

spawning of carps using salmon gonadotrophin. Thirty-three percent of the silver carp tested and 37.5 percent of the bighead carp tested have been induced to spawn. Grass carp, traditionally the most difficult of the Chinese carps to spawn in the tropics, have yet to be successfully spawned.

One of the difficulties experienced at the station so far has been the lack of adequate numbers of sexually "ripe" fish. It may be that the failure of the fish to spawn is due to this reason and not to potency of the hormone. Several new preparations of salmon gonadotrophin have been provided by B.C. Research of Canada, and comparative potency tests will be carried out using these extracts on the "Java" carp *Puntius gonionotus*.

One very positive result of the project has come from the nutrition experiments on the brood stock of the grass carp and bighead. It was found that when proper feeding techniques were applied — such as phosphates, Napier grass and rice bran — a very much improved gonadal development was achieved.

The nutrition team is also working on techniques for the production of live food for the carp fry. *Moina*, a small crustacean, is now being mass-produced using chicken dung as fertilizer. Bighead fry raised solely on *Moina* exhibit a survival rate of well over 90 percent. Formulating feeds from cheap, locally available materials is one of the primary objectives of the nutrition team.

As in most IDRC-supported projects, training is an important aspect of the carps project. Two of the Malaysian assistants have attended four-week courses on fish culture techniques in Indonesia. Another took a six week course on induced breeding and pond management at Cuttack, India, and the Malaysian nutritionist will study for an MSc. at Cornell University's Tunison Laboratory of Fish Nutrition. This should give MARDI the expertise to do very extensive long-term research on the nutritional requirements of any kind of fish.

Towards the conclusion of the project in 1977, the results will be discussed with representatives from other Southeast Asian countries at a seminar to be held in Malacca. A pilot hatchery, incorporating the principles developed in the project, will be constructed and used as a centre for training people in all aspects of spawning techniques.

It is anticipated that through this method MARDI can help to increase the fish seed supply for growing fish as human food in Malaysia and the region. Who knows, there may even be a market for bighead soup in Canada!

This article is based on a report compiled by the project staff — A. Tajuddin, E.C. Watts and J.D. Funk and program management staff W.H.L. Allsopp and F.B. Davy.

Wood - th neglected

Wood, widely used as a construction material in many parts of the world, has been largely neglected in many Andean countries despite the vast timber resources available. Cultural rather than technological reasons are at the base of this neglect: Spanish tradition favours brick and concrete houses, and many people believe wood structures to be shorter lived and less secure. The fact that wood is extensively used in slum dwellings means that it is labelled a "poor man's material", and thus has inferior status.

The region's timber resources are considerable. In total, tropical forests cover some 220 million hectares of the countries of the Andean Pact Commission — Colombia, Venezuela, Ecuador, Peru and Bolivia — representing 60 percent of their combined land area.

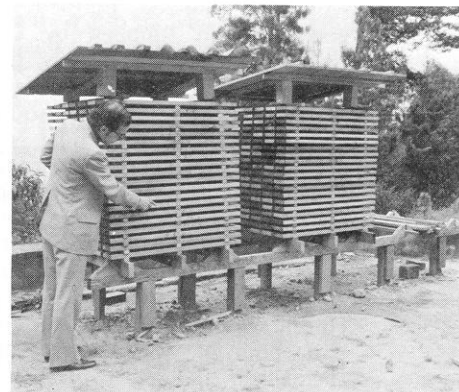
Recent studies have indicated that less than 0.1 percent of these forest resources are currently being utilized and that 80 percent of the wood harvested is used for fuel. Of the estimated 2500 tree species growing in the region, only about 50 are now used commercially. Yet, as many as 400 of the most abundant species may have commercial value.

The building industry provides by far the most important market for timber products throughout the world. The only way to make a significant breakthrough in tropical timber utilization in the Andean region, therefore, is to penetrate this market. The greater utilization of the timber resources could also help to solve the region's acute housing shortage, making more low-cost houses available in both rural and urban regions.

In 1971, the Andean Pact Commission began a series of studies aimed at establishing a science and technology program that would stimulate economic and social development in its five member countries. One of these detailed studies was on the use of forest products and it highlighted the need for research into the technological properties of many lesser known species.



Researcher recording precision measurements of wood samples at the District University of Bogota.



Open-air drying tests of wood samples, also in Bogota.

Photos: Jaime Rojas

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Susana Amaya

Such a research program was launched in 1975 by the Andean Pact Commission in order to develop the technology of tropical timber, particularly for use as a structural material in wood construction. Luis Takahashi, Peruvian engineer in charge of design for the project, points out, however, that the aim of the project is not to substitute wood for concrete, the most widely used construction material in the region, or for other materials. "The housing deficit is so great that there is no way to do so... the idea is for timber to become a part of the package of materials used by the architect and the engineer," he says.

As a construction material wood does in fact offer many advantages. Readily available, easy to transport, light and easy to handle, it does not require sophisticated techniques for its assembly. Equipped with an axe and hammer, a farmer can build his own house using the surrounding trees. And because wood is a poor heat conductor, wood houses are cool, an important quality in hot, humid regions.

In earthquake-prone regions wood is more resistant to breakage than concrete. If damaged, wood structures can be quickly and cheaply repaired. Chile, for instance, has long used wood in construction because of its ability to resist stress during earthquakes.

Wood also requires less energy to be transformed from tree to lumber — as little as one-twelfth the energy required to transform iron into steel. And the development of a forestry industry would provide much needed employment opportunities outside the major cities.

A number of problems, however, hamper the development of the forestry industry in the region. The great variety of species has made large scale industrial exploitation difficult. Getting the timber out of the forest is often a perilous undertaking because of the steep topography of the area and the abundant rainfall.

The tropical rain forest also grows slowly: from two to three cubic metres

of wood per hectare annually. To avoid denuding the forest, longer felling cycles must be observed and careful planning and selection carried out. Yet, despite these hindrances, a case study has shown that one hectare could produce 90 cubic metres of potentially industrially usable timber.

By determining the industrially functional properties of different species and developing appropriate technologies, the Andean Pact study should help realize the forest's potential. To do so, the forestry technology project emphasizes the practical utilization of wood, based on the study of the physical, mechanical and other properties of 100 different timber species, 20 chosen for study by each of the five participating countries.

Among the properties being studied are the compression strength and the elasticity of different species. The wood's natural durability is being evaluated under field conditions and in laboratories and tests are done to find the most suitable means of preserving certain species against insects or fungi. Seasoning tests of hardwoods are conducted for both air-drying and kiln-drying. And the defect peculiarities of various species are also being noted in order to prepare proper stress grading standards for the timbers.

Since the technology normally used for connecting softwoods is not applicable to tropical hardwoods, the researchers are studying various types of joints that could be used for timber assemblies. The woodworking and machining properties of tropical woods are also being tested.

The project is being carried out through a network of universities and forestry laboratories in the five countries. Participating in this IDRC-supported project are: The Forestry Office Laboratory of the Ministry of Breeding and Agriculture and the Merida University in Venezuela; the Office for Forestry Development and the Central University in Quito, Ecuador; the National Agrarian University and the Forestry Office Laboratory

in Peru; the District University in Bogota and the National University, Medellin, Colombia; and San Andres University in La Paz, Bolivia.

Coordination of the country teams, classification of species by defects and structural and architectural design work are done at the Pact's headquarters in Lima, Peru.

As each country's knowledge and experience in this field varies, they are exchanging information and advice. Specialized, practical training in timber grading and timber design and in statistical techniques applied to timber technology are also being offered to research assistants.

The results of the studies will be compiled in manuals and technical guidebooks for use by lumber mills and builders for whom the new technology is designed. Specifications arrived at will also allow architects and engineers to use timber in construction with the same confidence with which they now use steel and concrete.

In a second stage, the project will focus on the design of model wood structures — domestic, industrial and farm constructions — suited to the needs and characteristics of different areas. At this stage, the researchers will have to deal with the deep-rooted cultural barriers to wood construction.

These activities are only a part of a wider program aimed at introducing and establishing a new technology in the region. Included in this program are the selection and dissemination of technical and scientific information, the mapping of forests by means of radar images and the establishment of a technical assistance service for forest industries in order to make the information available to users.

The project's organizers hope that in the long run, wood construction will become widely accepted in both rural and urban areas. But 400 years of tradition are not easily overcome. The success of this project rests ultimately in the hands of the governments and national interest groups concerned. □