not already familiar with the importance of protecting and managing forests for the wide range of goods and services they provide.

Section 4 (**Forest Management during Refugee and Related Operations**) focuses on refugee-assistance programmes in general. Drawing on recent experiences, some key issues and concerns are highlighted which may need to be addressed during the different phases of “classic” UNHCR interventions, bearing in mind, however, that no two operations are likely to be identical.

In Section 5 (**Responding to Needs – Practical Actions to Consider and Apply**), a series of practical actions are described to help users put initial damage control measures in place, identify demand and supply needs of various timber products, develop a wood supply plan, and begin to consider what form of tree planting might be best suited to that operation and region. A deliberate attempt has been made to keep the explanations as practical as possible, while at the same time providing users with sufficient guidance for them to be able to knowledgeably undertake actions which would appear to suit their needs.

The final section (**Elements of a Forest Management Plan**) prescribes a number of steps to take in drawing up a local management plan, based in part on the information provided in Section 5, as well as other non-traditional forestry activities. Here, in particular, users are encouraged to try and approach the issue of forest management from a broad perspective – not just planting trees of the same species – appreciating the multiple uses of forests, and looking to see how local forest resources might be used to help improve the welfare and livelihoods of refugees/returnees and local populations, while also improving the integrity and security of the forest and ecosystem resources. Monitoring and evaluation activities are also addressed in this concluding section.

A glossary of some of the most commonly used terms in the Handbook is available after Section 6. This, in turn, is followed by a selected bibliography. Seven annexes are also included, providing specific technical information on issues such as:

- estimating the supply capacity of a forest;
- wood supply programmes;
- plant production and nursery design;
- tree planting and maintenance techniques;
- common agroforestry practices in the tropics;
- suggested tree species for different climatic zones;
- a checklist of common forest management activities to assist with monitoring.

To further benefit from this Handbook it would be useful if users had some of the following skills or resources available, including:

- a broad approach towards, and practical experience of, forest management, particularly in terms of identifying innovative and

more environmentally and culturally sound approaches towards managing forests and selected forest resources;

- links with actual and potential partner agencies experienced with forest management
- an understanding of project design and management – especially important to prevent forestry concerns and issues being dealt with in isolation;
- resources for accessing the Internet and/or obtaining other useful publications. To be effective, this Handbook cannot be comprehensive in its coverage of detail, so it identifies other literature and points of reference where more additional information might be obtained; and
- funds, or the potential for funding, for specific activities. Typical project/programme costs might include materials (from seeds and soil bases to means of physically protecting trees), training and extension needs, forest guards and monitoring services.

Forest guards are an essential component of a natural resource protection strategy, alongside tree marking and zoning.

The most viable strategy in protecting forest resources under pressure from refugees is not to prohibit cutting, but to manage, direct and control cutting in order to spread its effects as thinly as possible. This provides the greatest opportunity for regeneration. The first stage in this process is an evaluation of the status of existing resources, and the identification of different zones for different management regimes. This is followed by tree selection and marking.

Well trained forest guards, ideally drawn from refugee and local communities, become the crucial intermediaries between the policy and the actual harvesting.

An alternative approach is to encourage and help establish recognised committees of representatives from the refugee and local communities and local government authorities. Such committees assume direct joint management responsibility of natural resources.

3

Forests and Ecosystem Management

3.1. Functions of Forests and Trees

Forests and trees provide a variety of goods and services, not all of which are immediately evident. Although timber and wood production might be the most obvious and known function associated with forests others, such as the production of non-timber forest products (NTFPs) like medicinal herbs, honey and mushrooms, and the provision of ecological services – such as preventing soil erosion – are at least equally important.

Why Forests Matter.

Forests, worldwide, provide a broad range of goods and services each day, including:

- Timber
- Non-timber forest products
- Clean air
- Clean and regulated water supplies
- Protection against landslides and erosion
- Buffers against global warming
- Habitats for animals and plants
- Spiritual values
- Esthetical values
- Recreational facilities
- Demarcation and assertion of ownership of land

The type of goods and services provided, as well as their relative importance, vary with the type of forest and with the region in which they are located. In general, however, one can distinguish three major functions of forests – production, ecological and social.

3.1.1 The Production Function

Forest products are estimated to contribute about 1 per cent of world gross domestic product and to account for 3 per cent of international merchandise trade. The annual turnover of roundwood, sawnwood, panels, pulp and paper alone exceeds US\$200 billion.

In addition to a range of wood products such as timber, woodpulp, construction poles, fuelwood and charcoal, trees and forests also provide a large variety of NTFPs, including:

- fruits and seeds for food;
- oils;
- leaves for food, fodder and shelter;
- pigments, tannins, resins, latex and gums;

Marketing of non-wood forest products to sustain livelihood



- ▶ medicines, pesticides and toxic products used for hunting;
- ▶ fibres;
- ▶ mushrooms;
- ▶ wax and honey; and
- ▶ a wide range of wild game which provides food and skins.

While many of these non-wood products are collected and consumed locally, some are often commercially as important as wood products, especially on local markets in developing countries. The value of non-wood forest products and the environmental services of forests are difficult to estimate in economic terms, but they are critical to the livelihoods of an estimated 600 million people in the developing world alone.

3.1.2 The Ecological Function

Tropical rainforests are the world's richest areas of wildlife and biological diversity and, as such, they constitute an important genetic resource. Many scientists believe that the world's forests are home to between 50 and 90 per cent of the Earth's plant and animal species, with much of this richness occurring in the tropics. To highlight their significance, one should consider that people worldwide use about 3,000 different plants for food, of which only 150 are cultivated. To date, more than 1,650 tropical forest plants have been registered as vegetables. These, together with the many wild relatives of important domesticated crops, are part of the world's tropical forest ecosystems, which consequently represent a vitally important genetic resource in the context of global food security.

Tropical forests also play an important role in nutrient cycling. In these ecosystems, the nutrient richness is situated in the biomass (the plants themselves) and not in the soil, as is the

case in temperate regions. Thus, if this biomass is removed, for example as a result of forest clearcutting, an unproductive (mineral and nutrient poor) soil remains. Exposed to the elements of wind, rain and sunshine, these soils quickly become eroded and lose their structure. Any future forest growth on such degraded soils will never be as rich or varied as the original ecosystem unless careful, and usually costly, restoration work is undertaken. Even then, however, it is rare that the "new" forest will ever have or be able to support the same levels of biological diversity as the original forests of that region.

Nutrient cycling and the fragility of forest ecosystems are important factors to consider when practising shifting cultivation – a common agricultural production system in tropical forests. As soon as the minimal fallow or forest regeneration period is no longer maintained, the ecological balance is easily disrupted and cultivation quickly leads to forest degradation.

Functioning as a kind of giant sponge, i.e. absorbing and slowly releasing rain water, forests have a regulatory effect on the Earth's hydrological system. Groundwater reserves are regularly replenished and slowly released over time. This regulatory effect helps prevent flooding in periods of water abundance and drought in periods of scarcity.

Finally, forests and trees play an important role in the protection of watersheds and river banks – the extensive rooting systems of certain tree species help bind the soil particles together, preventing soil erosion. If the vegetation cover is suddenly cleared the underlying soils are quickly removed to the level of hard bedrock: any subsequent rains flow off such hillsides, often with devastating effects to lowland areas.

3.1.3 The Social Function

The contribution which forests make towards poverty reduction is often under-estimated.

Recent analyses, however, begin to note the broader significance of forests for local livelihoods and estimate that hundreds of millions of people depend on forests for subsistence production and environmental services like watersheds, soil erosion control, micro-climate, biodiversity and cultural services. It is estimated that 60 million highly forest-dependent people live in the rainforests of Latin America, South-east Asia and Africa. An additional 350 million people are directly dependent on forest resources for subsistence or income, and 1.2 billion people in developing countries use trees on farms to generate food and cash. Loss of forest resources is believed directly to affect 90 per cent of the 1.2 billion people who live in extreme poverty.

In many countries, especially poorer ones, rural populations depend on a range of forest resources for their livelihood. An understanding of the relationships between local, traditional cultures and their interactions with surrounding forests is therefore an important part of global forest management. The significance and role of protected areas (see Box 1) – those formally gazetted as well as other of local spiritual or other importance – also needs to be considered as refugee-related operations can have a significant impact on such resources unless special measures are taken.

Although deforestation is a problem in many countries, in the case of refugees it involves an additional socio-economic dimension as they use – and to some extent may depend upon – other people's commodities. The degree of competition with local communities for forest products and forest services will naturally vary considerably from place to place; at its most extreme it may even result in open hostility.

Unlike established local communities, refugees do not have a strong emotional tie to, and interest in, the local natural environment in the area in which they have settled. Local

Box 1

What is a Protected Area?

IUCN-The World Conservation Union defines a protected area as “an area of land and/or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means”.

Six categories of protected areas are recognized:

- **Strict Nature Reserve/Wilderness Area** – managed mainly for science or wilderness protection.
- **National Parks** – ecosystem protection and recreation.
- **National Monument** – conservation of specific natural features.
- **Habitat/Species Management Area** – conservation through management intervention.
- **Protected Landscape/Seascape** – landscape/seascape conservation or recreation.
- **Managed Resource Protected Area** – sustainable use of natural resources.

According to the above definition, the primary goal of management in these areas is to maintain or enhance biological diversity; human activities are only allowed with respect to the conservation goals.

people also live in a close social context which leads to greater respect for existing environment-related rules and regulations. Many such rules play an important role in preventing non-sustainable exploitation of natural resources (see also Box 2).

3.2 Types of Forest

A wide range of forests can be distinguished worldwide but for the present purpose two broad groupings will suffice – natural forests and plantations. Natural forests are composed of tree species that are indigenous, i.e. native to the area. Plantation forests, in contrast, are

established artificially, either by planting on land which has not carried forest within living memory – afforestation – or by planting on land which carried forest before, but where the indigenous species are replaced with a new species or genetic variety – reforestation.

The potential distribution of forests and forest types is mainly determined by climatic conditions and, to a lesser extent, by soil characteristics.¹ The most common classification of tropical forests is based on their structure, appearance, and species form and composition – aspects which largely vary with latitude. In the tropics, different forest types occur at different latitudes parallel to the equator, which are characterised by a similar total amount of precipitation and a similar annual rainfall distribution. As a rule, the further a forest is from the equator and the more extreme the site conditions, the more homogeneous the forest will be and the poorer its composition of tree species.

The following broad categories of forests can be distinguished: closed evergreen, or equatorial, rainforest; moist semi-deciduous forest; dry deciduous forest; savanna; and montane forests. A brief description of these ecosystems follows.

Closed evergreen rainforest is extremely rich in species and has a complex structure. Although the trees shed their leaves at regular intervals, the forest as a whole remains green throughout the year because the trees in a tropical rainforest follow individual biological rhythms. In addition, an individual tree would rarely shed all of its leaves at the same

¹ The term 'potential distribution' is used because certain limiting factors such as human presence, overgrazing and bushfires can prevent the natural development of forest vegetation. Intensive agroforestry practices in areas of high population density can, however, also produce more wood than might normally be expected.

time. Closed evergreen forests are found around the equator where the annual precipitation is at least 2,000mm, regularly distributed over the year. Humidity is very high throughout the year.

In comparison with closed evergreen rainforest, **moist semi-deciduous forests** are more homogeneous in composition as well as structure. The number of trees per hectare and the basal area of trees is also significantly less. Moist semi-deciduous forests lose most of their leaves in the dry season, which may last from 2–6 months. The average annual precipitation varies from 1,250–2,000mm.

Dry deciduous forests are completely bare for a more prolonged period during the dry season. Growth patterns are strongly seasonal: most trees flower at the end of the dry season. Such forests can differ considerably in species composition and structure, although many are characterised by an abundant occurrence of umbrella-shaped trees such as *Acacia* species, and very dense thorny shrubs. The height of the tree layer varies from 4–12m.

Dry deciduous forests are adapted to sites with less than 1,250mm annual precipitation and a dry season of more than six months. In

Community and forest bushfire control operation to protect the forest



Box 2

*Understanding The Livelihood Environment:
Responding To Local Rehabilitation Concerns In Zimbabwe*

Zimbabwe's Mozambican refugees repatriated in 1994. The five camps that had previously housed 150,000 of these refugees were quickly vacated, and the task of environmental rehabilitation began. Since 1992, the Fuelwood Crisis Consortium (FCC) had undertaken environmental activities in the camps, concentrating on the provision of improved stoves, environmental awareness-raising and tree planting. FCC's objective was to alleviate the effects of deforestation. Once the refugees had left, an opportunity existed for full environmental rehabilitation of the affected areas.

FCC conducted an environmental impact assessment to study the extent of degradation around the former camps. The study concluded that the overall change in forest land was from 78 per cent of the total area during 1981–1982 to 33 per cent during 1994, with much of the 12,000ha of forested land lost being converted to bush scrub savannah and scrub savannah.

At the completion of its mandate in 1994, the FCC was transformed into a new organisation, the Southern Alliance for Indigenous Resources (SAFIRE), the initial goal of which was environmental rehabilitation of Zimbabwe's refugee-affected areas. Unlike FCC, SAFIRE was conceived as a long-term initiative, concerned with ongoing community-based natural resource management. SAFIRE sought the input of local communities in determining priorities for environmental rehabilitation. It also developed natural resource management projects on the principle that a broad-based approach to environmental management focused on the economic role of indigenous resources would be more sustainable than a narrow focus on trees: this was borne out by the issues and constraints articulated by refugee-affected communities.

One of the early project ideas, planting trees for firewood (to 'replace lost firewood resources'), was seen as unsustainable as a project goal because the target communities had little interest in devoting arable land to planting something they would normally obtain from grazing lands. The same applied to tree nursery planting, unless there was going to be a ready market for seedlings. Only by realising an economic benefit from woodland products would communities become interested in reforestation.

While locals were interested in tree planting for commercial gain (especially in woodlots and fruit orchards), SAFIRE's initial concern had been for environmental rehabilitation: two quite different goals. It became necessary to reconcile the differing requirements of environmental rehabilitation and income-generation, such that the needs of the local community would be met without compromising the long-term objectives of rehabilitation. SAFIRE progressively altered its aims to coincide with those of local people, eventually abandoning the notion of environmental rehabilitation for its own sake. SAFIRE's stated goal became 'the economic development of rural communities based on sustainable management of natural resources.' This implied that post-repatriation environmental rehabilitation activities would only be warranted where environmental degradation had inhibited the capacity of local communities to derive a sustainable livelihood from their natural resources. Thus, SAFIRE focused on tree planting and other resource management activities with the specific objective of contributing to local income.

This experience shows that local people are often less concerned with replacing trees destroyed by refugees than they are with ensuring the sustenance of a natural resource base that best meets their long-term economic needs. This demands an appreciation of the 'livelihood environment', rather than the sole concern of lost trees.

Source: UNHCR, 2002a

addition, the amount of precipitation strongly fluctuates from one year to another and is most often concentrated in scarce but heavy showers. Forest soils are relatively fertile and spared from leaching.

People and fire have both had a strong impact on this type of forest: large areas of the tropics have been degraded as a result. In such regions, the original forest cover has been replaced by savanna-like vegetation.

With increasing distance from the equator, there is a gradual transition from dry closed forest to more open forest formations combined with grassy vegetation, a feature known as **savanna**. In such ecosystems, the tree/grass ratio decreases with increasing drought. The annual precipitation decreases gradually to 300–400mm, and the length of the dry season runs to 10 months.

Different categories of savanna are recognised:

- ▶ savanna woodland – open forest with a crown cover of between 10 and 40 per cent;

- ▶ tree savanna – continuous grass vegetation with scattered trees;
- ▶ shrub savanna – continuous grass vegetation with shrubs; and
- ▶ grass savanna – continuous grass vegetation without woody plants.

Montane forests grow at or above 1,800m above sea level. They tend to be more homogeneous and less rich in tree species than low altitude close canopy tropical forests. Generally high levels of atmospheric humidity encourage abundant growth of mosses, ferns and epiphytes – non-parasitic plants which grow on trees.

Besides the most common ‘zonal forest’ categories described above, other classifications could also be applied, for example, an ‘azonal classification’ which can be based on specific vegetation types – such as teak forests, miombo woodland, bamboo forests or tropical conifer forests – or certain environmental, usually soil, conditions – swamp, mangrove, flooded, peat or riparian forests.

4

Forest Management during Refugee and Related Operations

4.1 Introduction

People have long made use of forest resources, clearing forested land for settlement, cultivation and livestock grazing, collecting wild foods, and benefiting from a broad range of other services. As long as the population density remains below the carrying capacity of the concerned habitat, such activities can be undertaken and developed in harmony with the natural environment, and people tend to use the available forest resources in a sustainable way. This means that people make use of forest products and services without causing undue reduction in the forest's inherent values and future productivity, and do not cause undesirable effects on the physical environment.

The question of resource sustainability mainly becomes a concern with increased human concentration, or increased levels of activity, on a given piece of land – a typical situation in many refugee and returnee operations. The higher the concentration of people and the longer such a situation persists, the more evident the extent and scale of negative environmental effects.

UNHCR has a crucial role to play with the planning, co-ordination and control of all camp/settlement management activities. With regards to forestry, UNHCR should **first try to ensure that the settlement process is as least**

destructive as possible, while at the same time ensuring that refugees are supplied with sufficient forest products to meet their basic needs.

The impact that refugees may induce on their hosting environment will vary considerably from one situation to another. Among the main factors which will influence the type and scale of impact are the:

- number of refugees involved;
- duration of stay;
- housing arrangements – whether local settlement or camp establishment happens;
- fragility of the local ecosystem;
- carrying capacity of the allocated site;
- area of land allocated to refugees;
- general availability of forest resources;
- kind of cooking stoves and practices used;
- types of building materials;
- kinds of food people consume; and
- planning, co-ordination and control of forest-related activities undertaken for and/or by the refugees.

Practical guidance is given below as to how some of the most common and obvious environmental impacts might be lessened or avoided during the broad phases of refugee assistance programmes, although recognition must always be given to the different conditions experienced in each situation. Further options are explored in Section 5 while guidance is provided in Section 6 on how these and other possibilities might be considered when establishing a Forest Management Plan.

4.2 Emergency Phase

The Emergency Phase is the initial phase of a refugee operation, associated with the influx and settlement of frequently large concentrations of refugees. The principle of **'prevention before cure'** should be applied at this stage.

An effective planning process of preventing and mitigating destructive measures should be carried out as early as practicable. Experience shows that the quality of the first measures taken on the ground, as well as through later well thought out and co-ordinated planning, will largely determine the overall cost of refugee assistance over the entire duration of the relief operation. Such costs are not only economic, but also include social and environmental considerations.

Given the urgency of the situation, the planning of proposed activities will, to a large extent, be carried out by a small group of technically skilled people, including UNHCR's emergency teams, representatives of the local forestry administration, local or international non-governmental organisations (NGOs) and, eventually, other forestry specialists familiar with the forest situation in the concerned areas.

Some of the first matters which need to be considered are the **selection of camp sites** and **identification of an acceptable level of refugee density** in respective camps. Refugee camps and settlements are often located in forest areas which are usually less fertile zones and not the most suitable for agriculture. Whatever efforts are made to find an ideal location, refugees may end up in an environment that does not necessarily cater for their needs or allow them to develop sustainable practices of agriculture, livestock keeping or indeed forest management.

In relation to forestry, every effort should be made to avoid siting camps close to protected areas (see Box 1) or other sites which have an

important biological, social or economic role. If this is not achieved, there is a great risk that such sites will be degraded or destroyed. Remediation actions are expensive and time-consuming and may not achieve the intended objectives, as damage to such sites is often irreversible. The proximity of camps to extremely vulnerable and erosion-prone areas should also be avoided as such sites have a very low carrying capacity and are not suitable for hosting large concentrations of people.

On the other hand, existing forest resources in the surroundings of a refugee camp should be sufficient to meet the basic demands for forest products. Decisions need to be taken early on regarding matters such as the sort of building materials that might be required, or the best possible source of fuel for cooking and heating, as these may have direct impacts on the

Awareness raising campaigns can contribute to minimising unnecessary damage to forests and protected areas



local environment, or distant sites if materials have to be gathered and transported from elsewhere (see also Box 3).

Decisions taken with relation to camp site selection and the number of refugees in respective camps should, among other factors, be based upon assessment exercises of the quantity and quality of forest resources available in the surrounding areas, together with the refugees' likely demand for forestry products and services. Methods for conducting these assessments and guidance for the selection of factors which should be included in the exercises are described in Section 5.

① Box 3

Forest Management Measures during Camp Establishment

Since camp sites are more often established in forested areas than on agricultural land, the process of camp establishment and construction of access roads usually results in large areas of forest vegetation being removed.

Forest products such as poles, posts and sawn timber are often essential components of basic shelter. If not otherwise provided, refugees will search for construction materials in the vicinity of the camps and will harvest what they need from surrounding forests. In situations where refugees have also brought livestock, additional wood and fodder will be required for fencing and feeding, respectively.

Although the demand for construction materials is usually moderate in terms of quantity, compared with the amount of wood required for fuel, the process of collecting building materials is highly selective as only straight and well developed trees are cut for timber. This might add pressure to locally rare or important tree species. Clear guidance is needed from the outset regarding what trees/species may or may not be cut or collected – a message which needs to be clearly and frequently made to refugees and representative of local communities.

As soon as operations have started for camp establishment and construction of access roads, an efficient forest damage control system should be put in place. Obviously, a maximum amount of vegetation should be left and all cut wood products should be given an economic (or other) value. This initial control constitutes a first step in the development of forest harvesting and protection plans for surrounding forest resources. These plans should aim to promote and establish a sustainable use programme of forest products that, by preference, should be harvested from forest plantations rather than in natural forests.

Early development and implementation of awareness raising campaigns can contribute to minimising unnecessary damage to forests in the hosting area. Issues to address during such activities include the functions of forests and trees, the local forest situation, and established control measures and rules concerning the use of local forest resources.

4.3 Care and Maintenance Phase

With the transition from an emergency to the Care and Maintenance phase, a certain stability will have been reached within the refugee population of a given camp and a degree of self-sustainability will be in the process of being promoted. UNHCR's main concern at this stage is to ensure the safety of the refugees in camps and to provide them with material assistance.

Activities will now begin to address a longer term outlook and will be formulated in a systematic manner that takes into account the costs and expected benefits of alternative technical approaches. The planning and implementation of forest-related activities should now be co-ordinated and monitored by an **Environmental Task Force** (see UNHCR *Environmental Guidelines*, 2005a, and Section 6 of this Handbook). Such a group should include representatives from UNHCR field

staff, implementing partners (international and local NGOs), local and central government departments, specialised UN agencies if present, and, most importantly, local community and refugee leaders.

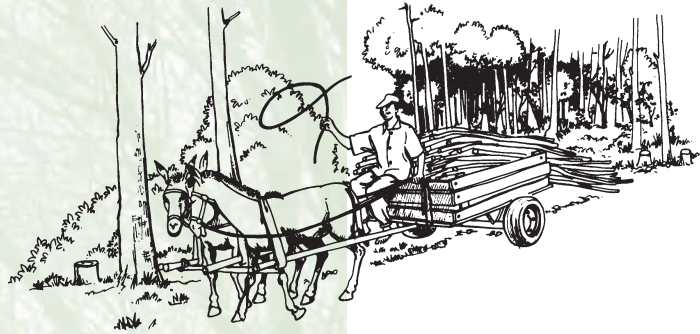
In certain circumstances, the co-ordination role for forest management may be entrusted to an environmentally active implementing partner. In large-scale and complex refugee situations, however, a UNHCR-assigned Environmental Co-ordinator should normally be in charge of co-ordinating environmental interventions.

Sustainable forest harvesting plans should be developed at this stage, stipulating how surrounding forest resources might be used by and for the refugees, without being depleted. Agreements will have to be made with the respective owners of the concerned forests. In many tropical countries, natural forests belong to the state and user agreements will need to be negotiated with the government, often through the national forest service. It is recommended that personnel from such national agencies are involved with developing such harvesting plans and in the supervision of allowed harvesting activities. Special arrangements may need to be deliberated if local forests are under the administration of communities who may or may not allow access to these resources.

In order to protect the forest and ensure that refugees can at the same time receive benefits from local forests, harvesting plans will have to include clear rules and regulations regarding illegal activities (e.g. charcoal burning, excessive harvesting, wood trading, hunting and the collection of forest products). A well organised control system needs to be developed and integrated in the overall plan in order to enforce established rules and regulations (see also Box 4).

It is generally only during the Care and Maintenance phase that the possibility of tree

Search for construction materials if not well-organized, places pressure on important local tree species



Box 4

Subsistence Activities that might Impact Forest Management Decisions and Practices

Fuelwood collection

The gathering and cutting of fuelwood, if not otherwise provided, is widely practised. Demand depends on the type of food being prepared, the kinds of cooking stove in use, and climatic conditions as additional energy may be required for heating. Fuelwood consumption may vary considerably (see *UNHCR Environmental Guidelines on Refugee-Related Domestic Energy Needs* for details) although it always represents an important factor when the use of forests and forest products is being considered.

Farming

Small-scale agriculture and horticulture are widespread activities during the care and maintenance and local settlement phases, especially by refugees who have traditionally earned their livelihood as farmers. Forest land is often cleared for this purpose. When locally important forests or protected areas are affected by such clearing practices, the host country's efforts to preserve its natural resources are often strained or jeopardised.

Grazing

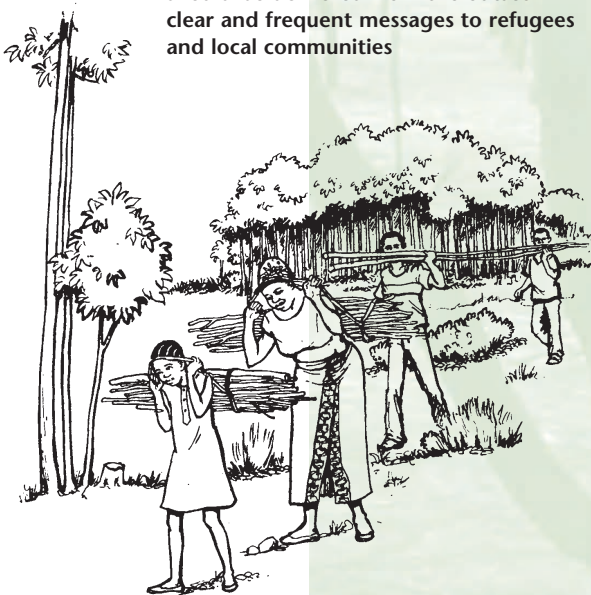
If large numbers of livestock accompany a refugee flight, intensive grazing cannot be avoided around the refugee camps. Depending on the carrying capacity of the area, grazing can quickly turn into overgrazing, and hence land degradation. Uncontrolled grazing by small ruminants is often a contributing factor with short- and long-term impacts for refugees, local communities and biodiversity.



Tree cutting within camp sites leads to environmental degradation and future costly rehabilitation

planting activities can first be considered. A range of options exist, but one of the first actions is to take a random survey among representatives from within the refugee community as to their thoughts, prior experiences and needs or preferences regarding tree species. Communications should also be extended to representatives from local communities, paying equal attention in both instances to ensuring that both a gender and age balance is reached among those being questioned.

Guidance regarding which trees/species may or may not be cut or collected, should be delivered from the outset in clear and frequent messages to refugees and local communities



Tree planting within camp boundaries is commonly seen at this stage. At a finer level, tree planting within and around refugee homesteads has often proved to be the most successful reforestation initiative, probably because of the clearly defined rights of ownership and level of access to the benefits derived from the trees. In anticipation of such benefits, refugees take greater care of seedlings, which results in higher survival rates (see Box 5).

Apart from identifying the most appropriate planting scheme – woodlots, agroforestry practices, or enrichment planting, for example – other activities to consider include:

- the procurement of tree seeds or vegetative reproduction materials;
- the establishment of nurseries and raising of plants;
- preparation of planting sites (with consideration to soil conservation measures);
- transportation of seedlings to the planting site;
- post-planting maintenance; and
- establishment of ownership agreements and user-rights of the planted trees and their products.

Such tree planting programmes offer many opportunities for refugees to provide labour and skills, in exchange for which they might receive wood, food, money or whatever incentive appears to be feasible and appreciated in the given situation.

The organisation of minor extension programmes might also be beneficial. In the first instance, awareness raising activities should be continued. In addition, basic technical forestry skills such as raising seedlings, planting trees and taking care of young trees could be

extended to the refugee population. While carrying out such extension activities, one will soon discover technically skilled people among the refugees who can be invited to play a major role in the planning and implementation of

further forest-related activities. Participative planning and the practical organisation of actions to be undertaken should also be part of the extension programme.

Box 5

The Use of Incentives to Achieve Double Environmental Goals

Activities such as household tree planting are commonly encouraged in refugee camps and settlements to reduce impacts on the local environment. In some cases it can be desirable to employ incentives to promote greater refugee involvement in such activities. This has been tried successfully in refugee camps in eastern Kenya.

High levels of population concentration are a new experience to refugees. In eastern Africa many may have traditionally experienced water shortages, but would have had little prior exposure to competition for wood products and the associated need to conserve energy and protect and plant trees. Somali refugees arriving in Dadaab, for example, knew almost nothing about efficient energy management, tree planting or the sustainable use of natural resources in situations of population pressure. The result was rapid depletion of firewood, construction materials and live fencing around the camps, and over-exploitation of limited grazing areas.

In response, in 1994 the German Development Co-operation Agency (GTZ) began a project known as RESCUE – Rational Energy Supply, Conservation, Utilisation and Education. Its goal was to reduce negative environmental impacts in and around Dadaab by working with refugees and local people in energy conservation, tree planting and educational initiatives.

GTZ acknowledged the refugees' limited knowledge and experience in sustainable natural resource management: the RESCUE project set out to use incentives to encourage tree planting around refugee households rather than relying solely on refugee interest and expertise. Seedlings raised in camp nurseries were distributed to refugees for compound planting, and incentives then offered to ensure their survival. These incentives, known as exchange commodities, comprised different types of wood-burning stoves. The more surviving trees, the better the type of stove provided to the family. As the project developed, stoves were also offered to refugees in return for contributions to other environmental tasks, such as erecting live fencing around protected regeneration areas or digging micro-catchments for water around trees planted within these areas. Further exchange commodities were also tried, including solar cookers, haybasket cookers and – at the request of refugee women – vacuum flasks to keep drinks warm.

The exchange commodity programme has resulted in the planting of 650,000 trees, with a 70 per cent survival rate, mainly in private compounds where they can be harvested by the refugees who planted them for firewood, fodder, fruit and building materials. Over 30 hectares of land have been enclosed with live fencing for natural regeneration. In return, some 29,000 improved ceramic stoves of various designs have been given to refugees, with an average energy saving achievable for each family of 20 per cent.

Exchange commodity projects such as that tried by RESCUE in Dadaab can achieve double environmental goals, both through the activities undertaken by the refugees and the types of commodities awarded to them. They do, however, depend on external donor support throughout to supply the commodities that refugees will 'earn'. The results can nevertheless be impressive, and the incentive-based system is especially suitable for refugee communities whose prior experience with sound environmental management may be limited.

Source: UNHCR, 2002a

Box 6

Income-generating Activities based on Forest Resources

Cutting wood for sale

Lack of wood/timber harvesting controls and the proximity of good markets encourage the cutting of wood for sale. In some cases, refugees are used as a source of cheap labour by local middlemen to extract fuelwood, timber or other forest products destined for urban areas.

Charcoal manufacturing

The production of charcoal is a questionable activity from an environmental point of view. Apart from high conversion losses in the transformation from raw wood to finished charcoal, and the low efficiency rates of commonly-used earth kilns, charcoal manufacturers only select certain trees species that produce good quality charcoal. This selective process may threaten the survival of certain species. From a social point of view, charcoal production generates income for some people while it reduces the fuelwood (and other) resources of a great many more.

Illegal hunting

Illegal hunting, or poaching, is a common activity in forests where wildlife is abundant. It is perceived by refugees as a means of adding to their food rations. Poaching can be of severe environmental and social concern, particularly since rare and/or protected species are hunted along with the more common ones. In some cases, where forest reserves shelter rare animals, such as mountain gorillas or elephant, hunting may be carried out for commercial reasons (i.e. to sell skins or tusks) rather than for food.

It should be noted that the above-mentioned activities are not, to a large extent, negative by definition. They do not differ from the activities carried out by local communities in normal situations. They only become a problem when they lead to an excessive (or unsustainable) and uncontrolled use of resources.

4.4 Durable Solutions Phase

The Durable Solutions phase includes the following activities:

- local integration and (semi-) permanent settlement of the refugees in their host country;
- repatriation to and re-integration in their own country; and
- rehabilitation of refugee-affected areas following (re-)integration in areas for permanent settlement.

4.4.1 Local Settlement and Re-integration

UNHCR assisted local settlement and (re-)integration projects, including quick impact projects (QIPs), should be environmentally sound and sustainable. These are small, rapidly implemented projects intended to:

- help create conditions for durable solutions for refugees and returnees through rapid interventions;
- through community participation, provide for small-scale initial rehabilitation and enable communities to take advantage of development opportunities; and
- help strengthen the absorptive capacity of target areas, while meeting urgent community needs.

Environmental considerations should therefore, for all of the above reasons, be included in the design of any projects. Forest-related concerns associated with the local settlement of refugees or the re-integration of returnees are essentially related to supporting sustainable development in the areas involved. General sustainable development programmes which include a forestry component are a common issue for most development agencies, on whose experience UNHCR and its partners can and should draw.

Refugee/returnee participation in planning, implementing and monitoring and forest-related activity is essential. As a first step towards setting up a sustainable development programme, a number of assessments should be carried out in the concerned camp/settlement areas. Possible techniques for this include participatory rural assessments, livelihood needs assessments, and assessments of the legal and socio-economic context. Based on information gathered, programme plans might then be initiated taking account of the priorities for that specific situation. Rural tree planting projects (using a mixture of tree species to provide multiple benefits), combined with watershed management, for example, are often important components of forest-related programmes to assist with settlement and/or re-integration programmes, but are not exclusive to such situations.

Attention should also be given to identifying and promoting appropriate forest-related income generating activities such as small-scale forest industries, harvesting and processing of forest products, the sale of non-timber forestry products, employment in tree nurseries, or engagement in tree planting activities. Such initiatives are often highly appreciated by the settled refugee population.

Since UNHCR may not be the only agency active in a specific geographical area, planned activities should fit in with development projects being carried out by other groups or agencies in the areas concerned.

4.4.2 Rehabilitation

It is normally not possible to eliminate all of the negative impacts associated with refugees prior to their departure from the hosting areas. However, given that a host country has been generous enough to allow the refugees to use part of its territory, basic courtesy demands that these areas be rehabilitated to the greatest extent possible. The absence of appropriate action by UNHCR at this stage would devalue the remedial measures taken during earlier phases of the support operations and would send a negative message to potential host countries, thus potentially undermining refugee assistance operations in the long-term.

Ideally, the question of rehabilitation should be addressed from the earliest possible moment in an operation. That way, actions might be prevented, or could be altered to minimise potentially negative environmental impacts and therefore eliminate the need for costly and time consuming rehabilitation.



Rehabilitation of former camp site after repatriation to resume the forest cover

Unfortunately, this is rarely possible giving competing needs and priorities and, often, the lack of manpower and experience.

At the time when rehabilitation needs are then actually being considered, an assessment of forest damage (and any improvements) will need to be made. For rehabilitation projects to be effective, their planning must involve all the major actors concerned, including the host government, UNHCR, development agencies, implementing partners and the affected communities, the latter being key since the activities being undertaken will have to meet those population's long-term needs. For this reason, it is essential that discussions focus on what people actually need from the environment – there is little purpose in developing and implementing activities that do not correspond with local peoples' own needs. Careful planning and consultation is therefore critical to shaping, implementing and managing whatever structures and activities might emerge from discussions.

A mechanism must also be set up to sustain rehabilitation activities until completion, at which stage local communities and authorities should ideally be willing and capable to any

future management – whether for environmental goods and services, or infrastructure. In many instances, specialist assistance may be required to strengthen the capacity of those individuals, groups or administrative structures who will be ultimately responsible for future management.

Various forestry-related options might be adopted during rehabilitation phases, including reforestation of affected woodlands or forests. Different techniques can be used for this purpose, such as encouraging and/or facilitating natural regrowth, forest enrichment through direct seeding or tree planting, and reforestation of larger bare areas (see Section 6 for further guidance).

Social forestry programmes should also be considered as a form of rehabilitation. These include agroforestry, the establishment of village-based woodlots, and road side plantations, all of which can benefit local populations (Section 6). To enhance the effectiveness of such programmes they may also be undertaken in combination with soil and water conservation measures, as well as livestock-keeping (see UNHCR, 2005b).

5

Responding to Needs – Practical Actions and Options to Consider and Apply

5.1 Introduction

There are a number of tried and tested, practical actions which can be applied from the onset of an emergency to help manage forest resources in a sustainable manner. The following activities – and there are others – might find relevance in most situations:

- early damage control;
- assess timber/woodfuel/other demands;
- assess possible supply/supplies;
- develop a wood harvesting and supply plan;
- tree planting; and
- development of income generating activities.

5.2 Initial Damage Prevention and Control

5.2.1 Objectives and Timing

In emergency situations, refugees will often immediately need wood for shelter construction – most commonly poles to support plastic sheeting, but also occasionally branches and grasses as roofing materials – and fuel for cooking and heating. As they may immediately start

to collect the required wood from the closest resources, without waiting for systematically planned wood harvesting and supply programmes to commence, a number of **immediate damage control measures will have to be taken** in order to reduce the potential damage to the extent possible.

5.2.2 Damage Control Measures can Pay Off

Preventing damage from taking place is the best option to strive for, during an emergency as well as in other phases of operations. Some proven measures to try and adopt – even before the results of comprehensive demand and supply assessments are known – are listed below:

- select camp site locations at a reasonable distance from protected forest areas, national parks, game reserves or vulnerable and erosion-prone areas – a minimum distance of at least 10–15km should be respected;
- similar distances should, if possible, be respected for water courses and water sources;
- avoid unnecessary tree and shrub cutting during the camp construction phase. Site planners in particular must ensure that clear cutting is avoided during camp site establishment. The integration of ‘green belts’ should be promoted in all camp and settlement sites;
- proper use has to be ensured of all removed woody vegetation;
- clearly **mark trees that should not be cut** in and around the refugee site – **the purpose and objective of this tree marking exercise (not to damage the marked trees) must be clearly explained to the refugee and local populations;**
- engage in early dialogue with representatives from local communities to establish environment-related issues of particular importance;

- ▶ launch refugee awareness raising programmes to explain which types of vegetation may be collected – dry wood, low branches, and old and badly shaped trees of low economic value – and from which location(s); and
- ▶ consider providing essential building materials for refugee shelter, e.g. wooden poles gathered from more remote and well-stocked areas, harvested under a well controlled scheme.

Restricting the movement of refugees from entering protected areas or other sites of local cultural/spiritual importance may prove necessary at this stage, given that such zones are often known reservoirs of medicinal herbs, wild game, timber and other NTFPs of possible subsistence and/or commercial value.

While these measures are being applied, more rigorous demand and supply assessments of forestry products should be started (see sections 5.3 and 5.4), in preparation for more systematic wood harvesting and supply plans. Information from these surveys, which should be carried out in conjunction with representatives from local communities and the refugee population, would then form the basis for an early environmental management plan for the camp/settlement.

5.3 Assess the Demand for Forestry Products

5.3.1 Objectives and Timing

Although refugee and returnee populations make use of all kinds of forest products and services (see sections 3 and 4), their need for construction materials, fencing poles and fuelwood is by far the most immediate, important and determining factor when it comes to environmental impacts. Early assessment of the likely demand for timber, construction poles

and fuelwood will therefore provide basic information for further planning of appropriate forest-related activities. This, in turn, is a useful planning exercise as it helps prioritise what resources might be needed from the immediate to a longer term perspective.

These planning and assessment exercises should be carried out as early as possible in the emergency phase of refugee operations and at the initial planning phase for intended returnees. A **preliminary demand assessment** should, however, be completed as soon as the approximate number of refugees or intended returnees is known for a given situation.

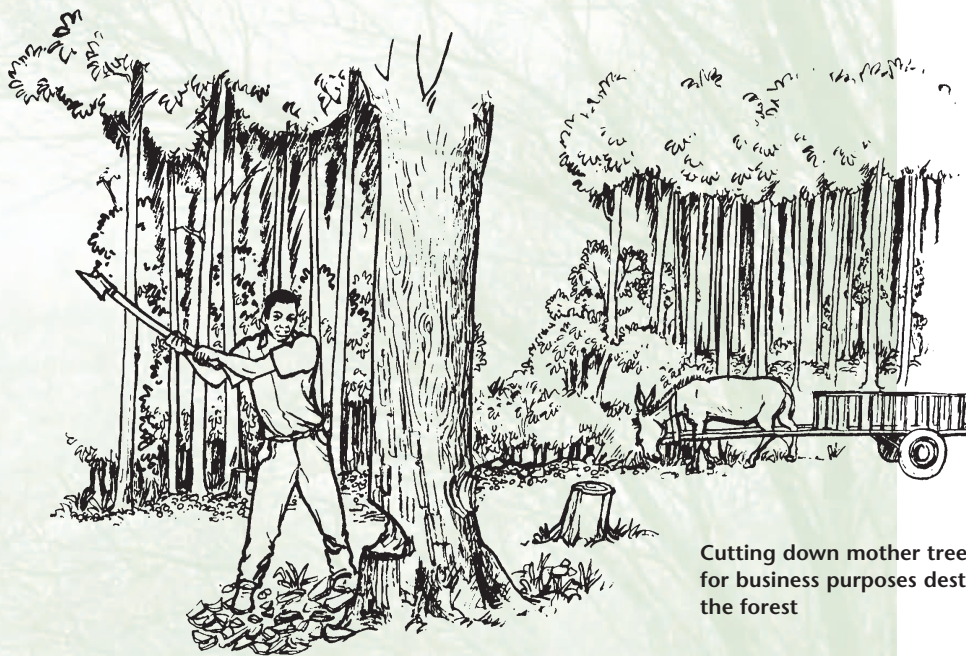
Initial planning and assessment exercises should be updated and fine-tuned throughout the care and maintenance phase. They should also be incorporated in planning for (re-)integration, with the objective being to provide up-to-date and appropriate planning parameters for forestry programmes.

5.3.2 Demand for Construction and Fencing Timber

A significant quantity of construction and fencing materials will be required when refugees first arrive at a camp or settlement. The needs assessment for these particular forest products can be based upon an exact measurement of the quantities used by a sample of representative households. Logically, these needs will vary with the construction habits of the population, with the presence of accompanying livestock (building secure pens might be an issue), and with the availability of other construction materials, e.g. mud bricks.

If no specific figures can be determined in time, the approximate needs may be calculated from existing records of other refugee programmes (see Box 7).

While assessing likely demands, one should not forget that due to termite damage



Cutting down mother trees for business purposes destroys the forest

Box 7

How Much Wood and other Materials is Needed for a Shelter?

For an emergency shelter built with local materials, the average quantity required is 80m of straight poles with an average diameter of 5cm, which is equivalent to 0.2m³ of timber per family (average of 5 members).

As young trees of good quality are used for this purpose, the harvesting of construction wood tends to be more harmful than fuelwood collection. Apart from poles, other materials required for construction include bark for binding, smaller branches to fill up the wall spaces, and roofing materials, e.g. palm fronds or grasses.

and/or fungal attack, construction wood will in most cases need replacement at regular intervals. The assessment should therefore also include wood requirements for the construction of communal buildings such as health posts, agency staff housing and offices, latrine slabs, and other wooden structures.

5.3.3 Demand for Fuelwood

As soon as refugees have settled, the demand for fuelwood will increase and easily outweigh demands for construction timber.

In refugee camps, wood is most often the only realistically available source of energy. Moreover, many populations traditionally use fuelwood for cooking since wood provides high quality fuel, is easy to use, is relatively economic and, if its consumption is properly managed, constitutes an environmentally sound source of fuel.

Fuelwood consumption varies with its availability, the kind of food that is to be prepared, the kinds of stove in use, and with climatic conditions. Most of the relevant literature, however, agrees on estimates of an average annual consumption of 1–2 kg/person/day. **It is important to realise that this quantity can increase considerably if no wood-saving cooking techniques are applied and if fuelwood collection is not restricted.** In camp situations, initial per capita firewood consumption of about 3kg/person/day is often observed: this can drop to 1–2kg/person/day with the conditions specified above² but may also

² For further details, please refer to Environmental Guidelines: Domestic Energy in Refugee Situations. UNHCR, 1998

increase if, for example, economic incentives are identified.

5.4 Assess the Possible Supply of Forestry Products

5.4.1 Objectives and Timing

Having assessed the expected demand for forestry products, one should then concentrate on how to meet this demand in the best way – economically as well as environmentally. The supply assessment should be carried out hand-in-hand with the demand assessment and precede the planning of forest-related interventions in the emergency, care and maintenance and durable solution phases.

The results of a supply assessment, which should reveal the existing quantity and quality of forest resources in the concerned region as well as their expected availability for use by refugees/returnees, will provide a key parameter for determining the location of a camp or settlement. Ideally, the selected site should be located at a place where sufficient forest resources, plantations and/or natural woodland are available to meet demands for forestry products in a sustainable manner. On the other hand, the proximity of national parks, ecologically fragile areas, protected or any other biologically or culturally valuable forests should be avoided at all costs.

5.4.2 Key Elements of a Supply Assessment

Assessing the supply of forestry products will in the first place involve a survey of the areas under forest cover – natural forests as well as plantations – within and around the region allocated hosting refugees or returnees. Practical guidance on how to estimate the supply capacity is given in Annex I.

In addition to the precise area of forest in the region, information should be gathered on the following:

- type and general quality of forest/plantation;
- standing volume and maximum allowable cut;
- kinds of harvestable products found;
- ownership and usufruct rights;
- managerial responsibility and any past forms of utilisation; and
- protection status.

Some of this information can be obtained from existing forest maps and, eventually, aerial photographs or satellite images made available by the local forestry administration or other specialised agencies. Existing management plans for the surrounding forest areas will also provide useful, and may contain data such as the area of coverage, species composition, the annual production, or recommended harvesting volumes. In practice, however, few management plans with this level of detail have been prepared for refugee/returnee operations.

Information gathered from the above-mentioned sources will still require verification (“ground-truthing”) in the field. During such field visits, one should not only check and complete the already acquired information, but also assess the access facilities to identified forest areas (existence and conditions of the access roads, the possibility of obtaining feasible arrangements with the owners regarding their use by/for the refugees, availability of transport, and so on) as well as the distance from camps/settlements. Information should also be obtained on the status of the land in terms of ownership, to avoid any conflict.

Close collaboration must be established with the local forestry administration and representatives of the local population, not only because of their knowledge of local natural resources but also because of their authority and

jurisdiction. The support of a natural resource expert would be an extra advantage in such situations.

5.5 Development of Wood Supply and Harvesting Plans

5.5.1 Objectives and Timing

Based on the identified needs for wood products (Section 5.3) and the survey of available harvesting areas and their stocking volume (Section 5.4), a wood harvesting and/or supply plan should then be established.

A wood harvesting and supply plan provides the basis for further preventive and mitigating measures. Wood supply plans should be developed during the emergency phase as soon as the results of the above-described assessments are available. Such plans will assist decision-makers in deciding on the main options for wood supply, i.e.:

- ▶ supervised/controlled harvesting by refugees themselves; or
- ▶ an organised and centrally managed wood supply.

A wood supply plan will also provide the technical and managerial details for actions which may need to be taken, such as structuring the wood supply, directing and organising wood harvesting activities, and establishing mechanisms to check uncontrolled wood cutting.

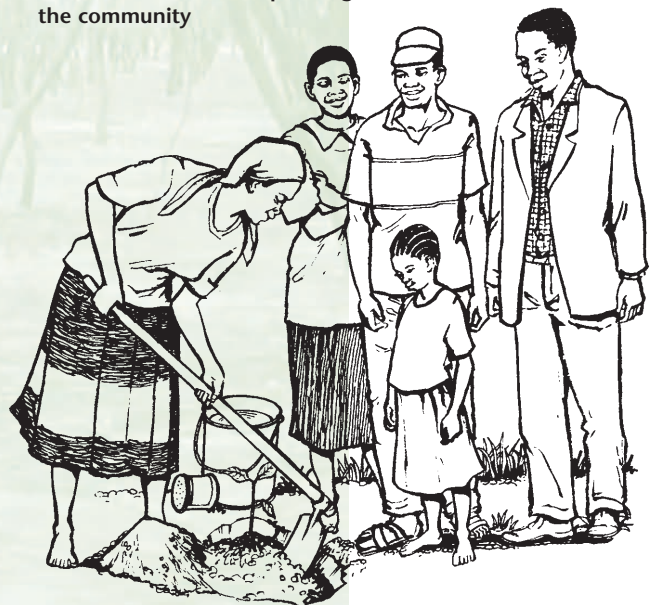
As wood harvesting and supply is bound to continue during the care and maintenance phase, regular revisions and adjustments of the initial plan will be required.

5.5.2 Key Elements of a Wood Harvesting/Supply Plan

Among the main considerations of a wood harvesting and/or supply plan (see also Annex II) are:

- ▶ the demand, in kind (e.g. building poles, roofing materials and fuelwood) and volume;
- ▶ the chronological sequence of the demand;
- ▶ if applicable, demand-reducing factors, for example, fuel-saving measures such as improved stoves, or fuel-switching measures such as a change from fuelwood to kerosene or agricultural residues;
- ▶ extractable volume of wood derived from organised forest operations, in particular the geographical location of wood sources, the kind of wood (e.g. construction or fuelwood), and the methods and cost of extraction;

Demonstration of tree planting to the community



- ▶ other sources of wood, even if only temporarily available, such as woody biomass from land clearing/camp construction; wood/charcoal from forest industries; and traded wood (from outside areas);
- ▶ logistics (transport facilities, cost of transport);
- ▶ legal and fiscal aspects of forest utilisation, for example, right of access, concession rights or royalties; and
- ▶ organisational framework (job-sharing with the forest administration, communal forest owner or private owners).

Whenever possible, harvesting activities should take place in forest plantations and not in natural forests, as regeneration in natural forests is more difficult and, in some cases, impossible. Old plantations with relative large amounts of dry wood should be a first priority for harvesting. Such plantations are often found in regions where large areas were once planted to supply wood for industries which in the meantime may have disappeared – around tea, tobacco or pyrethrum drying plants, or near brick-makers. Plantations of species which can be successfully coppiced, as well as those in areas where wood is not in short demand – and would therefore not pose a problem to the local population – are also suitable harvesting sites.

If no wood is available from plantations, selective wood harvesting will have to be organised from natural forests. In this case, some tree marking will be necessary. The first trees to be cut should be old specimens, badly shaped trees and those of low economic value. The collection of dry wood and low branches could also be authorised. If well-established harvesting priorities are followed, this will considerably reduce the need for rehabilitating reforestation activities during the later phases of a refugee assistance programme.

Harvesting in national parks and gazetted forests, areas with endangered species (plant and animal), game reserves, as well as any other ecologically sensitive area should be strictly prohibited. Areas surrounding such sites, commonly referred to as buffer zones, should also be spared from major extraction activities.

Tree cutting should also be avoided in zones identified as water catchment protection and/or erosion control areas.

5.5.3 Controlled or Supervised Wood Harvesting

With controlled or supervised wood harvesting, refugees collect and harvest the wood they need. This option can be permitted in situations where the stocking volume of the wood and forest areas within reach of refugee sites is sufficiently high to meet the wood demands in a sustainable – or almost – manner, and where wood collection by refugees will not lead to security risks, problems with the local population or violation of forestry regulations. Even when forest conditions are favourable enough to allow refugees to freely collect their wood requirements, extensive supervisory control, law enforcement and awareness raising measures will still have to be taken.

In addition to the measures already mentioned under Section 5.2, attention should also be given to the following:

- ▶ clear demarcation of forest areas where wood harvesting is allowed and prohibited. Such demarcated areas can be identified on the basis of results from forest inventories;
- ▶ tree marking in harvesting areas. It should be made very clear to everyone which trees are marked – those which can be cut and those which must remain untouched;
- ▶ control of the amount and type of harvested wood. Forest rangers from the local forestry

department or trained supervisors from among the refugee population will be given responsibility for leading the refugees to the harvesting areas, supervising collection activities, and advising them on appropriate harvesting methods and cutting techniques;

- ▶ protection of forest areas restricted or prohibited from wood harvesting. Assistance will again be required from local and/or refugee forest guards or rangers. In most cases, guards will have to be provided with communication and camping equipment, with transport facilities, uniforms, tools and other essential materials;
- ▶ placing signs and fencing at selected locations along the perimeter of out-of-bounds areas, as well, as along access roads; and
- ▶ awareness-raising campaigns, which should help raise awareness of the multiple functions of forests, environmental risks arising from inappropriate wood harvesting, the proposed supervisory and control measures with regards to wood collection, the advantages, and appropriate harvesting methods and cutting practices.

5.5.4 Organised Wood Supply

With organised wood supplies, the wood is not directly collected by the refugees themselves: harvesting, transportation and distribution is organised under agency management, with varying levels of refugee participation.

Although it presents a major advantage for easier monitoring and control on the subsequent operations of harvesting, transportation and distribution, **a fully organised wood supply is still more the exception than the rule.** It is a costly and management-intensive undertaking which will only be justified in situations where the refugee population density far exceeds the supply capacity of surrounding forest areas, where freedom of refugee movement is

restricted by the host government, or in cases of security risks related to wood collection.

Organised supply of construction wood (compared with fuelwood) may be desirable because specific requirements such as durability and termite resistance, together with certain measurement restrictions, may not be locally available. Procurement of such materials from more distant areas is, in such instances, the only alternative. Where this option is being considered, every effort should be made to ensure that

Box 8

Forest Certification

Forest certification is the process of evaluating forests or woodlands to determine if they are being managed according to an agreed set of standards.

The Forest Stewardship Council's (FSC) mission is to promote environmentally appropriate, socially beneficial, and economically viable management of the world's forests.

- **Environmentally appropriate** forest management ensures that the harvest of timber and non-timber products maintains the forest's biodiversity, productivity and ecological processes.
- **Socially beneficial** forest management helps both local people and society at large to enjoy long term benefits and also provides strong incentives to local people to sustain the forest resources and adhere to long-term management plans.
- **Economically viable** forest management means that forest operations are structured and managed so as to be sufficiently profitable, without generating financial profit at the expense of the forest resources, the ecosystem or affected communities. The tension between the need to generate adequate financial returns and the principles of responsible forest operations can be reduced through efforts to market forest products for their best value.

More details on the Forest Stewardship Council, including certified suppliers of FSC timber can be found on www.fsc.org

materials emanate from plantations or forests certified under the Forest Stewardship Council (Box 8).

Experience has shown that organised fuelwood supplies only becomes effective in precluding refugee-induced damage to forest areas if a full supply of the minimum wood requirements is provided, and if complementary protection measures are enforced to prevent refugees from additional harvesting.

An ample supply of firewood, as opposed to a free supply, may be another measure to reduce the consumption. **Provision of free supplies should be avoided at all costs.** In some instances, refugees, excluding the more vulnerable groups, may be asked to provide labour for a variety of environmental projects, public works or other tasks in return for supplied fuelwood.

5.6 Tree Planting – Some Practical Considerations

5.6.1 Objectives and Timing

In climatic zones with a significant dry period, tree planting should be carried out in the wet season, preferably at the beginning of the rains.

Tree planting might appear as an obvious solution to meeting demands of fuel and construction materials, but the situation needs to be carefully examined and considered before any actions are taken. Before planting trees, for example, consideration must again be given to the needs (real and expected) of intended beneficiaries. Basic preparation of the soils also needs to be undertaken, while selective – usually manual – weeding may be required to prevent competition with planted seedlings (see Annex III and Annex IV for detailed information on nursery design, and tree planting techniques and maintenance). It is not necessary to remove all of the vegetation from the

planting site; clearing a circular space (0.5–1m diameter) around the future planting hole is normally sufficient.

Anti-erosion measures are strongly recommended if the planting site is on a steep slope. Such measures include:

- ▶ planting trees along level curves;
- ▶ leaving natural vegetation along gullies and banks;
- ▶ leaving strips of natural vegetation along level curves; and
- ▶ planting trees or shrubs with a dense and soil fixing rooting system along level curves.

An alternating planting design will also contribute to maximum soil fixation and help prevent gulley formation and contribute to hydrological functions. It will also help encourage wildlife to the area.

5.6.2 Tree Species Selection

A number of criteria determine the choice of tree species to be planted. In particular, the following factors should be considered:

- ▶ the **objective** of (re)forestation and the expected services. Examples include quick restoration of the tree cover (protection), long-term rehabilitation of rather low degraded forests, need for specific products (firewood, building materials, forage, fruits), auto-consumption or commercial purposes, or multipurpose functions.
- ▶ **ecological conditions** including climatic factors (length of dry period, desiccating winds), water availability (scarcity or excess), soil parameters (depth of root penetrable soil layer, water stocking capacity, chemical characteristics), erosion hazards, etc.

- **social conditions** – ownership and user-right issues including rent or gift traditions, pressure on land for agricultural or other purposes, specific preferences or a reluctance to use certain species.

According to these criteria, the following properties of candidate tree species have to be examined:

- quality and type of products or services with regards to the objective;
- experience in the region;
- people's acceptance or reluctance;
- market potentiality;
- ecological requirements (climatic and edaphic);
- speed of growth;
- availability of seeds or cuttings;
- susceptibility to fire, pests and insect attacks; and
- regeneration capacity (by cuttings or from seed).

Various needs and values should be considered regarding the choice between indigenous or exotic species. Local tree species, appreciated by local populations, most often grow in natural forest ecosystems and cannot be used for reforestation of degraded sites. Growth of such species (e.g. *Parkia*, *Butyrospermum*, *Balanites*) is often slow and their ecological requirements for shelter and shade make them unsuitable for planting at exposed sites. Particularly during the first phase of site rehabilitation, the more extreme conditions of degraded areas require the use of pioneer species (local or exotic) which are usually not very demanding (e.g. *Acacia* spp).



Participation in tree species selection contributes to community confidence and ownership

In addition, it is often more difficult to find sufficient quantities of seeds of indigenous species compared with the more popular exotics. The propagation techniques (seed treatment, nursery requirements, etc.) of indigenous species are also often not fully known. Personal preferences also need to be considered. Finally, people often believe that what is growing naturally, does not need to be taken care of and does not need to be planted.

Rural communities often prefer to use exotic species such as *Eucalyptus* in afforestation programmes – many people request *Eucalyptus* species on account of fast growth rates and quality for wood construction. Caution must be exercised, however, when promoting such species which tend to deplete the soil of important nutrients and require extensive amounts of water, all of which can have negative environmental impacts and further degrade an already fragile ecosystem.

General recommendations on the choice of local and exotic species according to climate conditions are listed in Annex VI.

5.7. Forestry and Income-Generating Activities

5.7.1 Objectives and Timing

The promotion and creation of opportunities for refugee populations to generate some revenue is very important in the sense that it will contribute to enabling them to provide, entirely or partly, to their own subsistence and, therefore, in helping them escape from being totally dependent on external support. If the local environment can also benefit from such income generating activities, this is a double benefit.

Appropriate income generating activities should therefore be promoted and assisted whenever possible. Most opportunities for this type of activity will only become apparent during the care and maintenance and durable solutions phases.

5.7.2 Income Generation and Illegal Activities

Forest-related income generation is quite often linked to illegal activities such as charcoal burning, timber cutting and pit sawing and, specifically for refugee situations, the resale of supplied and/or illegally harvested timber or fuelwood outside the camps. UNHCR cannot support nor promote this type of activity.



Though generating income, charcoal making threatens the forest resources

5.7.3 Types of Supported Forest-Related Income Generating Activities

There are many possibilities, agreeable to local authorities, to provide refugees with an income generated through activities associated with forestry and environment. For instance, refugees can be paid in cash, with fuelwood or with other items (e.g. fuel-efficient stoves) for the following tasks, many of which have direct environmental benefits:

- tree nursery work;
- activities relating to tree planting;
- establishment and maintenance of fire breaks and fences;

Income Generating Experiences from the Field.

In Tanzania, refugees paid royalty fees to the government and were in turn allowed to harvest non-timber forestry products such as rattan and cane grass. These were then used to make chairs and baskets. In so doing, refugees could earn up to Tsh40,000 (US\$40) for a pair of chairs or Tsh3,000 (US\$3) for a basket. This added value to these forest resources and refugees gained more income

In Sudan, women and youth groups are provided with simple tools and support to raise tree seedlings. The environmental programme later buys tree seedlings at Sdd25 (US\$0.1) per seedling from these groups, the income being used to establish a revolving fund for agricultural and family support.

- ▶ plantation tending and maintenance;
- ▶ controlled harvesting operations;
- ▶ authorised and controlled charcoal production;
- ▶ agroforestry practices (maintenance of fire breaks through the cultivation of land surrounding tree plantations, or cultivation between trees in a plantation) and/or water harvesting measures (e.g. micro-catchments);
- ▶ erosion control measures (e.g. contour planting or terracing); and
- ▶ construction and maintenance of forest roads.

Instead of providing labour to central nurseries, refugees could also be encouraged to start their own small tree nurseries and to sell the seedlings to the local population or to agencies involved in reforestation activities. Such initiatives have in the past been assisted by UNHCR and other agencies through, for example, the procurement and provision of basic equipment (hoes, watering cans), seeds and plastic containers, and by providing education/extension in tree nursery techniques.

Food for work is another way of compensating refugees and the local population for forest-related activities.

6

Elements of a Forest Management Plan

6.1 Introduction

Managing forest-based resources is one of the most demanding and challenging environment-related issues during refugee and returnee operations. Equally important is the need to realise that impacts are not confined to forests alone – the use of forest-based resources can impact on people's security, their well-being, health and many other aspects of their lives and livelihoods.

To help address these environmental concerns in a more holistic, yet practical manner, it is strongly recommended that a **Forest Management Plan** be drawn up for each operation. Such a plan could be designed at different levels – country, region, specific camp or settlement – but it should not be seen as definitive or static: it will need constant review (through monitoring and evaluation) as the situation changes. Only with such an overarching framework can UNHCR, its partners, government authorities and affected communities begin to ensure that programmes being implemented respond to peoples' needs and will not be detrimental to the environment or to peoples' livelihoods or security.

This Section contains specific guidance to assist users to elaborate some of the main components of a Forest Management Plan. Certain associated issues, particularly those relating to harvesting and demand/supply assessments, have already been dealt with in Section 5, but also need to be considered in this exercise.

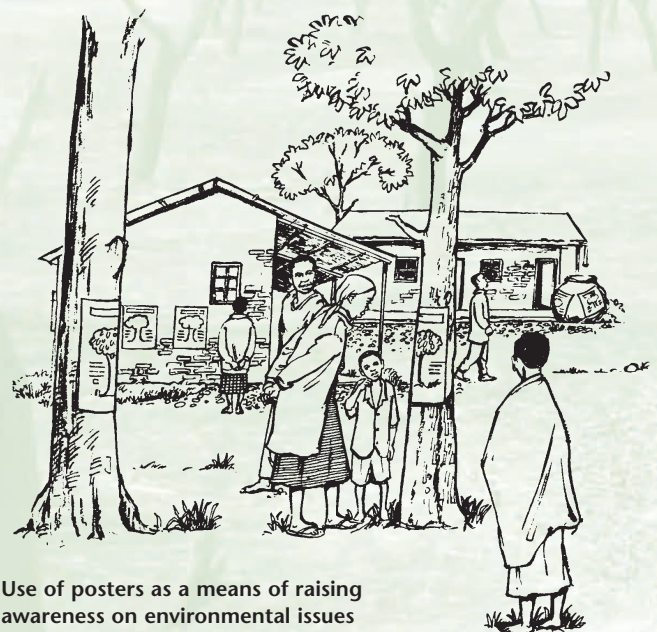
Key activities addressed in this Section include:

- awareness raising;
- constituency building;
- identifying needs and opportunities;
- identifying a forest system to address needs – social or production forestry;
- forest landscape rehabilitation; and
- monitoring and evaluation.

6.2 Awareness Raising

6.2.1 Introduction

Raising public awareness of the importance of forestry resources is one of the fundamental and most instructive steps towards developing a management plan. Awareness raising campaigns should start as soon as possible after the refugees' arrival in a camp, or as early on as possible while returnees are being repatriated. These need not be very detailed to begin with –



Use of posters as a means of raising awareness on environmental issues among the communities

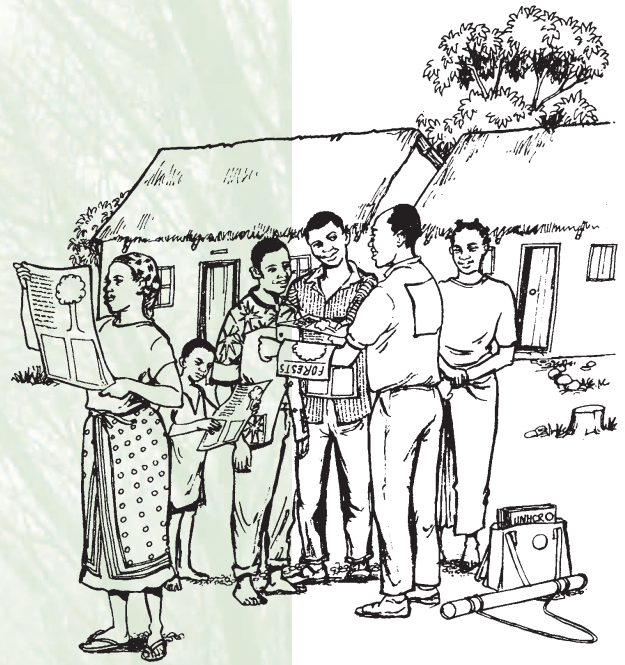
it is more important to transmit a few key messages at this stage, to make sure that these are understood, and to have them repeated at regular intervals. Forestry extension – support to active, practical interventions – will only become possible and useful when refugees or returnees are somehow organised, a feature that normally occurs during the care and maintenance phase for refugee operations.

An awareness raising campaigns among refugee and/or returnee populations should strive to achieve the following:

- ▶ clearly explain why forests are important and why environmental protection is required (see Sections 3 and 4);
- ▶ draw attention to the potentially negative impacts of forest damage on the quality of life of people living in the surrounding degraded areas; and
- ▶ encourage communities to work together through common structures and agreements to promote sound forestry practices for their own, and the environment's, well-being.

Such campaigns should also focus on the refugees' own responsibilities in safeguarding forest and other natural resources. Suggested issues to address might include:

- ▶ strict respect for prohibited or protected areas – which can be linked to an organised fuelwood supply or allowing refugees to collect limited amounts of wood from clearly designated areas;
- ▶ avoiding conflict, for example, by respecting the role and guidance of forest guards and/or by not competing with local populations for scarce resources
- ▶ possible advantages which might be accrued through positive engagement in activities like tree planting, forest protection and the



Newsletter/magazine distribution through extension services as outreach materials

like. Possible benefits to participants might include fuel-efficient stoves or gardening equipment.

6.2.2 Opportunities

There are many opportunities to tackle the subject of environment and forestry with refugee populations: none should be neglected. Examples of possible interventions include:

- ▶ weekly meetings between refugee leaders, UNHCR and agencies, where discussions should be related to forestry, energy and the environment;
- ▶ special meetings, open to everyone, organised to discuss and plan forest-related activities, including forest management plans;
- ▶ extension days and/or workshops on specific forest-related problems or activities where certain techniques can be learned, where specific actions are prepared or where theoretical issues are explained;



Community meeting on forestry related issues

- information and education centres;
- on-the-job training, for example, in pilot nurseries, during afforestation activities, or during routine maintenance;
- integration of environmental and forestry issues in the school curricula; and
- organised tree planting days and/or competitions in tree planting and maintenance.

Participation of local forest authorities, local community leaders, school teachers, women committees and other community groups in the opportunities mentioned above will be an advantage as they can share acquired information and experience.

6.3 Broader Constituency Building

Raising awareness of the issues described above are also important outside of the refugee camps – ideally the two should go hand-in-hand.

In many cases, it may be opportune to organise awareness raising sessions for UNHCR

staff members, local forest departments and other active agencies, members of the international community and potential donors. For UNHCR's own purposes, an efficient exchange of information should be established during meetings with field officers, sectoral specialists and implementing partners. Activity reports, photographs, satellite images and maps should be used to illustrate information, but there is no replacement for actual site visits to present the situation in real life and to discuss problems and possible solutions.

Consideration should also be given as to how to communicate observations and results with other outside communities. Time should, for example, be given to explaining forest-related issues to journalists and members of the media who show some interest in forestry and environmental conservation. Journalists can be a good vehicle for reaching a much broader audience, providing information not only on humanitarian problems, but also about the environmental consequences of refugee situations, the negative impact which these may have on local populations, and the positive impacts which mitigation measures may have.

For the same reason, specialists and consultants from international organisations such as the United Nations Development Programme (UNDP) and other development agencies, as well as national and international conservation organisations should be briefed on the situation in refugee-hosting areas, should there be a possibility of overlapping interests. Such an extended information network will help make donors aware of the potential environmental risks. In turn, they may be able to provide technical and financial assistance to address the problems by including mitigating measures in their programmes and budgets.

Awareness raising and constituency building exercises are also opportune moments to start to introduce the notion – if it has not already happened – of formally establishing

Box 9

Replicable Emergency Measures To Protect The Environment: Start-Up Programmes In Western Tanzania

From 1992 to 1997, Tanzania received over 800,000 refugees from Burundi, the Democratic Republic of Congo and Rwanda. The majority entered the country in two waves, the first to Kagera Region in mid-1994, the second to Kigoma Region in late 1996. Despite widespread local harvesting of fuelwood and building materials, environmental concerns were not at the fore in either case due to the sheer number of refugees involved and the speed with which people fled to Tanzania, demanding a rapid relief response simply to meet basic needs. Nevertheless, UNHCR and its implementing partners, particularly GTZ and CARE, were still able to implement a range of successful measures during this period which limited the scope of environmental damage around new settlements.

Establishment of co-ordinating forums was considered a priority in both refugee-hosting regions. These were chaired initially by UNHCR, but responsibility for the Environmental Task Forces (ETFs) was later transferred to the District governments. The ETFs enabled international agencies, local NGOs and government departments working on environmental issues to harmonise approaches, and for UNHCR and the government to communicate environmental guidelines and policies that were to be applied.

In Kagera, marking trees that were not to be cut with white oil paint was found effective if used in conjunction with a network of forest guards. Selected trees were not necessarily the largest trees, but those with the greatest potential for rapid growth and seed production, often the younger specimens. For greater effectiveness, forest guards persuaded refugees to spread their cutting as thinly as possible in both regions, and to prevent cutting in some areas.

Careful sourcing of construction materials was also promoted in Kagera and Kigoma; UNHCR and the ETFs established guidelines for the types of trees to be used and recommended source areas. These tools were more effective around smaller camps where harvesting could be better controlled. Meanwhile, agencies benefited from clear guidelines on where they could procure building poles for new structures.

Multilingual signs and posters as well as refugee meetings were used to communicate host government rules and local community traditions regarding access to natural resources. This helped establish an appropriate sense of environmental responsibility amongst the refugees, especially in Kigoma, immediately upon their arrival.

Implementing agencies, meanwhile, continued to monitor and actively influence decisions relating to camp siting, size, density and layout, rations provided, cooking utensils and other factors that might have environmental impacts.

Source: UNHCR, 2002a

mixed working groups to be responsible for overseeing day-to-day management of agreed or enforced guidelines for forest management. Such Forest Management Committees or Environmental Working Groups (see Box 9) thus become the entry point for debate (as they are chosen to represent the respective communities/agencies) and dissemination of information. The success of such a group will depend to a large degree on who is represented: it is essential that this process is transparent and that all interested parties, of any age, have the opportu-

nity to have their expressions presented. Gender considerations also need to be taken into account at this stage (see Box 10).

6.4 Identifying Needs and Opportunities

Planning and undertaking tree planting programmes will normally only start from the care and maintenance phase but can be expected to continue throughout the durable solutions

phase. It is also likely to find relevance during returnee operations. These activities are strongly governed by rainfall patterns and seasons so good planning and knowledge of the local climate is essential.

Because of their long-term nature, tree planting activities should be carefully planned. A sound plan will be based on information gathered from a broad range of local stakeholders, consultation with specialists (if different), and taking into account other relevant experiences from similar situations. Baseline surveys are again the starting point – information being required on the following subjects, although this list is not exhaustive:

a) Overall policy regarding refugee assistance:

- Is local settlement allowed?
- Do refugees have freedom of movement?
- Do refugees have access to local resources?
- Do refugees have access to land? What, if any, are their rights to grow and own trees?
- Are refugees allowed access to local labour markets?

b) Institutional aspects:

As a minimum, clarification needs to be sought on the following:

- Forest legislation.
- Land tenure and ownership.
- Forest ownership and user rights.
- Forestry institutions and agencies, including their technical and operational capacities.

c) The refugee population:

- What are the demographic and socio-economic characteristics of the refugee population? Is this stable or are additional refugees likely to be settled in the same area at some point in the future?
- Is the camp/settlement conducive to forestry activities?
- Do some of the refugee population have any forestry skills?

Box 10

Gender Concerns in relation to Forest Management

Because of traditional gender divisions of labour, women have specific needs and interests in forestry. In most rural areas, women and children collect the household's fuelwood for cooking and heating, as well as a variety of food products, medicinal plants, raw materials and marketable non-wood products from the forest. Women are therefore often the sole repositories of knowledge about forest products, plant attributes and traditional methods of tree and forest management. It must also be recognised that women have often proved more interested than men in raising trees for fuelwood, food or fodder.

If, however, tree planting projects are to successfully involve and benefit women, there is a need for more refined gender-based planning during the preparation phase. For example, women's tenure rights to land and newly planted trees must be strengthened and women's groups should be assisted to undertake their own plantation or rehabilitation activities. Direct involvement of women in management schemes can reduce the destruction of forests caused by fuel and fodder gathering. To increase incentives to women, their incomes could be substantially raised by helping them gain access to wider markets for forest products and by enabling them to undertake value-added processing of primary forest products.

- Are refugees willing to engage in tree planting and maintenance activities? If so, who among them? What form of activity would they support?
- Are there income generating opportunities?

d) The local population:

- What are the demographic and socio-economic characteristics of the local communities? (Note: consideration should also be given to seasonally migrating tribes.)
- What are the main (if any) forms of natural resource use? Who are the primary users within the community?

- How are the communities organised?
- What, if any, forms of forest management are practised?
- What forest goods and services are used? And how?

e) Physical aspects:

- What are some of the main physical aspects of the site/region, in particular the climate, soil(s), topography, hydrology and water resources?
- Is the region prone to erosion?
- Are there protected areas in the vicinity?

f) Area and type of forest resources:

- What is the physical area of forest land now compared with, e.g. 10 years earlier, or before the arrival of refugees/returnees?
- What is the main tree species composition? Is there evidence that this has changed?
- What is the forest density and stocking volume?
- What other forest-based resources can be identified and are these used by people?

g) Forest functions and use:

To what extent is the forested area used for the following:

- Timber and/or firewood production?
- Soil and water conservation?
- Nature and biodiversity conservation?
- Shelter belts?
- Hunting?
- Grazing?
- Agroforestry?
- Human settlement?

h) Use of forest resources by refugees and locals:

Information should be obtained on the following:

- Quantity of wood used for different purposes.
- Degree of commercial timber extraction.
- Is charcoal burning practised?
- Level of hunting carried out.

- What, if any, pressure exists from other competing resources, e.g. livestock grazing?

i) Existing or planned forestry activities:

- What ongoing/planned activities can be identified within the region? What is the planned timeframe for these?
- Who are the main implementing agencies – government, NGOs, local communities – and what are their capacities?
- Who are the major donors supporting these programmes?

Most of this information should already have become apparent during the earlier wood supply and demand assessment exercises. These data may, however, need to be updated and refined.

Information can be gathered from a wide range of sources, including local administration and its technical departments, local community leaders, refugee leaders, technical institutes, universities, mapping departments, statistical departments, development agencies, NGOs, and from documentation on planned and ongoing projects. Similarly, as outlined in Section 5.3, existing information should be verified in the field. For this, rapid field assessments will need to be carried out, in close co-operation with local authorities and refugee representatives.

Channelling the planning and co-ordination of forest-related activities through an Environmental Task Force, or similar, will ensure a participative approach where relevant expertise and local concerns and priorities will be considered. Moreover, close participation and involvement of local agencies, groups and individuals will increase the probability that initiated forest-related activities will continue after UNHCR's withdrawal. Once the major issues have been decided, the resulting plan for the tree planting programme/activity will have to be formulated in a systematic manner.

6.5 Which Forestry System Best Addresses Identified Needs?

Several approaches can be applied when planning and carrying out tree-planting and forest management programmes. These can be loosely classified as “social forestry” and “plantation forestry”.

Social forestry, also referred to as farm forestry, community forestry, community-based natural resource management or forestry for local community development, refers to a broad range of tree- or forest-related activities that rural landowners, local communities and, in this instance, refugee groups may undertake to provide products for their own use as well as to generate income. Social forestry mainly includes communal woodlot establishment, agroforestry, local seedling production and management, and the sustainable use of

common natural forest resources – some of which are described in more detail below. Communities or individuals earning income from the gathering, processing and sale of minor forest products also fall under the category of social forestry, as do governments and other organisations or groups who plant trees on public land to meet local village needs.

In contrast to social forestry where the primary focus is peoples’ needs, conventional production forestry has its focus on the wood produced. The involvement of people in production or the benefits accrued from trees during their growth are secondary considerations. Listed below are some of the most important points of difference between these two concepts (Ohlsson, 1990). Examining the characteristics of both approaches, it becomes quite clear that social forestry is more closely aligned with the general principles of UNHCR assisted refugee programmes.

	Conventional production forestry	Social Forestry
Objectives	One-dimensional (wood production)	Multipurpose and socio-economic objectives directly related to the consumer/producer. Enhancing self-reliance
Technology	Uniform and centralised	Locally developed and manageable.
Peoples participation	Insignificant. People, target groups and consumers are to be motivated and/or employed	A requirement for relevant production. People are considered as the main resource, an asset to be supported. People are involved and responsible
Labour	Employed	Employed or self-employed
Organisation	Centralised ‘work order’ system	Local, village production units (e.g. extended families or individual families)
Relation to other activities	Separate, segmentation	Integrated in space and time in small farmer production systems
Structure and scale	Few large plantations with uniform management	A large number of small areas with a variety of input requirements and production
Time perspective	Long-term	Both long- and short-term. Short-term is important because of limited resources for delayed benefits

Site Rehabilitation In The Democratic Republic of The Congo.

Refugee camps in the Democratic Republic of Congo impact local forests primarily through bush fires and inappropriate agricultural practices, the root causes of which can be traced to local poverty and the pressure of hosting refugees. UNHCR's response has been to:

- use enrichment planting of fruit trees such as orange, avocado and safou trees which have nutritional and economic values;
- promote natural regeneration;
- promote agroforestry with nitrogen fixing plants such as *moringa* trees and African winged-beans; and
- engage in environmental awareness raising and improved monitoring and evaluation practices.

This low-cost approach is expected to reduce pressure on natural forests, promote more appropriate and improved agriculture, generate much needed income and help reduce the level of malnutrition.

6.5.1 Block Plantations – A Quick Response to Unmet Needs

The establishment of block plantations is, compared with enrichment planting and most agroforestry practices, a rather large-scale, intensive operation as extensive areas are planted with nursery-raised seedlings of one or more productive tree species. Site selection and site preparation are carried out prior to planting.

Plantations have primarily a production function, often for industrial purposes. Yet, village or small-scale private block plantations are also widely used or integrated in social forestry programmes for the production of locally used or marketed timber, and to provide local energy needs.

Plantations usually have a much higher production level than natural forests as mainly exotic, fast-growing species and varieties are used which have been selected for their wood quality, growth rate, stem form and disease resistance. Because of the relative uniformity of

the trees, plantation management is much easier and more efficient to manage.

Extensive monocultures – plantations consisting of a single tree species – are to be avoided because of the enhanced risk of problems with disease and pests, because of their often poor humus quality, on account of their generally low ecological value, and because of the lack of product diversity.

Mixed plantations offer an interesting alternative: for instance a mixture of leguminous trees, *Azadirachta* (neem) and teak with a spacing of 1x1m to 2x2m, or a mixture of *Gmelina*, *Khaya*, *Terminalia* and *Afzelia*, with a minimum spacing of 4x4m is a suitable planting system.

Coppicing has also proved to be very valuable for certain species in fuelwood plantations.

Plantation failures can be caused by inappropriate species selection, drought, insufficient weeding, or bad soil conditions. Replanting of failed trees is usually carried out if the diagnosed losses exceed 10 per cent. For this operation, particularly vigorous plants are used the year after the initial planting. Further information on planting techniques and tending of young trees is given in Annex III.

6.5.2 Agroforestry – Social Forestry with Multiple Benefits

Agroforestry is a collective term for land-use systems and technologies where woody perennials such as trees and/or shrubs are used deliberately in conjunction with agricultural crops and/or animals in a mutually beneficial manner. It is generally accepted that agroforestry:

- combines the production of multiple outputs with protection of the resource base, in particular the soil;
- emphasises the use of indigenous, multipurpose trees and shrubs;

- ▶ is particularly suitable for low-input conditions and fragile environments; and
- ▶ is more concerned with socio-cultural values than most other land-use systems.

In practice, trees can contribute to farming systems and farmer welfare in three main ways:

- ▶ by improving the productivity of farmland by fixing nitrogen, by providing green manure and by reducing wind erosion and soil moisture loss when trees are used in shelterbelts or windbreaks. Trees planted along contours and in other critical areas can act as effective barriers to the surface flow of water and thus increase rainfall infiltration and reduce soil erosion and loss of nutrients. Finally, trees provide wood that can replace animal dung



Sustainable agricultural practices such as alley cropping and agroforestry are used to improve soil fertility

and crop residues as fuel for cooking and heating, so that dung and residues can go back into the soil and help crop and pasture productivity;

Alley Cropping

Alley cropping is an agroforestry system in which food crops are grown in alleys formed by hedgerows of trees and shrubs, preferably legumes. Fast-growing species such as *Leucaena leucocephala* and *Gliciridia sepiumare* can be used to create the alleys of hedges. These require regular pruning to reduce shading for the crops grown in the alleys – clippings provide fodder for livestock, fuelwood or stakes for construction and/or mulch.

Alley cropping can sustain or even improve soil fertility and crop production, but it is not a solution to all soil fertility problems. Like other applications, it works only under certain climatic, social and economic conditions. While many benefits can accrue from alley cropping, it does require space and is time consuming. It is, however, a practical proposal for refugee situations where land is available and can make positive contributions to local environmental enhancement.

- ▶ by contributing to livestock production. In many parts of the world, farm trees (as well as forest trees) provide fodder for livestock. They also provide shade for animals and can serve as living fences to keep livestock from crop areas; and
- ▶ by providing a great many products for on-farm consumption or for sale. Chief among these products are fuelwood; fruits, nuts and other edible products; medicines; gums; tannins; poles and posts for construction and other uses; and timber for housing, furniture and implements.

On the other hand, trees can also compete for scarce moisture and, through shading and root competition, can reduce crop productivity,

Box 11

Combining Environmental Rehabilitation With Food Production In Côte d'Ivoire – The *Taungya* System

The establishment of tree plantations may be a suitable response to damage caused by refugees, especially where managed state forests have been damaged and the host government wishes to have them rehabilitated. A project in Côte d'Ivoire shows how this can be achieved, for the mutual benefit of the government and the refugees.

From 1990 to 1994, 325,000 Liberian refugees fled to Côte d'Ivoire, settling spontaneously in a 25 km wide strip along the country's western border. Several forest reserves and a national park were threatened by encroachment from the new arrivals. On the western border of the Haute-Dodo Forest Reserve, for example, the population density increased from 26 people/km² to 68 people/km² during this period. Incursions for wood products and raffia palm became commonplace and unauthorised refugee cultivation started within several gazetted areas.

The Ivorian forestry department, SODEFOR (Société pour le Développement des Forêts), is responsible for managing the country's forest reserves. Prior to the arrival of the refugees, SODEFOR already had plans to rehabilitate an area of some 17,000ha in the Haute-Dodo Reserve: implementation of the programme became all the more pressing when damage began to occur on account of the people's needs. SODEFOR decided to turn the refugees' presence to its advantage by inviting them to cultivate in areas designated for rehabilitation under the '*taungya*' system. This agroforestry system permits farming between rows of newly planted trees. The advantage for the forester is soil and water conservation and minimal weeding. The farmer, meanwhile, gains access to productive land for a period of time until root competition and shade from the growing trees becomes too great for continued crop production. This is typically from two to four years in Côte d'Ivoire.

In a pilot scheme with UNHCR, SODEFOR identified 50ha for *taungya* trials in 1996. This was planted with *framiré*, a local commercial species used in construction. Refugees were then allowed to plant rice and maize between the newly planted trees. There is now a 10-year plan to put a further 150ha under the *taungya* system through a series of 25ha contracts with refugee groups.

While refugees are given no long-term rights over the forest land, the possibility of cultivating crops provides gives them access to fresh food and a source of income from the sale of surplus crops. They also gain basic technical expertise in forestry. Meanwhile, UNHCR and SODEFOR have a productive working relationship which combines humanitarian assistance and environmental rehabilitation.

Provided clear contracts are established at the outset to ensure that contracted refugees do not exceed their allotted time of occupancy, the *taungya* system can be a cost-effective way to establish or rehabilitate forest plantations, while at the same time improving food security and creating a sense of self-determination and independence among refugees. Such arrangements can work elsewhere provided host-refugee relations are good and that the government accepts for the refugees to cultivate the land.

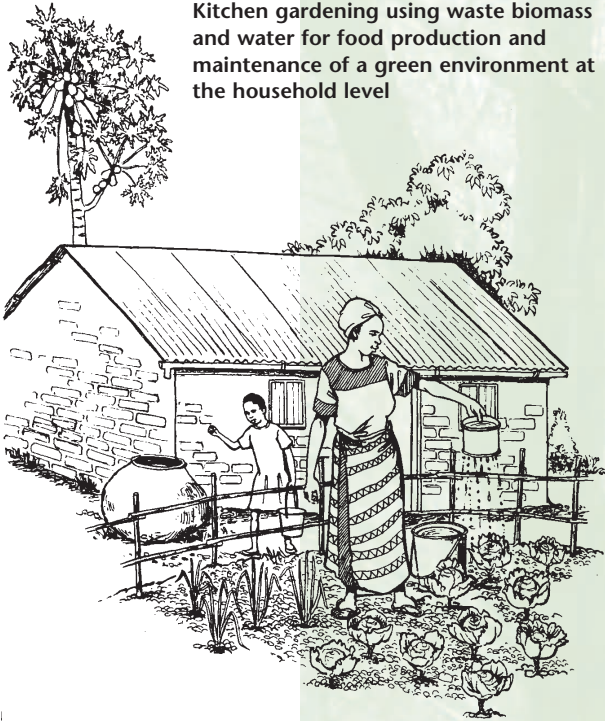
UNHCR, 2002a

(Note, however, that this system may not work effectively in all situations: in countries where there is a strong pressure on land, e.g. Rwanda, people may be unwilling to give up access to land when trees are maturing, perhaps even to the extent of cutting trees, to ensure that they still have access to some land.)

although this can be reduced through judicious pruning. As in all agricultural practices, positive and negative aspects have to be considered and weighed. Annex V provides an overview of some of the most common agroforestry practices

in the tropics and a particular form of agroforestry is described from West Africa in Box 11.

Kitchen gardening using waste biomass and water for food production and maintenance of a green environment at the household level



6.6 Forest Rehabilitation at a Landscape Level

Despite best attempts to control and limit damage to the environment, some impacts are likely to be inevitable, especially if and where high numbers of refugees have been accommodated for long periods of time. Addressing the issue of rehabilitation at such a time requires careful thought and much discussion with stakeholders (see also Section 4.4.2).

The benefits of rehabilitating, or restoring, the functions of forests across the landscape include improved water quality and soil stabilization, enabling local communities to continue to live off the land by producing food and raw materials such as fruit, nuts, rubber and rattan.

Facilitating natural regeneration (e.g. in *miombo* woodlands) has proven to be an effective means of re-establishing natural ground cover in already forested areas which were

subjected to use during refugee operations. It also connects forest fragments, linking protected areas and creating corridors for wildlife. And by achieving the right balance of land-use, it helps to mitigate the impact of devastating weather events and builds natural resistance to the onset of climate change.

Forest landscape rehabilitation is a carefully planned process that aims to regain ecological integrity and enhance human well-being in degraded or deforested forest landscapes. Like the intended purpose of the forest management plan itself, landscape rehabilitation takes a broad approach to the subject matter, but its overarching goal is to reverse negative trends and activities in forest management to conserve biological diversity, enhance options for people's livelihoods, and reduce poverty.

The broad, landscape approach adopted through forest landscape rehabilitation ensures that ecological systems and service – not just patches of forest – are considered in refugee/returnee operations. The approach thus helps:

- restore damaged environmental functions;
- natural regeneration;
- preserve watersheds, thereby improving water quality and quantity;
- restore benefits for people through *inter alia* providing food and raw materials, or preventing natural disasters;
- address root causes of forest loss and degradation by consulting and involving local people, changing policies related to land-use, and replacing harmful incentives with more positive ones;
- planning with key stakeholders to identify solutions and training local communities; and

- ▶ stabilise and improve soils and rangelands; and
- ▶ improve and/or expand habitats for wildlife by connecting fragmented forest patches, providing windbreaks and preventing erosion from taking place.

A few of the most relevant aspects of forest landscape rehabilitation to refugee/returnee operations are described below: readers seeking additional information on this subject are referred to the bibliography.

6.6.1 Facilitating the Natural Regeneration of Degraded Forests

Degraded forests often have the capacity to naturally regenerate. The degree of degradation together with the climate and soil conditions determine the capacity and the time needed for regeneration.

Natural regeneration is often the quickest, most appropriate and most cost-effective means of forest rehabilitation. It can be facilitated through silvicultural operations such as soil preparation and the removal of competing vegetation in certain locations for easier establishment of young trees. Yet, success will only be guaranteed if the concerned area is left alone for some time. Protection measures are therefore invariably essential to ensure successful regeneration. These may include fencing the area and protecting it from grazing animals and human encroachment or, if community action is strong enough, awareness raising programmes may be sufficient to prevent people from entering these off-limit areas (see Box 12).

In some situations, however, natural revegetation will either not be possible or will take a long time, for example, in situations where trees have been uprooted (a frequent occurrence in refugee situations), where soils are poor or severely eroded, and under extreme climatic

conditions. In such situations, alternative solutions will need to be found (see for example Section 5.6).

6.6.2 Enrichment Planting in Natural Forests

Enrichment planting is carried out in natural forests in order to rehabilitate – either partly or entirely – degraded forests. Forests should preferably be enriched by planting useful tree species which already occur as part of that ecosystem, as there is always a risk that the introduction of other tree species would modify the original forest composition.

Many indigenous species of commercial value are, however, slow growing, difficult to propagate and need rather specific conditions to become successfully established. For this reason, planting fast-growing exotic species (e.g. *Acacia* or *Gmelina* species) that can produce the needed fuelwood, fodder or poles in a relatively short time is a solution which is occasionally preferred in refugee operations. This happens for example in cases of acute shortages of forest products or when the original forest is so degraded that it would not be practical to plant indigenous species. In most situations, however, this should be avoided and natural regeneration favoured.

Discussions with local forestry authorities should provide an indication on how best to approach enrichment planting. Further destruction to existing natural forest should be avoided, so careful choice of species and sites needs to be considered. Care should also be taken to avoid the introduction of invasive alien species that could do long-term harm to an ecosystem. Planting is probably best carried out in open spaces, where small groupings of narrow-spaced (1x1m to 2x2 m) trees might be established. Competition between the seedlings and trees will reduce the need for further tending.

Area Closures for Natural Regeneration, Tigray, Ethiopia

Land is a scarce commodity in Tigray, northern Ethiopia. Since 1991, several hundred thousand refugees have returned from Sudan. Population pressure has intensified, compounding problems of over-cultivation, overgrazing and unsustainable exploitation of vegetation for fuel, fodder and building materials. Mountainous areas are most severely affected, with over-exploitation often leading to soil erosion on steep slopes.

Regional government surveys in 1993 recommended that priority be given to rehabilitating degraded areas to return them to productive use. This was to be done through collaboration between the Regional Agricultural Bureau, local communities and the Relief Society of Tigray (REST). Through negotiation with local community members, a total of 45,000ha has been designated for protection. Human interference is limited in those areas to allow natural vegetation to regenerate. Two control options are practised: either access is forbidden, or livestock grazing and grass cutting are permitted. Most of the 'closed' areas are not actually fenced, but their boundaries are known and agreed by local communities.

Community members have shown strong compliance with restrictions on access to closed areas. Trespass, grazing or extraction of wood products are considered punishable acts. Anyone who commits such an act or fails to report offenders is often viewed as a saboteur of a national cause. They are not only subject to stigma, but can also be charged through the legal system.

In situations where land is particularly degraded, enrichment planting of trees is carried out to encourage re-growth. REST operates over 150 central and community nurseries with an annual production capacity of 12 million seedlings: 25 per cent of these are used in the rehabilitation of closed communal lands to complement natural regeneration.

The primary cost for area closures are wages for guards (paid by REST through a food-for-work scheme) and, sometimes, fencing materials. Closures can deprive livestock herders of pasture, or local people of forest products. The use of natural resources for short-term economic gain is not sustainable. Consultation with the affected communities has contributed to the success of these efforts and an understanding of their limitations.

6.7 Monitoring and Evaluation

While a careful build up to identify and assess needs and opportunities is a fundamental starting point for any forest management plan, ensuring that this same plan has a carefully thought out, appropriate and, above all, practical monitoring and evaluation component is of at least equal importance.

This section briefly deals with two different kinds of monitoring, both equally important for further planning purposes and for measuring the impacts of the activities so far undertaken. It also contains a streamlined checklist which may be useful in the monitoring/evaluation process.

6.7.1 Monitoring of Ongoing Activities

Through relatively simple programme monitoring it is possible to know:

- how the programme is proceeding compared with the schedule;
- the impact of implemented actions;
- which activities have been successful; and the reasons behind eventual failures, non-acceptance or delay; and
- what steps might need to be taken to address those aspects which may not be performing as well as anticipated.

This kind of information – derived from group discussions, site visits and analysis – facilitates a quick re-orientation of the initial plans when deemed appropriate, and helps ensure that the programme remains flexible and focussed.

The development of an operational monitoring and evaluation system requires a detailed initial planning with the identification of indicators (see UNHCR, 2002b), a data recording system, frequent visits to the field, interviews with involved people and an efficient system for analysing field records. As the set of indicators constitutes the core element of a monitoring and evaluation system, some examples of indicators relevant to the forestry sector are given below:

- ▶ tree nursery best practices introduced and followed;
- ▶ number of seedlings produced v target;
- ▶ number of surviving seedlings at end of first growing season; and
- ▶ increased refugee involvement in planning/managing forest resources and tree nurseries.

6.7.2 Monitoring Changes in Vegetation Cover

Monitoring deforestation, degradation and afforestation processes on a large scale is an essential planning tool for people identifying, designing and evaluating refugee assistance programmes.

Changes in vegetation cover can be evaluated using satellite images or aerial photographs taken over a known period of time. While interpreting and analysing the available imagery, factors such as vegetation type (including species composition), vegetation density, vegetation quality (growth rate, health), and distance from camp sites to forest supply areas should be considered.

Satellite images and aerial photography interpretation, in combination with ground-truthing, using global positioning systems, are also useful but still relatively costly techniques in preparing forest and vegetation maps.

Possible indicators to consider for this aspect of monitoring are:

- ▶ area of degraded land;
- ▶ change in vegetation cover; and
- ▶ land set aside for fallow/regeneration.

Information gathered from all of the above should be routinely analysed and used to monitor any change taking place, the resulting information being used to revise and guide the project/programme process further. A checklist of common forest management activities with regards refugee and returnee operations is provided in Annex VII to assist with regular monitoring of this nature.



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Electronic Resources

<http://www.toolkitparticipation.nl/>

The Participation Toolkit Partnership website is a growing group of civil society (NGO) and local government organisations, working to

promote participatory governance in local governance. The site offers information on tools which promote citizen participation and a forum for discussions, and holds articles for further reference.

<http://www.worldbank.org/participation/tools&methods/toolkitsmanuals.htm>

This section of the Civic and Participation Group website of the World Bank provides toolkits and manuals for performance monitoring, governance, civic engagement, community driven development, sectoral issues, sustainable development and more.

<http://wbln0018.worldbank.org/dg/povertys.nsf/Surveys+By+Country?openview&Count=1999>

Directory of national household surveys, social indicators, poverty assessment summaries and participatory poverty assessments (PPA/PPAs), focusing on those related to poverty issues. Entries describe the survey, its contents, methods and how to access the data. Compiled by the World Bank PovertyNetdepartment.

<http://www.ids.ac.uk/ids/particip/>

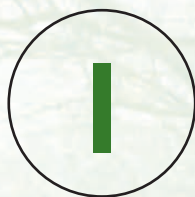
This is the homepage of the Institute of Development Studies' Participation Group which serves as a global centre for research, innovation and learning in citizen participation and participatory approaches to development. This site has downloadable books and publications on participation.

<http://www.odi.org.uk/pppg/index.html>

ODI's Poverty and Public Policy Group (PPPG) has the mission to contribute through research, advice and communication to measures that work effectively towards the goal of eradicating poverty on a global scale. PPPG interests span all aspects of public policy for poverty reduction, including "upstream" policy and management issues and "downstream" analysis of the causes of poverty and social exclusion. This site has downloadable books and publications on participation.

<http://www.eldis.org/participation/index.htm>

The Eldis Participation Page is a comprehensive online listing of major participation resources with description of organisations, site content, contact details, Practical manuals, Major www sites, Bibliographic sources, Organisations, Networks and Discussion lists.



Estimating Supply Capacity of a Forest

A sustainable supply of timber or fuelwood implies a harvesting rate that does not exceed the annual wood production rate. To assess the sustainable wood supply of a forest or plantation, it is necessary to estimate its total area and annual production capacity. Note, however, that such measures of sustainability do not take into account other forest values or functions.

The annual production of a forest or plantation varies considerably according to local environmental conditions (exposure, soil types, rainfall), species represented, and with the level and nature of silvicultural management. If local forest services cannot provide details on the production rates of local forest areas, the examples in Tables 1 and 2 could be used as an indication for further calculations.

Table 1. Average Growth Rates in some Tropical Plantations (Lamprecht, 1989)

<i>Location</i>	<i>Tree Species</i>	<i>Mean Annual Increment (m³/ha/year)</i>	<i>Rotation (years)</i>
Usutu Forest, Swaziland	<i>Pinus patula</i>	19	15–17
Viphya Pulpwood Project, Malawi	<i>Pinus patula</i>	18	16
Fiji Pine Commission	<i>Pinus caribaea</i>	15–20	17–20
Jari Florestal, Brazil	<i>Pinus caribaea</i>	20	16
Unité d'Afforest. Ind. du Congo (UAIC), Congo	<i>Eucalyptus hybrids</i>	35	7
Aracruz Florestal, Brazil	<i>Eucalyptus grandis</i>	55	7
Shiselweni Forestry, Swaziland	<i>Eucalyptus grandis</i>	18	9
Paper Ind. Corp. of the Ph.(PICOP), Philippines	<i>Paraserianthes falcataria</i>	28	10
Sabah Softwoods, Malaysia	<i>Paraserianthes falcataria</i>	30	7–10
Jari Florestal, Brazil	<i>Gmelina arborea</i>	15–25	10
Commonw. N. G. Timbers, Papua New Guinea	<i>Araucaria spp</i>	20	40
Seaqaqa plantations, Fiji	<i>Swietenia macrophylla</i>	14	30

For closed evergreen rainforest, the mean annual increment for an unmanaged closed evergreen rainforest would be around 3m³/ha/year (Whitmore, 1992), while for savanna woodland growing under harsh conditions one should consider only 1m³/ha/year. This figure will drop even more in the case of tree and shrub savannas (Whitmore, 1992). By means of comparison, the average annual production of west European forests varies from between 2.4m³/ha and 2.7m³/ha (A. Bary-Lenger et al., *La Forêt*, 1979).

Table 2. Growth Rates of Managed Forests and Plantations (After Lamprecht, 1989)

<i>Forest Resource</i>	<i>Mean annual increment (m³/ha/year)</i>	<i>Rotation (years)</i>
Sub-tropical eucalyptus	5–30	8–25
Teak plantations	4–18	40–80
Tropical hardwood plantations	25–45	8–20
Tropical pines	15–45	8–30
Tropical eucalyptus	up to 70	7–20
Tropical high forest (managed)	0.5–7	—
South-east Asia dipterocarp forest (managed)	up to 17	—

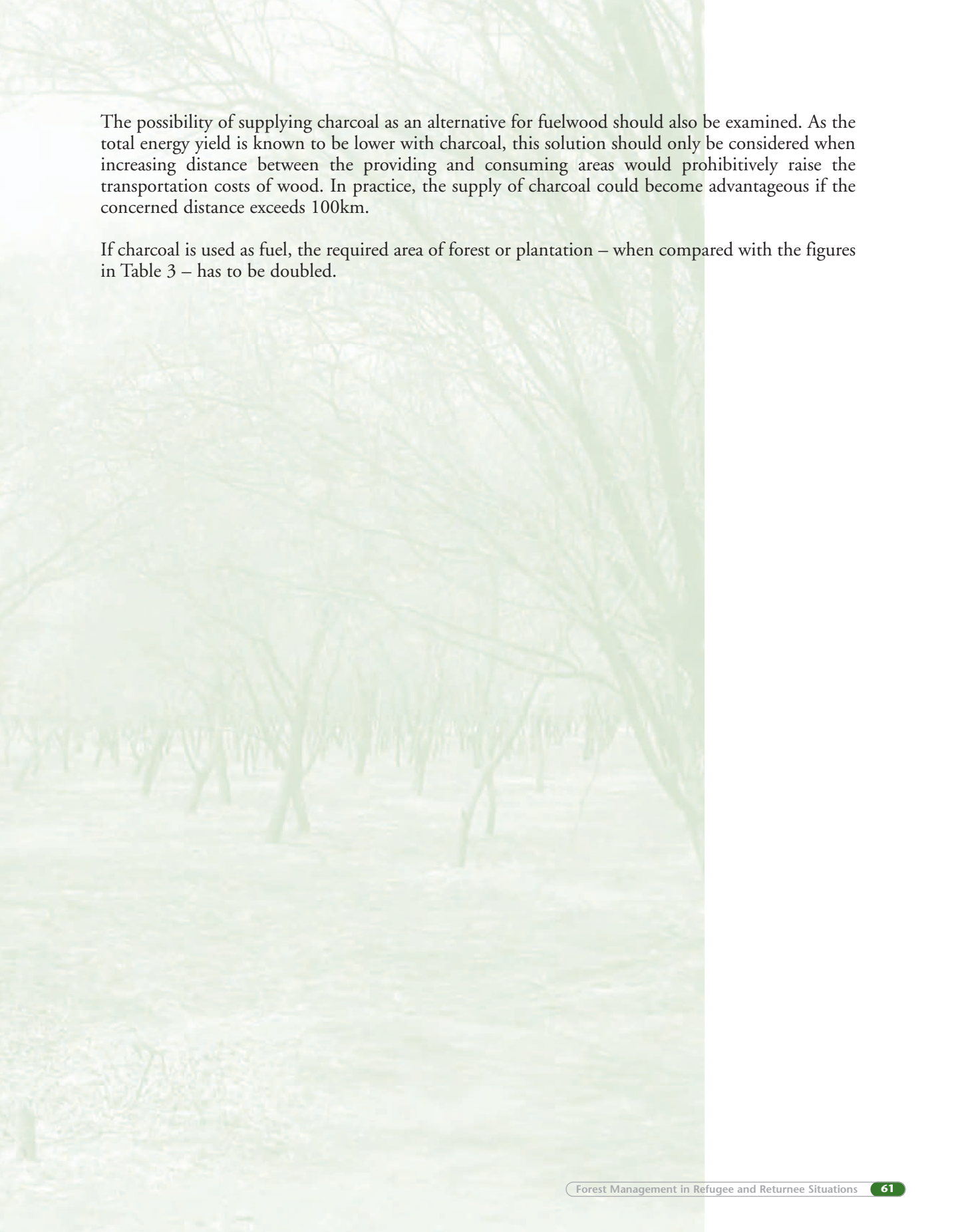
Having estimated the production of the concerned forest resource, one can then calculate the number of hectares of this type of forest needed to meet the total demand assessed. Considering, for example, a minimum requirement of 0.5m³/year/person and an annual production of 10m³, **one hectare will be sufficient to sustainably produce wood for 20 persons**. In this case, the total surface which will be necessary is: Surface (ha) = Population divided by 20. If the production is different from 10m³/ha/year, the surface should be multiplied by the co-efficient: 10/the actual production rate.

In most cases, however, it will not be possible to identify places with sufficient forest resources whose annual production would completely cover the demands of a refugee/returnee population. As a consequence, more than the annual production – and thus part of the forest’s stocking volume – will be harvested. In this respect, it is necessary to calculate the stocking volume of the surrounding plantations or forests. This can be done either through a forest inventory, enquiries with the forest authorities or the forest owners or, for plantations, through multiplying the average yearly production by the age of the plantation.

Table 3 provides indicative data on the stocking volume of the different natural forest types and on the maximum extractable volume (40 per cent of the stocking volume) under emergency situations. It is assumed that the forest will have the capacity to regenerate naturally if at least 60 per cent of the initial stocking volume remains untouched and if no further extraction takes place during the regeneration period. However, **if negative changes in the original structure and ecology of the forest are to be avoided, the extraction should be evenly spread over a range of trees of all species and age classes**. With regard to the figures of respective stocking volumes, it is assumed that the concerned forest has not been cut during the past few years. If this is not the case, the figures presented in Table 3 have to be adjusted according to the formerly harvested volumes.

Table 3. Indicative Values of Stocking Volumes of Forests

<i>Forest Type</i>	<i>Stocking Volume (m³/ha)</i>	<i>Maximum Extractable Timber (m³/ha)</i>
Closed evergreen forest	360–500	140–200
Moist semi-deciduous forest	180–300	70–120
Dry deciduous forest	70–160	28–70
Savanna woodland	40–100	16–40
Tree and shrub savanna	< 40	< 16



The possibility of supplying charcoal as an alternative for fuelwood should also be examined. As the total energy yield is known to be lower with charcoal, this solution should only be considered when increasing distance between the providing and consuming areas would prohibitively raise the transportation costs of wood. In practice, the supply of charcoal could become advantageous if the concerned distance exceeds 100km.

If charcoal is used as fuel, the required area of forest or plantation – when compared with the figures in Table 3 – has to be doubled.



Key Aspects of a Wood Supply Programme

In addition to the information outlined in Section 5.5, the following details should also be noted.

Access to Supply Areas

Though harvesting in remote areas may initially seem to be the more expensive option – due to transportation and eventual road rehabilitation costs – it can avoid irreversible damage to nearby valuable forest areas and reduce future costs of forest rehabilitation.

Areas selected for controlled harvesting/supply programmes are quite often situated in less densely populated and remote places. When harvesting from such forest areas, one will have to cope with problems related to their location. Access roads, for example, might be lacking or be in bad shape. In such instances, planning for rehabilitation and the possible construction of feeder roads must form an essential part of supply plans.

Transportation

Transportation is often the more expensive part of an organised wood supply. Before signing any transportation agreement, it is necessary to determine the common means of transport (lorries, donkeys and so on) in the concerned area, as well as the normal corresponding prices.

In general, wood transportation will cost US\$5–15 per stère delivered to the camp, depending on distance from the harvesting areas and on the opportunity for the hauliers to take on another load for the return journey.

A call for tender and competitive bidding might be considered, but this is often not feasible due to the structure of candidate companies. A permanent negotiation with the hauliers and the establishment of short-term agreements (e.g. one month) is an excellent alternative that still allows sufficient space for competition.

If the need for transportation exceeds the local capacity and negotiations with operational partners (NGOs, agencies or international private companies) becomes necessary, establishment of longer-term (> 6 months) agreements may be required through tendering.

In some cases, transportation agreements can be made with refugee entrepreneurs, provided that this can fit within the refugee policy of the host country (limitation of movement, prohibition of the issue of working permits for refugees or of any income generating activity, encouragement to repatriation rather than settlement, etc.)

A last option could be the hiring or purchase of lorries by UNHCR itself, although the management and maintenance of a transportation fleet could easily grow beyond the capacities of the UNHCR's local logistical support unit.

As the loss of wood during transportation is a common feature, it is advisable to strictly monitor the quantity of wood delivered. The stère is an imprecise measure as it depends very much on the way wood is stacked. Any control is therefore best made by unloading the wood and stacking it again in stères at the storage area(s) in or near the camp. For the same reason, and as previously described, the unit price paid for transportation can best be fixed per unit delivered wood.

Distribution

Before distribution, wood should be given sufficient time to dry in order to improve its burning qualities. In this regard, it may be necessary to keep the collected wood for some time at storage/distribution sites. Such distribution sites may be located in the camp itself or at some distance from the camp, preferably within walking distance.

Wood that has been chopped by the supplier before transport will be much better seasoned. In most cases, however, the task of chopping is left for the refugees themselves who will take care of it following distribution. A special team is usually engaged to ensure supplies to services such as community centres, hospitals and nutritional centres.

Wood distribution should be carried out on the basis of updated beneficiary lists. The rules for distribution should be unambiguous and made clear to the refugee population in order to avoid conflicts and irregularities. Experience has shown that well-designed distribution systems allow for a reduction in supervising and assisting personnel. Depending on the local situation, the wood rations can be distributed to individual families, groups of families or well-defined camp sections through group leaders. In special cases, wood may only be distributed to vulnerable groups who are unable to collect wood themselves.

Protection Measures

Organised fuelwood supply to refugees will only be effective in reducing or stopping uncontrolled wood harvesting, and subsequent damage to woodland, if measures are taken to protect wooded and forested lands in the vicinity of the camps against illegal and/or damaging cutting by the refugees. These measures include:

- the enforcement of forestry rules and regulations through patrolling and punitive actions;
- the placement of signposts and fences; and
- awareness raising on the implications of illegal and uncontrolled woodcutting.

Agreements with Owners and other Implementing Partners

Transparent and comprehensive contracts will have to be prepared with institutions, organisations and individuals involved in the supply chain. These contracts should specify the harvesting areas, the kind and volume of wood to be extracted, harvesting schedules, unit prices, restrictions, and transportation arrangements.

The price of wood at harvesting sites is usually between US\$1–8 per stere. In refugee situations, this rate tends to increase and prices of US\$10, or more, can be expected. In such cases, it is recommended to negotiate. Whenever possible, contracts should be awarded following competitive bidding. Inflation of wood prices may encourage plantation owners and farmers to sell their last pieces of wood in order to get a quick income. This may lead to irreversible damage and wood shortages for the local population. On the other hand, the purchase of wood from plantation owners and farmers may be a positive incentive for them to plant more trees.

Monitoring the Wood Balance

Regular monitoring of the wood balance should provide the required elements for ongoing planning of forestry activities, as well as for controlled harvesting and fuelwood supplies. Good records on the wood demand, as well as the levels of wood supplied, are therefore essential.

On the demand side, records should be kept of changes in wood requirements as a result of population fluctuations, per capita wood requirements, or any change following the availability of alternative energy sources. At the household level, wood requirements should be monitored with selected families by means of a repeated weighing of stock and of new, incoming wood. At the camp level, wood consumption is measured through intake surveys, recording the total number of loads coming into the camp along each road/pathway and subtracting from this the total number of loads being taken out. The resulting figure is then divided by the camp population to give the average per capita consumption.

On the supply side, records should be kept of changes in the forest and woodland areas, as well as changes in species composition as a result of wood harvesting activities (controlled and uncontrolled), natural regeneration of forests, plantations and reforestation. This is achieved through an ongoing process of forest inventories and mapping. Aerial photography and interpretation of satellite images, in combination with ground-truthing using global positioning systems, are useful techniques in preparing forest and vegetation maps.



Plant Production and Nursery Establishment

Introduction

Seedlings for tree planting programmes are commonly raised in nurseries. Nurseries can be either permanent or temporary, they can be private undertakings or managed by the national forest department or an NGO, and they can vary widely in capacity. Common characteristics of nurseries and their development are their objectives, their location requirements and their basic infrastructure and inputs.

Refugee participation should be encouraged in the production of forest plants. The management of a small tree nursery can easily be observed by individuals, family groups or modest co-operatives. The quality of raised seedlings is generally better and it provides an excellent opportunity to encourage income generating initiatives.

Purpose and Design

The main objectives are:

- seedling production for reforestation or afforestation activities, using specific seedlings;
- multipurpose seedling production for dissemination to households, corresponding to previous needs analyses carried out within the community; and
- seedling production for sale.

Location requirements include the following:

- the nursery should be as close as possible to intended planting sites in order to reduce costs and difficulties (for example during the wet season) in transporting the seedlings;
- a permanent water supply must be available;
- the site should be well drained;
- if natural shelter is not present, screens (cloth, branches, leaves...) will probably need to be provided against strong sun and heavy rain;

- the proximity of a source of adequate soil material is an advantage; and
- sufficient local availability of personnel, labourers, as well as managerial staff.

When planning a new tree nursery, the design should allow for:

- a productive area which will be the place where seedling beds are laid out. The number and size of the seedling beds has to be calculated on the basis of production targets;
- security against animals, theft or natural features such as flooding;
- paths between the seed beds; and
- an additional area for the construction of a store and office and for other activities such as soil preparation and seed processing.

An indication of the relations between the area to be planted, the number of seedlings to be raised and the required size of the nursery is shown below.

<i>Nature of Programme</i>	<i>Indicative Surface of Planting Area (ha)</i>	<i>Nursery Capacity (number of plants)</i>	<i>Nursery Surface (square metre)</i>
Individual lots; agro-forestry	<3	<10,000	<250
Village afforestation	3–20	10,000–50,000	250–1,000
Multivillage/regional	20–50	50,000–125,000	1,000–2,500

Needs

The most basic tools include wheelbarrows, watering cans, shovels, rakes, hammers, pruning tools, knives, boxes for seedling transport, axes, hoes, sprayers, sieves for soil and seed, boxes for seed, measuring tapes and a weighing scales. A functional watering system with a pump, water reservoirs, pipelines and taps should be installed.

Nursery supplies include seed, suitable containers and substrate for seed beds and plant containers. Trees are either propagated from seed or cuttings. Seeds can be obtained from forest seed centres or from other seed supplying forest services that provide seed from selected stands or individual trees. Seed can also be collected locally from vigorous and well-shaped parent trees. If collected locally, the seed should be properly dried, cleaned and treated before storage or sowing.

Forest seed centres can accurately calculate the required amount of seed for the production of a given number of seedlings of a certain species. Following purchase, seed should be stored in dry and well ventilated conditions. In order to germinate properly, some seeds may require pre-sowing treatment, of which several possibilities exist. Supply companies will, upon delivery of seeds, indicate the most

appropriate treatment for the concerned seeds. One of the most common treatments is soaking seeds for a certain time in cold, hot or boiling water.

The most widely used containers for seedling production are polyethylene bags or tubes. Several factors might be taken into consideration when deciding upon suitable containers. Bags, for example, have a bottom, have a defined size, are ready for use, have holes on the side for drainage and are easier to fill than tubes. Bags are, however, more expensive than tubes.

An appropriate substrate should be used for raising seedlings. The soil mixture must have the right physical and chemical properties; it must be homogeneous, free of stones, pieces of wood, grass or other objects; and it should not contain more than 20 per cent of clay soil.

The production of high quality seedlings, especially fruit trees, requires a specific substrate containing a lot of organic matter and mineral nutrients.

Nursery Operations and Techniques

Subsequent nursery operations are:

- sowing (timing, depth of sowing, sowing in containers or in seed beds);
- shading and daily watering of the seed beds;
- pricking out or transplanting;
- hardening off the seedlings;
- regular weeding and pruning; and
- grading, culling and seedling transportation to the planting site.

Nursery techniques can differ considerably according to the tree species and climatic conditions, in particular, the length of the dry season.

Seed is usually sown in seed beds where it germinates and where it is left until the plants show 3–4 leaves. According to the species, this phase takes 1–3 months. The type of sowing varies with the size of the seed: line sowing is applied for small seeds (*Cedrela*), broadcast sowing for very small seeds (*Eucalyptus*) and hole sowing for larger seeds (*Anacardium*, *Tectona*). Tree species with large seeds (e.g. *Acacia*, *Tectona*, *Khaya*, *Azizelia* species) are frequently sown and raised directly in polyethylene bags. Freshly sown seeds should be protected against direct sunlight. This can be accomplished by placing screens made from local materials over the seed beds.

Seedlings are often transplanted in order to obtain more vigorous plants with a dense rooting system. Transplanting has to be done carefully in order to avoid any damage to the fragile roots. Seedlings can be transplanted to containers, notably to large (22cm high and 18cm wide) or small (13cm high and 7cm wide) polyethylene bags/tubes or, again, to seed beds but at a larger spacing (e.g. 20x20cm for *Gmelina*).

The price of polyethylene bags increases production costs but the plants are usually less fragile compared with those raised under other means. Raising seedlings in containers makes it easier to transport them successfully to the planting site. The plants cannot, however, stay for prolonged periods in the nursery because the roots start winding and strangling (regular root pruning should be done).

Transplanting in seed beds and the production of bare-rooted seedlings is another technique that requires more care during the extraction and transplantation operations. This should be discouraged in dry areas where the root system would easily dry out.

In humid equatorial climates, direct sowing in seed beds to obtain bare-rooted plants (*Aucoumea*, etc.) or stumps is not a problem. The seedlings remain in the nursery for about one year. Just before planting the leaves are stripped off (stripling) – two or three leaves are left on larger plants – which facilitates transportation to the planting site and reduces the risk of drying out.

The length of the raising period in the nursery is strictly dependant on the species and on the methods used, and varies from 4–12 months. The planting schedule, which depends on the timing of dry and wet seasons, is the decisive factor for the nursery time schedule. With a seedling growth period of around eight months, and with a planting season in July, soil preparation in the nursery has to be done in November, with sowing and transplanting taking place in December and January, respectively.

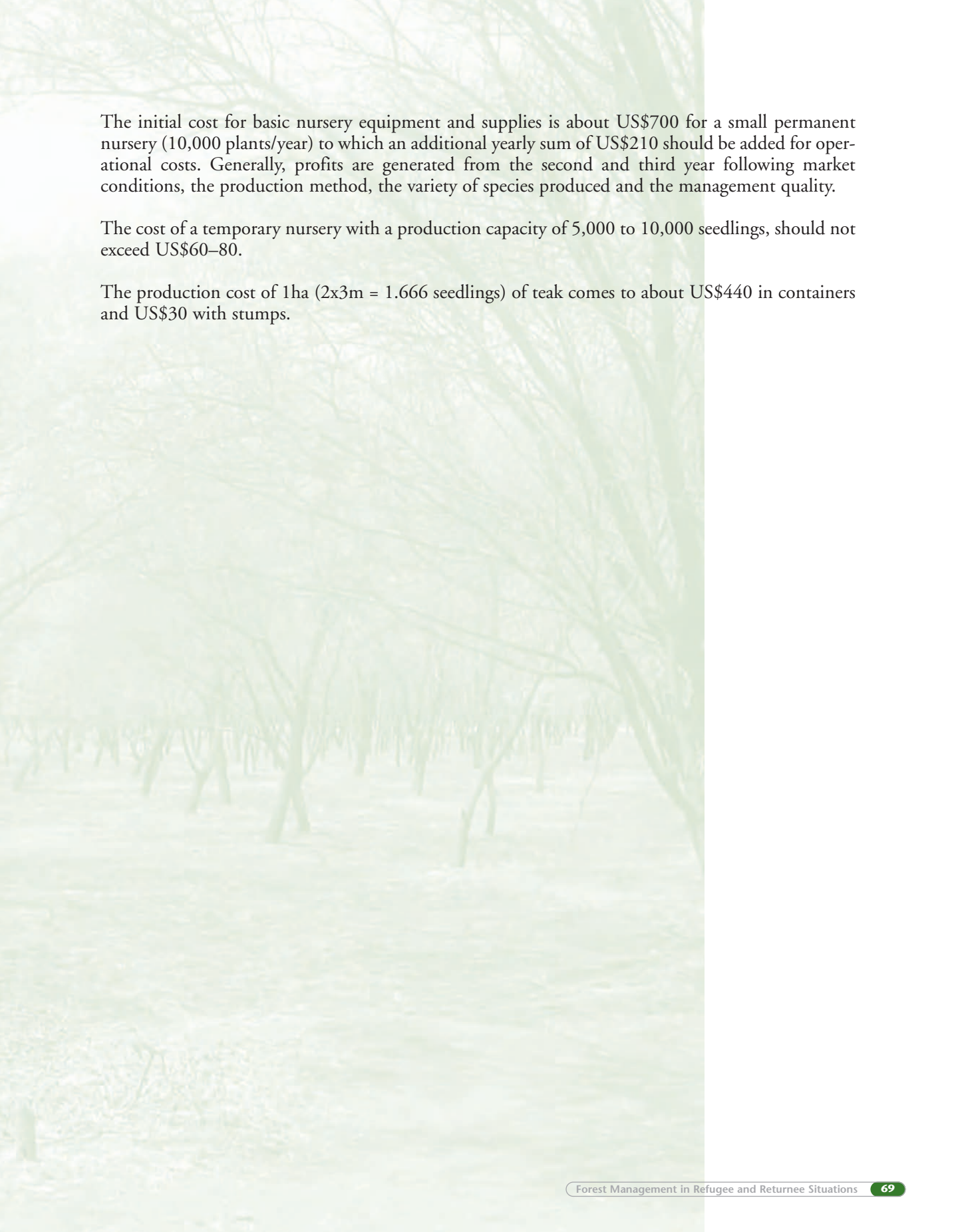
Cost Norms

Initial investment costs include:

- construction of a permanent infrastructure, including an appropriate, reliable, water supply system and shade provision. Construction materials, as well as labour, should be considered. The costs will increase with an increasing capacity of the nursery, though not at a proportional level; and
- procurement of equipment and basic tools as listed under Annex III. Prices will vary considerably with the local market and with the quality and amount of equipment required.

Recurrent costs include:

- materials such as seed, soil substrate, containers, fertilizers and pesticides;
- labour for activities such as soil mixing and preparation, container filling, seed processing, sowing, weeding, pruning, watering, transplanting, grading, culling, and loading for transport;
- transport needs for the supply of materials and soil substrate, and for the distribution of the seedlings produced; and
- a watchman.



The initial cost for basic nursery equipment and supplies is about US\$700 for a small permanent nursery (10,000 plants/year) to which an additional yearly sum of US\$210 should be added for operational costs. Generally, profits are generated from the second and third year following market conditions, the production method, the variety of species produced and the management quality.

The cost of a temporary nursery with a production capacity of 5,000 to 10,000 seedlings, should not exceed US\$60–80.

The production cost of 1ha (2x3m = 1.666 seedlings) of teak comes to about US\$440 in containers and US\$30 with stumps.

**IV**

Tree Planting and Maintenance Techniques

Planting Techniques

The most common technique is planting in formerly dug holes (minimum size 30x30x30cm) which have been cleaned of stones and roots. If the seedlings are delivered in containers, one must remove this container before putting the plant in the ground. In case of bare rooted seedlings, one should protect the roots from drying out by not exposing them to desiccating winds or direct sunshine. If there are delays between delivery and planting, it is advisable to temporarily plant the seedlings in a shallow ditch prepared especially for this purpose, firming them in gently in a shallow, covered trench.

During planting, the seedling's position should be such that the roots remain as natural as possible, the root collar being level with the surface. After refilling the hole with soil, eventually enriched with some manure or fertilizer, the soil should be firmly pressed in by hand and subsequently tamped with the feet, and the hole filled in once again with loose soil.

In humid climates with vigorous growth of vegetation, it is recommended to leave the marking pegs in the field, as this will help locate young trees during future tending operations.

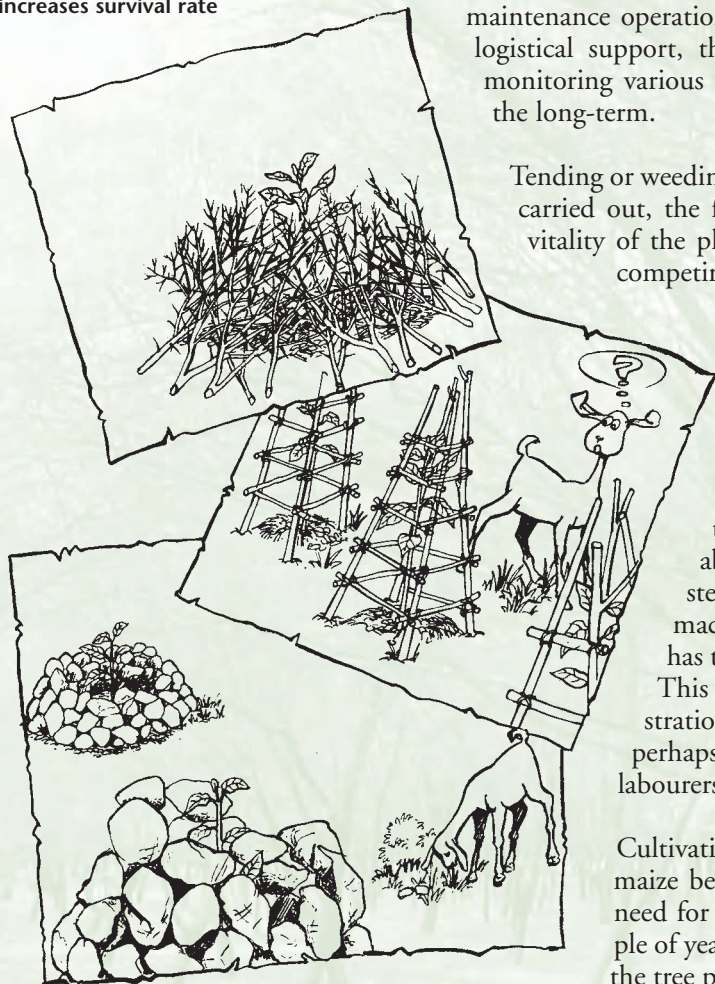
In drier areas – Sahelian and Sudano-Sahelian areas, for example, or rocky slopes and dry exposures – the creation of micro-catchments (hollow or lunar-shaped holes) at the planting holes helps increase the survival of young trees as they concentrate available water close to the roots of the seedlings. Another technique to apply in dry areas is mulching, where the area around the tree collar is covered with coarse organic material in order to reduce evaporation. In some cases, tree plantations can be irrigated; this is a more expensive but efficient way to overcome drought problems.

Waterlogged planting sites should be avoided as, due to lack of oxygen in these soils, the seedlings tend to suffocate.

Tending and Maintaining Trees and Plantations

Young trees need proper maintenance in order to survive, regardless of where they have been planted. Only in rare cases where large and vigorous seedlings are used in combination with a fertile soil and abundant rainfall, will young trees manage to survive and compete successfully with natural vegetation without weeding operations.

**Protection measures
for newly planted trees
against animals
increases survival rate**



It is strongly recommended that the skills and know-how of local forest authorities or other organisations are used for maintenance operations. If provided with some financial and logistical support, they will contribute to supervising and monitoring various activities that will help communities in the long-term.

Tending or weeding is the first operation which needs to be carried out, the frequency of which will depend on the vitality of the plants compared with the growth rate of competing vegetation. In general, the frequency of weeding will vary from once during the first season after planting, to twice per season in the following two or three years.

Tending consists of removing vegetation growing up around the young trees, clearing for example a circle of about 50cm in diameter around the tree stem. This is done manually using hoes, machetes or a scythe. Particular attention has to be paid to not damaging the tree itself. This can be avoided by good initial demonstrations, close supervision of workers and perhaps subsequently imposing a penalty on labourers who cut a tree.

Cultivation of agricultural crops such as beans or maize between large-spaced trees can reduce the need for costly tending operations during a couple of years as the farmers – who must be aware of the tree planting exercise – will naturally take care of this during routine maintenance.

Survival rates should be assessed at the end of the first season. If more than 10 per cent of the planted trees have died, one would normally consider replanting (“beating up”) those empty spaces. For this purpose, large, vigorous seedlings should be used so that their progress will soon match that of the other trees.

Although watering is not always required for young trees, the seedlings’ survival might depend on it in dry areas or in periods of excessive drought. In places with water supply problems, trees should only be watered with waste water. In order to keep the soil around the trees moist, mulching practices or planting techniques that involve micro catchments should be applied, in addition to watering.

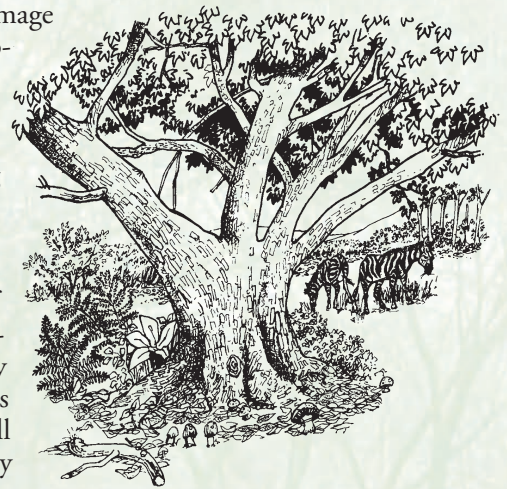
Pruning and thinning operations will considerably increase the quality of the produced timber. Pruning consists of cutting the branches along the trunk. This is done to reduce the number of knots

in the produced timber. If feasible, the pruned branches should be used as fuelwood and not be wasted. During a thinning operation, the number of trees is reduced in order to give the dominant (tallest) and straightest trees more growing space, and thus better conditions for development. These two operations are normally not necessary for the production of fuelwood or poles.

Protecting Trees

It is important to protect seedlings and young trees against damage from fire, by grazing animals or by human activities. The establishment and maintenance of fire breaks is therefore essential. Fire breaks of 6–20m width should be established around and eventually within a plantation by cutting the vegetation, working the soil and removing all organic material, the latter being used as mulch.

Controlled burning outside the plantation or woodlot perimeter is also a possibility. As soon as the trees have reached a height of 3–4m, controlled burning could also be applied within the plantation. Obviously, this measure bears a certain risk and the key concern is to find the right moment to start burning. If the fire is set too early, when the grass is still green and fresh, burning will be difficult. On the other hand, if one waits too long, the grassy vegetation will be very dry and there is an increased risk of fires going out of control.



A rich tree environment

Allowing people to cultivate fire breaks can be part of an effective management system, providing access to additional agricultural land and, hence, additional income or food, while at the same time reducing the costs of regular tending and clearance.

In many areas, it will be essential to protect seedlings and young trees against cattle, goats and other livestock. This should be done in co-operation with livestock owners and might require guarding and/or fencing. For single trees along roads or around houses, it is often necessary to protect them individually against grazing by means of small cages made of bamboo, reeds, thorny branches, bricks or wire.

Local populations or refugees can also destroy a plantation by early harvesting or by lack of care while cultivating between the trees. Sometimes this is done intentionally to maximise the area of cultivable land available. In such cases, dialogue is necessary with the concerned people to make them aware of the benefits of the plantation and, if possible, to find another solution to their problems.

Coppicing Plantations

Another type of maintenance is applied after cutting coppicing species, for example certain *Eucalyptus* species. Cut tree stumps naturally produce a large number of rather useless, thin stems. If, however, these are thinned out, leaving just 2–3 per stump, they should grow into vigorous trees as there is no longer as much competition for light or food. Such operations usually take place one or two seasons after cutting the original tree.



Common Agroforestry Practices in the Tropics

Fogrosilvicultural Systems (crops – including shrub/vine/tree crops – and trees)

<i>Agroforestry practice</i>	<i>Brief description of arrangement of components</i>	<i>Major groups of components</i>	<i>Agro-ecological adaptability</i>
Improved fallow	Woody species planted and left to grow during the 'fallow phase'	w: fast-growing preferably leguminous h: common agricultural crops	In shifting cultivation areas
Taungya	Combined stand of woody and agricultural species during early stages of establishment of plantations	w: usually plantation forestry species h: common agricultural crops	All ecological regions, where taungya is practised; several improvements possible
Alley cropping (hedgerow intercropping)	Woody species in hedges; agricultural species in alleys in between hedges; microzonal or strip arrangement	w: fast-growing, leguminous species that coppice vigorously h: common agricultural crops	Subhumid to humid areas with high human population pressure and fragile (productive but easily degradable) soils
Multilayer tree gardens	Multispecies, multilayer dense plant associations with no organised planting arrangements	w: different woody components of varying forms and growth habits h: usually absent; shade-tolerant ones sometimes present	Areas with fertile soils, good availability of labour, and human population pressure
Multipurpose trees on croplands	Trees scattered haphazardly or according to some systematic patterns on bunds, terraces or plot/field boundaries	w: multipurpose trees and other fruit trees h: common agricultural crops	In all ecological regions, especially in subsistence farming; also commonly integrated with animals
Plantation crop combinations	<ol style="list-style-type: none"> 1: Integrated dense multi-storey mixtures of plantation crops 2: Mixtures of plantation crops in alternate or other regular arrangements 3: Shade trees for plantation crops; shade trees scattered 4: Intercropping with agricultural crops 	w: plantation crops such as coffee, cacao, coconut and fruit trees (esp. in 1); fuelwood/fodder species (esp. in 3) h: usually present in 4, and to some extent in 1; shade-tolerant species	In humid lowlands or tropical humid/subhumid highlands (depending on the plantation crops concerned); usually in smallholder subsistence systems

Home gardens	Intimate, multi-storey combination of various trees and crops around homesteads	w: fruit trees predominate; also other woody species, vines, etc.	In all ecological regions, especially in areas of high population density
Trees in soil conservation and reclamation	Trees on bunds, terraces, raisers, etc., with or without grass strips; trees for soil reclamation	w: multipurpose and/or fruit trees h: common agricultural species	In sloping areas, especially in highlands, reclamation of degraded, acid, alkali soils, and sand-dune stabilisation
Windbreaks and shelter belts, live-hedges	Trees around farmlands/plots	w: combination of tall-growing spreading types h: local agricultural crops	In wind-prone areas
Fuelwood production	Interplanting fuelwood species on or around agricultural lands	w: fuelwood species h: local agricultural crops	In all ecological regions

Silvopastoral Systems (trees and pastures and/or animals)

Agroforestry practice	Brief description of arrangement of components	Major groups of components	Agro-ecological adaptability
Trees on rangeland or pastures	Trees scattered irregularly or arranged according to some systematic pattern	w: multipurpose; of fodder value f: present a: present	Extensive grazing areas
Protein banks	Production of protein-rich tree fodder on farm/rangelands for cut-and-carry fodder production	w: leguminous fodder trees f: present a: present	Usually in fairly densely populated areas
Plantation crops with pastures and animals	Example: cattle under coconut crops in south-east Asia and south Pacific	w: plantation crops f: present a: present	In areas with less pressure on plantation crops
Home gardens with animals	Intimate, multi-storey combination of various trees and crops, as well as animals around homesteads	w: fruit trees predominate; also other woody species a: present	In all ecological regions with high human population density
Multipurpose woody hedgerows	Woody hedges for browse, mulch, green manure, soil conservation, etc.	w: fast-growing and coppicing fodder shrubs and trees h: similar to alley cropping and soil conservation	Humid to subhumid areas with hilly and sloping terrain

Other

<i>Agroforestry practice</i>	<i>Brief description of arrangement of components</i>	<i>Major groups of components</i>	<i>Agro-ecological adaptability</i>
Apiculture with trees	Trees for honey production	w: honey producing (other components may be present)	Depending on the feasibility of apiculture
Aquaforestry	Trees lining fish ponds, tree leaves being used as 'forage' for fish	w: trees and shrubs preferred by fish (other components may be present)	Lowlands
Multipurpose woodlots	For various purposes (wood, fodder, soil protection, soil reclamation, etc.)	w: multipurpose species; location-specific species (other components may be present)	Various


 VI

Selected Tree Species

**Species Worth Considering in Areas of 400–650 mm of Rainfall
Mean Annual Temperature (Altitude)**
24°C and above (0–600 metres)

Acacia albida
Acacia nilotica
Acacia tortilis subsp. raddiana
Butyrospermum paradoxicum
Parkia biglobosa

22–24°C (600–1000 metres)

Acacia albida
Acacia cyanophylla
Acacia cyclops
Acacia salicina
Brachychiton populneum
Ceratonia siliqua
Colophospermum mopane
Dalbergia sissoo
Eucalyptus camaldulensis (N. Provs.)
Eucalyptus cladocalyx
Eucalyptus microtheca
Eucalyptus occidentalis
Euphorbia tirucalli
Parkinsonia aculeata
Prosopis cineraria
Prosopis juliflora

20–22°C (1000–1400 metres)

Acacia albida
Acacia cyanophylla
Acacia salicina
Brachychiton populneum
Ceratonia siliqua
Dalbergia sissoo
Eucalyptus camaldulensis (N. Provs.)
Eucalyptus camaldulensis (S. Provs.)
Eucalyptus cladocalyx
Eucalyptus occidentalis
Parkinsonia aculeata
Prosopis juliflora

**Species Worth Considering in Areas of 650–1000 mm of Rainfall
Mean Annual Temperature (Altitude)**

24°C and above (0–600 metres)	22–24°C (600–1000 metres)	20–22°C (1000–1400 metres)
Acacia albida	Acacia albida	Acacia albida
Acacia auriculiformis	Acacia cyanophylla	Acacia cyanophylla
Acacia nilotica	Albizia lebbek	Albizia lebbek
Acacia seyal	Alnus nepalensis	Alnus nepalensis
Anacardium occidentale	Azadirachta indica	Cupressus torulosa
Anogeissus leiocarpus	Borassus aethiopum	Dalbergia sissoo
Azadirachta indica	Cassia siamea	Eucalyptus botryoides
Borassus aethiopum	Dalbergia sissoo	Eucalyptus camaldulensis (N. Provs.)
Butyrospermum paradoxicum	Eucalyptus camaldulensis (N. Provs.)	Eucalyptus camaldulensis (S. Provs.)
Eucalyptus citriodora	Eucalyptus citriodora	Eucalyptus citriodora
Eucalyptus tereticornis	Eucalyptus microtheca	Eucalyptus gomphocephala
Khaya senegalensis (valley sites)	Eucalyptus tereticornis	Eucalyptus tereticornis
Parkia biglobosa	Euphorbia tirucalli	Ficus benghalensis
Tamarindus indica	Ficus benghalensis	Gleditsia triacanthos
	Gleditsia triacanthos	Jacaranda copaia
	Jacaranda copaia	Jacaranda mimosifolia
	Jacaranda mimosifolia	Leucaena leucocephala (Hawaiian type)
	Leucaena leucocephala (Hawaiian type)	Leucaena leucocephala (Salvador type)
	Leucaena leucocephala (Salvador type)	Pinus elliotii var. elliotii
	Pinus elliotii var. elliotii	Prosopis juliflora
	Prosopis juliflora	

**Species Worth Considering in Areas of 1000 –1600 mm of Rainfall
Mean Annual Temperature (Altitude)**

24°C and above (0–600 metres)	22–24°C (600–1000 metres)	20–22°C (1000–1400 metres)
	Gleditsia triacanthos	Pinus elliotii var. elliotii
	Gliricidia sepium	Pinus kesiya
	Gmelina arborea	Pinus palustris
	Jacaranda copaia	Pinus patula subsp. tecunumanii
	Jacaranda mimosifolia	Schizolobium parahybum
	Melaleuca leucadendron	Taxodium distichum
	Pinus caribaea var. hondurensis	
	Pinus elliotii var. elliotii	
	Pinus merkusii (continental Provs.)	
	Samanea saman	
	Sesbania grandiflora	

**Species Worth Considering in Areas of 1600 mm and above of Rainfall
Mean Annual Temperature (Altitude)**

24°C and above (0–600 metres)	22–24°C (600–1000 metres)	20–22°C (1000–1400 metres)
Afzelia africana	Aghatis dammara	Aghatis dammara
Afzelia bella	Albizia falcataria	Araucaria hunsteinii
Afzelia bipindensis	Araucaria hunsteinii	Eucalyptus deglupta
Afzelia pachyloba	Cariniaria pyriformis	Pinus merkusii (Island Provs.)
Aucoumea klaineana	Eucalyptus deglupta	
Cariniaria pyriformis	Tectona grandis	
Chlorophora excelsa		
Cleistopholis glauca		
Entandrophragma cylindricum		
Eucalyptus deglupta		
Hieronyma chocoensis		
Musanga cacropioides		
Nauclea diderrichii		
Octomeles sumatrana		
Tarrietia utilis		
Tectona grandis		
Terminalia ivorensis		
Terminalia superba		
Triplochiton scleroxylon		

VII

Checklist of Common Forest Activities

Wood Supply and Harvesting

- Quality and quantity of required wood products?
- Expected fluctuations in time?
- Demand-reducing factors to be expected?
- Existing forest resources in the surroundings?
- Their supply capacity in volume and in kind?
- Presence of protected areas or other sites of importance?
- Presence of harvesting priority areas?
- Accessibility?
- Distance to refugee sites?
- Transport required?
- Harvesting agreements with the owners?
- Centrally organised supply or controlled harvesting by the refugees?
- Control and protection measures?
- Support from local administration and/or implementing partners?

Tree Planting Programmes

- Objectives, purpose of the tree planting activity?
- Type of re/afforestation: blocks, agroforestry systems, enrichment planting?
- Planting site?
- Tree species?
- Availability of planting stock or seed to raise the required planting stock?
- Need for nursery establishment? Type, capacity, management?
- Time schedule?
- Transport of seedlings?
- Organisation of the planting activities?
- Most appropriate planting technique?
- Ownership and user agreements?
- Support from local administration and/or implementing partners?

Maintenance of Young Plantations and Trees

Required post-planting operations?
Who will take care of the young plantations and trees?
Needed protection measures?
Need for beating-up?
Incentives for high survival rates?

Awareness Raising Campaigns and Forestry Extension

Who can assist in conducting such campaigns and extension activities?
Objectives and content of the sessions?
Preparation of extension material (flip charts, posters, leaflets)?
Identification and invitation of the target groups?
Frequency of the sessions?
Infrastructure and required equipment?
Nature of the session: informative meeting, participative discussions, practical on-the-job-training?

Income Generating Activities

Nature of the activity?
Nature and level of the incentives: cash, food, wood?
Who will provide the incentives?
Who will supervise the quantity and quality of the work?
Recruiting procedures?
Possibilities for promotion of private initiatives?



UNHCR's environmental activities are designed to prevent, mitigate and, when necessary, rehabilitate the negative effects of the refugee camps/settlements on the environment so as to secure the welfare of the refugees and local populations, and foster good relations with host governments who provide asylum to refugees.

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