

FORESTRY TRAINING CENTRE INCORPORATED

(An Associate Body of the Guyana Forestry Commission)



AN INTRODUCTORY COURSE ON FOREST MANAGEMENT FOR COMMUNITIES



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Foreword

As we strive to manage our forests to improve our well being, we may probably ask the following questions: What to do, why do something at all and what are the alternatives? Who should do it, and when? Who will benefit? Are the benefits sustainable? What skills sets are required, are they available, and if not available how do we develop capacity for generating the benefits we crave? What do we really want to achieve this year, in five years, in twenty-five years? What *partnerships* will be required? These are useful questions because they make us THINK through the variables associated with forest resources management.

Forest resources are renewable and under favourable conditions and/or treatments would remain indefinitely in the same location and in a functional, self-sustaining state. We all benefit from forest resources in various ways and more importantly we (and those who come after us) can all continue to enjoy most of those benefits indefinitely if we simply take time to plan our use of the forest resources; to think about and choose the proper technologies and skills sets to optimise the harvest the products we need; and more importantly to conserve forest resources, *in situ*. The operatives engaged in forestry activities at all levels must help take **responsibility** for the quality of forest practices implemented by a forest enterprise or a community.

This manual is intended to address the basic training needs of the ordinary forest operatives at the community level who are expected to:

- a) make and implement decisions on the exploitation of their resources,
- b) take full advantage of emerging employment opportunities near their communities, and
- c) contribute to policy decisions that the national, regional and community levels that affect them.

Forest management objectives, goals and prescriptions are more useful when documented in a forest management plan (or a community development plan or business plan), because forest resources based developments occur over long periods. It is important that different people (stakeholders) be able to work with the same **plan** over time and that they understand the basis on which decisions were made; any changes should be understood by all and documented. Forest enterprises and communities in particular require such plans for their own purposes and they must take care to prepare one, whatever the **objective of management**. Forest enterprises and communities are encouraged to maintain an adequate system of records to track trends in costs and production.

This version of FTCI's '*Introductory Course on Forest Management For Communities*' has been developed from manuals prepared by FTCI for various clients and benefitted considerably from feedback from trainees and donors.



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1. USEFUL CONCEPTS AND DEFINITIONS

Several terms and concepts set the context for our discussions on forest resources management.

Forestry

Forestry may be fined as the practice of studying, establishing, and conserving forest resources, and managing them to achieve specific human benefits. Forestry is a science because forest resources exist on scientific principles: tree growth, flower pollination and seed dispersal for example are based on certain biological and ecological principles. Forestry is also an art because one has to make decisions on investments or inputs and take certain risks in order to create the desired economic or social benefits.

Forestry Authority

The agency assigned to manage public forests (or State forests or the forest estate) is the forestry authority. Authorities go by different names in different countries. In Guyana, the forestry authority is designated the Guyana Forestry Commission; prior to 1979, the local forestry authority used to be called the Forestry Department. In some countries such as Guyana, the forestry authority deals only with some segments of the forest resources such as forest enterprise for timber production, while other segments such as tourism, watershed management, and wildlife for example are managed by other authorities such as the Environmental Protection Agency or the National Parks Commission. In Trinidad & Tobago & Dominica on the other hand the forestry authority, the Ministry of Agriculture, manages the forest resources and all related forest resource based goods and services.

Forest and Forest Resources

Forest refers to a parcel of vegetation dominated by trees. A tree within a forest environment usually carries a single straight bole greater than 5m and with all branches at the top of the trees. Forests frequently contain lianas. (Note that a savannah is dominated by other plants such as grasses or shrubs).

Forest resources refer to *everything* that we encounter within a forest, including plants, rocks, nests, eggs, feathers, takubas, creeks, flowers, fruit and orchids. When we talk about benefits from forest resources, we include timber and any other product we can take, including fresh water. *Ecotourism* benefits considerably from non-timber resources in the forest.

Forest Management

Forest management is the application of business principles and forest technology to a forest resource to achieve specific objectives. Forest management requires consideration of a number of social, technological and ecological considerations. It includes the examination of the resources available, decisions on what to do with the resources, the review of the various economic options/technologies that could be employed to manage (the harvesting or conservation) of those resources. Forests are frequently managed for timber, wildlife conservation, conservation of biodiversity, conservation of water resources, and conservation



of soils. (In Guyana, mangrove forests are deliberately left in place to protect many coastal areas.

Forest conservation

Forest conservation allows for controlled or regulated use: one may extract products, subject to certain conditions. Ways of conserving forests include diameter limits on felling trees, restricting the harvest of some species, restricting the volume of timber that could be harvested per unit area, restrictions on hunting, fishing and seed collection, penalties for the careless use of fires within forests, protection of forests on the margin of rivers and creeks, and restrictions on use of potential pollutants (such as oil) and garbage within forest resources.

Forest preservation

Forest preservation refers to the act of maintaining a parcel of forest in its natural state; no active interventions may be allowed - no hunting, no fishing and no harvesting of any physical product, no matter how insignificant it may appear.

Forest ownership

Forest ownership may take various forms.

State forests are forests owned and managed by the State via a forestry authority; in the case of Guyana the name of the forestry authority is the Guyana Forestry Commission. Subject to prevailing policies at the national level, the Guyana Forestry Commission decides who should harvest forests, where and when and how much volume of timber may be removed and under what conditions. State forests are normally allocated to private persons, cooperatives or corporate entities via various forms of *forest concession agreements or permits*.

Communal forests are owned by communities; for example the forests within the Hururu Amerindian District are owned by the people that comprise the Hururu community.

Institutional forests are owned by institutions; an example is the forests held by Iwokrama via the Iwokrama Act.

Private forests are owned by individuals, cooperatives or corporate entities; many eco-resorts may fall into this category.

Multiple uses of forests

Multiple uses refer to the management of the forest resources for different objectives either simultaneously or in a sequential manner (for example, one may harvest timber, then other persons may collect non-timber forest products afterwards).

Exclusive use refers to the use for which a forest is managed, no other use is permitted; for example Iwokrama has identified its forests into zones- where only



specific activities may occur in each zone. An ecological reserve where strict forest preservation is enforced is also an example of forests managed under a regime of *exclusive* use.

Primary use refers to the use for which a forest is primarily managed, with allowances for other managed **secondary uses**; for example it is possible to manage a forest for timber production while allowing the harvesting of non-timber forests or the bleeding of balata; note that both the harvesting of timber (the primary use of the forests) and non-timber products (the secondary use of the resource) are *managed*.

Incidental uses refer to uses which are allowed but not managed; for example it is quite common for hunters and gatherers of Crabwood seed, Sawari nuts, or Awara, to enter forests that are *managed for timber production*. However the activities of the gatherers are *not managed*.



2. The forest environment and the context for forest management

2.1 Forest products

Forests offer a large range of forest products with considerable potential for sustaining human welfare (see Figure 1). Typical forest products available in the forest resources of Guyana are:

- a) Fresh water
- b) Timber: logs, piles, poles, posts, spars, wattles, firewood, rods, shingles, staves
- c) Lianas: Kufa, nibbi
- d) Reeds: muku
- e) Decorative/ornamental plants: ferns, bromeliads, and orchids
- f) Meat: venison-deer, iguana, and capybara; fish, crab, worms
- g) Vegetables: Manicole palm,)
- h) Fruits: Ité, awara, akuyuru, cashew, kokerite, plum, fat pork, turu
- i) Pharmaceutical products: Sarsparilla, kapadula, quashi bitters, Crabwood seed
- j) Gums, resins and latex: rubber tree (Hevea), Bulletwood, Kufa
- k) Oils: akuyuru, awara, Crabwood,
- l) Dyes: annatto
- m) Eggs: Maam, Powis, Marudi, turtle
- n) Honey, syrups from selected palms
- o) Pets: parrots, macaws, Warakabra, Powis, ocelots
- p) Barks: for wrapping/tying-Maho; for walling and flooring-Baromalli;
- q) Bark for teas: Locust
- r) Leaves for teas: Congo Pump
- s) Leaves for roofing: dallibana, troolie, ité
- t) Poisons (fishing) haiari, kunami,
- u) Reeds (used for arrows)
- v) Beverages (from fruits and vegetables)
- w) Flowers, fruits, seeds, stones and feathers used for decoration and ornaments
- x) Pegasse/peats

Indigenous peoples have made extensive use of several of these items from time to time, but in most areas timber production is the primary economic activity. Manicole palm, crab oil and trade in wildlife have been the basis for major non-timber enterprises in Guyana.



Figure 1: A sample of products within local forest resources



2.2 Forest services

The forest environment offers a number of services that fosters human welfare, even though we do not normally pay as much attention to these as with the more tangible products such as timber and fruits.

2.2.1 Introduction-forest dynamics

As trees grow they absorb nutrients and water from the soil through their roots and sunlight, carbon dioxide and oxygen through their leaves and manufacture various products that give rise to new leaves, flowers, fruits, and bark that may be used directly by animals and sometimes parasitic plants. When plants produce flowers, their nectar is used by a range of birds and insects and these pollinate the flowers, facilitating their development into fruits. When the fruits ripen they are eaten by animals; in many cases when the fruits and/or their seeds pass through the digestive systems of birds and herbivores the seeds become better prepared for germination and the propagation of new plants. In addition animals tend to move from place to place, in many cases to avoid predators or even other competing animals contributing to seed dispersal, thus allowing species of plants to occupy new sites or spread their geographic range. Some fruits, while still on the tree are partly eaten by birds (parrots, toucans) and monkeys; then partly eaten fruit falls to the ground where they are consumed by herbivores such as wild hogs. Some animals feed primarily in the day and others primarily at night. The same tree could therefore support a large diversity of fauna.

Many animals use trees for setting up nests in holes or on branches (owls, parrots, owls) while others use trees for preying on other animals (hawks, jaguars).

Some animals dwell and forage only on the ground (wild hogs, deer, tapir); some dwell and forage in the lower branches or lower storeys of trees (snakes, squirrels, opossum, coatis); some dwell and forage in the upper levels of trees (most monkeys, sloths, iguanas) and some dwell primarily in the canopy layer (eagles); some animals dwell only in water (fishes, otters, manatees, caimans); some dwell and forage in water and on land (capybara, caimans, boa constrictors); some animals forage in water *and* on land (jaguars).

The diversity of animals comprises a large number of herbivores and carnivores which prey on the herbivores. In the forest environment, animals create space where they can feed safely, reproduce and hide from predators. On the other hand many predators within forests prey on parasites of agricultural crops. In natural systems, there is some balance between predators and prey, and the system recreates itself with each passing day.

Meanwhile, when plant parts (such as leaves and bark) fall from the tree they decompose over time, depositing minerals into the soil; these minerals become available to the plant again for uptake to produce new plant parts, a process described as nutrient recycling. Of course, large roots also create conditions for animals to establish burrows for rodents and snakes; dead animals are also a useful source of minerals for plants.



Finally, trees die and fall due to old age, severe damage, and the action of parasites or predators or violent storms. When this happens, a large number of juvenile trees in the understory seize the gaps created in the canopy and in turn occupy the space until they too succumb and in turn new plants replace them. This cycle of growth (and cycles of flowering, pollination, fruit development and fruit dispersal) and death, leading to changes in the structure and species composition of forests, is frequently referred to as forest dynamics. The cycle of events described above creates very many benefits for human welfare.

Watersheds

As trees grow and push their roots deeper and wider to better capture nutrients, they make the soil more porous, and increase the capacity of the soil to absorb water. When the soil absorbs water, there is less surface flow and therefore less surface erosion. In areas where there is some surface flow, plant debris on the surface of the soil, commonly referred to as litter retards the flow of surface water and allows more time for water to infiltrate into the soil. Trees therefore contribute to soil conservation and to water conservation. In areas with very hilly terrain, it is vital to maintain forest cover to protect soil and to allow water to infiltrate the soil, an area of study referred to as watershed management. These water reservoirs created frequently support agricultural projects, especially irrigated crops like rice and sugar cane.

In talking about soil conservation and water conservation, there is another fact for us to think about. Large extensive areas of forests cover very large areas of soil, and the mass of vegetation absorbs the impact of rainfall; rain falling on top of the canopy, trickles down to the soil along the trunk of the trees or drip off leaves onto the under-storey vegetation or litter layer, protecting the soil from the direct impacts of rainfall, and facilitating its infiltration into the soil. The water eventually emerges over a long period of time via springs and streams, some of it evaporating into the atmosphere, creating potential for rainfall. For these reasons, areas with large bodies of vegetation are also associated with a large numbers of perennial rivers and creeks with **fresh water**. Forests are therefore an integral part of the Water Cycle.

Soils conserved by forest cover are potential soils for future agricultural production.

Climate mitigation

When you stand in a forest, you will notice that conditions there in terms of light, humidity, temperature and wind is somewhat different than for areas not forested. Consider for a moment, a savannah which receives the full impact of rain, wind and sunlight, and then when you think about a forest (see Figure 2); the conditions there are very different -its darker, less windy, frequently stuffy, and probably it is difficult to see well beyond 50 meters.

Forests absorb dust and sunlight; create a braking effect on strong winds; conserve moisture in the under storey by restricting excessive evaporation of moisture from the forest floor; and by restricting wind flow in the under-storey, forests have more stable regimes of temperature and humidity. For these reasons forests have a stabilising effect on the climate



-the average weather conditions-temperature, humidity, sunlight and wind- and their variation in a particular region over a period of years.

Scientists also believe that the forests role in the carbon cycle and the water cycles respectively contribute to amenable and uniform temperatures in the various regions of the earth.





Wildlife

A diverse fauna occupy various vertical positions in forests (in trees); some are active by day (birds -Powis, monkeys-baboons), some by night (labba, owls), and some by day and by night (tapir, jaguars). There is evidence that the study of animals contribute to the resolution of several (health) problems humans encounter every day: for example: vaccines are first developed and tested on animals before being given to humans; some snakes kill their prey by drastically lowering their blood pressure and it is believed that such venom hold the key to the development of medicines to manage high blood pressure in humans; and some wild animals carry genes that could improve the quality of domestic livestock (horses for example).

A few years ago, during a Tsunami in the Indian Ocean Rim on December 26, 2004, it appears that the animals knew of the event (the Tsunami) before it happened and rushed off to the hills where they all survived the tidal waves that wrought massive destruction on human habitations. How the animals knew beforehand of the event is an intriguing problem that humans would want to resolve.

Ecologists study the occurrence of certain animals to determine ecosystem health-whether forests are healthy or whether they are degrading. For example, the presence of jaguars and monkeys are considered signs of a healthy ecosystem, and many forest based residents believe that otters travelling constantly down-stream signals upcoming dry weather.

Therefore wildlife is vital to humans because humans learn from animals in several different ways. The life strategies employed by some animals, migratory behaviour, and reproductive behaviour are useful to scientists. Hunting strategies employed by various predators are useful to the military. The beauty of animal skins (for example ocelot, jaguar) and the plume of birds (harpy eagle, toucan, macaw) have inspired clothing designers and artists for decades.

Wildlife management in many countries, especially in Africa, is a source of considerable income as tourists crave a view of animals 'in the wild'. Consider for a moment the sums expended on air fares, fuel, tour guides, cameras, hotels, food, and fuel and you will get an idea of the volume of business generated by African safaris. Here in Guyana, the annual Rodeo in Lethem (Region 9) and the Fish festival (Region 10) attract large numbers visitors and have the potential to garner significant income for residents there.

In many countries, the authorities create conditions where the populace can enjoy views of animals, including those that only occur in different environments (outside the tropics for instance), by setting up zoological parks near urban areas.

Aesthetics

Forest environments offer tremendous opportunities to relax or to enjoy diverse range eco-touristic experiences including hunting, fishing, hiking, bird watching, safaris, painting of natural landscapes, swimming, picnicking, canoeing/boating/rowing and just sight-seeing. Again, consider the flights, cameras, GPS, binoculars and other gadgets, vehicles and fuel,



foodstuffs, guns and bows/arrows, rucksacks, hiking boots, mess equipment, tents, hammocks and sleeping bags, tents, knives, axes and hatchets and field clothing and you will get an idea of the huge sums of money expended on ecotourism ventures world-wide.

We have frequently heard of the comments by participants in the annual Safaris to Regions 8 and 9 about the beauty of the landscape. Beautiful landscapes and easily viewed fauna are major reasons for eco-tourism infrastructure. The Bartica Easter Regatta, the Lake Mainstay Regatta and the Splashmin's Regatta are all major annual festivals benefitting from the aesthetic appeal of large bodies of fresh water and other landscapes.

2.3 Land Use

Before we contemplate forest management, it is useful for us to appreciate that forests cover very extensive areas, and that these areas have very useful, even critical economic potential for national development. Other economic potential (land use options) available within the forest resources include hydro-power development, agriculture, mining, ecotourism, road & airstrip construction, and even housing development (see Figure 3).

Before we contemplate forest management, it is useful for us to appreciate that forests cover very extensive areas, and that these areas have very useful, even critical economic potential for national development. Other economic potential (land use options) available within the forest resources include hydro-power development, agriculture, mining, ecotourism, road & airstrip construction, and even housing development (see Figure 3). These 'other land use' developments are a critical part of national development.

Frequently, the GFC engages with other policy makers in the natural resources sector to manage situations where two or more agencies wishes to manage the same resource or different resources within the same geographic area within State forests (see Section 3.2). For example, the GFC has an interest in Mangrove forests because they are a part of State forests; the Environmental Protection Agency and the Wild life Agencies have an interest in mangroves because of the uniqueness of the mangrove ecosystem and the diversity of fauna that spawn and live within mangrove forests; and the Hydraulic Department Sea Defence, Ministry of Public Works & Communications, has an interest in mangroves because of the protection they afford sections of Guyana's coastline that are vulnerable to erosion. In other cases, areas with well stocked, intact forests may lie over commercial stocks of minerals or the areas in question may be required by the Central Housing & Planning Authority for housing or industrial development; clearly these scenarios require more collaboration between the authorities.

The Environmental Protection Agency frequently requires developers targeting large tracts of land to conduct environmental and social impact assessments (ESIAs); these ESIAs allow public agencies to review the nature and scope of all potential conflicts when one form of land use is prioritised over the others, and to take whatever decisions are appropriate in the national interest.



Figure 3: Illustrations of common land use activities within State forests

At the end of the day however, there should be at least a few thousand square kilometres of forest resources where sustainable forest management in its true essence could be carried out indefinitely. A major policy initiative to achieve this is to align forest development goals with national development, via an over-arching framework such as the Low Carbon Development Strategy.

2.4 Aligning forest development goals with national development

Given all that we can derive from forests, our challenge is the nature and intensity of interventions we make now versus the benefits we derive in the long term. Ideally benefits should be tailored in such a way that they may be sustained indefinitely and with the minimum conflict possible with other sectorised developments.



Forests are generally managed for three objectives: production, protection and recreation. Normally, when we manage forests for protection, we avoid too many 'interventions'; in other words, we avoid actions -cutting, felling, noise, road construction, clearing areas, farming or even collecting fruits - that disrupt the ecosystem, we try to do everything possible to conserve the area in its natural state to the maximum extent possible. In many cases, research activities are permitted and interventions in such cases are well regulated and confined to specific areas. When forests are managed for protection, protected areas, it is important that the areas be duly designated as such, using sign boards and well defined boundaries on the ground and of course on maps of the area.

When forest resources are managed for recreation, interventions are limited to putting in aids or facilities for the tourist without detracting from the natural setting. Interventions could include huts, trails, signs, bridges or walkways over streams, sanitary facilities, waste bins, ramps, piers, look out platforms in trees or on rock outcrops, warning signs, even cooking or picnicking spots. Every care is taken to match colours so as to create as natural a setting as possible. The conservation of tree cover is paramount, although there could be the weeding of the under storey in some instances. In this type of management, noise is normally prohibited, though there could be zoning where (loud) music is tolerated in some areas and not in others.

Managing forest resources for production necessitates interventions varying with the nature of the product. Interventions can vary from simple trails to collect fruit (Crabwood fruits for example) to roads, skid trails and log markets where timber production occurs. Chainsaw milling and the use of portable sawmills lead to a high intensity of noise for short periods, while the passage of trucks and tractors lead to rather regular bouts of noise up to several times a day. Logging operation potentially can create the greatest damage to forest resources through poor tree felling practices, poor road and skid trail alignment, spilling of fuel, oil and grease, poor sanitary practices, flooding, and erosion. Fortunately, reduced impact logging practices and codes of practice for timber harvesting that prescribe how timber harvesting and post harvesting works should be carried out have been developed.

Once we are clear about our forestry development goals, it then becomes easy to test their validity against existing or emerging policy developments. To avoid a piece meal approach, it is desirable that the national context within which forest management may occur be established. While forest resources may be easily quantified, the same cannot be said about other (subsurface assets) such as gold or diamonds or even natural gas, so it is not always easy to set priorities from various resource use alternatives. Recent overarching platforms with potential to align the development of the forestry sector with other 'non-forestry' development include the National Development Strategy 2001-2012, the Poverty Reduction Strategy and most recently the Low Carbon Development Strategy, 2009.



3. THE LEGAL FRAMEWORK FOR FORESTRY

3.1 The Guyana Forestry Commission (GFC)

The current *legal basis* for the GFC is the GFC Act of 2007. The GFC comprise between nine to thirteen members *appointed by the Minister* on the basis of relevant knowledge and experience in various areas *including* but not limited to forest management, forest industries, environmental management, and land use planning. The Commissioner of Forests is an ex-officio member of the GFC. The structure of the GFC is set out in Figure 4.

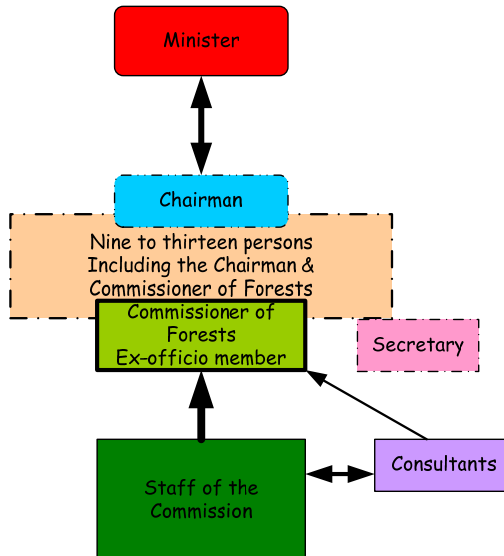


Figure 4: Illustration of structure of the Guyana Forestry Commission

The *objective* of the GFC is to encourage the development and growth of forestry in Guyana on a sustainable basis. The *functions* of the GFC include:

- 1) Developing, advising the Minister on, and carrying out the forestry policy;
- 2) Preparing plans, codes of practice and guidelines for the conservation and management of forests;
- 3) Researching, collating, analysing, preparing and disseminating data, statistics, and other information about forests and all aspects of forestry including forest ecology and the use of forest produce;
- 4) Carrying out forest inventories;
- 5) Providing or facilitating education and training in forestry and forestry -related jobs;
- 6) Providing forestry extension services and give advice to persons and communities interested or involved in forestry; and providing an inspection, certification, and accreditation service for quality control of forest produce.



3.2 State forests, forest concession agreements, other agreements and permits

The land area of Guyana, State lands, is administered by the Guyana Lands & Surveys Commission (GLASC). GLASC allocates land for specific purposes in accordance with the developmental objectives of the Government. The area of State lands assigned for the development of forestry practices-the forestry sector- is designated State forests.

The Guyana Forestry Commission, the forestry authority, has direct responsibility for the management of State forests. In accordance with national goals and forestry legislation respectively, the GFC allocates parcels of State forests to individuals, enterprises, communities and organizations via *forest concession agreements* or other agreements approved by the Government. In contemplating the award of any parcel of forest, the GFC may impose such conditions as it sees fit including the submission of environmental and social impact assessments and business plans. The GFC routinely consults with public agencies and other stakeholders in contemplating and deciding on the award of any agreement, permit or authorisation.

In granting a *forest concession agreement*, the GFC prescribes:

- a) Who may enter and occupy a specified area of State forests
- b) The manner of cutting and taking specified kinds and quantities of forest produce in the area
- c) The manner of carrying out specified forest operations or carrying out forest conservation operations in the concession area
- d) The manner of carrying out specified operations in any other area of State forests as necessary to facilitate the activities or operations specified in paragraphs (a), (b) or (c);
- e) The period in which any activity or operation may occur;
- f) The conditions under which an agreement may be amended or renewed.

Other 'concession types' issued by the GFC include:

Exploratory Permits- permits the holder to carry out exploratory operations within a specified area of State forests with a view to applying for a concession in respect of that area or any part of it; in addition it allows the permittee to cut or take specified kinds and quantities of forest produce *primarily* for testing and research.

Use Permits - allow the holder(s) to conduct: scientific research; education and training; recreation or ecotourism- including hiking and camping; and taking photographs or making films or videos or sound recordings.

Community forest management agreement-allows communities to acquire and secure rights to manage and benefit from their local forests on a sustainable basis in order to help meet local needs, stimulate income generation and economic development, and enhance economic stability.



Afforestation agreement-allows the holder to plant specified trees and specified plants in a specified area of State forest and to manage the planted area in accordance with a forest management plan approved by the GFC.

State forest authorisation-generally grants temporary, non-exclusive access to State forests for a specific purposes agreed with the GFC.



4. THE BASIS FOR FOREST MANAGEMENT

4.1 The nature of forests

4.1.1 Forests and other masses of vegetation

There are different sets of vegetation (see Figures 2, 5, and 6). Savannahs for example refer to areas dominated by grasses and/or scrub. Fields of mature cane or rice are of course dominated with grasses, while an orchard of coconuts or oil palm may also lay claim to being a forest through they are dominated with palms. For our purposes, we are dealing with forests-areas dominated by trees and lianas and which could be divided into various vertical layers depending on the respective vertical positions of mature and juvenile trees, lianas, orchids and other plant forms. Tropical forest resources are very complex eco-systems (see Figure 3) and we need to take a closer look at the nature of these resources before managing them.



Figure 5: Photos of savannah (left) and forest (right)



Figure 6: Profile of tropical forests showing the various plant forms present: at left, Cayenne (Richards, 1998), at right Brunei (Whitmore, 1990).



4.1.2 Forest types

Soil conditions frequently vary from one area to a next with terrain. Near water courses for example, the soil tends to be water logged, while on hill tops with sandy soils the soil tends to be well drained. On gently rolling terrain between the hills and the watercourses, conditions are more intermediate, neither too wet nor too dry. Each tree species appear to grow well on specific soil conditions. Therefore we have what are called forest types, groups of trees occupying only certain soil types. According to Vieira (1980), common forest types in the lowland area of Guyana are:

- Wallaba forests-characteristic of white sand soils; the dominant species is Wallaba (*Eperua spp.*).
- Mixed forests-these occur on deep, well drained brown sands, loams or lateritic clay soils on hilly or undulating terrain. These forests are heterogeneous in composition and provide most of the commercial timber. Common species are Greenheart (*Chlorocardium rodiei*) and Kabukalli (*Goupia glabra*) (see figure 3).
- Marsh and Swamp forests-these occur on flat, low lying terrain. The soils vary from alluvial silts or clays to pegasse. The length of the period of inundation, and the drainage conditions strongly affect the composition of these forests (see figure 4). Common species are Crabwood (*Carapa guianensis*) and Manni (*Symphonia globulifera*)
- Evergreen Seasonal forests-this type occurs mostly on well drained brown sands, east of the Demerara River. It may be similar to mixed forests in composition. (Common species are Kauta (*Licania spp*) and Suya (*Pouteria speciosa*)

4.1.3 Other resources in forests

Forest resources are not just about timber however. Forests (and tropical forests in particular) host a large assortment of fauna and non-timber products (see Figures 7 and 8).

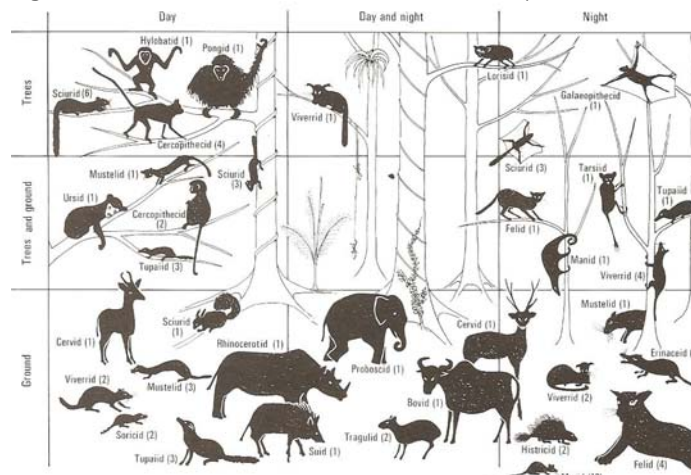


Figure 7 Diagram illustrating how animals occupy forests
(Source: Whitmore, 1990)



Animals contribute immensely to the pollination of flowers (see Figure 9), seed dispersal, and to sustaining soil fertility through nutrient cycling. Animal - animal predation and animal-plant predation also helps to keep the spread of diseases under control.



Figure 8: Livelihood opportunity: young men harvesting heart-of-palm

4.1.4 Forest products and services

From the economic perspectives, forests do not simply exist. They perform a variety of functions, such as in the recycling of water vapour, the recycling of carbon and oxygen respectively, and in soil formation processes. Forests help ameliorate or stabilise climate and help create large masses of fresh water that support thousands of riverine/marine organisms. Figure 9 shows nutrient cycling and flower pollination processes respectively.

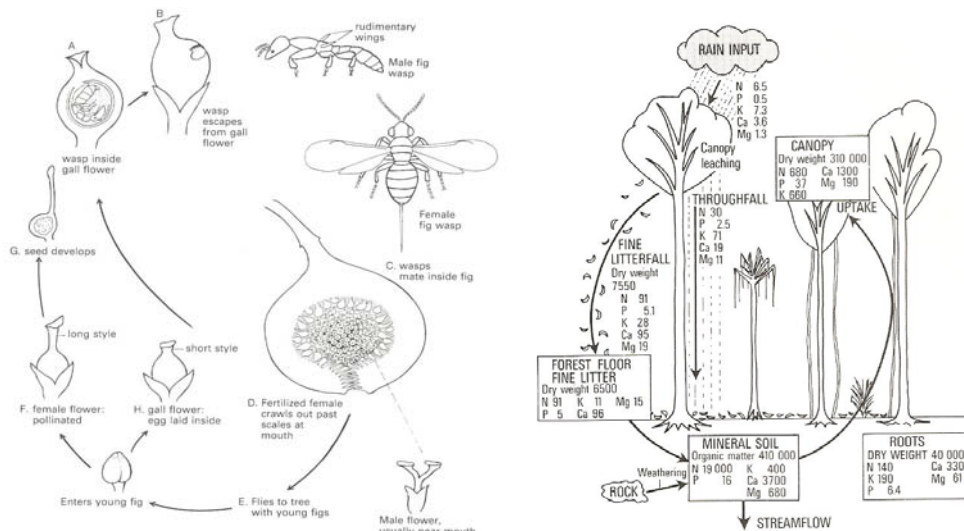


Figure 9: Diagrams showing services provided by forests: at left, flower pollination; at right, nutrient cycling (Whitmore, 1990)



Incidentally, the benefits of many intangible services have a significant impact on our agricultural potential.

Soil formation processes, fresh water storage, and populations of insects capable of pollinating agricultural crops or serving as predators of common pests affecting agricultural crops are useful benefits. At this point in time, in the face of global warming and related consequences, many economists and scientists are trying to put costs on some of the intangible functions that forests perform. Therefore by conserving forests, it is possible to reap considerable value from emerging developments.

4.1.5 Forest Dynamics

Under normal forest conditions, trees die from old age, injury, from strong winds or felling damage, disease, and predation. These trees are replaced by younger trees in the understory and the forest remains intact, more or less. This constant change in the structure of forests (in age class, species composition, the relative proportion of young and old trees and the resulting changes in mean tree height and mean diameter) is referred to as forest dynamics. In contrast, interventions by loggers, such as in road and skid trail construction, log market and borrow pit construction, and the felling of trees above a certain diameter at breast height represent rapid interventions in the forest, to the extent that the forest may not always be able to carry out the services described above, considerably reducing its commercial and ecological values and reducing the benefits previously provided.

One of the concerns over forest conservation is to make sure that forests continue to provide the range of goods and services indefinitely. Where there is deforestation, all the benefits are lost (permanently) and it would take centuries and huge costs to recreate forests to the extent that it begins to provide the full range of useful benefits again as the original forest.

4.2 Objectives of management

In the face of all the potential benefits of forests, forests may be managed *primarily* for two purposes: production or protection. Management for production focuses on timber and non-timber products; fruits/seeds; latex resins and dyes; edible parts of plants. Management for protection allows for forest based services and aesthetic values and includes activities related to wildlife management, watershed management, conservation of biodiversity, eco-tourism and scientific research. It is possible to manage forests for more than one objective however, providing these are all compatible. Therefore the first step in forest management is to set objectives for forest use.



5. PLANNING

5.1 The need for planning

Forests represent a system comprising diverse species, fauna that should be conserved and varying soil and terrain conditions. In natural forests, therefore, there is usually very little uniformity in field conditions. Forestry authorities cannot afford to gamble and therefore they frequently publish legislation and guidelines to regulate the use of forests.

The question for forest enterprises then is 'How can enterprise make money in the face of such a complex resource, and prescriptions guiding all interventions? The enterprise must put all considerations (or variables) on the table, and after evaluating them, try to make the best decision possible, based on its own objectives of management. Enterprises must therefore plan.

5.2 The benefits of planning

We plan in order to:

- Ensure consideration of all variables (species of timber and their peculiarities, diameter classes of commercial timber, forest technology, skills sets, etc.) that could affect the enterprise.
- Organize the provision of inputs required for timber harvesting
- Use forest resources more efficiently (and manage multiple uses of the forest resources).
- Optimise the use of logging equipment and reduce logging costs
- Plan timber harvests
- Manage timber quality
- Control all interventions to the forest resources, ensuring compliance with national prescriptions or guidelines
- Consider long-term events.
- Plan the development of skills sets
- Ensure the integration of legal obligations

5.3 Levels of Planning

5.3.1 Strategic Planning

For strategic planning, the enterprise or community must consider, in the face of the general prevailing socio-economic conditions nationally and regionally:

- a) What are its own goals; in the case of a community, the focus may be community development rather than a focus mainly on profits.
- b) What does it want to do with its forest; should it focus on a few primary products or a wide range of products;



- c) What level of technology it will employ: communities may wish to focus on labour based technologies rather than sophisticated machines that require considerable inputs (in terms of lube oil, diesel, oil filters, etc.
- d) Will the proportion of young people within the community increase substantially?

5.3.2 Operational 3-5 yr (Forest Management) Planning (See Annex 1)

3-5 year periods represent a useful period for the realisation of most short term management goals. 3-5 years represent a convenient time to plan and implement major infrastructure such as roads, train staff, conduct pre-harvest inventories, purchase logging equipment and plan marketing strategies.

5.3.3 Annual Operations Plan (see Annex II)

An annual operations plan is a subset of the 3-5 year operational plan. An annual plan in essence reports on events over the past year, and sets out the extent and scope of activities for the next twelve months (see outline in Annex III). Maps are exceedingly important in describing key operational events, including the location of road works, logged over areas, areas inventoried and to be inventoried, the location of forward camps, etc.

5.4 Basic Planning and other requirements for timber production.

5. 4.1 Basic steps for forest management

The first steps to undertake in the management of a forest area are to:

- a) Establish the extent and borders of the concession area and post suitable notices; and
- b) Establish the nature and extent of its various resources.

5.4.2 The extent and borders of the concession

You can only manage something that you have *control* over (and that is why most of us place a mark on things that we own or put a fence on the perimeter of our properties).

In forestry, it is critical that work in this regard starts off with the proper topographic maps at a scale of 1:50,000 or 1:100,000 depending on the size of the area; such maps are available from the Guyana Forestry Commission (GFC) and the Guyana Lands and Surveys Commission (GLASC) for a small fee.

The next step is to get a proper description of the area to be placed under management. In the case of a forest concession, the description may be obtained from the Guyana Forestry Commission while for Amerindian communities; the description may be obtained from the Ministry of Amerindian Affairs or GLASC. Once there is no major problem with the description, the next steps are to demarcate the boundaries and place sign boards at strategic points. In many cases, rivers and creeks are used as natural boundaries. In many instances though, cut lines are required and in such cases basic surveying skills are required.



Sign boards should contain the name of the enterprise or community and the Forest Licence number. The idea here is that you want anyone who ventures near to the concession to be aware immediately that this concession belongs to someone and that the relevant permission must be obtained before one ventures further.

5.4.3 The nature and extent of forest resources

A reconnaissance survey and a forest inventory are useful ways to start collecting data on the nature and extent of the forest resources (see Annex III for useful tools).

The GFC and the EPA frequently asks new developers in the forestry sector to carry out EIAs that involve in part, collecting very basic data on the concession area. The GFC also issues SFEPs to new developers in order that they may collect basic data on the concession area of interest before formulating their business plans.

A reconnaissance survey involves the collection of data on:

- a) Current land use practices within the area
- b) Communities within the area and whether some residents are available for employment
- c) Options for accessing the area, including routes for conveying timber or other products from the concession area
- d) The roads and trails in the area, their orientation, their condition and who uses them and for what purposes
- e) Other logging, forest based enterprises or conservation measures in the area including eco-tourism or biodiversity reserves
- f) Special indigenous assets to be preserved.
- g) Options for setting up the main administrative centre and forward camps

A forest inventory involves obtaining quantitative data on the forest resources mainly in terms of estimated volume per hectare, estimated number of commercial trees per hectare, estimated number of the key species per hectare, and the distribution of the forest types to allow the developer to obtain a basis for investment. More importantly, the size of trees and the overall volume will help decide cutting levels in terms number of trees per species, total number of trees and the minimum diameter for trees to be felled.

5.4.4 Requirements for timber production.

In order to manage forests as a business, one needs to consider:

- a) The species composition within the area (and in particular the relative proportion of commercial versus non-commercial species).
- b) The technological characteristics of the most important species (in other words, for the existing species, what could the species be used for)



- c) The distribution of diameter classes (the relative sizes of the trees, and in particular, the number of trees with bole diameter >33cm -the legal limit for felling trees). Although the DBH rule is not applicable to private or communal forests, it is a useful standard for holders of such forests to adopt to ensure sufficient residual trees.
- d) Technological options: what product(s) to harvest, in what quantities and in what manner
- e) Marketing options: who wants to buy the products available, where, in what quantities, over what time and what price are they willing to pay.
- f) Social considerations: the availability of skilled labour, training requirements, cultural or religious concerns. (Members of the Seventh Day Adventist Church will not work on Saturdays and such employees require separate considerations).

These considerations guide the collection of data, and the data obtained must be sufficient to form the basis for planning a viable logging operation. Once the data is obtained it must be organised.

Vegetation data superimposed on topographic maps are available from the GFC and provide an excellent starting point for planning because forest types are easily related with terrain; however a management level forest inventory and a reconnaissance survey are useful for getting information on the current or actual conditions on site. Information of soils and geology in the concession area are also important because these have an impact on road construction activities. Such maps are also available from the GFC for a small fee.

5.5 Reduced Impact Logging

5.5.1 Reduced Impact Logging (RIL)

RIL entails the planning of every operational activity. RIL consists of technologies and practices that are designed to minimize environmental impacts associated with commercial timber harvesting operations. There is no single, globally applicable definition of what constitutes RIL because the specific procedures adopted, the environmental standards, and the types of logging equipment used vary with local conditions.

5.5.2 The Basic Elements of RIL phase

Forest organisation:

- Operational plan, compartments, blocks

Planning phase:

- Pre-harvest inventory and mapping of individual crop trees and terrain,
- Cutting of vines



- Pre-harvest planning and indication of roads, skid trails, and landings (on maps)

Pre-harvest activities phase

- Locate and demarcate roads, skid trails, and landings on the ground
- Determine felling direction for each tree based on skid trail lay-out and environmental guidelines
- Mark protected trees (potential crop trees, seed trees, habitat trees) near trees to be felled and along skid trails
- Prepare roads, skid trails, and landings
- Construct roads, landings so that they adhere to engineering and environmental design guidelines.
- Pre-construct skid trails (optional)

Harvesting phase

- Use directional felling and proper bucking techniques, to minimize damage to the residual stand, to avoid waste, and to maximize volume and value recovery
- Winch logs to planned skid trails and ensure that skidding machines remain on the planned skid trails at all times.

Post-harvest phase

- Restore drainage along skid trails by deactivating skid trails after the operation (e.g., by cross ditching) to minimize erosion or water logging conditions.
- Restore drainage of log landings
- Conduct post-harvest assessments to provide feedback to the timber concession holder and the logging crews.



6. STOCK MAPS

Good quality stock maps are essential for good forest management. Stock maps are very useful for summarising information on progress with the timber harvesting operations. Three main types of stock maps are frequently used.

6.1 Concession level stock maps

The typical concession level stock map (see Figure 10) shows in the main baseline data on topography and developmental or administrative measures taken:

(a) Topographic data

- a) The nature and extent of forest types,
- b) water courses,
- c) elevation,
- d) neighbouring concessions

Administrative/developmental measures

- e) Constructed and planned primary roads and the corresponding bridges and culverts
- f) The main administrative centre and its relationship to forward camps
- g) The location and extent of compartments
- h) The position of key access points for the concession
- i) The location of signboards
- j) The location of communities within the concession area

6.2 Compartment level stock maps

Only the scale of the map limits the amount of information that could be displayed on compartment level stock maps (see figures 11).

The blocks in the compartment

- a) Extent of the compartment and position relative to other compartments
- b) Soil types, forest types and topographic data
- c) Blocks harvested and blocks to be harvested
- d) Blocks where pre-harvest inventory has been completed and blocks where pre-harvest inventories are planned (over the next year or so).
- e) The network of planned roads and constructed primary, secondary and access roads respectively and associated structures such as bridges and culverts
- f) Log markets
- g) Forward camps
- h) Key protected areas
- i) Forest reserves and protected areas
- j) Position of sign boards and other notices

6.3 Block level stock maps (see Figure 12a and 12b).

These show in the main:



- a) Skid trails and log markets
- b) Buffer zones
- c) Protected areas
- d) The location of selected commercial trees within the block

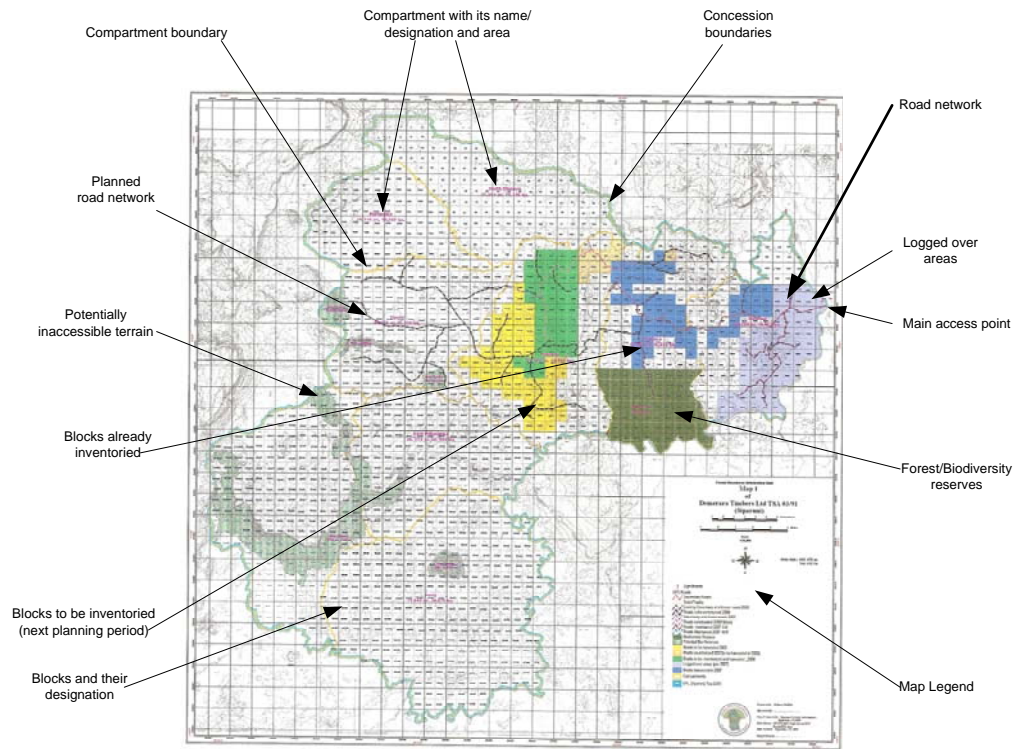


Figure 10: Specimen of a concession level stock map.

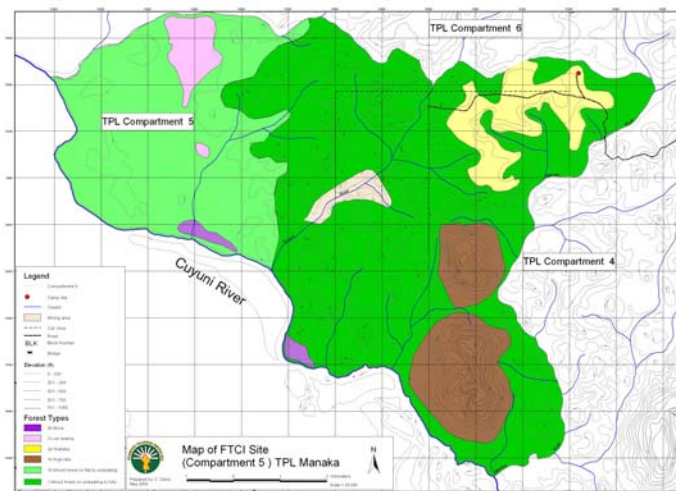


Figure 11: Specimen of a stock map at the compartment level.

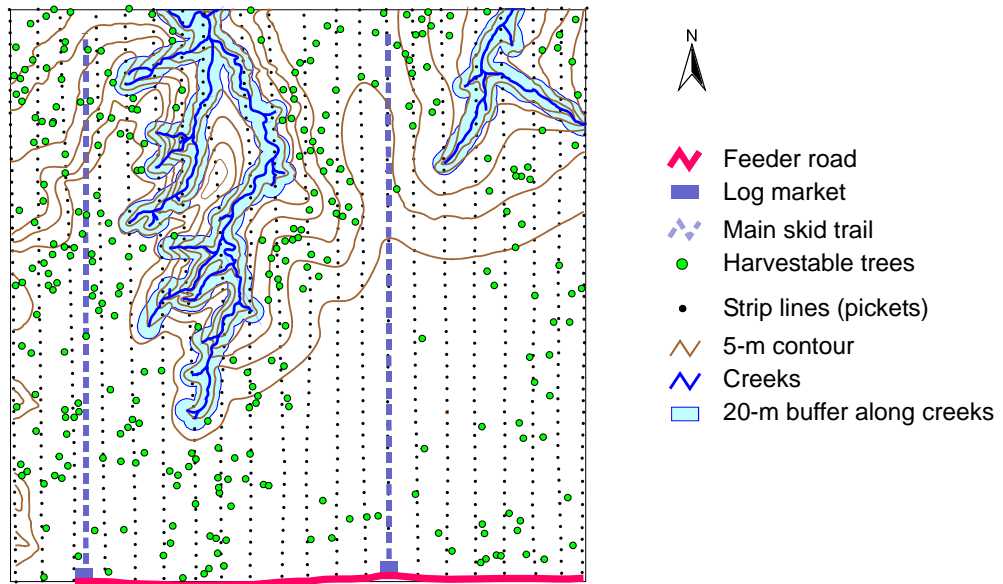


Figure 12a: Specimen of a stock map at the block level

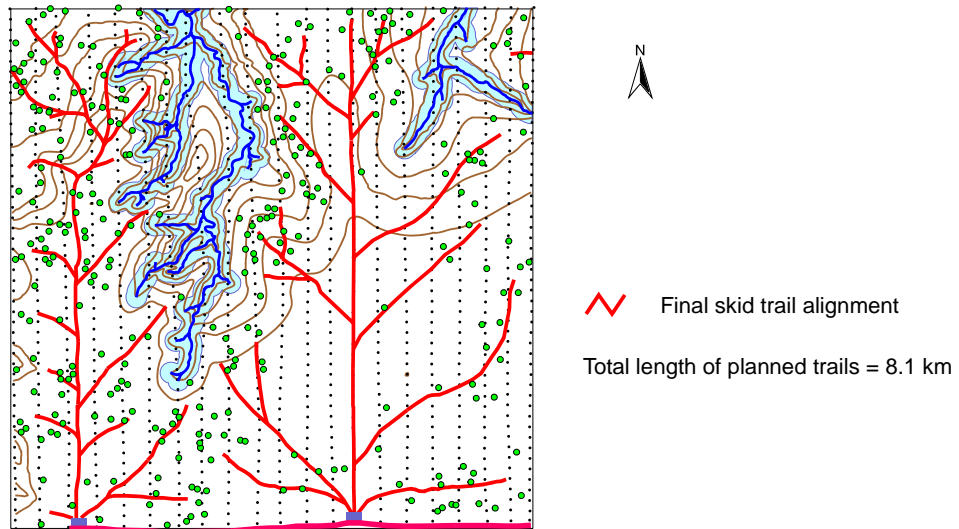


Figure 12b: Specimen of a stock map with skid trails at the block level



7. FOREST CONSERVATION

7.1 Concept

Conservation in forestry not only implies wise use of the resources but the adoption of active measures to ensure commercial stock at short term intervals and prevent undue commercial or ecological degradation of forests. Two primary forest conservation measures are control of yield-regulating the volume harvested per unit area and silvicultural practices.

7.2 Yield Control

Yield control is an important component of forest management because by controlling yield, sufficient commercial timber will be available at specific cycles, and the capacity of the forest to renew itself will be preserved. Foresters have grappled with the question: what is the most effective but practical manner to regulate forest production. Diameter limits, species protection, and volume area limits have been the primary methods used to regulate how much timber should be harvested.

7.2.1 Diameter Limits

Diameter limits are a common method of regulating yield. For example, the forestry authority may decide that no tree with diameter less than 30cm may be felled. The hope is that trees under 30cm dbh will attain or exceed that limit within a reasonable period and allow the harvesting of a second crop of timber. The diameter limit is chosen based on the mean size of merchantable trees—trees big enough to display their best technological properties but not big enough to display many defects or biological degrade. A major challenge in tropical forests is that the actual age of trees are unknown, and frequently different species of the same age may be vastly different in their ages. Diameter limits may apply to all trees or there could be diameter limits per species or for groups of species, based on their technological and utilization properties.

Diameter limits as the only method of yield control is frowned upon because it allows for all trees exceeding the diameter limit to be felled; and where such trees occur in close proximity to each other, significant gaps (or degraded areas) are produced.

7.2.2 Volume/area limits

In this method, using a number of formulas, a cutting cycle is established for the area; for example, if the cutting cycle is 60 years then each parcel or block of forest may only be cut once. Secondly based on data on tree growth and on actual forest stocking gleaned from inventories, a maximum volume per hectare is agreed or prescribed.

In Guyana, the yield per hectare is proportional to the cutting cycle in such a way that the longer the cycle, the higher the yield per hectare. (A 60 year cycle allows a yield of 20m³, while a 50 year cycle allows 16.6m³). In practice, the productive area of the concession is divided by the value of the cutting cycle; then the annual allowable area is multiplied by the approved yield per hectare to establish the annual allowable cut.



For example (in Guyana), a forest concession agreement for a concession area of 10,000 hectares has a productive area of 9,050 hectares and will operate with a 50 year cycle. The annual allowable area will be $9050/50 = 181$ hectares/year, then the annual allowable cut will be $181 \times 16.6 = 3,004.6\text{m}^3$.

7.2.3 Species Protection

This simply entails a prohibition on the harvesting of one or more species based on calculations on the actual number of trees per unit area (its scarcity) or fears that the species is so endangered that it should be protected at all costs.

7.3 Silviculture

Silviculture may be defined as the art of establishing tree crops and controlling their composition and growth. Essentially, forests aim to conserve forests by actually planting trees, by physically enriching a parcel of trees with certain fast growing, high value commercial species or by establishing plantations of high value species to avoid or reduce the rate of harvesting of natural forests.

7.4 Other forest conservation measure

7.4.1 Laws, Codes of Practice

Many countries conserve forests by producing Laws and Codes of Practice which aim to:

- a) Regulate the size of gaps (distance between trees, prescribing the width of roads, the size of log markets)
- b) Minimize hazards such as fires, water logging which can lead to forest degradation or forest loss
- c) Control the disposal of potential pollutants which can lead to forest degrade
- d) Place restrictions on hunting to ensure sufficient stocks of fauna to maintain plant pollination and seed dispersal processes

7.4.2 Forest reserves & protected areas

Many countries deliberately set aside significant representative parcels of natural forest as forest reserves, where no interventions for commercial harvesting of timber are allowed.

7.4.3 Reduced impact logging

RIL, with its emphasis on planning all interventions allows post harvest forest conditions not very different from the original forests, there is a mere reduction in commercial stock.



8. OCCUPATIONAL SAFETY & HEALTH

8.1 Introduction

Forestry is one of the most hazardous industrial sectors in most countries around the world. Safety at work is not only ethically imperative but also makes economic sense. Good occupational health and safety performance in forestry depends on the awareness and required attitude of workers.

8.2 Employer's commitment

The employer's commitments include the provision of a safe working environment for employees and the installation and maintenance of systems and methods of work which are safe and without risk to employees' health.

8.3 Orientation and training

Occupational health and safety orientation is necessary for all employees of all logging companies. The company should hold training seminars on safety. The company should have an accidents and incidents investigating committee. Training of employees should be both initial and continuing. Individual proficiency verification would be an asset for employer and employees.

8.4 Benefits of a safety programme

The benefits of a safety programme include: saving lives and preventing injury; reducing unnecessary damage to equipment; increasing job efficiency and production; and providing better job satisfaction and higher working morale.

8.5 Occupational health and safety practices

All personnel who enter the forest whether as a worker or observer must be equipped with some basic safety apparel: safety helmet, safety footwear, high visibility garments, suitable clothing (see figure 13).



Figure 13: Specimens of basic safety items for forest operatives

Eye protection and protective apparel for other parts of the body should be worn whilst working with impact tools. Effective ear protection should be used. Additional equipment



should be carried in a manner that leaves the hands and feet free. Dangerous equipment e.g. sharp, edged tools should be sheathed, and operated in a safe manner. Flammable fuels and oils, dangerous chemicals and explosives should be carried in approved containers, transported and stored in the approved manner and used in compliance with the appropriate laws and guidelines. Chemicals used in the forest should be handled with care and protective apparel must be worn.

Supervisors must act to rectify dangerous behaviour. Persons should be made aware of potentially dangerous situations. All personnel should be made aware of the danger of falling objects within the forest. Under no circumstances should anyone work in the forest under the influence of drugs or alcohol. Persons taking over the counter drugs should seek medical advice before engaging in field work. The employer must maintain a register of all work-related illnesses, accidents, or near misses that occur at the work place.



9.0 INTRODUCTION TO MARKETING

9.1 Definition

We may define marketing as the process of planning, developing, promoting, distributing and selling ideas, goods and services that meet the needs of individuals, communities, and organizations.

Marketing is more than just selling. When we really want to sell something we advertise it more often, we reduce its price or we add certain bargains or incentives to encourage people to buy the item. Marketing focuses on getting buyers what **they** want. If people want kiln dried lumber, then we will organise our productive assets to produce the kiln dried lumber. Marketing is an ongoing process because what people want today may be very different from what they want tomorrow.

9.2 Marketing and forest management

The basis for forest management is the production of some goods or services which people want; once we know what people want and we have the capability to produce to the standard required, the higher the probability of a successful enterprise.

It follows then that the use for the timber of any tree at our disposal should be determined and the timber should be 'sold prior to felling the tree. We should avoid felling trees first, and then trying to sell the timber afterwards. Source a consumer, determine what that consumer wants, then create the operations to generate the product. Once a community knows that people want *crab oil* or *organic cocoa* or *access to good fishing grounds*, it is relatively easy to first of all make a decision about whether the community has the capability to get involved in the venture to produce such items or services

9.3 The essentials of 4Ps of marketing

The essential 4Ps of marketing are:

Product: entails finding out what customers want and what can actually be produced taking into account available technology and the structure of costs;

Place: Distributing products-seeking out feasible ways to get the products to the from the forest or mill to the end consumer

Promotion: Promoting products - promotion involves advertisement, product labelling and favourable press coverage and praise from other consumers;

Price: Pricing products to maintain consumer interest and demand while trying to maximise profits to ensure a viable enterprise.



9.4 The need to understand marketing

We need to understand marketing for three fundamental reasons

Customers are the reason why businesses exist; therefore marketing is important to every forest enterprise. It is essential to obtain and **conserve the interest of consumers** in the products we sell; and we need to be alert to trends in consumer behaviour so we can adjust our marketing to meet their requirements.

The promotion and distribution of timber and non-timber products frequently account for more than half **the price of a product**. A good understanding of marketing can therefore help us keep our costs down or at least allow us to compete with other producers.

Thinking about marketing considerations lead to better entrepreneurs. Thinking about consumer needs and ways of meeting such needs in a timely manner help individuals, communities and organizations better **manage businesses to adapt to emerging challenges** and consumer interests.

9.5 Niche Markets

Niche market refers to a specialized and targeted but profitable segment of a market. A niche market is in fact a narrowly defined group of potential customers. An enterprise that focuses on a niche market, addresses a need for a product or service that is not being catered for by mainstream providers.

Niche markets are useful because:

- niche markets frequently tap relatively small high value resources
- other businesses may not be aware of a particular niche market
- some large businesses may not want to bother with a niche market because it's too small for them (not profitable enough)

9.6 Getting ready for the market-key questions to answer

Some useful questions for reflection before entering a particular market are:

- a) Do you have the products for your market type?
- b) What do you need to do to enter your preferred market?
- c) Do you have the personnel and team to help you enter the market?
- d) What do you expect to achieve in this market?
- e) How do you give yourself the greatest chance of being successful in the market (in terms of quality, reliability)?
- f) How do you want to distribute your products?
- g) Who can you turn to for assistance?



10.0: RECORDS

It is important to maintain operational records to help monitor whether goals are being met, to help monitor costs, to help appropriate agencies (for example, commercial banks and the GFC) to monitor operations and compliance with operational criteria set by those agencies.

Although, many agencies including the GFC request records from logging enterprises, including community based enterprises, the records are in fact very valuable tools for the enterprises themselves.

Important records that should be kept by every logging enterprise include:

- a) Employment matters (employees x gender x nationality)
- b) Remuneration records especially as these relate to contracts and statutory payments of income tax and NIS
- c) Inputs (fuel and lubricants, rations, spares, etc.).
- d) Production (volume x block x year)
- e) sales (volume/markets/year)
- f) industrial disputes or any major activity with trade unions
- g) special projects with communities
- h) log tags and removal permits registers
- i) Accident register

Note that stock maps are also an excellent source of information and record keeping for logging operations planning and implementation.



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Annex 1: FMP Outline: Guyana Forestry Commission

Foreword

Acknowledgements

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 - 12.2.1 Illegal operations
 - 12.2.2 Fire
 - 12.2.3 Pest and disease management
 - 12.3 Use of Chemicals
 - 12.4 Biodiversity reserves
 - 12.5 Coordination with other resource users
- 13. Monitoring and research
- 14. Social Issues
 - 14.1 Training initiatives
 - 14.2 Employment policies
 - 14.3 Issues of employee welfare
 - 14.4 Trade unions
 - 14.4.1 General Agricultural and Workers Union
 - 14.4.2 Guyana Labour Union
 - 14.5 Contractors
- 15. Markets and utilization
 - 15.1 Timber products for the next five years
 - 15.2 Markets for DTL
 - 15.3 Processing facilities
- 16. Records
 - 15.1 Records maintained by the concessionaire
- 17. Maps



Annex **II**: Outline of Annual Operations Plan: Guyana Forestry Commission

1.0 Introduction

- 1.1 Details of Concession Licence
- 1.2 Brief background of the company/individual
- 1.3 Linkages to the current Forest Management Plan

2.0 Review of work carried out in previous year

- 2.1 Area (ha) logged by compartment and felling block
- 2.2 Number of Trees and volume (m³) felled per species, by compartment
- 2.3 Mean annual volume felled per hectare (m³/ha)
- 2.4 Forest Inventory completed during 2006
- 2.5 Inventory methods and summary of results to date to be appended
- 2.6 Biological, ecological or other survey methodologies
- 2.7 Road construction or access completed (km)
- 2.8 Road maintenance completed (km)
- 2.9 Waterway access and maintenance (km)
- 2.10 Base/Forward Camps completed
- 2.11 List of Employees
- 2.12 List of work related accidents and or industrial disputes, if any
- 2.13 The Status of community based initiatives

3.0 Physical Infrastructural Works planned for 2007

- 3.1 Road construction or access road completed
- 3.2 Road maintenance completed
- 3.3 Base/Forward camps planned for 2007
- 3.4 Waterway management
- 3.5 Forward camps projected for 2007

4.0 Inventory Operations planned for current year

- 4.1 Forest enumeration
- 4.2 Other biological, ecological, cultural surveys
- 4.3 Tree location maps
- 4.4 Plans for tree marking

5.0 Production operations planned for current year

- 5.1 Area (ha) to be logged by compartment, felling block
- 5.2 Number of trees, volume (m³) to be felled per species

6.0 Other Operations planned for 2007

- 6.1 Boundary demarcation and maintenance tasks
- 6.2 Concession monitoring activities
- 6.3 Procedures for the disposal of wood waste
- 6.4 Records, registers maintained by the company
- 6.5 Machinery assets available for use in 2007
- 6.6 Consultants, Contractors to be employed in 2007



- 7.0 Social Issues to be addressed in 2007
 - 7.1 Workers, contractors and consultants to be employed
 - 7.2 Occupational health and safety practices
 - 7.3 Employee training projected for 2007
 - 7.4 Outreach activities planned for nearby communities
 - 7.5 Public awareness efforts
 - 7.6 Community development efforts
 - 7.7 Contracts in place for 2007

- 8.0 Significant policy changes since the submission the FMP

- 9.0 Interagency Collaboration

- 10.0 Collaborative activities with public agencies and NGOs

- 11.0 Maps

- 12.0 Annexes



Annex III: Useful tools for forest operatives



GPS Device

A **GPS Receiver** is a device that receives Global Positioning System (GPS) signals for the purpose of determining one's present location, mapping one's route, or determining the direction and distance (polar coordinates) relative to one's present location and any other location whose coordinates are known. In forestry it is used to establish plan surveying tasks (for example the starting points for lines), to monitor progress with and the accuracy of surveying tasks, and to validate field work.



Compass

A **Compass** is a magnetically sensitive device capable of indicating the direction of magnetic north; it is therefore used for determining direction relative to the earth's magnetic poles. The face of the compass generally highlights the cardinal points of north, south, east and west. It is used in forestry for conducting surveying works related to boundary demarcation, forest inventory and skid trail alignment.



Clinometer

A **Clinometer** is an optical device for measuring vertical angles. It is used in forestry mainly for establishing slope angles, which is critical in measuring horizontal distances in surveying and in road and skid trail construction. Clinometers may also be used for computing tree heights.

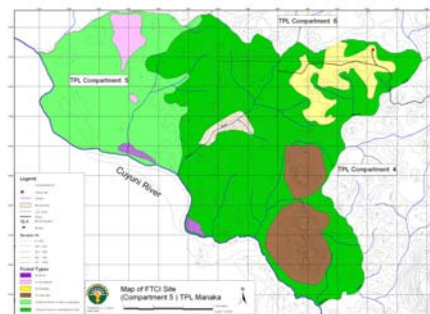


Diameter Tape

A **Diameter Tape** is a cloth or metal tape used to determine the diameter of a tree at breast height, by measuring the circumference of the bole at breast height. Diameter is one of the most critical measurements in forestry and is vital for the computation of the volume of the tree. Diameter tapes are also used to establish whether a tree meets the minimum diameter limit established by the GFC and the logger respectively.

Maps:

- **Planimetric maps** : Useful for indicating boundaries, locations of signboards, forward camps
- **Topographic maps** : provides profiles of the terrain; useful for planning the primary road network
- **Thematic maps** : provides very specific information- vegetation types, soil types, road, log market and skid trail network; blocks and compartments, stock maps



Example of a vegetation map



Annex IV: Scientific names of some plants and animals cited in the Manual

#	Common name	Scientific Name
A. Plants		
1	Akuyuru	<i>Astrocaryum spp</i>
2	Anatto	<i>Bixa oreallan</i>
3	Awara	<i>Astrocaryum spp</i>
4	Baromalli	<i>Catostemma commune</i>
5	Bulletwood	<i>Manilkara bidentata</i>
6	Cashew	<i>Anacardium spp.</i>
7	Congo Pump	<i>Crecoxia peltata</i>
8	Crabwood	<i>Carapa guianensis</i>
9	Dallibana	<i>Genoma baculifera</i>
10	Fat pork	<i>Chrysobalanus spp.</i>
11	Haiari	<i>Lonchocarpus chrysophyllus</i>
12	Ité	<i>Mauritia flexuosa</i>
13	Kokerite	<i>Maximiliana maripa</i>
14	Kufa	<i>Clusia gandiflora</i>
15	Kunami	<i>Phyllanthus brasiliensis</i>
16	Locust	<i>Hymenea courbaril</i>
17	Maho	<i>Sterculia pruriens</i>
18	Plum	<i>Spondias mombin</i>
19	Rubber	<i>Hevea sp.</i>
20	Truli	<i>Mannicaria saccifera</i>
21	Turu	<i>Jessenia batau</i>
B. Animals		
1	Arapaima	<i>Arapaima gigas</i>
2	Baboon	<i>Alouatta palliata</i>
3	Boa	<i>Boa constrictor constrictor</i>
4	Cabybara	<i>Hydrochaeris hydrochaeris</i>
5	Caiman	<i>Caiman crocodilus</i>
6	Coatis	<i>Naswa nasva</i>
7	Deer	<i>Mazama spp</i>
8	Hogs	<i>Tayassu spp.</i>
9	Iguana	<i>Iguana iguana</i>
10	Jaguar	<i>Panthera onca</i>
11	Macaw	<i>Ara spp</i>
12	Ocelot	<i>Leopardus pardalis</i>
13	Opossum	<i>Monodelphis brevicawdata</i>
14	Otter	<i>Lutra longicaudis</i>
15	Parrot	<i>Amazonia spp</i>
16	Powis	<i>Crax alector</i>
17	Sloth	<i>Bradypus sp., Choloesus sp.</i>
18	Tapir	<i>Tapirus terrestris</i>
19	Tortoise	<i>Geochelone spp</i>
20	Toucan	<i>Rhamphastos tucanus tucanus</i>