

FOREST MANAGEMENT

Wuthipol Hoamuangkaew¹

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INTRODUCTION

Forestry plays an important role in the economy of a number of countries in every region of the world because it is not only provide tangible value (wood and non-wood products) but also intangible value (soil conservation, flood control, preservation of environmental quality, recreation, plant and animal genetic resources, carbon sequestration etc. In the recent years, forest cover has declined substantially in developing countries, particularly in tropical regions. In the tropical countries of Asia, deforestation amounted to 3.9 million hectares per year between 1981 and 1990. The major direct cause of deforestation and forest degradation in Asia and the Pacific is clearing for agriculture (including shifting cultivation). Land-use change have varied considerably among the sub-regions. This mainly due to population increased pressure, rapid and often tumultuous political and socio-

economic change (FAO, 1998). Hence, forest are managed for multiple uses because multiple uses are unavoidable. Effective systems of management can ensure that biological resources not only survive, but in fact increase while they are being used, thus providing the foundation for sustainable development and stable national economics. Thus, the aim of this paper is to present the principles of sustainable forest management for multi-purpose and creating a supportive environment for sustainable forest management as well as people participation in forest management.

SUSTAINABLE FOREST MANAGEMENT

Forest management is defined as dealing with “.....the over administrative, economic, legal, social technical and scientific aspects involved with the handling of conservation and use of forests. It implies various degrees of deliberate human interventions, ranging action

¹ Department of Forest Management, Faculty of Forestry, Kasetsart University, Bangkok Thailand 10900

Corresponding e-mail: fforwth@ku.ac.th

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aimed at safeguarding and maintaining the forest ecosystem and its functions to favoring given socially or economically valuable species or group of species for the improved production of goods and environmental services” (FAO, 1991).

Sustainable development is defined as “.....the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for the present and future generations.

Thus, the concept of sustainable forest management must define the role of the forestry sector in contributing to all aspects of development. The impacts of sustainable forestry management practices on the environment and on society must be sufficiently quantified to permit rational choices between competing interests while at the same time justifying the allocation of scarce funds to the forestry sector.

Sustainable forest management therefore involves planning the production of wood for commercial purposes as well as meeting local needs for fuelwood, poles, food, fodder, and other purposes. It includes the protection or setting aside of areas to be managed as plant or wildlife conservation, or for recreational or environmental purposes. It is concerned with

ensuring that conversion of forest lands to agriculture and other uses is done in a properly planned and controlled way. It also covers the regeneration of wastelands and degraded forests, the integration of trees in the farming landscape and the promotion of agroforestry. It is a multidisciplinary task, requiring collaboration between government agencies, non-governmental organizations (NGOs) and, above all, people, especially rural people, it is concerned at local, national, regional, and global levels (FAO, 1993)

Sustainable forest management for wood production.

The sustainable management of forests for wood production is based on a deceptively simple principle: the harvesting rate is no greater than the growth rate. The problem of sustainable management arises from the difficulties coordinating the four elements involved ascertaining the increment, identifying the appropriate part of the forest to be felled to the increment, replacing that part of the forest to be felled in conjunction with the harvesting operation and harvesting so that no serious and permanent damage results to other goods and services or to the forest capacity to continue supplying them in the future. The first two elements taken together cover the yield regulation

part of a sustainable management system, the third the regulation or silvicultural part, and the fourth the harvesting part. In practice, it is not easy to devise, measure, apply or monitor any one of these, and the difficulties are compounded because all parts have to work together and simultaneously. The difficulties increase with the ecological and structural complexity of the forests to be managed and their economic and social environment (Janzen, 1975).

The consequent and some what necessarily ad hoc nature of economic planning under the above circumstances rarely favorable for sustainable management of resources. Management plans can be easily over ridden by the more powerful political and social appeal of such considerations as income and employment generation or foreign exchange earnings.

A well-defined and stable sustained yield unit is it sensible to estimate the allowable cut, i.e., the average quantity of wood that can be harvested from the unit, annually or periodically, under sustainable management. The sustainable yield results from a combination of the following four elements: the wood increment over the unit as a whole; the distribution over the unit of the age or size classes of the trees producing the type of wood required; the methods used to replace the trees removed in the harvesting area; and safeguarding of the

supply of other products and services and respect for the other parties with interests besides those of wood production, especially during harvesting operations and silvicultural treatments.

There are three factors affecting the success in forest management namely:

1. The interaction between the yield regulation and the regeneration parts of management. Under ecological conditions in which the primary function of the canopy openings is to release already established regeneration, simplifications in yield regulation by area are less risky than when the openings must induce the regeneration.

2. The typically uneven aged structure of most tropical moist evergreen forests. In this structure, neither size nor position in the canopy is a reliable guide to relative maturity of the many species in the highly variable forests. Silvicultural selection systems in association with more direct volume control seem to be a safer and more logical basis for sustained yield management.

3. The economics of logging under prevailing market and commercial conditions, virtually dictates forest management possibilities for most of the tropical moist forest. It alone is enough to rule out sustainable management consistent with the biological, structural and other social factors as a feasible proposition,

while making even sustained yield management primarily for wood a doubtful one. This is because these market structures and patterns as well as the accompanying commercial relationships force operators into high-output, heavy technology, short-cut logging systems. These are physically and economically incompatible with management systems that for sustained yield, depend on following the regeneration or on carefully calculated and controlled canopy openings in order to induce regeneration. They are even less compatible with the standards that must be met under sustainable management for products and services other than wood.

Based on the conception of sustainable management framework for wood, the technical characteristics of forests can be combined with the markets for woods and other non-wood products. The sustainable management of forest is relatively easy if they can be effectively protected from forest fire and conversion to other forms of land use and if they are not then commercially exploited for industrial wood.

In case of sustainable management is to included industrial timber production, sustained yield management for wood must be combined with very low-impact harvesting. To qualify as a low-impact system, harvesting has to be conducted under these conditions: the

felling of very few trees per hectare; negligible damage to the residual stand, any advanced growth and already established regeneration; retention and protection of trees, shrubs, vines, palms and ground flora that have actual or potential commercial or handicraft value an ecological or cultural significance as food or forest fire or importance in environment, stream bank and soil protection or the conservation of biodiversity, or that serve as link in food, pollination and seed dispersion chains.

The four additional conditions on any logging system:

1. No heavy machinery for skidding is to be used.
2. Careful and accurate directional felling should be carried out
3. Road and extraction routes are to be planned, designed and constructed to conform to standards for environmental protection and social and cultural welfare rather than primarily to minimize log transportation costs. This implies narrow road line clearings, avoidance of vulnerable slopes and sensitive localities, minimum of earth movement and the highest standards for surfacing, maintenance drainage and stream crossing as well as camps and settlements.
4. Operations are to be suspended during wet weather and for some time

afterwards.

One inevitable consequence will be greatly increased harvesting costs compared with those of most current operations. The costs of low-impact harvesting are the unavoidable price of sustainable management just only for management based on some form of selection silviculture. In order to reduce the costs of low-impact harvesting, so the harvesting have to revert to low-powered system in which planning and highly skilled operators are substituted for the high-power, high output system characteristic of present harvesting (Tropical Science Centre, 1982). In addition, management will therefore have to concentrate only on those species that now or could command prices high enough to carry the cost of low-impact harvesting.

Feasibility of low-impact management in wood production seem to rest on a return to the despised practice of high grading, but it also implies that considerable effort expended to increase utilization of lesser-used species is misguided. To prevent the focus on high-value species from degenerating into a device for high grading, the diameter limits corresponding to the technical rotation for the target species and the target products should be guiding rather than binding. In the selection of trees for harvesting, therefore, silvicultural considerations must

override the diameter limits. The allowable cut could thus include some trees below the diameter limits as well as some above them. The ruling criterion would be improved productivity potential in the broadly defined sense and not present marketability. The second implication is correct. It would be wrong only if a virtually impossible combination of conditions prevailed such as the extra volume harvested with the more intensive utilization of lesser used species would have to improve the financial revenue to cost ratio substantially, silvicultural systems approaching clear-felling would have to be generally applicable, and harvesting under such systems would have to have a negligible adverse impact on all other products and values.

Sustainable management for non-wood forest products.

Non-wood forest products are all of the biological material (other than round wood, sawn timber, wood-based panels, wood chips and pulp) that may be extracted from natural ecosystems and managed plantations. Non-wood forest products are an integral part of the survival and development strategy for the continuing well-being of man, livestock and native flora and fauna. Thus forest management can no longer be concerned solely with timber production. It is also necessary to consider

environmental impact studies and the effect of timber production on the well being of local people in terms of floral, faunal and medical ecology, ethnobiology, sociology, etc.

The aim is to provide essential products and services while simultaneously allowing for the needs of the local rural people. For non-wood forest products the challenge is therefore to assist development while simultaneously promoting the continued and possibly increased sustainable utilization of such products (Wickens, 1991)

There is a wide variation in management requirements associated with non-wood forest products, reflecting the varied environmental requirements and habitats of the species concerned. Furthermore, other management requirements include such diverse interests as the local communities acting either as individuals or collectively, external entrepreneurs acting independently of the local community, and local or national government agencies with interests and policies that may or may not reflect the well-being of the local community. Thus, there can be no single solution to the management requirements for non-wood forest products.

Both natural and man-made forests are a rich source of non-wood forest products. Unfortunately, harvesting their wild products is

sometimes inefficient and using destructive method. The potential markets for some of these products has resulted in their replacement by cheaper, synthetic products. The need for a constant supply, as in the case of pharmaceutical products, has led to synthesization. Thus, entrepreneurs and government policy-makers need to consider supply, demand and global economics affecting the more commercially viable non-wood forest products, which may or may not concern the rural user. Moreover, the natural resources may be managed and maintained by the community without any need for government intervention.

Sustainable management for soil and water conservation.

Forest management for soil and water conservation is carried out for many purposes or for combining several complementary or conflicting objectives. Scenarios range from cases where the only requirement is to establish norms for minimizing damage to soil and water resources by observing a few basic management rules including road construction, land preparation, pest control and forest harvesting to case, such as municipal watersheds in humid tropical mountain areas, where the need for undisturbed forest cover may be so overriding as to exclude all activities that would affect or change the

forest vegetative cover.

Management option for sustainable soil and water conservation. Soil and water considerations constitute the sole objective of forest managements only in a few cases, such as small step municipal watersheds. Thus, this will call for the management options as follows

1. Natural vegetation and plantations.

Plantations have often been used by government forest services, even when the main objective was land reclamation, which could have been achieved more suitably, both economically and biologically by regenerating natural vegetation. However, the local population would not respect the protection of natural regeneration in the same way as with a plantation, commonly the exotic species. Nevertheless, with the increased understanding that sustainability can only be achieved with the active participation, from the planning stage, of the local population, a change is due in the way forest service activities are implemented.

Forest plantation is the best option for watershed management especially for land suitability and the long-term land use objective, it is still possible to consider a range of alternatives aimed at optimizing the soil and water conservation benefits of such plantations.

Forest plantation do not necessarily provide good soil protection unless litter and

ground cover is favored and maintained, mostly through early thinning, pruning etc. Similarly, grasses and other undergrowths can be stimulated by the variation of spacing.

Although management is emphasized, species selection remains an important factor. In most cases, however, the decision to plant rather than rely on natural vegetation would have been based on the mix of major and minor forest products required. Species selection would be based on this factor, combined with an analysis of the corresponding site factors, including soil and water conservation. Species selection should always be based on local criteria and objectives.

2. Plantation by agroforestry system.

The sustainability of agroforestry systems is based on three major factors: maintenance of biomass production levels; return per person-day to the farmer compared with alternative sources of income; and maintenance of site productivity and other environmental factors (Young,1988) the contrary, rather than looking up into the tree crowns, it is necessary to look down at the ground cover in order to assess the effectiveness of trees in soil conservation.

A strategy for the future, sustainable forest management for soil and water conservation cannot be separated from the social and economic conditions generally governing

society. The first guiding principle should therefore be to consider forests in the national and local socio-economic context. Second, it is useful to distinguish between six different scenarios: 1) natural forest which should be protected in its natural state for water, wildlife and genetic resources conservation; 2) natural forest subject to the harvesting of timber and non-wood forest products according to a forest management plan; 3) forest plantations, 4) land-use conversions to plantation crops, pastures, agroforestry, agriculture, urban land uses; 5) shelterbelts and other environmental tree planting. Third, people and communities affected should participate in planning and local communities in general have no incentive to protect forest resources. Finally, institutions, including government agencies and farmers organizations, must be given continuing support to ensure long-term stability. Otherwise, no confidence will be attached to agreements, management plans, grazing rights, etc.

Sustainable management for conserving genetic resources in forest ecosystems.

Forest, the biological diversity they contain and the ecological functions they help maintain are a heritage of human kind. Forests and woodlands contain a large range of species of actual or potential socio-economic importance

globally, nationally and locally, including wild-life species, wild relatives of important crops and trees producing wood and timber, fodder, fruits, latexes and other products. Forests are in a key position to help ensure the conservation and wise use of these valuable resources (FAO 1988). Genetic diversity in forest ecosystems and variation among and between species are the basis for their adaptation to environmental stress, including the future, and possibly more extreme, effects of global climate change and the emergence or introduction of new pests and diseases. Furthermore, genetic diversity is the fundamental base for sustainably developing and improving forest resources for human use. This is an urgent need, as the expansion of human populations and ever-higher aspirations for economic development demand a more efficient use of the finite land resource and the conservation of the resource base. Genetics resources include the economic, scientific or social value of the heritable materials contained within and between species. The values derived from genetic resources are generally associated with the different levels of organization and diversity that exist in nature, from ecosystems to species populations, individuals and genes (FAO, 1988). The conservation of genetic resources at the species and intra specific levels in natural forests depends on maintaining essential

functional components of the ecosystem. This may include interactions such as symbiotic relationships and interdependence between tree species and their animal pollinators, seed dispersers, etc.

The conservation of natural forest eco-systems is an important function of national parks and other fully protected areas and may often be compatible with other objectives such as watershed management or the protection of wildlife resources.

Forests are naturally dynamic systems, subject to cyclical changes through periodic disturbance, senescence and ecological succession. Their genetic diversity particularly in the more complex formations, results not only from the number of species present in a given area ,but also from successional changes. The richest areas of diversity are likely to be those including secondary forest in various stages of recovery. Depending on the forest management system and the degree of understanding of forest dynamics underpinning it, genetic diversity and specific genetic resources may be enhanced by human intervention in given areas of forest over given time periods. The most vital need in conservation is the adequate control and continuity of management to meet specified aims and to be carried out within consistent land-use plans and national forest

policies. Based on a sufficient knowledge of forest composition and dynamics, management system aimed primarily at producing timber and other forest products, and services can contribute substantially to conserving a forest's genetic resources.

Management systems aimed at combining production objectives with the conservation of genetic resources require some understanding of both forest dynamics and the genetic structure of species and populations. Understanding genetic diversity and the patterns of distribution of genes within and between the target populations is critically important for efficient conservation strategies, both in situ and ex situ. The genetic structure of a species results from mutation, migration, selection and gene flow between separate populations, and it is strongly influenced by the genetic system, embracing the breeding system and dispersal mechanisms for pollen and seed.

Knowledge of the genetic structure has implications for the location, number, size and management of in situ conservation stands and for sampling for ex situ conservation. However, even without such knowledge it seems likely that, for out-crossing and widely distributed species, a few populations in each major geographical zone may be sufficient to conserve much of the genetic diversity

(National Research Council, 1991). Genetic conservation need not cover all populations, but those in different ecological conditions are more likely to contain different genotypes, genes and gene frequencies. By targeting ecosystems at the extremes of a species natural distribution range, with an effective population size of a few hundred individuals each and a total population of a few thousand, sampling will ensure a high probability for capturing alleles (Namkoong, 1991)

Tree species of proven economic value that are already used in large-scale plantation programs are frequently subjected to genetic improvement programs, which include the selection, breeding and propagation of desirable individuals. Even when multiple population breeding programs are planned maintain or enhance genetic diversity of the species in use, some elements of the diversity in the original wild population may be incidentally lost. Sustainability in long-term plantation and tree improvement programs may ultimately depend on retaining access to the original wild populations, left to evolve and adapt to changing conditions. These original populations, furthermore, constitute a standard against which others, of different provenance or the result of selection or breeding, may be judged.

Sustainability of forests through protection from fire, insects and disease.

Forest Fire, insects and disease are integral parts of forest dynamics. However, under certain conditions, they adversely affect the flow of goods and services that forests provide. They can affect tree growth and survival, wood quality, water quality and yield, wildlife habitat, recreation, scenic values, forage for domestic animals and cultural resources. Consequently, measures to protect forests from fire, insects and disease must be integral to forest management if sustainable levels of goods and services are to be assured.

Forest Fire is a natural component of many ecosystems but it can adversely affect the ability of forest to produce sustainable levels of goods and services. Forest Fire kills vegetation : even fire-tolerant trees that sustain injury from fire may be more susceptible to attack by insects or fungi (Amman and Ryan, 1991). More intense fires can kill all vegetation on a site and destroy years of growth in a matter of hours. Habitat for indigenous flora and fauna may be lost. Usually, many years are required for a site to recover from a forest fire. The destruction of vegetation by forest fire causes soil erosion, especially on steep slopes, which can lead to landslides and the situation of water supplies.

Fire occurrence and behavior depends on fuels more than any factors. Forest fuels are generally classified into three categories; ground fuels, surface fuels and aerial fuels. Ground fuels include duff, decayed wood and peat. Surface fuels consist of the loose litter on the forest floor and include fallen foliage, twigs, bark, cones and small branches. Aerial fuels include all burnable material, living or dead located in the understorey or upper forest canopy.

Climate factors such as temperature, moisture and atmospheric stability influence the probability of an ignition and the rate at which fuels are consumed by forest fire. Increasing temperatures, decreasing moisture levels and increasing wind velocities favour the intensity and rate of spread of fires.

Topography can significantly influence fire behavior. Steep slopes favour the spread of forest fire, a fire moving up a steep slope often resembles a fire spreading before a strong wind (Brown and Davis, 1973)

Forest fire management encompasses three activities required to protect wildland resources from fire : prevention, presuppression and suppression. Fire management also includes the use of prescribed fire to meet land management objectives (USDA Forest Service, 1990). Prevention includes two general areas; activities directed at people, the major cause of

fire, and activities directed at mitigating the flammability of forest resource. The former include public information campaigns and fire prevention messages. The latter include fuel management to reduce fire risk (e.g. prescribed burning, thinning, brush removal). Legislation must complement fire prevention by establishing the setting of incendiary fires as a crime and penalizing offenders in proportion to the damage caused (Velez, 1990). Prevention also benefits from regulations defining the conditions under which intentional burning can be undertaken. Prescribed burning is an effective fuel management tool in forests of fire-tolerant species and benefits include reduced hazardous fuels, disposal of logging debris, site preparation for seedling and planting, improved wildlife habitat and management of competing vegetation. Presuppression includes all fire management activities planned and accomplished in advance of an ignition. They are designed to ensure effective suppression and include fire planning, detection, dispatching, fire danger rating, fire weather monitoring and suppression training and qualification (USDA Forest Service, 1990). Suppression. The objective of fire suppression is to suppress forest fire at minimum cost consistent with land and resource management objective. There are three methods for bringing a forest fire under control. A direct attack is an

attack on the burning edge of the fire and is used when fires are small. A parallel attack involves the construction of a fire line parallel but close to the edge of the fire. An indirect attack is used when the fire is too intense for other means of attack and entails the construction of fire lines some distance from the fire edge and the burning out of all intervening fuels (Chandler, *et al*, 1983). Insect and disease. Forests are also damaged by various pests. These include insects, mites, fungi, bacteria, parasitic plants, anthropogenic pollutants and other agents. Approximately 751,000 insect species, or 54 percent of the world's known living organisms, have been described (Wheeler, 1990). Disease. Plant disease is defined as any deviation in the normal functioning of a plant caused by a biotic (non-living) and biotic (living) factors. A biotic factors include air pollution, temperature extremes, drought, chemicals or mechanical damage. Biotic factors include fungi, bacteria, virus, insects, mites, and parasitic plants. Disease can be recognized by symptoms and signs. A symptom is an expression of disease. Diseases often have unique symptoms which are helpful in identifying the pathogen: reduced growth, dieback, decay, yellowing or chlorosis of foliage or abnormal growth. Fungi are a leading biotic cause of tree disease. They cause wood decay, rusts, cankers, foliar diseases, wits

and root rots. Some fungi benefit trees. Mycorrhizae act as extensions of a tree's root system and increase water and nutrient uptake and resistance to root disease (Manion, 1981). Several groups of parasitic plants cause growth loss, deformity and tree mortality. Every part of tree can be host material for insects and disease. Trees of all ages, from seedlings to mature trees, are subject to attack. In addition, insects and diseases are pests of logs and wood products. Thus, in order to sustain the forest resources, fire, pest, and diseases programs should be designed to reduce losses in line with resource management objectives. They include both prevention and suppression strategies. Detection and monitoring are important in ensuring that fire and pest activity is discovered before extensive damage occurs and in providing data to support decisions on appropriate tactics. For maximum effectiveness, forest protection should be an integral part of sustainable forest management and should appear as a key element of strategic forest plans.

CREATING A SUPPORTIVE ENVIRONMENT FOR SUSTAINABLE FOREST MANAGEMENT

The supportive environment for sustainable forest management comprises mainly depend on policy, legal and institutional

aspects as well as the people participation in forest management.

Policy.

The main development policy stream can thus encourage consistent sustainability approaches among all sectors. This particularly important for those activities dealing with renewable natural resources and competing for the land resource. Such a context constitutes a prerequisite to, and a basic incentive for sustainable forest management. Within the broad context of rural development and land-use and environment policy, forest policies deal more specifically with forest resources and their management : the socio-economic aspects of increasing sectoral performance, the role of forest and tree resources in land use and rural development, their function in nature conservation and environmental protection.

In modifying the policy framework to provide effective incentives for sustainable management, the following considerations are particularly important.

1. Land-use planning and policies : recognizing forests as a major renewable natural resource of value for present and future generations.

2. Macroeconomic policies and structural adjustment measures : identifying and

assessing possible negative impacts of agricultural programs or privatization policies on forest conservation - cash crop expansion, or rural people migrating to expand subsistence farming etc.

3. Policy interactions between forestry and related sectors such as agriculture, livestock, infrastructure, industry, energy, mining : verifying and developing consistency and complementarities with forest management activities; and minimizing the negative impacts of specific pricing and incentive measures in other sectors against sustainable forest management and use.

4. Conservation and wise utilization of forests, its unequivocal recognition as a national priority in forest policy and its simultaneous reflection in environmental and development policies. Sustainability is a long term perspective characterizing the application of such a policy to a demarcated permanent forest estate comprising production forests and protection forests.

5. Forest policy should focus on the behavior of various social groups with interest in using the forest resources and encourage them to organize themselves. Sustainability is likely to result from convergent and comprehensive approaches that reconcile local community needs with the broader demands for economic growth

and environmental stability.

6. Forest dwellers and neighbouring commodities : their rights of access to those products on which their livelihood depends should be recognized. Forest policy must recognize their secure and sustainable livelihoods and the protection of the cultural integrity of their forest heritage. The policy must therefore encourage the design and implementation of management approaches enabling local people to organize themselves and be involved as preferential partners and beneficiaries.

7. Fiscal policies revenues accruing to the government can not be based solely on forestry taxes and fees in isolation from revenues generated by the general taxation system. Fiscal policies, general and forestry related, influence the willingness and ability of the institution in charge of forest management to invest in its sustainability. Financial grants and compensations may also be considered : grants for improving long-term production potential such as reforestation, silvicultural improvement and infrastructure; compensation for cost of specified management measures undertaken by forest owners.

8. Pricing policies for all marketed forest goods and services are particularly important in determining the economics of forest management and especially the levels of

investment and reinvestment for conserving and improving forest resources. The interplay of market forces and competition should make forest product prices reflect real economic values while monitoring the possible interactions of price differentials with alternative non-forestry productions. The efficient economic performance is important in sustainability. The markets for forest products should operate so that a fair share of revenues accrues to those who are actually responsible for managing the forest: a government entity, a private concessionaire, a forest owner or a local community or user group.

Laws and regulations for sustainable forest management.

Nominal forest law comprises legislation which specifically addresses forests and forestry. It refers primarily to forest law itself, dealing with forest conservation and development. It also includes complementary regulations and rules. Like forest policy, nominal forest law has three important aspects : it is sector specific legislation focusing on forest conservation and development and, as such, in part of the economic development and natural resources legislation; it is an important and integral part of land use and rural development legislation concerning forests as part of rural space, and it

is an indispensable element of environmental protection law and of nature and landscape conservation legislation.

Functional forest law refers to a wide range of laws and regulations which address other subjects and problem areas. However, their provisions have some relevance or impact on forest conservation and development.

Legislation of particular importance to sustainable forest development may be grouped as follows:

1. Legislation referring to the general and specific aspects of environmental protection.

2. Legislation principally concerned with renewable natural resources : legislation related to agriculture, grazing, fishery, agrarian reform, erosion control, land rehabilitation and their various interfaces with forestry and combined production systems.

3. Legislation dealing with social and economic measures for developing rural space : land tenure legislation, land-use planning legislation, tax legislation etc.

4. Legislation concerning nature protection : principally laws protecting flora, fauna, and undisturbed landscapes, and hunting, wildlife and national parks Act.

Depending on social needs and the prevailing forest ecosystems, the general objectives of the law may cover a wide range of

individual targets and goals. Points of general importance concerning a comprehensive sustainable forest utilization are :

1. Protecting the forest cover and its regional distribution in order to maintain a stable environment and to provide a basis for economic and social forest development.

2. Protecting all prevailing natural forest ecosystems in order to maintain biodiversity and landscapes.

3. Establishing and supporting a viable and multifunctional forest economy, combining ecological conservation and economic resource utilization.

4. Establishing new forests as far as they are required for environmental reasons and/or economic development.

To sustain forest resources, thus, the law has to define sustainability both in terms of the diversity and stability of the various forest ecosystems and of their contribution to present and future development needs. It has then to determine the meaning and relevance of sustainable management with regard to present and potential outputs, in particular.

1. The production of fuelwood and construction timber for local consumption as an input for rural economics.

2. The production of various categories of industrial wood as a basis for an industrial

sector economy.

3. The supply of a wide range of non-wood products both for local and industrial uses.

4. The provision of protective services against the consequences of natural calamities such as avalanches, erosion, landslides and floods.

5. The maintenance of the protective role of the forest cover for groundwater resources.

6. The provision of recreational uses for urban areas and/or tourist development.

Law and regulations usually contain little on public participation in management decisions. Forest management planning has been mainly considered a technical issue and left to forest owners, and forest services. Revised legislation is necessary in order to:

1. Provide institutionalized processes for forest owners, user groups and political entities to determine the range of forestry outputs, the management objectives and the necessary measures to reach such objectives.

2. Generate the political commitment essential for implementing sustainable resource development and to provide the necessary financial basis based on equitable cost sharing between forest owners and public entities.

Incentives are important to support sustainable forest management objectives involving immediate interests of forest owners and entitled user groups as well as the public and the usually more long-term interests of the community. Legislation should provide incentives that promote practices and benefits that concern the community as a whole.

2. Institutional and Organizational Aspects.

Public sector, private sector and non-governmental organizations (NGOs) play an important role in forest management. Public institution would seem to be better equipped for the following aspects:

1. Improving the knowledge of the resource and its value and potential through inventories of forests and other woody resources; monitoring changes in relation to other land uses and participating in comprehensive land-use planning and management.

2. Analyzing market and non-market incentives and their impact on resource protection and resource utilization; monitoring reactions and behavior patterns among the wide spectrum of land and tree owners and users and other interest groups; identifying divergences of interest among concerned groups and facilitating dialogue and conflict resolution.

3. Providing objectives and up-to-date analyses and understanding of the sector's perspectives concerning supply and demand of goods and services and of potential market developments to orientate forest management and related investments; identifying the implications of current demands on the forest potential to meet those of future generations.

4. Managing the state forest estate, accumulating experience and providing examples of good forest management.

5. Encouraging and checking the implementation of forest management and harvesting regulations by private owners and concession operators; determining performance control standards based on the regular monitoring of physical land use and forest management criterion; evaluating the relevant information submitted by the operator.

6. Providing support to developing sustainable tree-growing and management activities by rural people, the private sector and other organizations through information, extension and technical support.

7. Encourage an overall consistency of forest management approaches while deconcentrating initiatives and support at field level for building up partnerships with local forest managers and users and for establishing

an effective dialogue.

8. Cooperating with public institutions in other sectors on infrastructure development, population, energy, etc., and on coordinated approaches to intersectoral issues.

9. Managing or assisting in the management of appropriate funding mechanisms in order to provide credit and stimulate investment in forest management as well as to compensate the cost to the private owner or the user group of strictions imposed on the productive function as a means of safeguarding broader benefits of the forest both inside and outside its borders.

The private sector. Private sector organizations are essential partners in sustainable forest management. The entrepreneurship and management experience of private owners and enterprises can substantially enhance the performance and economic base of sustainable forest management. They represent by far the largest potential investor. The institutional framework should encourage the private sector to make long-term investments in sustainable forest management under conditions of profitability, fair competition and security which can compete with investment alternatives. Dialogue is essential and will be all the more effective if representative organization can

express the views of forest owners, including the smaller ones. Such organizations are essential channels for two-way communication with public institutions and for negotiations when needed. If properly supported and motivated, these organizations can strengthen the technical and managerial capacities of their members for sustainable forest management. Government institutions should also be efficient in checking and monitoring the effectiveness of sustainable management regulations. This is particularly important in those countries where major responsibilities in forest management are to be transferred to the private sector.

Non-governmental Organization. NGOs are also play an important roles in forest management. The diversity of NGOs and their expanding influence in forest management deserve special attention. Some NGOs focus on environmental, conservation and protection aspects of forest management. Others are concerned with rural development and poverty alleviation and actively promote the participation of rural people in tree growing and management as well as in the processing and sale of non-timber forest products as part of self help rural development programs. Still other NGOs concentrate more on the socio-economic and cultural aspects of development among forest dwell-

ing communities and indigenous peoples. These different types of NGOs play a useful role in underlining sustainability in forest management, and their cooperation should be actively sought.

Information, communication and training.

Forest management will be sustainable only if it's continuity is built on a strong human resource base, providing support and skills. Thus, adequate information activities are essential to build up common understanding and interaction among partners concerned with sustainable forest management and to ensure support from policy-makers and the public. In addition, the various communication process are also needed in orders to enable forest dwellers and other forest dependent rural groups to express their needs, expectations and experiences from the early stage of forest management preparation. This will facilitate two-way communication to stimulate participation and support in implementing the plans. Furthermore, communication generates convergence among groups when different interests may require negotiations and mediation. Furthermore, training should be needed for government and private staffs as well as rural community leaders who take responsibility for sustainable forest management.

PROPLE PARTICIPATION IN FOREST MANAGEMENT

The meaning of participation is local people (insiders) implementing wise forest management practices with adequate support, or in partnership with outsiders (foresters). Partnership or joint management is an especially important concept regarding forest resources, since most forests are legally controlled by forest services. Outsiders can support local management by providing or granting access to forest resources, removing impediments to receiving benefits from their management inputs, strengthening the local organizations situation or skills, assisting in planning, assuring that long-term benefits go to those who manage wisely, providing outside technical information, etc. Lack of participation is frequently an institutional problem and does not stem from a lack of interest or understanding. Thus, it is very important to clarify the term çinstitutioné and identify priority institutional opportunities to increase local participation. Institutions are organizations or groups with sets of rules that cover expected behavior, sanction for breaking the rules and rewards for behaving in the prescribed manner. (FAO,1992).

CONCLUSIONS

Management of forests solely for wood production, over the last four to five decades, has led to a steadily growing concern about the loss of other benefits, nowadays this will call for the sustainable multiple management of the forest so that itûs overall capacity to provide products and services to those living in and around it. Its role in the preservation of genetic resources and biological diversity and in the protection of the environment will also be maintained. However, In order to sustain the forest resources, for providing continuative tangible and intangible values to social, creating a supportive environment for sustainable forest management such as policy legal and institutional aspects will be needed. In addition, to manage forest effectively and sustainably, the participation of people is a must.

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