Bamboo is the fastest growing and most versatile plant in the world. It can stretch to a maximum of about 37 metres (120 feet) high and 30 centimetres (a foot) in thickness within a period of only two months. Reaching full maturity in one year, bamboo has been reported to grow more than a metre (four feet) in a single day.

As the most important forest product after timber in South and Southeast Asia, bamboo and rattan play an integral role in the lives of rural people and the economy. These giant grass-like plants are used in everything from house construction, scaffolding, ladders, mats, baskets, fencing, tools, utensils and furniture to food, fuel, and even paper. The interlocked roots of a bamboo grove prevent soil erosion and minimize damage from floods and earthquakes.

Although the two plants have been exploited and used for centuries, surprisingly little scientific research has been done on them until recently. Relegated to the status of "minor forest product," they have been the most neglected natural resources in Southeast Asia. Dependence on traditional methods of production, disappearance of large tracts of forest areas, and uncontrollable exploitation have depleted bamboo and rattan stock in some areas and have hindered the industry's socioeconomic development potential.

To help the rattan industry, a few producing countries, including India, Indonesia, Thailand, Malaysia, and the Philippines, have started in recent years to research the silviculture and utilization of rattan. Presently, the greatest proportion of the production comes from plants growing in natural forests. The rattan industry remains very much a part of village or rural life.

Ninety percent of the world's demand for rattan is met by Indonesia, the rest coming from other producing countries of Asia and a little from Africa. Hong Kong and Singapore dominate the rattan trade scene, but do not grow the produce themselves. It is estimated that half a million people in Southeast Asia are directly employed in cultivation, extraction, processing, and cottage-scale manufacturing of rattan. Trade in raw canes amounts to about CAS$65 million; by the time the manufactured product reaches the consumer, its value is increased to about CAS$1.6 billion—a great potential for earning foreign exchange.

However, according to a recent research report, agricultural development, overexploitation, greater exploitation of immature canes, and a preference for a certain species are all diminishing supplies. Demand for rattan has usually remained constant, but in the past few years demand has outstripped supply.
I
dRC was first made aware of the problems of the industry after it received an inquiry from Malaysia about the possibility of financing a research project on rattan. It became evident that very little information about rattan existed in any organized fashion. In June, 1979, specialists from seven Asian countries concerned with the production of rattan attended a workshop in Singapore. From this meeting developed the establishment of an information centre on rattan at the Forest Research Institute (FRI) in Malaysia.

The centre, which is supported by IDRC, collects, classifies, and stores all relevant information on rattan and disseminates this material to users. Also, reviews and manuals on special topics are published as well as a directory on ongoing research projects on rattan in the region. This is updated regularly in a quarterly newsletter on rattan. Researchers involved in the centre believe that, with easier access to information, the rattan industry will continue to grow.

In order to improve tropical forestry research in developing countries, IDRC and the International Union of Forestry Research Organizations (IUFRO) conducted a workshop on bamboo research in Asia in 1980. The main objectives were to review existing research on bamboo production, to consider constraints preventing greater use of bamboo and to identify regional research priorities on bamboo cultivation and management. Several research projects are now under way in various countries as a result of the workshop's findings.

Of the more than 10 million tonnes of bamboo produced annually in the world, an estimated 3.5 million tonnes are grown yearly in China. There are more than 300 species of bamboo found in 22 provinces and are mainly distributed on the plains, hills, and mountains at altitudes below 3000 metres.

China has conducted independent research on propagation methods of bamboo, disease and pest control and processing. But according to 1981 statistics, China is producing only about half of the national demand for bamboo and there is an urgent need to replenish the stock.

A bamboo research centre was recently established at the Sub-Tropical Forest Research Institute in Zhejiang Province, one of the major bamboo growing areas of the country. Supported by IDRC, the centre has embarked on a project to increase the production of bamboo in China by more intensive cultivation of natural bamboo stands and by selecting high-yielding bamboo species of good quality. A special survey of fast-growing and cold-resistant species of economic value is being conducted. Attempts are also being made to determine the nutritive value of edible bamboo shoots and to control their quantity and quality.

A similar IDRC-sponsored project is underway in Thailand, but involving research of species and agroclimatic conditions very much different from those in China. Conducted by the research staff of the Royal Forest Department and Kasetsart University's Faculty of Forestry, the study will introduce new species of bamboo and will develop improved silvicultural management methods for natural bamboo stands and cultivated plantations.

Most bamboo shoots, which are an important daily food for Thai people, are collected in the natural forests. This extraction is rarely controlled by any authority and is the main cause of the plant's depletion. The research project is attempting to establish a controlled system of planting in many areas of the country using a variety of edible bamboo species in order to preserve the natural regeneration of bamboo stands.

Several farmers and small landholders, eager to take advantage of the supply and demand theory, want to grow bamboo clumps on their own land to earn extra income selling culms and shoots as cash crop. Through the development of seed collection and storage methods, farmers may be supplied with seeds and seedlings on a much wider scale than is presently possible.

**TISSUE CULTURE**

Overexploitation, leading to a scarcity of mature seed-bearing canes, has threatened the rattan industry in Malaysia — and the estimated 50,000 aborigines and villagers that depend on it. In order to ensure there will be stock to plant in the future, the Forest Research Institute and Ministry of Primary Industries are cooperating in an IDRC-supported project to generate rattan from individual plant cells through tissue culture. The method chosen, the callus method, involves placing cells from a piece of tissue — taken from root tips, shoot tips, or other parts of the plant — in a hormonal solution that induces them to grow and divide into a callus or undifferentiated mass of cells. The callus is then placed in another hormone-and-nutrient bath that induces differentiation of roots and shoots, from which complete plants can be grown. The process is successful because individual plant cells are said to have totipotential, that is, the genetic capability of structuring the regrowth of the whole plant.

In spite of its many excellent properties, the natural durability of bamboo is generally low. Depending on how it is used, untreated bamboo may last fewer than one to three years when exposed to the elements. Under cover, it may have a life expectancy of four to seven years. Bamboo is susceptible to attack by fungi and insects such as beetles and termites, which are attracted to the high starch level in the culms.

The traditional method of preservation used by rural people in Indonesia and other Asian countries is to soak the bamboo in water in order to reduce the starch content. It has not yet been proven whether this system improves resistance to attack.

An estimated 3.3 million tonnes of bamboo are demanded annually in Indonesia; 80 percent is used in construction. Culms are relatively
inexpensive but the cost of repair or replacement, especially of bamboo houses, is substantial. Prolonging the life of bamboo structures and preventing decay are important procedures for rural people.

With the support of IDRC, the Faculty of Forestry at Gadjah Mada University, Indonesia, has undertaken a project to test whether or not the traditional methods of preserving bamboo are the most effective for increasing the durability of bamboo for various construction purposes.

Although most Asian countries have a variety of different rattan and bamboo species, only a small number of them are used widely. In Sri Lanka, only five out of fourteen species are used extensively for scaffolding, rural housing, handicrafts, and supports for beans. Little attempt has been made to cultivate the economically important species on a large scale. Demand for bamboo and rattan products now exceeds supply and this will have serious employment and economic consequences for the rural people.

The Forest Department, within the Ministry of Lands and Land Development, has recently received a three-year grant from IDRC to conduct a project with a goal of increasing the available sources of raw material and the supplies of bamboo and rattan to cottage industries. The Department plans to undertake trial plantings of native and exotic species, to improve nursery stock and seed storage, and to introduce better management methods.

**BAMBOO IN BANGLADESH**

The most extensive bamboo research project is taking place in one of the world's least-developed countries — Bangladesh. The population of 92 million uses 10 million tonnes of bamboo annually, most of it for the construction of rural housing. The livelihood of many people depends on the production and sale of bamboo articles. The recent scarcity of bamboo and consequent price increases have affected house building and various cottage industries, particularly in rural areas.

In August 1980, the government's Forest Research Institute (FRI) began the first stage of a two-phase project supported by IDRC that aimed at increasing the supply of high quality bamboo in village and state forest. Also during this first phase, staff was trained to administer bamboo research. Degrees at the MSc level were obtained by two researchers in bamboo taxonomy and tissue culture. There is now a group of four qualified researchers at the FRI to conduct practical research to increase the production of bamboo in Bangladesh.

The second phase of this ambitious project began in the summer of 1984. In addition to continuing research initiated earlier, studies focus on the effect of chemical fertilizers on commercially important bamboo species. Experiments are being conducted to determine whether the time required to form a natural clump can be reduced by fertilizer application.

In order to train rural people about better cultivation and management of bamboo groves, demonstration trials providing technical expertise are being set up in selected villages. In the first year, two villages in the Chittagong and Chittagong Hill Tract districts were chosen. Four more villages in different parts of the country will participate in the second and third years of the project, for a total of ten villages. A manual for the cultivation and management of village bamboo groves will be prepared and distributed to the villagers.

The status of bamboo and rattan as a natural clump can be reduced, and the grove survives because some of its rhizomes live on. This is the only time when the plant can extend its far-reaching network of rhizomes beneath the ground, all shoots are linked together, nourish each other and propagate without attention.

There are two main types of bamboo — monopodial and sympodial. The first, usually found in cooler or temperate zones, is described as a runner bamboo that sends its rhizomes in all directions. Symподial, or clump forming bamboo, is widespread in the tropics. Clump types multiply symmetrically outward in a circle. The rhizome puts forth an underground shoot, but this is connected directly to the parent and the link is short. Bamboo's most fascinating and mysterious feature is its flowering cycle. Depending on the species, flowering occurs every 60 to 120 years, perhaps only once in several human generations, and then most plants die. Flowering is spread over a year or two and is gregarious in nature. Every bamboo of the same species, even if planted in different countries, will flower simultaneously. This phenomenon indicates the common origin of bamboo and the strength of the genus.

The bamboo dies after flowering because the old leaves fall and, instead of being followed by new ones, are generally replaced by flowers. This prevents the bamboo from taking in water and nourishment and, deprived of strength, it perishes. Although the culm dies, the grove survives because some of the rhizomes live on. This is the only time when the plant can extend its growth sexually and during this period seeds are produced and take root.

It could take over 10 years for the next family of culms to reach the size of the previous generation, if the bamboo grove is left without proper attention. A large number of bamboo flowering simultaneously may have serious economic implications, because death of the bamboo deprives the people of a precious natural resource. Many bamboo research projects currently underway are studying ways to restore bamboo production as soon as possible after flowering.

In China's Sichuan Province, one particular species, the arrow bamboo, has reached the point in its 600-year-long life cycle where it is now flowering and dying en masse. The depletion of this valuable food source is having disastrous consequences on the rare giant panda population, which totals no more than a thousand.

**A NOBLE GRASS**

Bamboo is a member of the grass family but is categorized in the subfamily named *Bambuseae*. It is characterized by the woody and hollow stalk, or culm, and a complex rhizome (root-stalk) system. Culms are divided by walled septa, or nodes, which give the plant its strength. Ancient folklore refers to the smooth expanse between nodes as representing virtue, and the hollow interior symbolizes modesty and humility. The light, stiff, and strong culms are what make bamboo so valuable.

In all types of bamboo (there are over 1000 species of some 50 genera), the most striking characteristic is immense vitality. With its far-reaching network of rhizomes beneath the ground, all shoots are linked together, nourish each other and propagate without attention.

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Lorraine Cornelius is an Ottawa-based writer and audiovisual consultant.