A BRIEF REVIEW OF FOREST RESTORATION PROGRAMMES IN MYANMAR

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ABSTRACT

Evolution of the Myanmar strategy of forest restoration is reviewed and five types of forest plantations, with different sets of objectives, under different ecological conditions are described. Socio-economic and environmental issues of reforestation through plantation forestry are discussed and technical aspects of site selection, species choice, nursery practice, planting methods and follow-up silvicultural treatments are briefly presented. Use of well-adapted genetic resources; correct site/species matching, good silviculture and sustained protection at all stages from seed collection to harvesting is stressed. Priority areas of further research needs are also indicated.

Key words**:** Myanmar, strategies of forest restoration, forest plantations, socio-economic and environmental issues, site-selection, planting methods, silvicultural treatments, sustained protection, research.

INTRODUCTION

Many international and national studies have identified that the forests of most developing countries in the tropical region are gradually being depleted due to a mix of socio-economic factors such as:

1. over-exploitation of forest products, especially firewood, timber, posts and poles by an ever-increasing population;
2. uncontrolled forms of shifting cultivation with shorter fallow periods by hill people;
3. clearing forest for more attractive forms of land use like cultivation of diverse agricultural crops to increase livelihood security of landless farmers;
4. illicit logging, coupled with weakness in monitoring and
5. inadequacy of extension activities, seeking involvement of rural communities in resource management.

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Forest degradation leads to loss of wildlife habitat and disturbance of ecosystem functioning. These changing scenarios call for a concerted effort towards restoration of tropical forests by all possible means.

HISTORICAL ASPECTS OF FOREST RESTORATION IN MYANMAR

The Union of Myanmar is endowed with a diversity of flora and fauna. There are 2,088 species of trees, 1,696 shrub species, 96 bamboo species, 36 rattan species, 841 orchid species, approximately 300 mammal species, more than 1,000 species of birds and more than 400 species of reptiles and amphibians (FOREST DEPARTMENT, 1996). However, being a developing country, it has suffered forest degradation and depletion. Out of 34 million ha of forest area, 29 million ha is classified as closed forest and 5 million ha as degraded forest (MINISTRY OF FORESTRY, 1999). The forests of Myanmar have been subject to shifting cultivation for more than a century. Shifting cultivation has supported rural communities for many years, especially hill people, living in the vicinity of forests.

Historically, in order to create teak plantations, in conjunction with cultivation of agricultural crops on hill slopes, the so-called *taungya* system was adopted in Myanmar in 1869. The term *taung* in Myanmar language actually means hill and *ya* means a plot of agricultural land on a slope.

In those days, *taungya* cutters or slash-and-burn cultivators were allowed to practice *taungya* cultivation wherever they pleased, on condition that they planted teak seedlings provided by the Forest Department (FD) when they raised their crops.

The *taungya* system has the advantages that it provides land to grow agricultural crops, while teak trees are planted at a regular spacing of 1.8 x 1.8 m (or approximately 3,000 trees per ha), among the crops, almost free of charge. A nominal amount, depending on the survival percentage was paid to the farmers in the form of a bonus. FD field staff normally count the surviving trees in December of the first year of planting.

Some other tropical countries facing population increase, encroachment into forests for agriculture and subsequent degradation of forests, have also adopted the Myanmar experience of reforestation with teak and other high value species by means of the *taungya* method.

On the other hand, experience in Myanmar reveals that some of the teak plantations established by *taungya* cutters were located on unsuitable sites or were scattered over wide areas in small patches. They were consequently difficult to effectively tend, manage and protect. For example, lack of regular thinning of teak plantations led to stunted growth and soil erosion due to lack of undergrowth vegetation.

The lesson is that the *taungya* system of planting teak can be successful only if it is undertaken on suitable sites with proper tending and supervision.

EVOLUTION OF THE MYANMAR STRATEGY OF FOREST RESTORATION

Professional foresters in Myanmar, both past and present, generally agreed that the original *taungya* system was successful in raising teak trees in the form of compensatory plantations on a small scale. In fact, the average area planted per year was only about 1,000 ha (2,620 acres) during the period of 45 years (1896-1941) before the Second World War. The extent of plantations reached 47,167 ha up to 1941 (FOREST DEPARTMENT, 1999).

However, under changing scenarios of the political, social and economic situations in the country, there is a need to meet the increased demand for timber and firewood due to population growth, the rise in the standard of living and the establishment of more wood-based industries. Watersheds of newly constructed dams and reservoirs have to be properly maintained to reduce soil erosion and siltation. The scale of the annual plantation area has therefore gradually increased, reaching a peak of 42,891 ha (105,984 acres) in 1998 (MINISTRY OF FORESTRY, 1998). The Forest Administration has also adopted a new strategy of forest restoration through the creation of five types of forest plantations, four types having been undertaken by the State and one by rural communities as follows:

1. Commercial Plantations (established by the State sector) (FOREST DEPARTMENT 1999)
2. Village Supply Plantations (established by the State sector) (FOREST DEPARTMENT 1999)
3. Industrial Plantations (established by the State sector) (FOREST DEPARTMENT 1999)
4. Watershed Plantations (established by the State sector) (FOREST DEPARTMENT 1999)
5. Community Plantations (established by rural communities)

Commercial Plantations

In order to supplement timber production from natural forests and to assure a sustainable supply of teak and other hardwoods for the export and domestic markets, commercial plantations with high-value species like teak (*Tectona grandis*), *pyinkado* (*Xylia dolabriformis*) and *padauk* (*Pterocarpus macrocarpus*) are established by the State sector every year.

This strategy also aims to transform low-value, degraded natural forests into high-value forest plantations. Landsat images and aerial photographs are extensively used to formulate reforestation plans and to stratify different forest types and growth conditions. Degraded forest with a very sparse density of growing stock, low stem height and scrubby condition in the moist deciduous forest zones are initially delineated on maps and final selection of the site is made after a ground check for reforestation with commercial species (WINT, 1993)

In other words, ecological conditions are identified carefully in advance. This helps to avoid clear felling of good natural forest and it also assists in the selection of species for proper site-species matching. Teak grows well on well-drained slopes with deep sandy

loams in moist deciduous forest, while *padauk* can be planted in the same blocks, but on higher ridges where teak is less suitable.

As teak is site-sensitive, one of the main issues in the formation of large-scale teak plantations is to select the most suitable sites for good growth and production of quality timber without "bee-holes", knots and twisty grain. Other major issues include collection of seed from well-adapted genetic resources and weeding regularly in the first, second and third year until the height of the tree is well above aggressive weeds. These include *thetke* (*Imperata cylindrica*), *bizat* (*Eupatorium odoratum*) and also bamboos shooting from old stumps burnt over during site preparation.

Research is therefore needed to study and recommend the most economical and practical methods of weeding, including considerations such as the advantages and disadvantages of chemical weeding, mechanical weeding, manual weeding and ploughing. In Myanmar, manual weeding at the rate of 3:2:1 time per year in the first, second and third year of planting is generally practised, depending on growth conditions and budget allotment.

The comparative benefits of fertiliser application and planting of nitrogen-fixing plants in the form of a second story to stimulate faster growth may also be investigated. Cost-efficient planting and tending techniques are needed where labour is scarce and/or expensive. The financial return and indirect benefits of complex plantations against simple plantations may also be studied to achieve best economic gain from a piece of reforested land and also to conserve the soil and the natural environment as far as possible.

In Myanmar, most commercial plantations are established under the departmental *taungya* system, evolved from the original *taungya* system adopted by the Forest Administration before the Second World War.

Under the departmental *taungya* system, *taungya* cultivators are paid to clear sites for planting by the Forest Department in the form of minimum daily wage or on a piecework basis. Similarly, fixed rates for each stage of plantation establishment are paid to the villagers. On the social side, temporary forest villages including a primary school and water supply system are established for villagers who agree to participate in the work on a full time basis. These villagers therefore enjoy the benefit of a good income for their labour as well as income from the agricultural crops they grow in the plantation areas. The more facilities are provided, the more attractive it is for villagers to participate in departmental plantation work.

Again, the more income they can make from their crops, which are sometimes sold at the nearby markets of the towns and cities, the more they carry on with the plantation work under the departmental *taungya* system. The District Forest Officers normally oversee the situation and manage the programme as a measure to solve the socio-economic problems of landless villagers dwelling near the forests. This system works well in large-scale commercial plantation programmes.

The technique of raising commercial plantations normally includes selection of a suitable site, as noted above, extraction of remaining trees useful for commercial purposes, clear felling of useless trees and shrubs and planting of either stumps or seedlings raised in tree nurseries. This is followed by weeding, patching, counting of surviving plants, fire

protection up to the age of 5 years and thinning in the later years, as required (KERMODE, 1964).

In other words, good silviculture at all stages from nursery to final felling is considered vital in the establishment of commercial plantations. Issues like budget constraints under public ownership, fostering of a favourable climate for private investment, stewardship of the environment and uplift of community values need to be addressed for successful restoration of forests on degraded areas, as identified vividly in high resolution satellite images.

Village Supply Plantations

Traditionally, rural people collect firewood mostly from neighbouring natural forests and trees growing in their farmland and homestead. In Myanmar, the Forest Law permits villagers to fell any unreserved trees growing in unclassified public forestland within a 40-km (25-mile) radius from their village. It also allows villagers to fell trees growing in Local Supply Reserved Forests, managed under the coppice-with-standards system. Normally, a 20-year felling cycle is fixed and the villagers are allowed to extract firewood, posts and poles.

In conjunction with gradual population growth, the demand for firewood and charcoal has increased many times. The old management system was therefore re-inforced with a new strategy of forming firewood plantations in degraded reserved forests and protected public forests with multi-purpose tree species like *mezali* (*Cassia siamea*), *sha* (*Acacia catechu*), *auri-sha* (*Acacia auriculiformis*), and *bawzagaing* (*Leucaena leucocephela*). In addition, *Eucalyptus camaldulensis* and *gandasein* (*Prosopis juliflora*) are also planted in the central dry zone where average annual rainfall is approximately 500 mm.

Prosopis juliflora was introduced into Myanmar about 3 decades ago, because it grows well in arid zones. It is also well known as a 3-dimensional tree, because it provides firewood for cooking, pods for fodder and shade for man and cattle in the dry season. A few years after its introduction, however, some villagers rejected its use due to thorns on the stem. Consequently, its popularity declined. However, seeing and believing that it grows so well under adverse conditions and coppices so well after cutting for firewood, villagers developed a technique for handling *Prosopis* branches and stems without any harm. Currently, the species is planted on the poor gravelly slopes of the hills in the Dry Zone where other species cannot grow well. There is a research need on how to propagate and study the growth of the thornless variety of *Prosopis* in the Dry Zone of Myanmar and other arid areas of the Asia-Pacific region. Under mangrove reforestation programmes, *thamegyi* (*Avicenia officinalis*), *kanbala* (*Sonneratia apetala*) and *madama* (*Bruguiera caryophylloides*) are being planted with the aim of supplying firewood, charcoal and poles on short rotation.

Different planting methods are used, depending on ecological conditions including altitude, topography, soil, climate, natural vegetation and the silvicultural characteristics of the species selected for planting. Generally speaking, contour trenching in staggered arrangements and planting seedlings in containers is recommended for dry zone

reforestation. Direct sowing or planting with seedlings in containers is recommended for other reforestation programmes.

The main issue is the creation of village supply plantations in the dry zone under adverse conditions of low rainfall, poor soil and high population density of humans and livestock. Recently, a Dry Zone Greening Department was formed as a major Institution under the Ministry of Forestry to address this issue. The main tasks include restoration of forest cover by planting, as well as effective protection of remaining natural forests, a drive for fuel-wood substitution and search for water resources.

Industrial Plantations

Industrial plantations are established near each specific industry as required. The main objective is to assure a supply of raw material to industry without depending on natural forests and to reduce the cost of transportation of raw materials. In this way, natural forest resources are rationally utilised, whilst domestic wood-based industries continue to grow.

Experiences in Myanmar, for example, have proven that good quality writing paper can be produced by the paper mill at Sittaung with the use of *Eucalyptus camaldulensis* wood from nearby plantations and bamboo from natural forest, mixed at a specific ratio. It is considered that further research to replace bamboo with a suitable long fibre hardwood or softwood species may be undertaken in order to reduce felling of natural forests and to conserve the environment. It may also assist in the production of strong kraft paper for many industrial uses. Currently, many entrepreneurs are showing great interest in the production long fibre industrial wood, namely *tha-le* (paper mulberry) (*Broussonetia papyrifera*) in the highlands of Myanmar.

Watershed Plantations

In view of the construction of more than 100 dams and reservoirs, big and small, in the last decade by the State sector, watershed management has become vital to extend the life span of reservoirs through mitigation of siltation and sedimentation. The current strategy is to adopt the principle of multiple land-use systems whereby pure reforestation as well as agro-forestry practices are encouraged in the interest of local level farmers who traditionally cultivate various agricultural crops on the slopes of the watersheds.

Personnel from the Irrigation Department, Myanmar Agriculture Service and Forest Department collaborate to promote use of the latest technology for proper land-use with co-operation from local communities and NGO’s like FREDA.

The main issue in watershed management is to solve the socio-economic problems of rural people who practice slash-and-burn cultivation on the slopes of the watersheds. The people are simple, honest and struggling for their livelihood. Most of the grass-roots-level farmers have no access to modern agro-forestry practices. Research in land management is highly needed for maximum production, soil conservation and restoration of the forests on the steep slopes.

Community Plantations

It may be stressed again that in Myanmar, the population is growing at an annual rate of 1.8-2.0% and the demand for firewood, including charcoal, is ever increasing. In fact, the volume of wood felled annually for firewood is estimated to be around ten-fold the volume of timber harvested for export and local use.

Under such a scenario, it is considered that the scale of village supply plantations established by the State is not adequate to meet the demand. In order to restore denuded forest land, provide basic requirements for the rural poor and maintain environmental stability, the Forest Administration has recently given high priority to establishing community forests. These are to be planted, operated and utilised by rural communities in the form of User Groups.

This new concept of participatory forestry encourages the growing of suitable multipurpose tree species, in accordance with the ecological conditions of the locality and ensures management of community plantations as well as nearby natural forests by the communities themselves. The land is to be made available by the State through 30-year long leases. Leases may be extended, depending on the performance and desire of the community. This form of forestry aims to produce firewood, posts, poles and small logs for use by the rural community concerned. The programme also aims to help generate extra-income, by allowing User Groups to sell surplus produce. The objective is to reduce pressure on the natural forests, some of which are managed for commercial and other production and some for biodiversity conservation.

In order to promote participation of rural people, the Forest Department of Myanmar issued Community Forestry Instructions (CFI) in 1995 (FOREST DEPARTMENT, 1995). It is hoped that local communities, at large, will respond to the objectives and incentives of the programme sooner rather than later. The contents of CFI are rather simple and yet it is mandatory to prepare a management plan before the area earmarked is handed over or leased by FD. This is a kind of bottom-up approach, since the community has the right to express their views concerning selection of sites and species for planting, as well as selection of a 5-member committee for each User Group.

Success of the program will depend on increasing awareness of the concept amongst rural communities. Adequate numbers of well-trained and dedicated extension workers are needed to gain the confidence and trust of communities and to assist in planning and execution of the programme. This calls for concerted and co-ordinated efforts of both the personnel of Government Institutions and NGO's. These personnel have understand the socio-cultural background of the local community and seek co-operation from leading farmers, village elders, Buddhist monks, teachers and health workers in the target area, through personal contact at the grass-roots level.

So far, approximately 4,000 ha (10,000 acres) has been handed over to communities under 30-year leases for community forests. The achievement so far is rather encouraging. The programme is receiving technical assistance from UNDP and FAO of the United Nations and the Forest Resource Environment Development and Conservation Association (FREDA) - a local NGO in the forestry sector of Myanmar, as well as co-operation and collaboration from the FD and local communities.

Creating community plantations includes meetings with the community, socio-economic surveys, landuse surveys, selection of sites, survey and mapping of sites selected, formation of a Users Group, application for permission from the Forest Administration, preparation of management plan, issue of a 30-year leases, planting of tree species selected by the community under the guidance of the FD, UNDP, FAO, FREDA and follow-up activities, like weeding, patching, protection, and harvesting. The essence of the programme is the participatory approach; community forests created by the community for the community!

It is believed that, as news of the success story spreads through all kinds of information media, rural people will show more interest and volunteer to participate in the restoration of the forests.

The main constraint limiting community forestry is lack of access to the latest developments in concepts and directions of the Community Forestry Instructions and reforestation techniques by rural communities. Ironically, hill people who practise slash-and-burn cultivation and destroy the forests have less access to the latest technology and assistance due to the remoteness of their villages. Adequate funding, support and technical assistance is needed to deploy necessary numbers of qualified and dedicated extension workers to implement appropriate community forestry programmes on a wider scale.

On the other hand, there is also a need for research to identify the most suitable tree species, including fruit trees for correct site-species matching and also to study financial yields of those species recommended for planting by the community. In real life, those rural poor struggling for existence will have much interest in the value of tree planting, provided it can be expressed in terms of cents and dollars or income generation in the shortest possible time. This area of research may therefore cover not only species selection and financial yield of each species, but also techniques for maximum production and soil improvement. It is believed that the research findings would also help in restoring forests on denuded lands, as well as indicate measures for soil improvement.

RESTORATION OF HABITAT FOR WILDLIFE

Within the framework of the forest plantation and conservation programmes, the Nature and Wildlife Division of the Forest Department are undertaking restoration of habitat for wildlife. Statistically, there is a network of 23 wildlife sanctuaries and 5 parks, covering a total area of around 1.4 million ha. It constitutes about 2.02 percent of the total land area of the country. The ultimate goal is to extend it up to 10 percent.

Since part of these areas are degraded due to human disturbance in the past, the Forest Administration has adopted a two-pronged strategy of complete protection of natural forests and reforestation of the depleted areas by forming man-made plantations.

The Forest Department established a total of approximately 4,000 ha of forest plantations in the degraded areas and buffer zones of the Shwesettaw and Chatthin Wildlife Sanctuaries and Hlawga and Mt. Popa Parks during the period 1993 to 1999. The main purpose was to restore forest cover with suitable tree species like *Leucaena leucocephala, Eucalyptus camaldulensis, Cassia siamea, Acacia auriculiformis, Tectona grandis, Xylia*

dolabriformis and *Pterocarpus macrocarpus*. These species were chosen to restore vegetation cover for wildlife in core zones and to supply posts, poles and firewood for communities living in buffer zones.

In addition, under a collaborative programme entitled "Shin Than Yee" (Surviving Together) of the David Shepherd Conservation Foundation (DSCF) of the U.K., Global Survival Network (GSN) of U.S.A and Forest Resource Environment Development and Conservation Association of Myanmar, FREDA has established a tree nursery at Yinmarbin near Alaungdaw Kathapa National Park to produce seedlings of fodder and fruit tree species to planting inside the Park and in the buffer zone. The aim is enrichment of the habitat as well as distribution of trees to rural people around the Park for income generation. Protection of the Park, covering around 160,000 ha, is also in place with the support of the authorities concerned and DSCF/GSN/FREDA.

It is transparent that establishing any form of forest plantations in depleted forest is beneficial for wildlife conservation, directly or indirectly. The more the man-made forests are created in depleted areas, the more forest produce will be available to the local community, with the result of less disturbance to remaining natural forests, which serve as habitat for wildlife. Unless and until the demand for forest produce by an ever-increasing population can be adequately met, the logical trend will be to cut existing natural forests without consideration for the survival of wildlife.

It is also believed that populations of certain mammals and birds could be increased through by manipulation and planting of selected framework species in harmony with prevailing ecological conditions and the specific requirements of each wildlife species.

In other words, the concept of " Surviving Together " should form an integral part of wildlife conservation programmes, since the long- term survival of wildlife depends heavily on the attitudes of people of all strata in the communities concerned.

CONCLUSION AND RECOMMENDATION

It may be concluded that numerous types of plantation programmes would certainly help in the restoration of seasonally dry tropical forests and wildlife habitats in one way or another.

Experience in Myanmar has proven that the pressure on the natural forests has been reduced to some extent through the formation of forest plantations. The condition of the forest in certain parts of the central dry zone has improved. Where the environment has been transformed from denuded barren land to forest covered areas, by intensive planting and protection activities, the graceful Eld´s deer (*Cervus eldi thamin*) and Barking deer (*Muntiacus muntjak*) have re-appeared again.

In order to achieve forest restoration for man, wildlife and the environment, it is strongly recommended that appropriate forest plantation programmes should be formulated in the context of the individual socio-economic and environment needs of each region. Such programmes should be implemented properly, with the joint efforts of the government agencies concerned, the international and national NGO’s and the rural communities for sustainable development.

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