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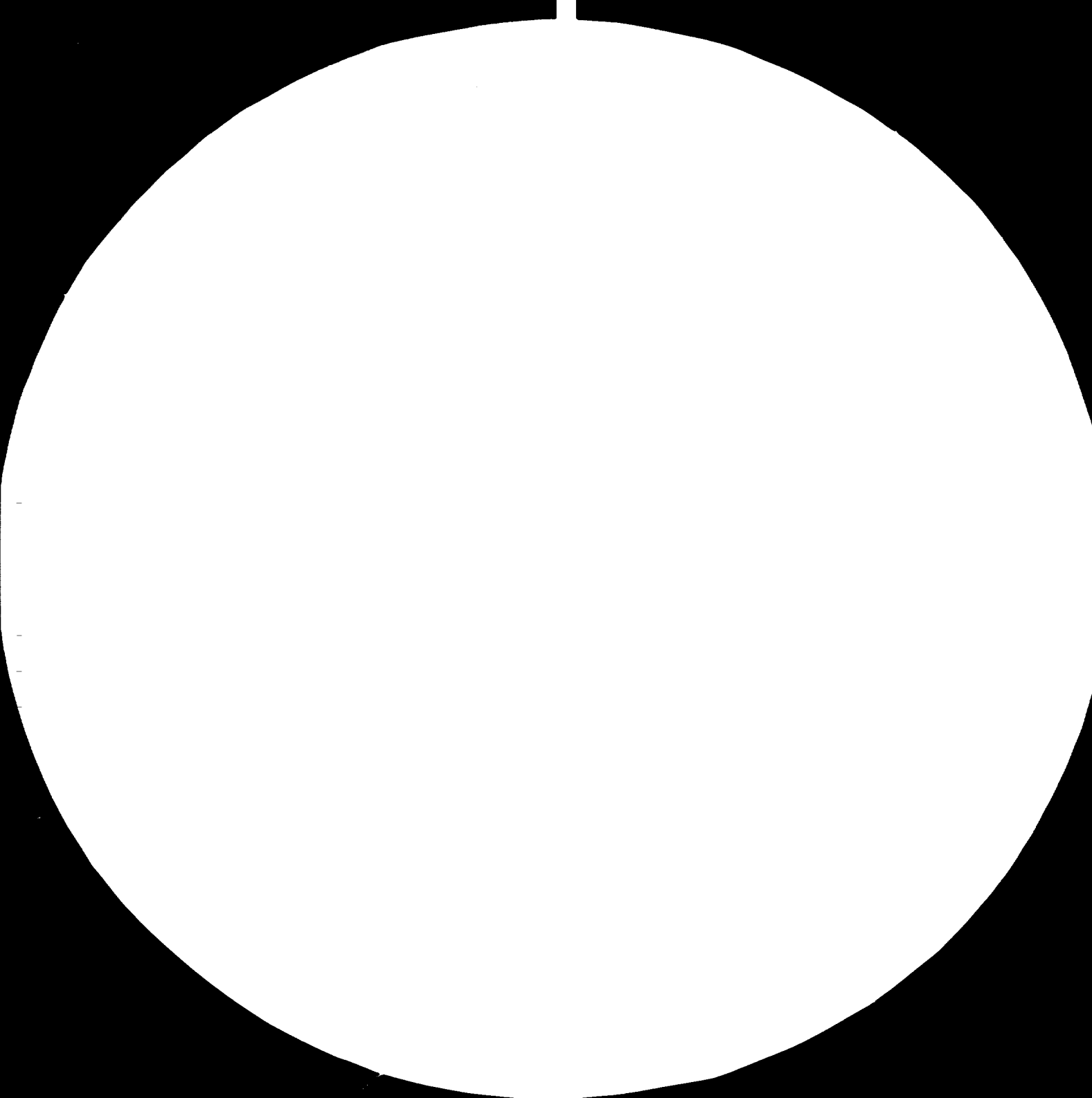

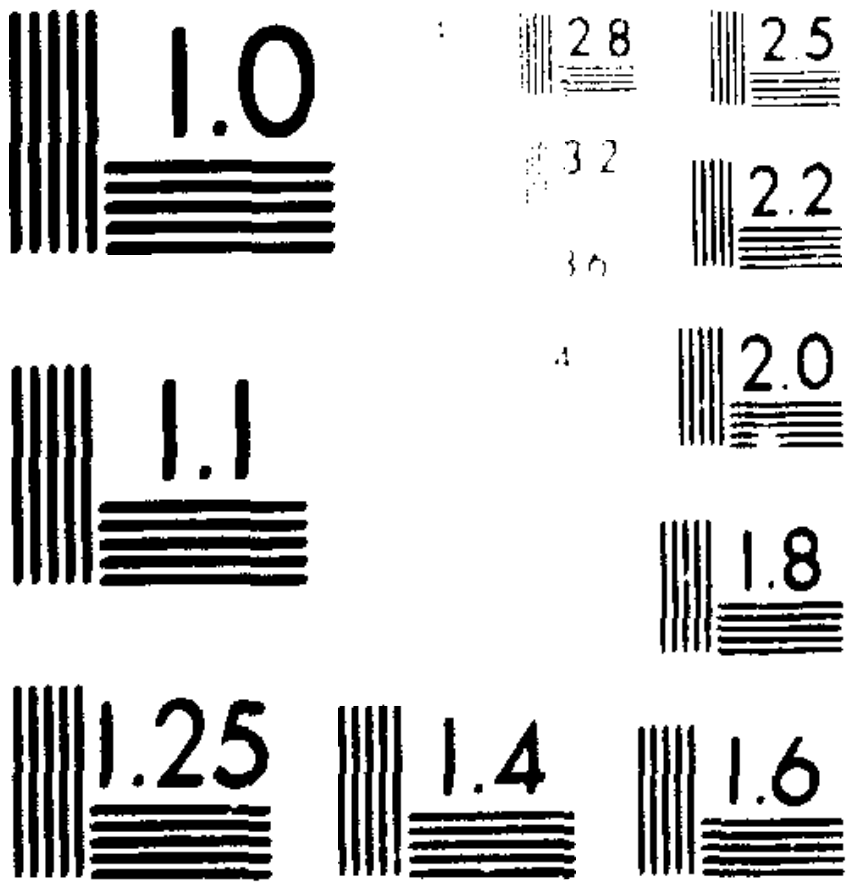
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ASSISTANCE TO CONSTRUCTION AND WOOD
INDUSTRY DEVELOPMENT
DP/NIC/80/008
NICARAGUA

(R) Technical Report: Proposed Assistance in Bridge Building and Wood Industries*

Prepared for the Government of Nicaragua
by the United Nations Industrial Development Organization,
acting as executing agency for the United Nations Development Programme

Based on the work of Robert M. Hallett
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Vienna

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Introduction

A request was made by the Resident Representative, Mr. J. Balcazar-Aranibar, in Managua to discuss with the Government Officials the possibility of introducing prefabricated modular wooden bridges into Nicaragua following successful development of this system in Kenya. It was also intended that other assistance to the wood industry sector should be considered. The bridge system there has proved to be cost-effective ($^1/_4$ - $^1/_3$ cost of concrete) and able to be implemented with simple tools and relatively unskilled labour.

The objective is to enable the national road network to be extended with significant savings in bridge costs. This is seen to be an important means of assistance and rural development (i.e. creating employment) as well as saving on specialized design and construction effort.

Discussions were held with COIP staff (Mr. Edward Schaffer and Mr. Luis Fiallos P., and Mr. C. Gillen - Project Manager of NIC/80/008) and the Ministry of Construction (Vice Minister, Mr. Alfaro and staff). A visit was made to the wood complex in the Managua area. Further discussions with UNDP/Project staff centered on future assistance to the secondary wood industries sector.

This report is the result of a mission by R.M. Hallett, who spent from 4 February to 9 February in Managua.

Two projects were identified:

(1) Low cost modular prefabricated wooden bridges - US$ 50,000 (6 m/m + Equipment and Manual) and
(2) Advice on restructuring the secondary wood industries - US$ 6,000 (1 m/m)

Annex I shows the people encountered, Annex II is a draft job description for project 1) and Annex III is a draft job description for project 2).

Discussions

Contact was first arranged by Mr. Larrabure, Deputy Resident Representative with Mr. Christian Gillen, who outlined the scope and priorities of assistance to the nationalized industries through COIP. The four priority areas were noted as: Food, Construction and Materials, Chemicals and Pharmaceuticals and Textiles with the Metal/Mechanical, Wood, Plastic and Paper Industries receiving less urgent attention. Wood as a construction material was therefore seen as a priority aspect, but the balance of the woodworking sector is under the direction of 'Agro - Ingra'.

Structural planning is important for all these industries in order to reduce duplication of production processes and to assure a balanced output of products from the various nationalized factories. The broad planning is expected to identify more specific assistance required for individual sub-sectors and larger complexes. This would concentrate on machinery and equipment selecting. plant layout and production technology, training etc. It was agreed that a project to promote the use of native timbers for bridge construction would be well received and that the Ministry of Construction would be the logical counterpart agency having control of all roads and bridges. Road construction is perceived by the Government as a high priority, especially the current programme to link Metagalpa with the Gulf Coast through Siuma and Puerto Cabereza. Improved access roads in the Ocotel region and the northeastern coastal area of Lake Nicaragua are also planned. The People's Forest Corporation is responsible for logging/access roads.

Two meetings were held with the Ministry of Construction - the first with the Vice Minister, Mr. Alfaro to explain the proposed wooden bridge project (together with Mr. Gillen) and the second with about 28 engineers from the Ministry involved in design of structures, materials and road and bridge construction (see list attached to Annex I - those marked with an asterisk would likely be involved further). The film "Short Cut Spans" was shown and many questions were answered concerning design detail, preservation of wood and expected lifetime of the bridges and their costs. Costs were worked out and estimated as varying from C$ 2,000 to C$ 4,300 per metre span (US$ 200 - 430/m) for bridges from 9 metres to 30 metres long

(2 and 8 trusses respectively). This includes the superstructure only - materials, depreciation, manufacture and erection, overheads at 10 per cent of materials but no abutments.

Costs of concrete bridges with steel reinforcing were quoted as C$ 25,000 per square metre, all works included or about C$ 150,000 per metre span for 6 metre wide bridges.

Based on these estimates, a 15 m - 6 m wide bridge in concrete would cost C$ 2,250,000 whereas two wooden bridges (one for each lane) would be about C$ 90,000 plus whatever abutments would cost.

The film was left with the UNDP Office since the Minister of Construction, Mr. Donald Ramirez was anxious to see it.

Discussions were also held with COIP Officials, Mr. Edward Schaffer, Co-ordinator of Wood Complexes, and Mr. Luis Fiallos P., Director of Planning. The five wood complexes are located at: Managua, Tipitapa, Granada, Matagalpa and Ocotel. Only the last has pressure treatment facilities but at the Managua complex preservative chemicals are introduced with the steam in the kilns. Most have old, worn out equipment or only the odd serviceable plant and production is erratic and unco-ordinated as between complexes. Kilns exist (at Managua and Matagalpa) but air drying was reported as very fast. Investment is generally lacking for new equipment.

Several timber species were suggested, aside from Pitch Pine, as suitable for bridge construction. These were Areno amarillo (Arariba, centrolobium), Nancitan (Suradan, Hieronyma), Zorilla, Canelo (Canela), and Madero Negro.

Discussions with Mr. Schaffer and Mr. Silvio Vanegas, Manager of COMADECO (Commercial de Madera) near Managua indicated that space, basic equipment and staff suitable for a workshop to make wooden bridge elements would be readily available on the site. Specialized equipment only would have to be imported. COMADECO now produces sawn wood, housing components and basic wood products - mostly from Cedro and Guanacaste.

It was evident that high level technical advice is required to assist COIP to re-structure the wood industries and to determine the most appropriate product types and mix for the nationalized complexes, bearing in mind the existence and capabilities of the private sector. He would also be expected to advise on specific technical assistance to COIP in the secondary woodworking sector for the 1982-1986 planning period.

ANNEX I. LIST OF PERSONS ENCOUNTERED

Ministry of Construction

Sr. Alfaro, Vice Minister
Sr. Rafaelo Medina Sandino, Structural Design
Sr. Mario Gutierrez P., Division Materials and Juelos
Sr. Luis Jerez B., Bridge Section
Sr. Rodrigo E. Obregón R., Bridge Construction Unit

C O I P

Sr. Edward Schaffer, Co-ordinator of Wood Complexes
Sr. Luis Fiallos P., Director of Planning
Sr. Silvio Vanegas, Manager of COMADECO (Commercial de Madera - near Managua)

UNDP

Mr. J.L. Larrabure, Deputy Resident Representative
Mr. Christian Gillen, Project Manager, COIP

List of Attendance at Film and Presentation on Wooden Bridges
(held on 9 February 1981)

Noel Zamora B.	Dirección Materiales y Suelos
Matilde Salmeron	Sección de Estructuras
Joaquin Nuñez S.	Dirección de Obras Civiles
Gonzalo Vallecillo A.	Director de Estructuras
Gerardo Mayorga Z.	Responsable Zona Masaya
Denis Pérez Ayerdis	" " León
Aaron Pineda Robleto	" " Boaco
Emilio Wong Vazquez	" " Nueva Segovia
Jorge Collado Beteta	Asist. Zona León
Rigoberto Martinez A.	Zona Granada
Ramón A. Ruiz P.	Regional C.Occ. Mant.
Rodrigo E. Obregón R.*	Unidad Construc. Puentes
Rodolfo Altamirano M.	Zona de Esteli
Bayardo Pérez L.	Zona de Managua
Luis Chong Flores	Zona Carazo
Roberto Talavera	Regional Sur Mant.
Carlos J. Canales	Zona Rivas
Cristóbal Guevara Arce	Regional Norte
Francisco Martinez O.	Asist. Rio Blanco Siuna
Noel Tijerino P.	Responsable Mant. Caminos
Salvador López	Gerente de Proyectos
Maria Lourdes Bravo	Zona Chinandega
Boanerges Ramirez C.	Zona de Madriz
Rafael Miranda Castrillo	Zona Chontales
Oswaldo Jirón Boza	Zona Este Lóvago, Chontales
Rafael Medina Sandino *	Diesño de Estructuras
Mario Gutiérrez P.*	Direcc. Materiales y Suelos
Luis Jérez B.*	Sección de Puentes

ANNEX II. LOW COST MODULAR PREFABRICATED WOODEN BRIDGES

DRAFT JOB DESCRIPTION

NIC/81/ /11-0

Title: Timber Engineer (Bridges)

Project: NIC/81/ /11-0

Duration: 6 months

Duty Station: Managua and region

Purpose of Project: To improve the country's national road network and secondary/access roads, to use natural resources and to provide employment especially in rural areas. Rural development will also be enhanced.

Duties: The expert will work with counterpart personnel and assist the Ministry of Construction to develop the ability to make and erect prefabricated, modular wooden bridges. In particular his duties will be to:

(1) Assist in compiling a survey of potential bridge sites suitable for the design parameters of the system developed in Kenya;

(2) Evaluate the availability and properties of Pines and hardwoods suitable for structural uses and group them according to the strength classes used by CSIRO, Australia;

(3) Check design/loadings for Nicaraguan species and conditions and modify specifications as required;

(4) Establish a workshop, in collaboration with COIP staff at one of the nationalized wood complexes, using as much existing equipment as possible;

(5) Train a workshop staff of about 8 persons in all aspects of making the modules and bridge components and in their assembly and erection;

(6) Erect a prototype bridge on a site determined in collaboration with the Ministry of Construction;

(7) Prepare a manual describing the decision-making process and giving all information necessary for manufacturing and erecting these bridges in Nicaragua suitable also for training.

Qualifications: Civil or structural engineer having experience with timber as a structural material. Familiarity with tropical hardwoods and bridge design would be an advantage.

Language Requirements: Spanish with some knowledge of English

Background Information: The Government has placed a high priority on construction in the country and has many road building projects planned - notably to improve and extend the route from Matagalpa to Siuma and the Atlantic Coast.

The Ministry of Construction is responsible for all road and bridge building excepting logging/access roads and is concerned at the expense of traditional concrete and steel reinforced bridge designs as well as the effort required by scarce technical staff in preparing designs for each case.

The prefabricated, modular wooden bridge system that was developed in 1975-1976 in Kenya as a UNDP/UNIDO porject has shown to be $^1/_4$ to $^1/_3$ the cost of concrete/steel although more suitable for secondary, tertiary and access roads than for primary, heavily travelled arteries. Advantages experienced include:

(a) cheaper abutments since the superstructure is lighter;

(b) short erection time (less than 1 week) for savings in site expenses;

(c) Manufacture of components is labour intensive and use of simple hand tools;

(d) erection can be done without heavy equipment the modules being capable of transport on light trucks and loaded by 4 to 5 men;

(e) design work is virtually eliminated since a manual is prepared to show number of trusses required for given species, span and loading specification (the American system is used in Nicaragua - the American Association of State Highway Officials - AAHSO);

(f) employment is created in rural areas since the concept can be applied to smaller workshops and local labour can be used for abutments and erection work to augment trained workshop and erection staff.

Cost estimates worked out in Nicaragua show a range from C$ 2,000 to C$ 4,300 per metre span which compares most favourably with C$ 25,000 per square metre estimated by the Ministry of Construction for concrete/steel constructions (including abutments).

The nationalized industries are controlled by COIP and include 5 woodworking complexes - at Managua, Granada, Tipitapa, Matagalpa and Ocotel. Some wood is also processed by the private sector.

It is envisaged that a demonstration workshop would be established at one of these complexes bearing in mind the availability of equipment, premises, treatment facilities, the necessary timber and mild steel raw materials, and the proximity to expected bridge sites. Workshop staff would be drawn from the Ministry of Construction and the Wood Complexes themselves. Staff from the Bridge Construction and Structural Design Units of the Ministry of Construction would be closely involved in the project.

Timber species currently being used are Pine (Pinus carribea) in the North and Northeast, plus various hardwoods in the Central and Southern regions. Notable are Zorilla, Canelo, Areno amarillo, Nancitong and Madero Negro.

ANNEX III. ADVICE ON RESTRUCTURING THE SECONDARY WOOD INDUSTRIES - DRAFT JOB DESCRIPTION

NIC/81/ /11-0

Title: Senior Timber Industry Adviser

Project: NIC/81/ /11-

Duration: 1 month

Duty Station: Managua and region

Purpose of Project: To prepare for a rational restructuring of the country's wood processing industry.

Duties: The expert will work with COIP staff within the framework of the existing UNDP project assisting in the planning of nationalized industries to draw up a rational plan for the development of the five woodworking complexes. In particular his duties will be to:

(1) Assess the present capability of each complex in terms of site, buildings, installations, machinery and equipment and staff;

(2) Collate and evaluate existing information on timber species available in Nicaragua;

(3) Recommend an appropriate range of product types for manufacture in the Nationalized complexes, bearing in mind:

- the species characteristics
- the main national requirements and priorities for reconstruction and other demands for products, including structural applications
- the possibility of export
- the potential of each complex
- the existence of the private sector

(4) Recommend the kinds of machinery and facilities necessary for the range of products to be made in the existing complexes;

(5) Recommend a co-ordinated sectoral development plan together with the particular UNDP assistance required for implementation.

Qualifications: Senior consultant or timber industry executive with considerable experience in secondary wood processing and with conditions in developing countries.

Language Requirements: Spanish with some knowledge of English

Background Information: Nicaragua has plentiful forest resources including several well-known species such as Pitch Pine, Central American Cedar, Guanacaste and Mahogany (Caoba) and many lesser-known species.

COIP is responsible for nationalized industries, including wood processing, and co-ordinates the activities of 5 woodworking complexes - in Managua, Tipitapa, Granada, Matagalpa and Ocotel. These produce a variety of manufactured products form sawn, dried timber such as profiles and mouldings, housing components, basic furniture and joinery items.

Equipment and facilities are quite varied in quality, age and condition and the total output is both low and unco-ordinated. Technical and managerial staff are scarce and production planning and control is only basic although some qualified staff exists.

In order to supply the country with a suitable range of well-manufactured products, an overall plan needs to be made for the rational development of this sector in terms of machinery, buildings and manpower. It is envisaged that expert consultancy assistance will be needed for specific aspects and this should be identified in a logical manner in consultation with Government Officials.

In particular, attention should be paid to the potential for timber-frame housing construction of earthquake resistant design and for timber engineered structures such as light industrial, institutional and commercial buildings, storage sheds, farm buildings and silos. The Nicaraguan lesser known species suitable for such purposes should be evaluated and grouped according to their strength properties to enable greater use to be made of them.

Specialty woods should also be identified for possible export as items of higher unit value, especially those suited to rural or small-scale operations.