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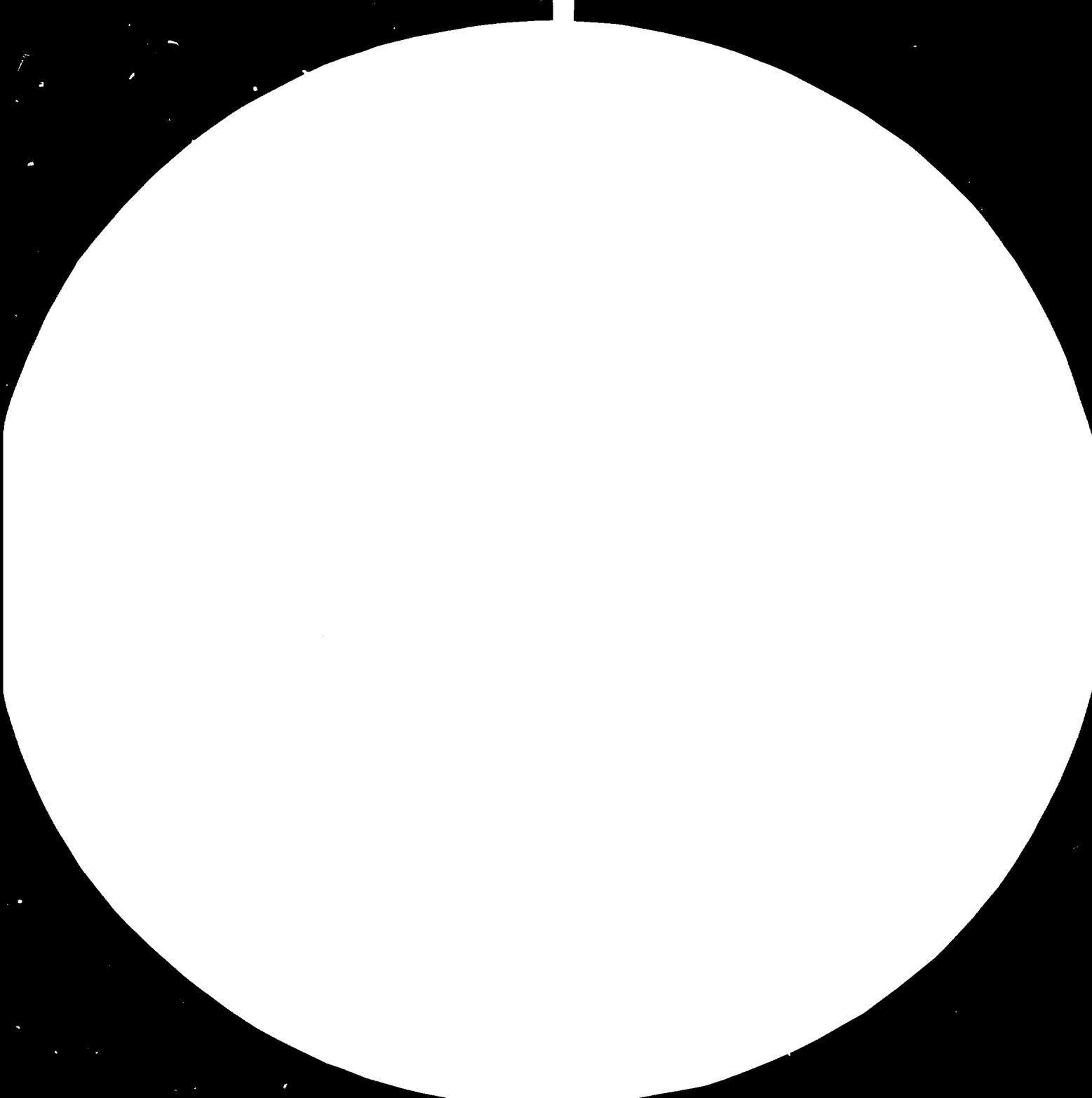
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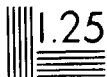
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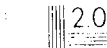
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ASSISTANCE IN THE ESTABLISHMENT OF
A TECHNOLOGY CENTRE FOR WOOD INDUSTRIES .

DP/PER/78/009 .

PERU .

Terminal report*

Prepared for the Government of Peru
by the United Nations Industrial Development Organization,
executing agency for the United Nations Development Programme

Based on the work of Walter T. Kaumann,
expert in wood processing research

United Nations Industrial Development Organization
Vienna

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Explanatory notes

The monetary unit in Peru is the sol (S). During the period covered by the report, the value of the sol in relation to the United States dollar was SUS 1=S 240.

The following abbreviations have been used in this report:

CIFF	-	Centro de Investigación Forestal y de Fauna
CIFFIM	-	Centro de Investigación Forestal y de Fauna y de Industrias Madereras
CTB	-	Centre Technique du Bois, Paris
CITFT	-	Centre Technique Forestier Tropical, Paris
CTM	-	Centro Tecnológico de la Industria de la Madera
DGFF	-	Dirección General Forestal y de Fauna
FAO	-	Food and Agriculture Organization of the United Nations
GNP	-	Gross National Product
INDUPERU	-	Industrias Peru, Peruvian Government development company
INIA	-	Instituto Nacional de Investigación Agraria
IPINTEC	-	Instituto de Investigación Tecnológica Industrial y de Normas Técnicas
MinAgr	-	Ministerio de Agricultura y Alimentación
MinInd	-	Ministerio de Industria, Comercio, Turismo e Integración
ORDELORETO	-	Ordenación de Loreto, Peruvian statutory authority responsible for the development of Loreto
UNIDO	-	United Nations Industrial Development Organization

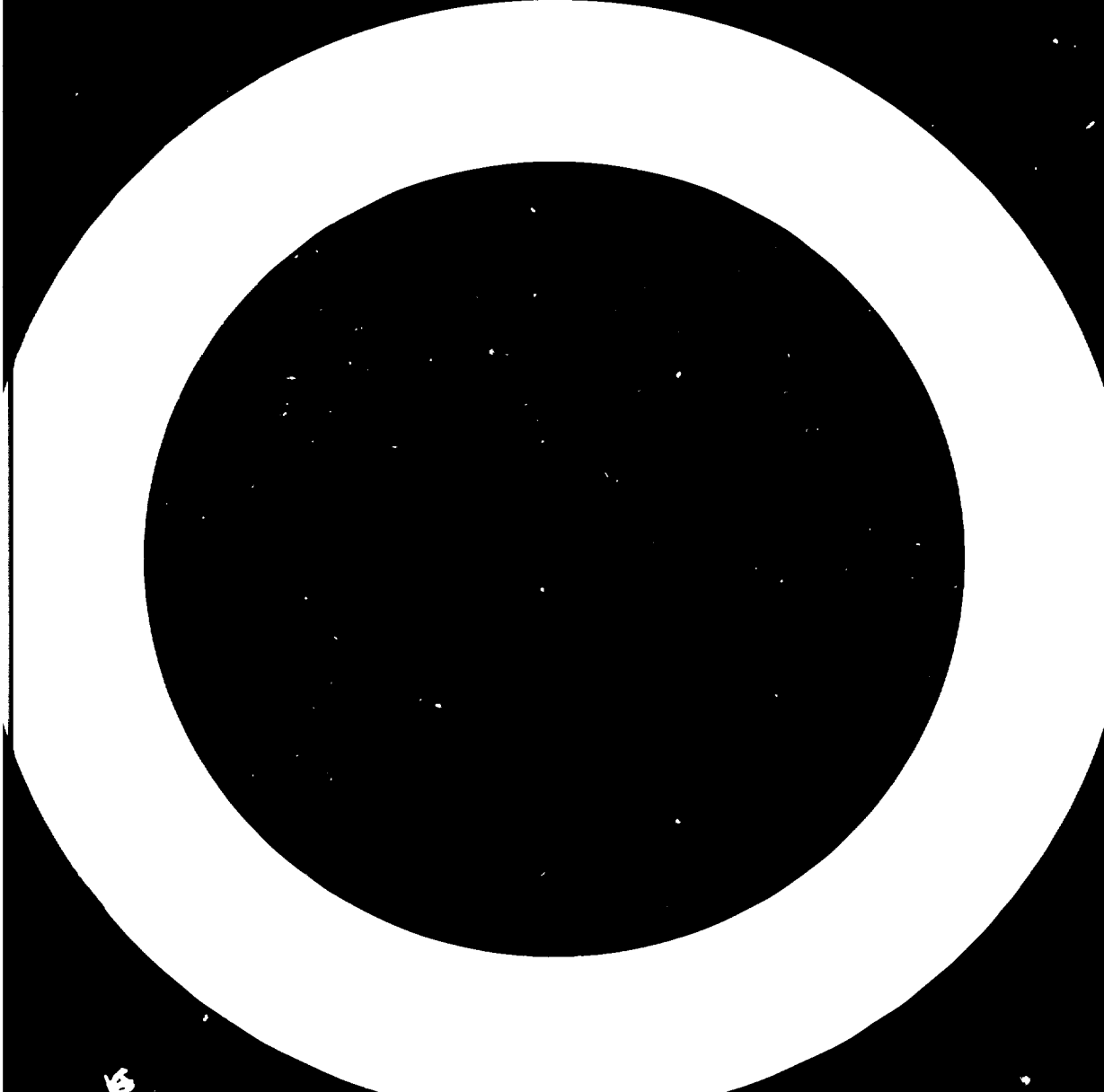
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ABSTRACT

Following a request by the Government of Peru for expert advice in connection with the establishment of a technological centre for the wood processing industry, the United Nations Development Programme (UNDP) approved project "Assistance in the establishment of a technology centre for wood industries" (DP/PER/73/009) on 10 October 1973. The United Nations Industrial Development Organization (UNIDO, was designated executing agency. The expert in wood processing research carried out his mission from 11 to 17 November 1979.

The immediate objectives of the mission according to the expert's job description were to assess the future activities of the centre; to outline a research programme assisting the Peruvian wood processing industry; to advise on such matters as standardization and the establishment of an information service; to recommend basic equipment for the centre including training facilities; and finally to evaluate an already existing feasibility study. In addition to the above, a work plan, prepared by INDUPERU, the government counterpart agency, was accepted as a basis for the execution of the mission.

The expert's principal recommendations relate to the position of the technological centre within the Peruvian administration, its structure, the activities it should undertake and the human as well as capital resources required for the implementation of the proposed activities. He stresses the importance of sales promotion and quality control in order to increase timber exports, proposes that the centre should engage in laboratory, experimental and assistance work and promotional activities in the areas of joinery, constructional timber and furniture and emphasizes the need to introduce basic and applied research in silviculture and forest management to conserve the Peruvian forest so that it will provide a continuing source of income for the nation.



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SUMMARY of PRINCIPAL RECOMMENDATIONS

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(The numbers in parentheses are the pages where the full text of the recommendations may be found.)

GENERAL PRINCIPLES

The consultant believes that the best way to ensure the success of the proposed Centre is to employ competent technical personnel, and have them participate in the formulation of the programme of activities to be undertaken, and of the list of equipment to be acquired. (3, 17, 60).

The future officers of the Centre must, of course, be given a Mission to carry out, an Administrative Framework within which to operate, a list of the Main Problem Areas to be tackled, and a Budget to define the scope of their activities.

The present Report, based on INDUPERU's Feasibility Study, attempts to define these points. On the other hand, the Report does not specify how the experimental project should be conceived in detail, and how the job should be done. This, in the consultant's opinion, should be left to the discretion of the Centre's future professional officers.

STRATEGY

Most of the wood technological problems which are impeding improved utilization of the Peruvian tropical forest can be solved by the judicious application of existing knowledge (5).

The most important requirement to increase timber exports is the availability of adequate volumes and a guarantee of quality (5, 27): Promotion and Quality Control must therefore be given high priority.

In addition to the activities proposed by INDUPERU, the Centre should undertake laboratory, experimental and assistance work, as well as promotional activities, in the areas of joinery, constructional timber and furniture (20, 50 to 53).

Basic and applied research is required in silviculture and forest management, and these activities must be closely coordinated with utilization and industry planning, in order to make sure that the Peruvian forest will be conserved and will provide a continuing and not only a temporary source of income for the Nation (5, 11).

ADMINISTRATIVE STRUCTURE (Forma empresarial)

The Centre should be a cooperative venture of the Ministries of Industry (through ITINTEC) and Agriculture (through INIA) and should function under the auspices of ORDELORETO. (13).

It should make use of the existing facilities of CIEFF, so that there is no danger of setting up two parallel institutions dealing with wood technology. (8, 9, 12, 13).

To set up a single Institution dealing with both Forestry and Industry, a joint recommendation by ITINTEC and INIA should be made to their respective Ministers for the presentation of a Decree-Law that will create the Centre (15).

The President of the Centre should be provided by ORDELORETO, and the Vice-President (for the first five years) by INDUPERU (13, 14). The Centre should be governed by an Administrative Council including representatives of the Ministries concerned, of the Forest Engineering Faculties of the Universities, and of the forest products industries (13, 14).

The Centre should have its own legal personality, and budget financed partly from Government Treasury and partly from income earned for services rendered to industry (15). During the first five years, the total expenditure should be guaranteed by the Government (15).

INSTITUTIONAL STRUCTURE

Executive responsibility for the Centre, under the authority of the President and the Administrative Council, should be vested in a Director General (14).

Under the Director General, there should be three Departments, each headed by a Director, viz. (14)

Forestry
Industry
Administration

Each Department should have the following Divisions (19, 20)

Forestry	-	Sylviculture Forest Management Dendrology Harvesting Wildlife
Industry	-	Primary Conversion Processing Techniques Timber Products Promotion
Administration	-	Administrative Services Technical Services

and each Division should have a number of Laboratories or Sections (19, 20).

TECHNICAL ACTIVITIES

All experimentation, technical assistance and training should be carried out by the officers of the Divisions of the Industry Department, listed above. Contrary to the INDUPERU proposal, there should not be a "Services" Department (17, 18, 27).

No basic research, and little applied research, is necessary in the area of wood technology in the context of the proposed Centre (5, 23, 57). (But see "Explanatory Note" below). (7, 79)

On the other hand, considerable experimentation is required to transfer and adapt technology to Amazonian conditions. The experimental projects to be undertaken should be defined, as far as possible, on the basis of problems arising in technical assistance. (25, 26)

Promotion, including marketing, quality control and standards should be an important component of the activities (55 to 56).

BASIC RESEARCH -- EXPLANATORY NOTE

(Not included in main body of Report)

The consultant has always strongly advocated that some basic research should be undertaken in developing countries (e.g. Kauman and Kloot, 1972). He believes and advocates that Peru should do some basic research in wood science.

His recommendation against basic research in the proposed Centre is based on the tasks assigned to this Centre by INDUPERU, ORDELORETO and other interested agencies (7, 79). In Peru, such research should be carried out in the universities. The Centre should sub-contract its basic research problems to other laboratories (cf. 41, 47, 48) giving preference, wherever possible, to the Forest Engineering Faculties of Peruvian universities.

IMPLEMENTATION

INDUPERU's alternatives of implementation (either over a ten-year period or within 27 months) are not considered realistic. The Centre is required now, but for organizational reasons, 27 months would appear too short (8, 58).

It is recommended that the Centre be established over a five-year period, and that the Industry laboratories should become operational in the following order of priority:

- | | |
|---------|---|
| Year -1 | Director General, Admin. Council |
| 0 | Administrative Service, Directors of Forestry and Industry |
| 1 | Technical Services of Admin. Department |
| 2 | Sawmilling, Drying, Preservation, Marketing |
| 3 | Veneer and Plywood, Technol. Properties, Joinery, Construction, Quality Control |

- Year 4 Gluings, Surface Treatments,
Furniture, Standards
- 5 Panels (possibly)

(The plan for the implementation of the Forestry Department is not considered in this Report)

PERSONNEL

The total personnel in Year 5 should be (60 to 64)

Dir. Gen. and Admin. -	Professional A, B	11	
	Technicians (Prof. C)	9	
	Other	<u>31</u>	51
Industry -	Professional A, B	23	
	Technicians (Prof. C)	25	
	Other	<u>56</u>	<u>104</u>
	TOTAL		155

(Forestry Department not considered).

Most professionals of grade A and B should be employed in Years 0 and 1 (65).

TRAINING

Training of professional officers should provide either for visits lasting from two days to two weeks, or of a minimum of six months, at any given laboratory.

FINANCIAL

Total expenditure for the Administration and Industry Departments is proposed as follows (millions of Soles) at Jan. 1979 cost levels:

	Cumulative to Year	
	<u>4</u>	<u>13</u>
Investments	584	664
Personnel and Operation	<u>682</u>	<u>2002</u>
TOTAL	1266	2666

The annual budget after full establishment (from Year 5 onwards) (68)

Investment	10 M Soles
Personnel	110
Operation	45
Promotion	<u>10</u>
TOTAL	175 M Soles p.a.

This is greater by 40 M Soles p.a. than the INDUPERU proposal, but it may be confidently expected that the Timber Products and Promotion Divisions will substantially add to the projected income. If the Centre is successful, there is a possibility that after 10 years it might provide a new utility that could be used to reimburse the initial investment (71).

INTERNATIONAL ORGANIZATIONS

It is recommended that UNDP give favourable consideration to any request by the Peruvian Government, supported jointly by the Ministries of Industry and Agriculture, and ORDELORETO, to support the Centre (71).

FAO should accept responsibility for the Forestry Department, and UNIDO for the Industry Department (72).

Support should take the form of up to 8 expert years (during Years 1 to 4 of the Centre's operation), 4 studentship years (Years 0 to 2, with possible additions after revision at end of Year 2) and 29 consultant months (72, 73).

U.K. support should start only after the completion of Year 0, i.e. when the Centre has been legally established by the Peruvian Government and has become operational on an administrative basis.

1. OUTLINE OF THE MISSION

The consultant was commissioned by the UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION (hereafter referred to as UNIDO) to advise on the establishment of a technological centre for the wood processing industry at or near PUCALLPA (Dept. of Loreto, Peru).

The terms of reference of the mission were as follows (UNIDO Job Description DP/PER/78/009/A/01/37-11-01/A dated 17 October, 1979:

1. Assess the activities of the centre for the primary wood processing industry in the field of sawmilling, wood based panel industries, timber engineering industries, lumber impregnation, etc.
2. Assess the activities of the centre for the secondary wood processing industry in the field of furniture, joinery and dimension manufacture.
3. Outline an assistance programme in research work for the primary and secondary wood processing industry in direct consultation appropriate to the conditions of the country.
4. Advise in co-ordination with the standardization institute ITINTEC to establish national standards for the wood processing industry.
5. Advise on establishing an information centre as a special service appropriate for the Peruvian wood processing industry.
6. Outline the basic equipment requirements for a machine room with training facilities.
7. Outline the laboratory and testing equipment appropriate to technological centres in industrialized countries.
8. Evaluate the Estudio de Factibilidad del Centro Tecnológico de la Industria de la Madera (prepared by INDUPERU) in comparison to European and other overseas research institutes.

In addition, on his first contact with INDUPERU (Industrias del Peru) on Nov. 12, 1979, the consultant was handed a "Plan de Trabajo" (undated) prepared by INDUPERU which was accepted by the supervising UNIDO Expert, Mr. Heinz Eldag, and himself, as a basis for the execution of his mission. The terms of this Plan de Trabajo were as follows:

- 1.1 Basado en el conocimiento de la organización, planes de desarrollo y tipos de investigación que desarrolla el CTB (Centre Technique du Bois, Paris, Francia) y otros Centros Tecnológicos de Europa, el Sr. Kauman recomendará los planes, estrategias y actividades de coordinación que deberá desarrollar el Centro Tecnológico de la Industria Maderera (CTM) para captar las experiencias e investigaciones que hayan ejecutado los Centros Tecnológicos mencionados, y de que forma podrán contribuir en la formación y desarrollo del CTM.

- 1.2 El Sr. Kauman recomendará la mejor forma empresarial para el CTM.
- 1.3 El Sr. Kauman recomendará la estructura adecuada que deberá poseer el CTM para su inicio y el mínimo requerimiento de personal e insumos para iniciar sus operaciones.
- 1.4 De acuerdo a la situación de la industria de transformación mecánica de la madera nacional, el experto propondrá cual es el apoyo adecuado que deberán brindar las instituciones estatales para su mejor desarrollo.

In pursuance of these instructions, the consultant arrived in Lima on November 11, 1979. From that day until including the day of November 17, he undertook, jointly with the staff of INDUPERU and with the supervising UNIDO Expert, to gather and discuss the information required for the formulation of his recommendations, in accordance with the above terms of reference.

During this period, a number of institutions were visited in Lima, Iquitos, Pucallpa and La Molina. Details of these visits are given in APPENDIX 1.

In addition, further meetings with officers of INDUPERU and the Ministry of Industry were held on November 20, 24 and 26 while the consultant was engaged on another mission on behalf of UNIDO.

On his arrival in Lima, the consultant was given a copy of the "Estudio de Factibilidad del Centro de la Industria de la Madera" prepared in June, 1979, by the "Gerencia de Proyectos" of INDUPERU. This is a document of three volumes totalling more than 600 pages, with an additional "Sumario Ejecutivo" of 35 pages. (Hereafter, this document will be referred to as "INDUPERU 1979".)

In view of the great volume of this Feasibility Study which the consultant is asked to evaluate (UNIDO instruction 8) and the fact that there was still considerable doubt about the proposed organizational form of the future "Centro Tecnológico de la Industria Maderera" (hereafter called CTM), it was materially impossible to outline the facilities of the Centre and formulate definite recommendations during the consultant's stay in Peru.

2. PLAN OF THE REPORT

2.1 LIMITATIONS (Humboldt Forest Industries Project)

In an informal discussion on Saturday, 24th November 1979 (i.e. after the conclusion of his INDUPERU mission), the consultant was given to understand that there is a project of major proportions for the establishment of a forest industry complex at the Humboldt Forest location (86 km from Pucallpa), including a sawmill, venser and parquetry plants, production of poles and possibly plywood. The feasibility study for this project was said to have been completed by INDUPERU, and implementation was scheduled to begin on January 1, 1980. The plant is to be fully operative within four years, and the total investment plan was stated to amount to some US\$ 30 million.

The installation of this project is to be undertaken by a company which was said to be in process of being established, with the participation of INDUPERU, ORDELORETO (a statutory authority responsible for the development of the Department of Loreto) and an undisclosed foreign partner. Of the eventual production, 40 % were said to be earmarked for local consumption, and 60 % for export. (cf. Appendix 2 for details of support by ORDELORETO.)

It is obvious that the existence of a US\$ 30 million forest industry complex near Pucallpa, with modern machinery and presumably skilled foreign staff in the initial stages at least, would put an entirely different complexion on the proposed Wood Technology Centre (CTM) project. At the time of writing the present report, the writer had not yet received any details of the feasibility study for this industrial complex prepared by INDUPERU. In the absence of this information, the present report is submitted with the express reservation that the conclusions and recommendations may be substantially modified if and when this information comes to hand.

Although the establishment of a forest industry was not included among his terms of reference, the writer wishes to repeat his very earnest advice, given to the Peruvian officers present during the discussion on Saturday, 24th November 1979, that if this has not already been done, informed and independent technical opinions should be sought before any final investment decisions are made for the proposed forest industry complex.

2.2 BASIC CONSIDERATIONS

The successful operation of a technical centre depends on, in order of priority,

- the professional competence of its staff
- the administrative structure which must provide for adequate logistic support and flexibility to enable the professional staff to do their jobs
- an assured budget to guarantee adequate salaries and operating expenses
- equipment, installations, buildings.

In temporal sequence, the establishment of a technical centre ab inicio should proceed as follows:

- Define the administrative structure ("forma empresarial", instruction 1.2 of INDUPERU "Plan de Trabajo" p.2), including the duties and spheres of responsibility of the senior officers of the proposed Centre.
- Engage the best qualified persons for the senior positions provided in the administrative structure. (If necessary, arrange for training either by visits abroad or employment of experienced foreign technical officers during the initial stages).
- Commission the senior officers of the new Centre, as their first task, to draw up a Programme of Activities and a List of Basic Equipment Requirements, in consultation with foreign specialists.

In the present case, however, the proposed Wood Technology Centre is not going to be established ab inicio. At least one such centre is already in operation at Pucallpa, and its existence must be taken into account (see Chapter 3). In addition, considerable experience in wood technology exists in the Forest Engineering School of the National Agrarian University, and in the Technological Group of the Andean Pact.

The drawing up of the programme for the establishment of the proposed new centre will be greatly facilitated by the Feasibility Study prepared by INDUPERU (1979). This well-researched document provides a checklist of activities and equipment that will be useful in estimating the investment required and the initial operating expenses. It may also serve as an initial framework, suitably amended as suggested by the consultant in the present report, for the employment of the senior officers and for the preliminary planning.

The Feasibility Study should not, of course, be taken as an actual set of specifications of activities to be carried out or of equipment to be acquired.

2.3 PRESENTATION OF THE REPORT

In accordance with the basic considerations given above, we shall first discuss the administrative structure of the proposed Centre and its place in the context of existing Peruvian institutions (Instructions 5, 8 of UNIDO terms of reference, 1.2 of INDUPERU "Plan de Trabajo"). This will be the subject of Chapter 3.

In Chapter 4, we shall propose an institutional structure for the Centre (Points 1 to 3 of UNIDO terms of reference, 1.3 and 1.4 of INDUPERU "Plan de Trabajo").

Chapter 5 will include a detailed discussion of activities and equipment proposed in INDUPERU 1979, with modifications required by the recommendations of Chapter 4. (Points 4, 6, 7 of UNIDO terms of reference, 1.1 and 1.4 of INDUPERU "Plan de Trabajo".)

In Chapter 6 we shall examine financial and personnel aspects, and formulate suggestions on support to be provided by national and international institutions.

The writer wishes to point out that there is some danger in advocating comparison with European technological centres when evaluating Peruvian proposals (Point 8 of UNIDO terms of reference, point 1.1 of INDUPERU "Plan de Trabajo"). It is rarely advisable to transpose organizational structures and technical programmes from one country to another. In the present report, we endeavour to determine the structures and programmes which, in the consultant's professional judgment, are inherently most appropriate for Perú.

3. STRATEGY AND OBJECTIVES

3.1 BASIC CHALLENGES AND PROBLEMS

Perú, like many other developing countries, is deriving only minimal benefit from its abundant forest resources (1 % of the GNP for 5.2 ha per inhabitant - INDUPERU 1979 p. I-14).

To determine the strategy for increasing this benefit, there are some basic facts which must be clearly understood. We shall group them under three headings:

- Wood Technology.-

The solutions to the wood-technological problems which stand in the way of producing more wealth from the tropical Peruvian forest are basically known: We know how to log, saw, dry and convert tropical timbers in general. Experimental work is needed, of course, to apply this knowledge to Peruvian species and conditions, but no basic research, and little applied research, is required for this purpose.

- Promotion and Marketing.-

For the promotion of Peruvian timbers on world markets, knowledge of the technological properties is desirable, but much more important is the availability of adequate volumes of any new timbers proposed for marketing, and a guarantee of constant, sustained quality of the products put on the market.

- Forest Management.-

The solutions to the fundamental silvicultural problem of ensuring the conservation of the resource are not so well established. We do not know with adequate precision how to manage a tropical forest for perpetual yield on an economic basis. We do not know enough about the ecology of the Amazon basin, and indeed of humid tropical forest systems in general, to make informed

decisions about possibilities of replacing them by exotic plantations or of introducing agro-forestry schemes. In these areas, basic and applied research is indeed required.

These basic facts point to some immediate challenges.

How to :

- Transfer known technology required for the conversion and utilization of as great a range of Peruvian species as possible.
- Promote preferentially species available in large and accessible volumes, and institute adequate quality control, in order to place on international markets quality products able to meet competition.
- Continue and intensify research into silviculture and forest management so that the forest may provide a continuing and not just a transient source of income for the Nation.

The writer believes that these challenges implicitly define the strategy and the programme for a technological centre intended to help increase the contribution of forests to Peru's economic and social welfare.

In the subsequent discussions, we shall examine how they can best be met.

3.2 PERUVIAN PROPOSALS

It is not intended, in this report, to review in detail the existing situation and the solutions proposed by the Peruvian authorities which are already adequately documented in the INDUPERU feasibility study (INDUPERU 1979) and in a preliminary report by the supervising UNIDO expert (Eldag 1979).

We shall limit ourselves in the following to a brief summary of two projects which are basic to our analysis and recommendations.

3.2.1 Ministry of Agriculture

The Ministry of Agriculture and Food (Ministerio de Agricultura y Alimentación, hereafter referred to as MinAgr) through the National Institute of Agrarian Research (Instituto Nacional de Investigaciones Agrarias, hereafter referred to as INIA), is operating a Forest and Wildlife Research Centre (Centro de Investigaciones Forestales y de Fauna, hereafter referred to as CIFF) at Fucallpa, Department of Loreto, which in November 1979, had a staff of about

	3	professional forest engineers
	2	qualified forest technicians
	3	laboratory assistants
	3	administrative personnel
some	50	labourers

with a budget for 1979 stated to be about 40 million Soles (roughly 170,000 US\$), half of which was earned by the Centre.

Three wooden buildings have been erected and some equipment has already been installed and is in use for the determination

of technological properties (microscope, balances, miscellaneous laboratory equipment). An experimental preservation plant is installed but not yet operating, and additional equipment has been obtained but not yet installed (universal testing machine, saw sharpening shop). Negotiations are in progress to obtain an experimental drying kiln and experimental sawmilling equipment. A new wooden building to house the saw doctoring shop is in process of construction. (cf. also INDUPERU 1979, Vol. III).

The Centre is being supported by the Andean Pact Technological Programme, by FAO and by Swiss bilateral cooperation. It was stated that in 1980, it is hoped to bring the personnel up to the authorized strength (6 engineers, 4 technicians, etc.) Also in 1980, ORDELORETO is committed to contribute an amount quoted as 20 million Soles (roughly 80,000 US\$) for additional buildings. (See APPENDIX 2 for details about ORDELORETO).

About half the personnel is located at the wood technology laboratories 4.5 km from Pucallpa, and the other half at the Humboldt Forest Station 86 km from Pucallpa, along the Tingo María road.

The objectives of the ClFF (which is operating within the framework of Art. 32 of the Statutes of INIA (1979)) are stated by ORDELORETO (1979) as follows: "... bring about an integral and rational utilization of the tropical forest resources and ... create our own technology ...". ORDELORETO officers further stated that ClFF is commissioned to undertake applied research in wood technology and provide technical assistance to industry.

3.2.2 Ministry of Industry through ITINTEC

The Institute of Industrial Technology Research and Standards (Instituto de Investigación Tecnológica Industrial y de Normas Técnicas, hereafter referred to as ITINTEC) is an organization attached to the Ministry of Industry, Commerce, Tourism and Integration (Ministerio de Industria, Comercio, Turismo e Integración, hereafter referred to as MinInd).

In 1976, ITINTEC commissioned its Department of Technology (Dirección de Tecnología) to carry out a preliminary study on the establishment of a Wood Industry Technological Centre (Centro Tecnológico de la Industria de la Madera, CTM). On the basis of their report, ITINTEC commissioned INDUPERU some time later to carry out a technical-economic Feasibility Study of the installation of the proposed Centre (INDUPERU 1979).

The objective of the proposed CTM is stated to be "the creation of the infrastructure to ensure as far as possible the generation and/or adaptation of technology and its application to the national (forest) industry" (INDUPERU 1979, Summary, p.1). The Centre is to be established at PUCALLPA, possibly at the km 4.5 adjacent to ClFF.

As of November, 1979, it would appear that no definite decision had been taken regarding the establishment of the CTM. However, ORDELORETO officers stated that some 28 million Soles (roughly 110,000 US\$) had been earmarked for further studies in the 1980 budget.

In the Feasibility Study (INDUPERU 1979), two alternatives are discussed for the establishment of the Centre:

1. "Modular" establishment, the Centre becoming fully operative after 10 years.
2. "Rapid" establishment, the Centre becoming fully operative after 27 months.

INDUPERU recommends the first "modular" alternative, with the following timetable for the installation of the laboratories:

Year 2	-	Anatomy and physico-mechanical properties
6	-	Sawmilling
7	-	Drying and Preservation
10	-	Veneer and Plywood

However, sawmilling training courses and standards work would start as from Year 1 (INDUPERU, SUMMARY, p. 22 to 23, also pp. V-1 to 47 in Vol. II).

The total staff on full establishment is planned to be

27	professionals	
29	technicians	(INDUPERU 1979,
57	skilled and unskilled workers	SUMMARY p. 31)
26	employees in support areas	

Total investment at February, 1979 prices is calculated to be some 404 million Soles (roughly 1.6 million US\$) of which some 336 million Soles (1.35 million US\$) would be for real estate, buildings and equipment.

The operating cost for the "modular" establishment is calculated as follows:

-	Year 3	-	Income	18M Soles (70,000 US\$)
			Expenditure	64M Soles (260,000 US\$)
				Net cost: 46 M Soles (190,000 US\$)

Year 10 (not counting investments)

Income	84M Soles (340,000 US\$)
Exp.	114M Soles (430,000 US\$)

Net cost: 30 M Soles (110,000 US\$)

(INDUPERU 1979, p. V-37)

3.3 DISCUSSION OF PERUVIAN PROPOSALS

It is obvious that as far as wood technology is concerned, the already existing CIFF and the proposed CTM pursue more or less the same objectives. However, CIFF is integrating wood technology and forest management in the same institution, whereas CTM contemplates work on wood technology only.

The personnel and budget figures for the two institutions are of similar magnitude (Table 1), at least for the first few years of operation of the CTM.

The writer considers that it would be absurd to have two separate institutions, in the same location, responsible to two different Ministries, to deal with the same subject area.

Table 1. Budget proposals for CIFF and CTM.
(Initial years of Operation)

CIFF - Forest and Wildlife Research Centre operating under the National Institute of Agrarian Research

CTM - Wood Technology Centre proposed in INDUPERU 1979

Year	CTM Modular establishment as recommended by INDUPERU	CIFF
Millions of Soles		
Prior to 1978	} 29	3.9
1979		32.7(*)
1980		38 (+)
Projected CTM		
Year 0	79	
1	38	
2	113	
3	64	

(+) Verbal information, not confirmed

(*) In addition, some 20M Soles were received as income for services to industry

See also Tables 6, 7 and Appendix 2

Such a course, i.e. the establishment of two separate institutions pursuing the same objectives, would clearly result in duplication of effort, competition for funds and trained personnel, administrative top-heaviness, inefficiency and unhealthy competition in the dispensation of technical assistance, all leading to energy-consuming friction between the two Centres and their governing authorities.

Without exception, every Peruvian and international officer interviewed during the Mission agreed with the principle that there should be only one wood technology centre, and not two, at Pucallpa.

On the other hand, there was considerable disagreement about the administrative structure of the proposed Centre. Opinions expressed to the consultant fell broadly into three categories:

1. The proposed new Wood Technology Centre (CTM) to be fully integrated with the existing CIFF, under the control of INIA but with representation of ITINTEC in INIA's Administrative Council (Consejo Directivo).
2. The proposed new Wood Technology Centre (CTM) to be installed adjacent to the existing CIFF laboratories at km 4.5 in Pucallpa, under the full control of ITINTEC:
There were two variants to this opinion:
 - 2.1 The work of CTM to be coordinated with that of CIFF at the technical level, the mechanism of coordination to be determined.
 - 2.2 CIFF to discontinue all activity in the area of wood technology and to confine itself to forest management, silviculture and similar areas. The existing wood technology facilities of CIFF to be transferred to CTM.
3. The proposed Wood Technology Centre (CTM) to be established as an autonomous body, possibly under the supervision of ORDELOPETO (see APPENDIX 2), and incorporating the present wood technology activities of CIFF (similar to 2.2).

The administrative control of the proposed Centre is obviously an internal Peruvian affair to be decided by the Peruvian Government. However, in accordance with Point 1.2 of the INDUPERU "Plan de Trabajo" for his mission, and insofar as the administrative structure of the Centre affects its efficiency, the consultant wishes to offer the following suggestions and recommendations.

The consultant considers the following facts as self-evident:

1. Having regard to the "basic facts" listed in 3.1, forestry and forest products research, development and technology should be controlled by the same body.

(If this is not the case, and given the fragility of the tropical environment, there is a very great danger that Peru will derive only short-term benefit from its forest and in doing so, will destroy the resource.)

2. The professionals available in Peru with training and experience in wood technology are very largely graduates of forestry, many of them serving either in the National Forest and Wildlife Service (Dirección General Forestal y de Fauna, hereafter referred to as DGFF) or in the Forest Science Faculty of the National Agrarian University (Universidad Nacional Agraria, La Molina).

3. At the institutional level, there is much to be gained by an interdisciplinary approach associating the Ministries of Agriculture and Industry in a common endeavour to derive maximum benefit from a renewable natural resource requiring biological management to produce an industrial raw material.

(Wood technology is indeed a practical art of interdisciplinary character, having equally important connections with silviculture and forest management as with mechanical, civil or chemical engineering.)

Having regard to these facts, the consultant considers that none of the three alternatives summarized on the preceding page entirely satisfactory:

- To place the proposed Centre entirely under the control of INIA would make it difficult to absorb the input proposed in the INDUPERU (1979) Feasibility study and to maintain the necessary coordination with ITINTEC.
- To place it entirely under the control of ITINTEC would not make the best use of the existing CIFF and of the effort and funds already spent on its establishment.
- To create the Centre as an independent autonomous institution would prejudice the necessary links with INIA; DGFF, and ITINTEC and would be potentially disastrous to the indispensable liaison between forestry and forest products activities.

In the next Section, the consultant proposes what he considers the best compromise, in the interest of the Peruvian Nation, between the conflicting sectorial opinions discussed above.

3.4 CONSULTANT'S RECOMMENDATION

The purpose of the present Section is to formulate a recommendation on the administrative structure of the proposed Institute ("Forma Empresarial") within the general framework of Peruvian Government Administration. (cf UNIDO Terms of Reference Point 8, INDUPERU "plan de Trabajo" point 1.2).

This recommendation follows largely those made previously

- by the supervising UNIDO Expert (Eldag 1979) who states on p. 14 of his report:

"...the different Ministries should jointly prepare through a Committee the activities of the wood technology centre. The responsibility of the Ministry of Agriculture should be forestry related only on the following subjects: silviculture, reforestation, logging, preservation, pulp and paper, naval stores, wood chemical, charcoal. The responsibility of the Ministry of Industry should cover the following industries: Primary wood processing: sawmilling, panel production, dimension manufacturing, kiln drying. Secondary wood processing: pilot plant for furniture and joinery, tooling maintenance station, product testing laboratory.

.....

During the establishment of the Centre, INDUPERU will coordinate the work for setting up the Centre

- by the INDUPERU Feasibility Study (INDUPERU 1979) p. IV-00, Point 4.1.1.1 DIRECTORIO, which states:

"(El Directorio) estará formado por representantes de organismos públicos comprometidos con la industria forestal, y por representantes de la industria privada Entre el sector público se encuentran: ITINTEC, Ministerio de Industria, Turismo, Comercio e Integración, Ministerio de Agricultura y Alimentación, Ministerio de Vivienda e Instituto Nacional de Investigaciones Agrícolas." (NB. The last word should read: Agrarias, the Institute referred to is the INIA).

It is noted that both UNIDO and INDUPERU recommend an association between the Ministries of Industry and Agriculture in the management of the proposed CTM. The consultant agrees with these opinions.

As mentioned previously (Section 3.3.), every Peruvian and international officer interviewed during the mission concurred that there should be one joint Centre, not two separate ones.

An omission from the previous recommendations is the Organization of OPDELORETO (see APPENDIX 2) which is charged with the coordination of research and development in the Department of Loreto.

Under the Peruvian Government's decentralization planning, ORDELORETO was said to be assuming direct management responsibility for carrying out research and development activities within the Department, coordinating the input by the different Ministries. The Organization is responsible directly to the President of the Republic.

The seat of ORDELORETO is at Iquitos, but a delegate responsible for activities in the Province of Coronel Portillo is located at Pucallpa.

In view of the situation described above, the most urgent task is to arrive at an understanding between the Ministries of Industry and Agriculture, and ORDELORETO, on the establishment of the CTM.

As far as the consultant was able to ascertain, no formal contacts or negotiations had been made between the two Ministries up to November, 1979, although some informal meetings took place.

In his meetings with MinInd, ITINTEC, MinAgr, DGFF, INIA and ORDELORETO between November 12 and 26, 1979, the consultant had no brief to negotiate or propose any consensus or agreement. He did, however, ascertain the opinions and positions of each of these organizations, as expressed by the officers interviewed. A summary of these positions - some of which are conflicting - has been presented on p.10.

The recommendation which follows takes account of all the opinions stated to the consultant, but obviously cannot reproduce any one of them since it was necessary to arrive at a compromise.

RECOMMENDATIONS

1. The CTM should be established under the auspices of ORDELORETO, as a joint venture of the Ministries of Industry (through ITINTEC) and Agriculture (through INIA).
2. The President of the CTM should be appointed by the President of the Republic at the proposal of ORDELORETO who will consult with MinInd and MinAgr as regards the suitability and acceptability of candidates.
3. The CTM should make use of the existing structure and facilities of CIFF.
4. The name of the Centre should reflect the fact that its activities are in the areas of forestry and forest products. The consultant's suggestion is

"CIFFIM" (Centro de Investigación Forestal y de Fauna y de Industrias Madereras)

An alternative, more snappy name would be

"CIF" (Centro de Investigación Forestal),

remembering that "Forestal" is often taken to include "Productos Forestales" (cf. Instituto Forestal, Chile; Centre Technique Forestier Tropical, France.)

5. During the initial five years of operation of the Centre, the Vice-president should be an officer of INDUPERU, subject to agreement by the President and General Manager of INDUPERU.

6. The Centre should be governed by an Administrative Council which should include:

The President of the Centre	(President of Council)
The Vice-President	(Vice-Pres. of Council)
The Director-General of the Centre	(Secretary of Council)

Nominees of:

The Minister of Industry

ITINTEC

The Minister of Agriculture

INIA

The Director-General of Forests and Wildlife (DGFF)

The Minister of Housing

The Dean of Forest Engineering,
National Agrarian University, La Molina

The Dean of Forest Engineering,
Central University, Huancayo

The Dean of Forest Engineering,
University of Amazonia, Iquitos

The representative of ORDELORETC at Pucallpa

and an equivalent number of representatives of industry, chosen from:

Chambers of Commerce with interest in forest industries.

Professional associations of forest industries.

Representatives of the industries of:

Sawmilling

Floor and Parquetry plants

Veneer and plywood plants

Furniture manufacturers

Timber exporters

etc.

(This list is based on the INDUPERU recommendation INDUPERU 1979 p. IV-00, 4.1.1.1. It should not be considered as exclusive).

7. The Centre should have two departments:

- Forestry Department
- Industries Department

Each Department should be headed by a Director, appointed by the Administrative Council after consultation with ITINTEC and INIA.

In addition, there will be an

- Administrative Department,

also headed by a Director, which will include Services.

8. Executive responsibility for the operation of the Centre should be vested in a Director-General, appointed by the Administrative Council with the agreement of the Ministers of Industry and Agriculture, and of ORDELORETC.

9. The Centre should be financed from Government treasury funds to be included preferably as a separate line in the National Budget (alternatively, in the budgets of ORDELORETO, MinInd and MinAgr).

During the first five years of operations, the total expenditure of the Centre should be guaranteed from Government sources, to avoid interruption of activities if income is not as much as expected (see INDUPERU 1979, SUMMARY p. 25, Table V-37 Vol. II).

INCOME earned by the Centre should be paid into a special account on which the Director-General, duly authorized by the Administrative Council, can draw to defray disbursements for operating expenditure and investment, subject to the usual auditing controls by the Ministerio de Hacienda and the Contraloría. Income earned should not become part of general Government revenue.

The Centre should be authorized to carry forward any positive balance in its accounts at the end of any financial year, as "Reserves" for use during subsequent years.

10. The Centre should have its own legal personality (personalidad jurídica).

The administrative structure inherent in these recommendations is summarized in Figure L. The internal organization of the proposed Centre will be discussed in Chapter 4.

3.5 SUGGESTIONS FOR IMPLEMENTATION OF RECOMMENDATIONS

Before any practical steps can be taken towards the physical establishment of the Centre, the institutions concerned should reach an agreement on their cooperation.

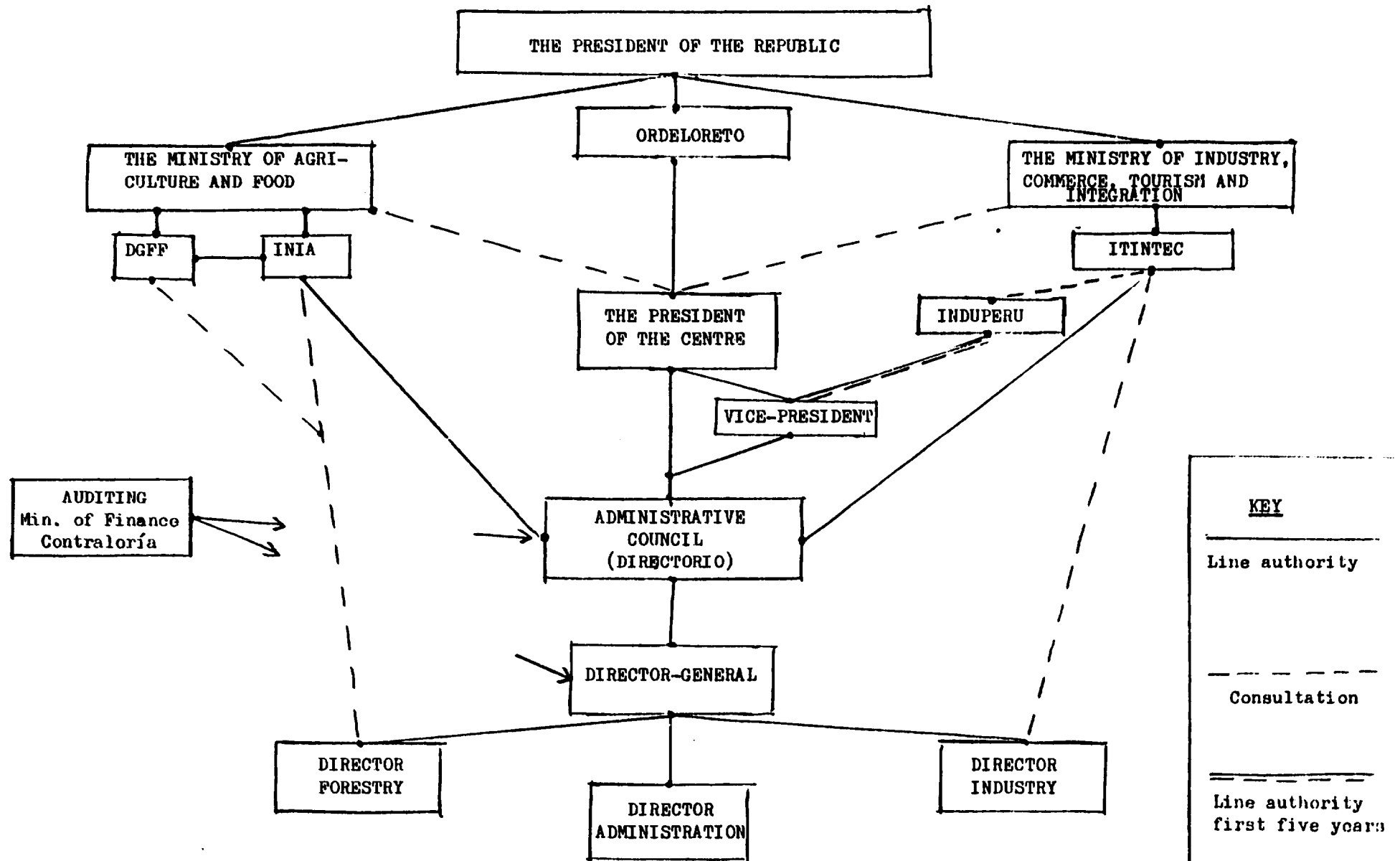
It is suggested that

- INDUPERU, through ITINTEC, recommends to the Minister for Industry, Commerce, Tourism and Integration that he propose to Cabinet the convening of a meeting between his own Ministry, ORDELORETO and the Ministry of Agriculture and Food, with the objective of establishing a project for a "Decreto" that creates the Centre.

(Note that, as the Centre can not acquire legal existence without a Decree, and as the Decree must be promulgated by the President of the Republic, it pertains to the Ministers responsible to take the initiative.)

- Simultaneously, INDUPERU invites ITINTEC, the Industries Department of ORDELORETO, and IMIA to join for a preliminary meeting. During this meeting, every attempt should be made to arrive at a joint recommendation, to be addressed by each participating institution to its Minister.

Figure I
ADMINISTRATIVE ORGANIZATION OF PROPOSED CENTRE
 (as suggested by consultant)



As soon as the Decreto-Ley creating the Centre has been promulgated, no time should be lost in constituting the Administrative Council and appointing the President and Vice-President, who in turn should appoint the Director-General and the three Department Directors as quickly as possible.

It will then be the task of these officers to prepare recommendations for the initial programme of work and purchase of equipment, as suggested in Section 2.2, p. 4 of the present report.

4. THE INSTITUTIONAL STRUCTURE OF THE CENTRE

4.1 DISCUSSION OF INDUPERU PROPOSAL

The internal organization of the Centre as proposed by INDUPERU (INDUPERU 1979, SUMMARY p. 32-33, Vol. II p. IV-1 to 8) comprises three departments,

- Services (Servicios)
- Administration (Administración)
- Experimentation (Experimentación)

(Details see Table S-4, p. 33 of INDUPERU SUMMARY)

The distribution of personnel is stated to be as follows (INDUPERU 1979, p. IV-7 to 11).

	Professionals A and B	Professionals C (Technicians)	Secre- taries
Director's Office	2	-	1
Services	7	2	1
Experimentation	9	20	1
Administration	7	8	3
Totals	25	30	6

(NB. These figures do not agree with those given under "Generation of Employment" on p. 31 of INDUPERU 1979 SUMMARY, 2.4.5.3. and quoted on p. 8 of the present report.)

We note that 30 % of the total staff and 28 % of professional staff are to be employed in administration which seems rather high, even though this Department includes documentation and publications.

However, the consultant does not agree with the INDUPERU proposal of setting up a Services Department which is to include: "Areas" (Sections) of Technical Assistance and Consulting, Training, Standards and Quality Control.

The procedure for technical assistance proposed by INDUPERU is this: an "agent" of the Services Department visits an Industry and identifies "problems". If he is able to, he gives solutions

immediately during his visit. If not, he takes the problem back to the Services Department where the problem is "confronted" with information contained in the Centre's own files and/or in the literature. If a solution is found from the files or from the literature, it is sent back to the industry concerned.

Only if the Services Department decides that the problem cannot be solved by reference to files and literature, will it contact the "Experimentation" Department and ask it to carry out research or experimentation to solve it. (INDUPERU 1979, pp. III-151-152 and IV 2-3.

The consultant is in fundamental DISAGREEMENT with this procedure. Alternative proposals are made in this report.

There is overwhelming experience, in forest products laboratories throughout the world, that the most effective technical assistance to industry is provided where the same technicians carry out the necessary laboratory experimentation and the actual on-the-spot assistance in industrial plants.

In the context of the Fucallpa area, as already pointed out, there is little need for applied research and none for basic research. There is, however, a very urgent need for laboratory experimentation in connection with problems present or arising in industry. It is only by having the professional officers of the Experimental Department visiting industry at frequent intervals that they will be able to identify the problems which need attention, and that industry will get effective technical assistance by the best specialist available in the area.

It is wrong to appoint an "agent" as a go-between to liaise between industry and the experimental department. At the very best, a competent, experienced agent could identify those plants which the experimental officer must visit to examine a problem, and even then, the agent might easily miss some problems that are not evident. At the worst, the procedure suggested carries the seeds of bureaucracy and a poor service to industry. (Note that each problem would be the subject of up to four internal reports: agent to Services, Services to Experimental, Experimental to Services and Services to agent - instead of a simple, practical solution provided immediately to the industry.)

Similar remarks apply to training. To be most effective, courses should be given with the participation of experimental officers of the laboratory concerned with each specialty, although some officers of the "Services" area might specialize sufficiently to give the more elementary parts of each course.

The consultant ^{further} considers that the subdivision of the Experimental Department into laboratories of

- Anatomy and Physico-Mechanical properties
- Sawmilling
- Veneer and Plywood
- Preservation and Drying

does not adequately cover the activities which the Centre should undertake.

Although the work of the Forestry Department will not be further discussed in this report, this should not be taken to imply that less importance is attached to this work. In fact, it is in the areas of silviculture and management, both for the native forest and eventual plantations, that the greatest research effort is required. At the same time, it will be of the greatest importance for the future that there is the closest possible coordination between planning for the development of the forest industries in the area, and decisions for forest management policies.

In the absence of such coordination, there is great danger of piece-meal development with patchy exploitation of the forest for short-term benefit, without regard to ensuring the conservation of the resource for sustained yield in perpetuity.

4.2.3 Industry Department

The Industry Department should have the following Divisions and Laboratories or Sections:

<u>Divisions</u>	<u>Laboratories or Sections</u>
Primary Conversion	Sawmilling Veneer and Plywood Panel products (at a later stage)
Processing Techniques	Phys-Mec. Prop., Anatomy Drying Preservation Gluing Surface Treatments
Timber Products	Joinery Constructional timber Furniture
Promotion	Quality Control Standards Marketing

The activities of the Industry Department will be discussed in Chapter 5.

4.2.4 Department of Administration

In the consultant's plan, the department of administration should have two Divisions:

- Administrative Services
- Technical Services

The use of the designation "Services" implies purely internal services. All external services (technical assistance, training, custom work such as saw-sharpening, kiln drying) are the responsibility of the technical departments (Forestry and Industry).

If the Centre is to make a significant contribution to the upgrading of the forest industries in Loreto and increase the proportion of value added to the raw material, it must concern itself with subjects such as furniture manufacture, joinery, surface treatments and promotional activities (cf. Eldag 1979).

The recommendations given in the next Section (4.2), already foreshadowed in the recommendations of Section 3.4, are based on the reasoning presented in the preceding paragraphs.

4.2 CONSULTANT'S RECOMMENDATION

Under the leadership and executive authority of the Director-General, there should be three departments

- Forestry (Departamento Forestal)
- Industry (Departamento de Industrias)
- Administration

The three directors responsible for these departments, together with the Director-General as Chairman, should constitute a "Committee of Management" meeting at frequent intervals to ensure good coordination of the work of all branches of the Centre.

We shall now discuss the organization of each department.

4.2.1 Director-General's Office

The Director-General should be assisted by a secretary. A legal adviser (preferably part-time) should be attached to his office. and a clerk

At a later stage, when the Centre has become fully operative, it may be necessary to appoint a Deputy Director-General. However, during the initial stages and certainly for the first five years, this should not be required.

If the Director-General has to absent himself from the Centre for more than a short period, one of the Directors should be Acting Director-General, preferably in rotation so that each of the three Directors may so act from time to time.

4.2.2 Forestry Department

Although the consultant's terms of reference do not include consideration of the Forestry Department, the organization of this department is included here for the sake of completeness.

The Forestry Department should have the following Divisions:

Sylviculture	including	Genetics Forest Ecology
Forest Management	including	Pathology Plantations Natural regeneration
Dendrology	including	Inventory Volume Tables
Harvesting	including	Protection of logs Roading
Wildlife		

However, external services require administrative assistance, particularly in regard to

- Invoicing and following up payments
- Coordination of assistance (e.g. by different divisions or laboratories to the same company)
- Provision of Transport
- Provision of teaching aids for training (projectors, audio-visual equipment etc. which should be controlled by a central office)
- Provision of lecture rooms for courses held at the Centre

The Technical Services Division will therefore include two small coordinating offices, one for Training Activities and one for Paid Technical Assistance.

The Department of Administration will thus have the following organization:

<u>Divisions</u>	<u>Sections</u>
Administrative Services	Accounting Personnel Purchasing and Sales
Technical Services	Maintenance and workshops Transport Documentation, Information Publications Coordination of <ul style="list-style-type: none">- Paid technical assistance- Training

4.2.5 Other facilities

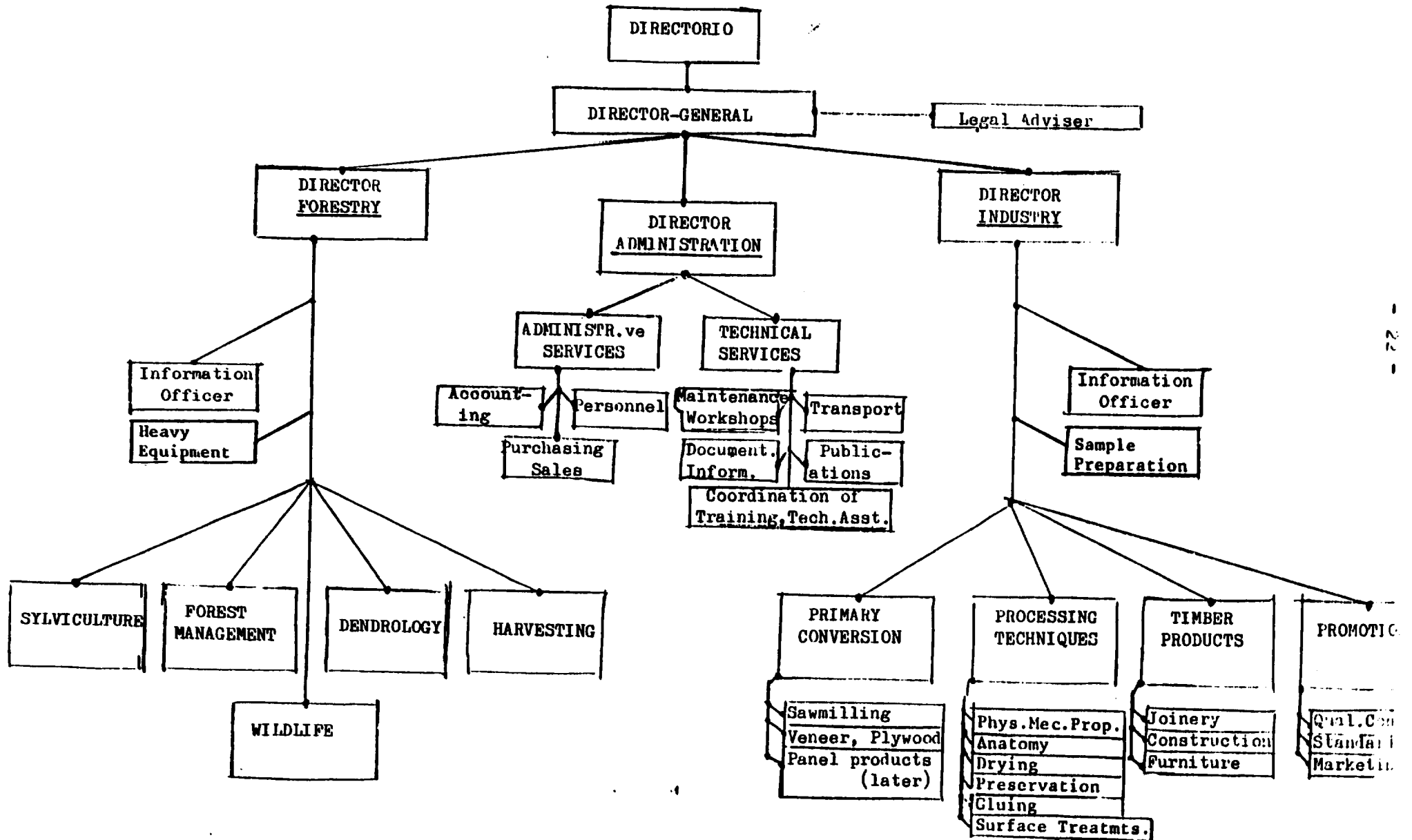
The consultant is in favour of the suggestion by INDUPERU 1979 to have a workshop for the preparation of experimental specimens attached to the Industry Department. (INDUPERU 1979, p. III 132a to 140). However, the personnel and equipment need not be as elaborate as proposed in the INDUPERU study since the assistance of the Forestry Department will be available for the obtention of experimental timber samples. (See p. 54)

Provision should also be made, though not necessarily right from the start, for an information officer in each of the technical departments (Forestry, Industry), attached to the Director, to act as a first filter for incoming requests for information and channel them to the Divisions and Laboratories concerned. (p. 54)

4.2.6 Summary

The proposed internal organization is summarized in Figure II.

Figure II
INSTITUTIONAL STRUCTURE OF PROPOSED CENTRE
 (as suggested by consultant)



5. THE TECHNICAL ACTIVITIES OF THE CENTRE

5.1 DISCUSSION OF INDUPERU FEASIBILITY STUDY

It has been pointed out in the earlier Chapters of this report that the Feasibility Study (INDUPERU 1979) is a useful checklist for the provisional planning of the programme of activities and of the list of equipment to be purchased.

However, the consultant believes that the Feasibility Study must NOT be considered as the actual programme of activities to be undertaken, nor as an actual specification for the purchase of equipment.

The actual programme of activities, and the specifications of the equipment to be installed, should be drawn up by the senior officers of the Centre, once they have been appointed, with the assistance and advice of competent national and international specialists in each area.

The Feasibility Study appears to be based on the following main premises: (SUMMARY p. 4 to 6)

1. Among the factors responsible for the low coefficient of exploitation of the Peruvian forest, there are (according to the Study) :
 - absence of information about technological properties of species,
 - absence of information about the best treatment of timber between the forest, the industry and the user,
 - absence of information about appropriate uses of non-traditional species.
2. The "demand" for technological research and technical assistance can be determined a priori by setting up a "Standard for Comparison" (INDUPERU 1979, p. I-1) for each type of industrial process, and then determining the percentage of actual production lines in industry that fall short of this "Standard".
3. On the basis of premises 1. and 2., it is possible to draw up an a priori document specifying the detailed programme of the proposed Centre for the first 20 years of its operation.

The consultant believes that these premises involve some assumptions which must be critically examined. This will be done below, in the same order in which the premises were stated.

In the consultant's opinion,

- Re 1. The low coefficient of exploitation of the Peruvian tropical forest is due to lack of adequate promotion and to lack of confidence

by buyers. The most important factors to gain acceptance by buyers, especially on the international market, are

- availability of an assured supply of adequate volume of any commercial timber offered,
("Adequate" volumes in this context would usually be of the order of 10,000 to 50,000 cubic meters log volume per annum, and "commercial timber" means any one species or group of related species marketed under a common trade name.)
- a competitive price,
- an acceptable guarantee of constant and sustained quality of the products offered.

Absence of information about technological properties is not the main obstacle. However, if the above conditions are fulfilled, information about technological properties becomes of interest.

Re 2. The procedure followed in the survey of the "market for technological assistance" may give a useful estimate of the potential number of companies requiring assistance. However, considering the fact the the "Standard for Comparison" detailed in pp. I-47 to 105 is open to discussion and criticism, and that the analysis of the demand for research and services assumes that this demand can be estimated by noting the conformity or otherwise of equipment characteristics with this "Standard" (pp. I-106 to 134), one wonders whether a statistically significant estimate could not have been obtained more simply.

- For instance, the "Standard for Comparison" for sawmilling appears to be based on only one reference (p. I-52). To cite only one example, the data given on the parameters of the headrig on pp. I-52 to 57 are open to questioning. Most specialists would recommend flywheel diameters above 1.80 m (not 1.60, p. I-55), the horsepowers given in the table on p. I-55 would appear rather small, the tooth profile and blade thickness (p. I-56) are functions of the design and operation of each particular sawing machine and cannot be specified in general for each class of sawmill, etc.
- Study of the tables on pp. 115 to 118 illustrates that for each individual factor considered, in most cases less than 30 % of the sawmills visited conform to the "Standard for Comparison". In several of the few cases where a high percentage of conformity

is reported (e.g. carriage networks, 89.8 %, horsepower of head bandsaw, 67 %), this consultant would question the correctness of the Standard for Comparison.

The discussion on pp. I-47 to 134 does show, on the other hand, that a considerable amount of information exists about the best treatment for timber between the forest, industry and user. If it were simply a matter of bringing all the industry up to a "Standard for Comparison", no experimental laboratory would be required.

However, sawmills and other wood conversion plants are not standard stock models which can all be given the same kind of assistance. Each plant, with its equipment, log supply, market situation and personnel available is a special case and must be studied on the spot.

- Re 3. It is debatable how far one should go in determining a priori the activities of a Wood Technology Centre yet to be established.

It is clearly useful to define the main areas, but programmes for actual experimental assistance, research and training activities should be drawn up with the participation of the senior technical officers who will be responsible for their execution.

In any case, the rapid evolution of the world economic situation and of the equipment manufacturing industry make detailed, meaningful planning very difficult beyond a horizon of about five years.

In the next Section (5.2) we shall discuss the main general conclusions to be drawn from this discussion for the overall operation of the proposed Centre. The activities of the individual Divisions and Laboratories will be discussed in 5.3.

5.2 GENERAL GUIDELINES FOR THE OPERATION OF THE CENTRE

The main Mission of the proposed Centre may be defined as follows:

"To increase the contribution of Peru's tropical forest resource to the national economy by

- establishing forest management patterns that produce maximum yield and ensure the conservation of the resource,
- promoting the utilization of as wide a range of species as possible for local and export markets."

This definition should be included in the Decreto-Ley creating the Centre.

For the operation of the Industry Department, this Mission implies the general guidelines given below:

Choice of species for promotion

The Forestry Department will provide information on species (or groups of species marketable under the same trade name) that are available in sufficient volume, in accessible and commercially exploitable sites, to have a chance of interesting international buyers and/or local markets.

Promotion

Regular and continuing market studies must be carried out to determine the demands that exist or may be created. On the basis of these market studies, an assessment must be made where the available species have the best chances of being accepted, and what type of technological conversion and processing is necessary to make them acceptable.

Properties of species

The aim of the determination of technological properties is not to make markets fit species, but to make species fit markets.

For initial promotion, density, aesthetic appearance, grain configuration, relative ease of drying and some approximate idea on durability are usually sufficient. These properties, together with an estimate of static bending strength, may be determined quickly by a number of assessment schemes proposed in the literature (e.g. Kauman and Kloot, 1968).

Systematic determination of technological properties for a wide range of species should be undertaken as time permits, but is of lower priority.

A full and detailed determination of properties of any one species (or group) is necessary only when there are indications that the client will require knowledge about these properties.

Conversion processes

The aim of experimentation on the basic conversion processes (sawmilling, veneer and plywood production) must aim to produce production parameters (saw tooth profiles, veneer lathe settings etc) that fit the whole range of species encountered, or at least a large proportion of the range.

Most laboratory work on conversion processes should derive from technical assistance and should have the purpose of solving problems in industry. However, if an entirely unknown species, existing in large volumes in the forest, comes to hand, some experimental trials of sawing and veneer peeling may be indicated.

Technical Assistance and Training

The aim of technical assistance is to help enterprises to produce according to the quality requirements of the new markets that the Centre will endeavour to conquer.

It is highly probable that most technical assistance will have to be "tailor-made" to suit the particular needs of each plant, and it should, of course, be provided on the spot by the technical personnel of the experimental departments.

In the initial stages, the main need for training courses is undoubtedly in sawdoctoring. Somewhat later, timber drying courses may be added. Courses on other subjects cannot at present be reasonably foreseen, they will be organized by the chiefs of the Divisions concerned as the need arises.

Quality Control

Quality control procedures must be developed at an early stage by the Promotion Division, in accordance with the requirements of the markets tapped, and in close cooperation with ITINTEC.

ITINTEC standards must be used wherever possible, and the Division should cooperate in the formulation and establishment of new standards.

Custom Work

As soon as the Centre is equipped to do so, it should be endeavoured to undertake custom work such as sharpening saws, kiln-drying of timber, impregnation with preservatives, and so on, for industrial undertakings in the region. This will not only produce revenue for the Centre but also help to gradually introduce higher standards.

In relation to promotion, the Timber Products Division may engage in actual manufacture of prototypes (e.g. furniture to be exhibited in Fairs, fancy sliced veneer for sample lots) and possibly even in pilot scale production of promising articles, on behalf of industry, until such time as industrial plants are sufficiently advanced and equipped to take over.

Specialty products

Notwithstanding the remarks made above about the necessity of having large volumes of species to be marketed, the Promotion Division must not overlook possibilities of small specialty markets which may permit one or two companies to stage successful operations (e.g. fancy veneers, exceptionally hard or light timbers, extractives, etc.)

5.3 CONSULTANT'S PROPOSAL OF TECHNICAL ACTIVITIES OF THE INDUSTRY DEPARTMENT

5.3.1 Introduction

The proposals presented in this Section are based on the Guidelines given in 5.2. They will be discussed under the Division and Laboratory headings recommended by the Consultant (Figure I). but references to the corresponding sections of INDUPERU 1979 will be given in each case.

The consultant wishes to stress once again that although the activities of the Forestry Department are not discussed in the present report, he considers them to be of the greatest importance for the future of Peru's tropical forest resource. The activities recommended below for the Industry Department have been conceived in a way so as to be compatible with the Forest Department's task, and if required the consultant would be prepared to expand on this point.

5.3.2 Division of Primary Conversion

5.3.2.1 General Remarks

The Division of Primary Conversion will be faced with the most important immediate technical challenge presented to the Centre in the industrial area. Existing industries are almost entirely small and medium sized sawmills (INDUPERU 1979 p. I-23, Table I-10) and a few veneer and plywood mills (INDUPERU 1979, pp. I-39, I-43). Sawn timber, sliced fancy veneer and plywood constitute the most promising initial exports of a developing forest industry economy (Page 1972), provided adequate volumes and an adequate quality can be guaranteed (Section 5.1, pp. 23-24)..

It will be the immediate task of the Primary Conversion Division to provide technical assistance, backed up by the necessary laboratory experimentation, to help industry increase the quality of its products.

In the consultant's opinion, it is important ^{that} the technical assistance in the veneer and plywood area be provided as rapidly as possible, and this laboratory should become operative at the same time as the sawmilling laboratory (cf. INDUPER 1979 p. III-59 and III-95). Even if it is not possible to have all the equipment installed immediately, personnel should be engaged as soon as the Centre is set up.

The consultant considers that is is not satisfactory nor adequate to provide technical assistance in the veneer and plywood area by an international "expert" visiting Peru once a year and spending five days in each plant (INDUPERU 1979, p. III-150, A.b), having as the only Peruvian participation "Coordination and provision of the best conditions to carry out his work" by a national "counterpart" (loc.cit. p. III-151). On the contrary, there must be a qualified Peruvian engineer permanently in charge of this technical assistance, with occasional visits by international technicians to clear up specific problems.

5.3.2.2 Sawmilling Laboratory

Programme

In the consultant's opinion, there is little need for research on sawmilling in Pucallpa. The main need is for technical assistance on the spot in industry, backed up by some laboratory experimentation.

In a heterogeneous tropical forest, the objective of sawmilling technology is not to determine the optimum conditions of sawing for each species, but rather to determine conditions (such as profile of teeth, sawspeed, feed, need for special hardening and stelling) for sawing the whole range of species received by each mill with the equipment available. At most, one might work with two sets of sawing conditions for "hard" and "soft" timbers.

The sawing conditions for a wide range of tropical species, including from the Amazon basin, are well known and can be ascertained by reference to a number of forest products laboratories and/or competent sawmilling equipment manufacturers. Care is required, however, in selecting the source of information in order to be sure that the relevant experience exists.

Having regard to the above facts, the consultant wishes to point out that a number of the activities proposed in the Feasibility Study (INDUPERU 1979) are not necessary. The most suitable tooth profiles can be obtained through competent consultants, tooth wear can be determined in a relatively simple manner (see below), saw speeds can be fixed by simple experimentation, and dynamometry is not required if breakdown saws are adequately powered. In particular, the consultant strongly recommends against experiments with a single tooth pendulum (p. III-42, method of Chardin) which constitute basic research not appropriate to the mission of the Centre.

On the other hand, a very important omission from the proposed programme of sawmilling research is the determination of growth stresses. Growth stresses are present in a significant number of tropical species and not enough is known about their distribution to predict their occurrence.

Another important omission is the determination of form and defects in relation to sawing patterns which is of the highest importance in obtaining maximum recovery from the sawing of natural grown tropical hardwood (Page 1972). This is only briefly alluded to under "Anatomical Structure" on p. III-4.

Methods

To put the above programme into effect, the following main experimental projects are recommended:

Sawing conditions

The laboratory will have to saw a certain number of trees for experiments of other laboratories (Properties, drying, preservation, etc) and possibly for Promotion.

Whenever this is done, observations will be taken on the behaviour of the timber and the quality obtained, adjusting sharpening procedures and saw speeds as required.

In combination with observations taken in industry during technical assistance operations, these observations will serve to check, and possibly to improve, tooth profiles originally recommended by experienced consultants (see p.29).

The experimental projects recommended overlap with b.2 and b.3 (p. III-36) of INDUPERU 1979. The consultant considers that no systematic work should be undertaken on the topics outlined in a.2 (p. III-42) and that dynamometric measurements recommended in a.3 (p. III-43) are of secondary interest. As regards b.1 (p. III-44), the aim, we repeat, is to have one tooth profile (at most two) suitable for all species, not different profiles for each group of species.

The systematic experimentation with a great number of species (p. III-38, Table 3-9, to begin in year 7!) is to be approached with great caution. Only species available in sufficient quantity to be of real commercial promise should be tested.

Saw speeds

The correct combination of saw speed, feed, power and tooth design able to accept the range of density, hardness, depth of cut and possible special characteristics (e.g. presence of silica) found in the logs received by a mill is of the greatest importance.

Many sawmilling engineers consider that for hard tropical timbers, one should use relatively low saw speeds (say, 1500 to 2400 m/min). To do so, one needs a robust machine, adequately powered, with a flywheel not less than 1.80 m diameter that can carry bands of adequate gauge.

Some experimentation should be undertaken on sawspeed (in combination with feed, tooth pitch, etc.). This can be done simply by providing sets of pulleys of various diameters for the power transmission from motor to saw. Suitable reference speeds are 1900 m/sec (hard, dense woods) and 2700 m/sec (less dense woods).

Sawing patterns, growth stresses

For the best overall recovery from tropical species having variable form and defects, the sawing pattern is often at least as important, if not more so, than tooth characteristics. This is even more critical for species having growth stresses.

It is recommended that observations on the presence of growth stresses be included as standard procedure during any sawing operation in the laboratory and in industry.

On the basis of observations on growth stresses, form, defects, conicity and feedback information from the drying laboratory on shrinkage and collapse characteristics, experimentation should be carried out

on all commercially important species to determine sawing patterns likely to give greatest recovery (cf. Page 1972).

This is not provided for in INDUPERU 1979, except marginally in b.3 (p. III-48)

Tooth wear

Notwithstanding the above recommendations, it is not always possible to diagnose the underlying reasons for particular sawing difficulties. In these cases, experiments on tooth wear (see a.1, INDUPERU 1979, p. III-39) can be very useful.

It is recommended that advice on the best way to institute such experiments be obtained from the Centre Technique Forestier Tropical (CTFT) of France.

Recovery

Studies should be carried out on recovery in terms of such factors as cubic meters per man-hour, per unit investment, per unit power installed, etc., for the different types of equipment in operation in the area (e.g. flat-top carriages, manually operated networks, riderless automatic carriages etc.) in relation to different options of sawing patterns. Attention should also be paid to the correct balance between the productivity of different machines and smooth flow of material through the mill.

Initially such studies will serve to help the personnel engaged on them understand the requirements of productivity in a sawmill. After gaining experience, they will gradually acquire the skill to prepare layouts and flow patterns for sawmills and recommend suitable equipment.

Grading

Although Grading is part of Quality Control, its importance is so great that it should be mentioned here. Although we do not discuss grading methods in this report, it is necessary to remark here on the need for the provision of correctly placed green chains with trim and docking saws, as well as stacking and storing facilities, to enable grading to be correctly carried out.

Waste disposal

The sawmilling laboratory must not overlook the need for providing advice on correct disposal of waste (sawdust, slabs, offcuts etc), considering its transport within the mill, appropriate methods of incineration and/or dumping, and hopefully methods for its utilization as fuel in the mill itself, firewood for sale, chips for particle boards and/or paper, and possibly use of slabs for low-grade rural building material.

Equipment (p. III-46 to 54)

It is not possible, within the framework of this report, to propose a complete list of equipment for the sawmilling (or any other) laboratory. Furthermore, the consultant believes that equipment should be specified only after the senior officers of a laboratory have been appointed (see Chapter 6.)

In the present Chapter, we shall therefore limit ourselves to a brief discussion of items calling for special observations.

Band Headrig and Carriage

It cannot be emphasized too strongly that if the laboratory is to acquire a breakdown bandsaw, this must have a flywheel diameter of at least 1.80 m. The unit of 1.40 m recommended on p. III-46 is definitely too small. The carriage should have four (not three) knees with independent automatic setting to enable sawing at different angles to the tree axis. It should be of very robust construction, with pneumatic flippers for shock absorbance when loading and assistance in turning logs. The log deck should be powered (e.g. by conveying chains) and have a hydraulic or pneumatic log turning device. At the outfeed end of the breakdown saw, a flitch storage deck should be provided. For saw speeds, see above: there is no need to provide for speeds of 6000 m/min which are inappropriate, the maximum necessary being about 3000 m/min. Changes to be obtained by changing pulleys, there is no need for a gear box.

Before any investment decision is made, the advice of a competent specialist should be sought.

Other equipment

The consultant recommends against the dynamometric pendulum (cf. p. 29) (a.3, p. III-47). Advice should be sought regarding the "Dynamometric Motor" (a.2, p. III-47). Advice should also be sought on the sharpening equipment (p. III-48 to 50) (for instance, the recommendation of a machine with capability of 110 teeth/min (b.2, p. III-48) for small bands must be seriously questioned).

On the other hand, an important omission is the absence of recommendations for saws other than the headrig. To do significant work, the laboratory needs at least the following:

Re-saw to take flitches produced by headrig
Edger or rip saw
Multiple rip saw
Docker

whose characteristics must be defined. Provision must also be made for evacuation and disposal of waste.

The above discussion of methods and equipment must by no means be considered as exhaustive, and the consultant wishes to repeat that competent advice of persons experienced in tropical sawmilling must be sought before investment decisions are made.

5.3.2.3 Veneer and Plywood Laboratory

Programme

Veneer and plywood are products with reasonable added value, a usually acceptable weight to value ratio for transport and capable of being manufactured from a wide range of species that might offer advantages for export even from a location as remote as Pucallpa.

The consultant therefore considers that the installation of the Veneer and Plywood Laboratory should be given a higher priority than contemplated in INDUPERU 1979 (p. III-194). Even if it is not possible to acquire immediately all the heavy equipment planned for (p. III-79 to 90), enough should be provided, at least at the same time when the sawmilling laboratory starts operations, to enable an engineer and one or two technicians to begin technical assistance to the industry.

The Veneer and Plywood Laboratory, in the consultant's opinion, has a higher priority than anatomy and physical properties, since it will have a direct influence on the export potential of the local industry. Determination of anatomical and physical properties can easily be done under contract by one or more of the Peruvian forest engineering faculties whereas technical assistance to plywood mills requires facilities on the spot.

An important omission from the proposals is work on sliced and fancy veneer, although this material is pointed out as having some potential for internal markets in the study of the demand for technical assistance (p. I-37 to 39). Surprisingly, no mention is made of the possibility of developing export markets (beyond the statement on p. I-38, 1.3.6.1: "...al no existir comercio exterior (para chapas decorativas)"). Surely this is a commodity that should be capable of finding a niche on international markets.

As rightly pointed out on p. III-70 (loc.cit) with respect to the veneer peeling operation, training of operatives during a "tiempo prudencial" is necessary. This applies to every phase of the experimental production of veneer and plywood, and proper selection and training of the laboratory staff must be of first priority.

Similar to what has been said in the discussion on sawmilling (5.2.2.2), the aim of experimentation on veneer peeling and plywood production based on a heterogeneous timber supply is not to determine the optimum conditions for each species and variety, but rather to find a set of production parameters that can be applied to the whole range of species offered. It would be non-sensical to carry out experiments lasting years to determine, for instance, veneer peeler lathe settings for each of the great number of species existing, quite apart from the fact that variations relevant to peeling within a given species or even within a log may often be greater than those between different species.

It must also be realized that similar to sawmilling, much is known about correct peeling, drying, gluing and pressing of tropical species, provided the right sources of information are tapped.

It is therefore clear that, again similar to sawmilling, the systematic exploration of production parameters for a great number of species (INDUPERU 1979, p. III-64) is not to be recommended. Instead, the programme should make provision for rapidly establishing a nucleus of highly trained technicians who will become thoroughly familiar with the operation of veneer and plywood production equipment, with its setting up, maintenance and possible defects, in order to advise and assist operators in industry.

To back up their assistance and advisory functions, the technicians must, of course, have their own laboratory. The experimentation to be carried out in this laboratory should be concerned in the first instance with problems arising from technical assistance.

These problems are likely to feature preheating of logs, splitting due to growth stresses, drying and humidity control, correct clipping, jointing, splicing and recovery in general, and of course gluing which will be discussed in Section 5.4. The solution of these problems should have a higher priority than the precise measurement of such parameters as peeler checks, surface roughness or mechanical properties of veneer sheets (loc.cit. p. III-63, 67).

The methods recommended below take account of these priorities.

Methods

The following initial experimental projects are recommended:

Choice and grouping of species (cf. b.2 p. III-61)

Based on information on volumes and accessibility of species provided by the Forestry Department, a choice of priorities of species for experimentation should be established taking into account

- volume available
- average form of trees and defects
- density

In close cooperation with the Promotion Division who will provide advice on the basis of their marketing studies, the species may be grouped, as far as possible, taking into account the above factors and, in addition,

- aesthetic qualities
- straightness or otherwise of grain
- shrinkage and collapse
- durability (as far as known).

The projects given below will be carried out with species (or groups of species) selected on the considerations discussed in this sub-section, giving preference to those most likely to find market acceptance.

NOTE: It is more profitable to concentrate on a limited number of species in function of the requirements of known markets, instead of optimizing the manufacture of plywood from a great number of species and classifying them

in terms of potential uses, without knowing whether markets for these species and uses can be found. (cf. p. III-61, b3)

Preheating of logs (cf. INDUPERU 1979, p. III-67 to 68)

It is dangerous to generalize that species above 0.5 g/cm^3 density need preheating, and those below not. The need for preheating cannot be predicted that simply, it depends, apart from density, on presence of knots, crossgrain, age of the wood, pH and other factors.

An important omission from the discussion is the danger of thermal degradation caused by preheating of excessive severity for a given species which may lead to increased shrinkage and collapse, "fuzziness" of the surface and reduction of mechanical strength.

The experimentation must investigate not only the rate of heat conduction, but the level of temperature, the time of heating and the effect of heating on growth stresses. The influence of preheating on subsequent shrinkage of the veneer must be kept in mind.

Peeling trials

As noted before, the aim of peeling trials is to develop lathe settings that can be used for the whole range of species offered, varying possibly the coefficient of compression.

Great care should be taken in using any mathematical model said to "predict" lathe settings. Veneer peeling is still very much an art rather than a science, and an experienced operator is of greater value than mathematical equations.

The evaluation of the green veneer may be carried out by a method such as that proposed by the French Centre Technique du Bois, but it should be noted that this is almost entirely qualitative. There is no need for complicated methods such as the measurement of surface roughness by a travelling automated feeler gauge, nor to determine the number and depth of peeler checks by colouring and microscopic observation, nor is it necessary to measure the mechanical strength of the veneers (cf. e1, e3, e4 p. III-71 to 73). These are precise methods that are used from time to time in a research project to solve special problems, but are completely unnecessary in routine experimentation.

Drying

Drying of veneer is a most important operation since synthetic glues require fairly well defined moisture contents. Also, for certain species, considerable degrade may be caused by incorrect drying conditions.

An experimental drier should have the greatest possible flexibility, and the consultant has some doubt whether the equipment proposed (loc.cit. p. III-82) is really appropriate. It is dangerous to prescribe the temperature a priori for all species (200°C as stated on p. III-82): temperature is one of the variables to be investigated.

One also wonders if it is most appropriate to buy a modern "jet" drier - the drier should have some relation to equipment available, or likely to be available, in local industry. Finally, a 3 m long drier having two decks (p. III-71) requires a certain quantity of veneer of the same species and thickness for any one experimental drying run which may cause delays if a number of different drying conditions are to be examined.

It is recommended that the drying operation be further discussed with a specialist.

Clipping

The clipping operation is one having considerable influence on veneer recovery and productivity. Given the relatively small experience in plywood plants of the region, consideration should be given to experimental programmes designed to improve clipping, especially of timbers presenting some defects. (This applies to clipping green as well as dry veneer)

Pressing

Once again, it must be pointed out that it is dangerous to adopt a method from the literature (INDUPERU 1979, p. III-76, Appendix 3-11) and set it up as a guideline to be followed in a different country, with different material, under different conditions.

For example, apart from the veneer thickness, pressing times depend on the hardener used, and the total length of a press cycle depends very much on the loading and unloading methods, closing and opening times. To avoid the danger of precuring, these factors must be well adjusted so that the adhesive in the sheets first loaded does not start polymerizing before pressure is applied.

The consultant wishes to insist that what is most needed is a skilled operator and skilled technical supervision, rather than a priori specification of operating methods.

The detailed programme for pressing experimentation must be determined by the Head of the Laboratory.

Recovery methods

We shall not discuss jointing, splicing, plugging of holes or punching out of defects, as the procedure for experimentation on these methods can only be determined by the technical staff of the laboratory. However, work on recovery must not be neglected.

Finishing

Normally the only finishing done in a plywood mill is sanding: the quality depends on proper choice, understanding and adjustment of the sander operation, and proper choice of the paper for each type of veneer. The ASTM standard (D-1666) cited on p. III-78 would only be partly relevant.

Testing

In INDUPERU 1979, p. III-76 to 79, 19 standards of three different authorities are cited as a basis for testing the plywood.

Normally, only a few of these tests are required. Among them, the most important ones are the destructive shear test to determine the strength of the glue line, and the empirical test of adhesion by forcing a knife between the laminations.

Tests of delamination after specified periods of immersion in cold or hot water may be required for certain applications, but most of the tests of mechanical properties cited on pp. III-76 to 79 are not normally carried out.

Equipment

As stated on p.32 for sawmilling, it is not possible, in the framework of this report, to discuss the proposed equipment in any detail. Reference is made to the fact that equipment should either serve for laboratory purposes in which case it should be of limited size and the greatest possible flexibility, or for production purposes in which case it should approach industrial size.

We shall limit ourselves to some remarks on selected items of equipment:

Peeling lathe (b.2 p. III-80)

In our opinion, a smaller lathe (70 or 120 cm) would be more suitable for the laboratory investigations intended. A fixed pressure bar is recommended instead or a roller bar.

Reeling (b.4 p. III-81)

The system appears rather elaborate for experimental purposes. Hand reeling, or "walking out" may be adequate.

Drier b.8 p. III-82)

See observations under "Drying" p. 31. Moisture control stations and/or "moisture alarms" should be added, and there must be more than two thermometers in the drier.

Press

For experimental purposes, a press with a single daylight and platen size 60 x 60 cm or at most 80 x 80 cm would appear more appropriate.

Other equipment

There would not appear any need for balances of an accuracy of 0.0001 g (c.2, d.2), nor for equipment to measure surface roughness (d.6).

Generally speaking, no investment decision should be made before the Head of the Laboratory has been appointed and consulted.

5.3.2.4 Panel Products Laboratory

The installation of this laboratory should be deferred until the Centre has become well established and accepted in industry. At that stage, which may be reached five to ten years after the start of operations, an assessment must be made whether a separate panel products laboratory is required to deal with subjects such as

- particle board
- fibre board
- insulation boards
- composite panels (wood-metal, sawdust-cement, wood-plastic, etc. etc.)
- blockboard

and others of similar nature.

In the meantime, the officers of the Veneer and Plywood, Gluing, Joinery and Construction Laboratories, and possibly of others too, should maintain themselves abreast of developments in the fields listed above so as to be able to gauge the advisability of introduction of new production processes and techniques in the Amazonia Region and possibly advise industry on installation and operation of equipment.

5.3.2.5 Fancy Veneer

As mentioned in 5.3.2.1, decorative fancy veneer should be considered as a possible export commodity from the Pucallpa area.

It would not appear necessary, in the initial stages at least, to instal at the Centre a special laboratory or equipment for this purpose.

However, the technical officers of the Veneer and Plywood Laboratory must make it their business to be well informed about slicing equipment and techniques so as to be able to advise industry in this area.

5.3.3 Division of Processing Techniques

5.3.3.1 General Remarks

In contrast to the Division of Primary Conversion whose task it is to upgrade production processes already widely in use in the Loreto Department and elsewhere in Peruvian Amazonia, the Division of Processing Techniques is concerned with the introduction of methods that are only being applied by a very few companies.

This implies that the Division must have laboratory facilities adequate to test known processing techniques with Peruvian species, and to prepare procedures and schedules for application in industry.

However, right from the start it is important that the officers of this Division visit and maintain close contact with industry, in order to advise on improvement of procedures where the various techniques are already applied, on their introduction where they could be useful, and on help that might be provided by the laboratories where the industrial undertaking is unable, for the time being, to carry out a technique in their plant (e.g. custom drying, impregnation with preservatives, gluing of prototypes).

The determination of technological properties is placed under the responsibility of this Division since its laboratory facilities are more akin to this activity than those of other Divisions. Work on anatomy and physico-mechanical properties is not of sufficient scope and magnitude, in the context of the proposed Pucallpa Centre, to warrant the establishment of a separate Division (cf. discussion on pp. 25-26). Most of it will be routine measurements, and whenever more advanced research is required, it would be more efficient and economic to sub-contract such research to one of the forest engineering faculties (La Molina, Iquitos in particular).

Even more than in the case of sawmilling and veneer and plywood, the programmes of the laboratories of the Processing Techniques Division must be conceived, established and evolved by the senior officers and technicians of the laboratories concerned. The discussion that follows will therefore be confined to stating the principles and general outlines of the work required.

5.3.3.2 Technological Properties Laboratory

This laboratory will undertake the activities attributed in INDUPERU 1979 to the "Laboratorio de Anatomía y Propiedades Físicas y Mecánicas" (pp. III-4 to 34).

Programme

On the whole, the consultant agrees with the programme proposed in INDUPERU 1979. He commends particularly the idea of carrying out the determination of properties at two levels:

- A preliminary determination which can be fairly rapidly applied to many species (p. III-7)
- A "complete" level to be applied only to species having definite commercial possibilities (p. III-8)

Some of the consultant's ideas on this subject have been presented in earlier publications (Kauman and Kloot, 1968, 1972; Kauman and Oddone, 1970.) He advocates, for a first quick estimate of properties, an even simpler scheme than the "preliminary" which takes only a few hours' work, with extremely simple equipment, to gain an acceptable idea of the technological aptitudes of a species.

In the Anatomy area, the programme should be confined to

- Identification
- Macroscopic and microscopic description
- Establishment of an authenticated (by botanical samples from the same tree) reference collection of macroscopic samples (e.g. 15 x 8 x 1 cm) and microscopic slides.

This work should be carried out in close cooperation with the Dendrology Division of the Forestry Department and, in the consultant's opinion, might advantageously be attached to that Division.

In any case, a forester must take part in the work. It is of the greatest importance that in each case botanical specimens be obtained from the same tree from which the wood samples are taken, and kept in a suitably classified herbarium.

In some cases it will not be possible to obtain immediately a positive identification of the species concerned. If this is so, the samples should be identified by the genus and a number, pending further taxonomic research.

Species which can only be distinguished on the basis of botanical material but not on the basis of the macroscopic wood structure and appearance should be grouped for commercial purposes under a common trade name. Their properties should be determined on a sample taken from all the species pertaining to the group (suitably weighted statistically, if necessary, in terms of their relative abundance). In other words, as far as properties are concerned, the group should be treated as if it were one species.

In the area of Physical and Mechanical Properties; it is sufficient to determine:

- at the "preliminary level"

Air-dry density
Shrinkage
Collapse (5 trees)
Static bending (green)

- at the "complete" level, in addition (10 trees)

Basic density
Compression parallel and perpendicular (green and air-dry)
Static bending (air-dry)
Shear (green and air-dry)
Toughness (green and air-dry)
Hardness (air-dry)
(and tests on 5 additional trees of properties measured already at the preliminary level)

It is a moot point whether Splitting and Tensile Strength need to be determined: the consultant recommends against it as a routine procedure. Similarly, tests on nail withdrawal and on the different types of joints should be done only if there is a special marketing reason, not as a routine measurement.

On the other hand, it is important to measure collapse, present in a number of tropical hardwoods, and the response to reconditioning. Equilibrium moisture content should be determined at Pucallpa in a sheltered outdoor location and also under controlled conditions (say 25°C, 65 % R.H.) to check for possible deviations from the generally accepted isotherms.

Methods

The experimental projects to be undertaken by the Technological Properties Laboratory are implicit in the Programme discussed above. For completeness, they are summarized hereafter.

Anatomical Reference Collection (cf. a.11, p. III-4, Ba, III-12)

Constitute a collection, including the greatest number of species possible, at least 2 trees each, of

- macroscopic samples (e.g. 15 x 8 x 1 cm)
- microscopic slides (one each in the three structural directions)

to be taken from trees selected by the Dendrology Division who will take botanical samples from the same tree in each case.

After some experience has been gained, the constitution of a key for identification should be considered in collaboration with botanists and wood anatomists of the Forest Engineering Faculty at the National Agrarian University, La Molina, and at the University of Amazonia, Iquitos, as well as at the Junta del Acuerdo de Cartagena, Grupo Tecnológico, Lima.

Physical Properties (p. III-5, III-13)

Preliminary level: (5 trees)

Air-dry density
Shrinkage
Collapse and reconditioning

Complete level: (10 trees)

Air-dry and basic density
Shrinkage, collapse, reconditioning
Equilibrium moisture content (sheltered outdoor location for at least two years, conditioning chamber at 25°C, 65 % RH)

Mechanical Properties (p. III-5, 13)

Preliminary level: (5 trees)

Static bending (green)

Complete level:

Static bending	(green, airdry)
Compression perpen. and parallel	" "
Shear	" "
Toughness	" "
Hardness	(airdry)

The consultant considers that the following experimentation should be left to other institutions:

- Solvent extraction (b.2 p. III-15)

The gain in precision for the determination of moisture content obtained by solvent extraction is not significant for industrial purposes. To derive value from this method, the extracted substances must be identified which requires a properly equipped and experienced laboratory of organic chemistry.

(Extractives can be important for the technology of gluing, finishing and staining. Any necessary work should be sub-contracted to experienced laboratories).

- Design stresses (c., p. III-17)

For the Andean region, a design manual for timber structures is already being developed by the Grupo Tecnológico of the Junta del Acuerdo de Cartagena, Lima, and is likely to have been published before the proposed Centre can start on this work.

Equipment (p. III- 17 to 21)

The consultant believes that the details of the equipment to be purchased should be checked and confirmed by the future Head of the laboratory. He wishes to offer the following comment on the INDUPERU 1979 list:

a.3 Temperature and humidity recorder

In addition, it is important to provide for at least two dry- and wet-bulb psychrometers with forced ventilation, and for a number of sling psychrometers. There should also be provision for thermocouples (to be made up in the laboratory) and a millivoltmeter.

Provision must be made for the calibration of thermometers, either in Lima, or by acquiring a standard thermometer and calibrating equipment.

a.8 Drying oven. Instead of two ovens of 0.8 m³ capacity, it would be preferable to have three of smaller capacity. Generally 120°C maximum temperature is sufficient, one might buy one oven capable of higher temperatures. (The same applies to b.6, and "termómetro de 0 a 25°C" would seem to be an error)

- A small steaming chamber for reconditioning tests is an essential item of equipment. This might be located in the drying laboratory.

b.1,2 Universal Testing Machines

It should be noted that the existing CIFF will receive a universal testing machine in 1980 through the Junta del Acuerdo de Cartagena (see 3.2.1, p. 7 of present report, ANEXO 1-6 of INDUPERU 1979)

5.3.3. Drying Laboratory

Programme

The programme for the drying laboratory is presented in INDUPERU 1979 (p. III-97 to 99) in a summary way only, and the consultant agrees largely with the ideas proposed. He commends particularly the proposition to dry species under three schedules only (III-98), a method he has proposed a number of times.

Once again, it must be understood that the objective is not to evolve drying schedules for all the 2200 species for which no information is yet available, nor even for the 200 for which some information exists (p. III-6), but to provide technology that will enable the processing of those species which have reasonable commercial prospects.

The consultant would suggest that it is preferable to commence with the most severe drying schedule (and not with the least severe) since if a species dries satisfactorily under severe conditions, it is not necessary to carry out further tests under milder drying schedules, thus saving time.

Incidentally, it should be understood that it is not necessary for a species to be botanically identified (p. III-98, last two lines) in order to undertake drying tests or other experimentation. A species or group of species that has a commercial identity (cf. p. 46) may be successfully marketed without knowing its botanical identity, provided the volume available, the price, quality and general properties are right.

The details of the programme are to be determined by the Head of the Laboratory, once appointed.

Methods

The consultant proposes the following main experimental projects:

Air-Drying

To be conducted according to well-known principles amply documented in the literature.

Kiln-Drying

To be conducted as suggested in b.3, p. III-98. In addition to the operations suggested, it is advisable to pay attention to:

- Reconditioning treatment of collapsing timbers
- Determination of drying stresses ("fork" test)

- Steaming or high humidity treatments to relieve drying stresses.
 - Equalizing treatments to relieve moisture gradients
 - Dry under weights to prevent deformations
- etc.

The project should not aim to develop drying schedules or programmes for each species or group of species. It is amply sufficient to state under which one of three standard drying schedules a species will dry. If at a later stage, a large volume is to be dried, the kiln operator concerned will interpolate between the standard schedules.

Accelerated air-drying methods

During the last 20 years, a number of accelerated air-drying methods have been developed, ranging from the construction of a simple roof to protect stacks from sun and rain, to heating coils which raise the temperature a few degrees above the ambient value.

In a tropical environment with constant high humidity, a number of these methods hold considerable promise, and experimentation should be carried out to determine their practical and economic value in the Pucallpa region.

Economics of drying, recovery

At an early stage, the technical staff of the drying laboratory should engage upon experimental tests and economic assessment of different methods and different equipment, for instance:

- compare complete air-drying with complete kiln drying and with partial air-drying followed by kiln drying
- compare high temperature kilns (where applicable) with kilns operating at 60°C or less
- investigate the economics of different handling systems (fork-lift truck, rails with transfer truck, hand-pushed trolleys, stacking methods)
- compare construction of kilns on the spot, with ventilators, fans, heating aggregates and control equipment bought separately, with complete chambers provided by the manufacturer.

Attention to these and many other problems will familiarize the staff with the operation and equipment of drying installations and enable them to acquire the experience necessary for preparing layouts of drying plants and recommending on the purchase of equipment.

Kiln Operation

Also at an early stage, staff should become familiar with the testing of kilns for correct circulation and temperature distribution, by means of thermocouples, anemometers and other appropriate instrumentation.

This activity will be an indispensable preparation for the rendering of technical assistance in industry.

Equipment

Comment is offered on a few selected items only:

a.1 Drying kiln.-

A drying kiln of 2 m³ capacity is useful for custom drying to earn revenue (and for that purpose might even be larger) and for occasional confirmatory drying runs of schedules for important species.

For experimental work, much smaller drying chambers holding about 1/4 m³ or less are much more satisfactory, since they permit flexible operation without consuming large amounts of timber.

The consultant recommends that consideration be given to the construction of about four small experimental kilns of this type. Plans and advice may be obtained, for instance, from the Forest Conversion Engineering Group, Division of Building Research, CSIRO, P.O. Box 56, HIGGETT 3190, Vic, Australia (Mr. M.W. Page).

If it is at all possible to provide steam on the premises, steam heating of the kilns would be preferred to electric heating. Steam is also necessary to operate a reconditioning chamber which is an essential item of equipment for the laboratory.

a.7 Humidity Balance - a marginal piece of equipment

5.3.3. Preservation Laboratory

Programme

The programme for preservation given in INUDPERU 1979 appears to the consultant to be very modest, and a more ambitious conception is advocated.

It is not possible, within the framework of the present report, to propose a complete relevant working plan for preservation in Pucallpa, and in any case, this should be drawn up by the future head of the laboratory. However, some general principles can be discussed.

The protection of logs in the forest is the responsibility of the Harvesting Division (see 4.2.2 p. 19) who should cooperate with the Forest Pathology and Preservation officers. (p. III-113).

The determination of natural durability is, however, one of the prime tasks of the Preservation Laboratory. The installation of a "graveyard" test (p. III-114) is certainly advocated, but it is not necessary to use 1 to 3 m long stakes. Small stakes of the order of 50 cm length and some 5 x 5 cm cross-section are

perfectly satisfactory. Also, it is not necessary to wait at least six years (p. III-115) to obtain first indications. After one year, and even six months, it is perfectly possible to identify the least durable species.

Much useful information on durability can be obtained in selvatic environments by questioning the local inhabitants and their craftsmen. By noting which timber they use for housing, boats, tools, weapons, makeshift bridges, etc., and by observing the state of conservation of such items that have been installed for a number of years, it may well be possible to draw up a first list of timbers in terms of their durability. Asking the opinion of a forest dweller is always useful.

Consideration should be given to the initiation of laboratory tests of durability against international standard strains of fungi and locally isolated fungi, using one of the internationally accepted methods.

Impregnation should be undertaken at an early stage to test the impregnability of the various timbers and check the loadings of preservative products that can be obtained.

For the details of the programme and necessary equipment, the Head of the Laboratory will, of course, be in contact with established institutions who can provide advice.

While waiting for the installation of the Preservation Laboratory, necessary information on important species may be obtained by sub-contracting Peruvian or overseas laboratories to carry out tests.

Methods

Methods for preservation experiments are too well known and documented to make it necessary to enter into details. The projects to be undertaken are

Natural Durability

- Enquiries and observations in existing forest settlements
- "Graveyard" tests
- Laboratory tests by standard methods

Impregnation

- "Simple" methods such as hot and cold bath, simple immersion, so-called double diffusion, boucherie for posts, etc.
- Vacuum and pressure methods

Early contact should be made with suppliers of preservative products who are usually prepared to provide assistance and advice.

Equipment

It should be noted that a preservation pilot plant is already installed at the CIFF (p. 7 of present report, ALEXO 1-6 INDUPERU).

The glassware listed under INDUPERU 1979, p. III-121 (c.2) seems to imply some chemical experimentation not mentioned in the programme on p. III-99 to 102. Also, there seems to be no provision for the use of histological instruments (c.1, p. III-121).

Instruments must be bought in function of the work to be carried out. Laboratory experimentation in Preservation, if any, will concern assessment of durability of untreated and treated specimens which needs Kolle flasks, Petri dishes, incubators and ancillary equipment.

The consultant does not consider it useful to establish a chemical laboratory for the analysis of either preservative products or quantitative retention in the wood, at least during the initial years of operation. Such work, if necessary, can be sub-contracted to analytical laboratories. The Preservation Laboratory should confine itself to purely qualitative analyses.

It is therefore obvious that the list of equipment must be revised by the future Head of the Laboratory before any orders are placed.

5.3.3.5 Gluing Laboratory

INDUPERU 1979 makes some reference to gluing as part of the work proposed for the Veneer and Plywood Laboratory (p. III-74 to 75) but the suggestions are limited to the citation of some ASTM standards.

Programme

As rightly stated on p. III-75 (f.7) of INDUPERU 1979, gluing is a critical phase of the production process. Furthermore, it is an operation which is likely to encounter some problems in a tropical environment, for instance through difficulties in controlling wood moisture contents.

Apart from its importance for the production of plywood, gluing may make a contribution to the manufacture of joinery and furniture with higher added value than sawn timber (finger-jointing, laminations) which could develop into export lines.

The consultant therefore considers that a separate gluing laboratory is an essential component of the proposed Centre.

For the first few years of operation, the gluing laboratory should not concern itself with the formulation of glues (suggested in INDUPERU 1979 p. III-74) but should use normal commercial glues to test the "glueability" of local species. Problems to be investigated in this respect would include

- effects of density
- effects of surface preparation
- effects of extractives
- moisture content control
- possible problems due to high ambient temperature and humidity
- good housekeeping in the production plant
- correct operation of equipment

To approach these problems, the staff of the Gluing Laboratory should

- seek advice from reputable glue manufacturers and independent laboratories on the most appropriate formulations of adhesives to be used under the temperature and humidity conditions of the Pucallpa region,
- seek similar advice on extenders and fillers, giving preference where appropriate to such national products as may be available (e.g. casave flour, ground cocconut husks, maize flour etc.), paying attention to the danger of fermentation of extenders and defining checks and controls,
- when seeking this advice, obtain guidance, where possible, on experimentation that might be carried out at Pucallpa on proportions of extenders and fillers, on eventual adjustments to shelf and pot life, use of hardeners, etc., and on recommended spreads (g/m^2).

Actual experimentation will initially consist in testing the recommendations made by these sources of information, and after some experience has been gained, introducing some variations if the recommended parameters are not found entirely satisfactory.

Eventually, this work will give the staff sufficient experience to be able to offer technical assistance on gluing problems. For the first few years, however, any special problems that may be encountered should be referred to outside laboratories, especially if they concern species available in sufficient volume to be of commercial interest.

Methods

The experimental projects to be carried out are implicit in the programme. For a start, two might be considered:

Bond strength obtainable with local timbers

On test plywood sheets made from local timbers with common commercial glue formulations, test bond strength by the standard shear test and the qualitative delamination test (forcing a knife between the laminations and noting percentage wood failure). The effect of wood density should be noted.

Effect of extractives

In a similar way, test whether the presence of extractives in certain species causes difficulty in gluing.

In addition, the staff should concern themselves with the economics of gluing so as to be able, eventually, to offer advice to industry.

Equipment

In addition to the equipment listed in Table 3-17 (INDUPERU 1979, pp. III-87 to 90), a certain amount of laboratory apparatus will be required, as well as a small testing machine for the standard shear tests to determine bond strength.

5.3.3.6 Finishing Laboratory

Finishing is referred to briefly in INDUPERU 1979 on p. III-76. The consultant considers that for the acceptance of timber products on the market, finishing is so important that a separate laboratory is justified.

Programme

The Finishing Laboratory will have to address itself to two primary tasks:

- Finishing for export (probably mainly furniture)
- Finishing for local markets
(very important if timber is to find wider acceptance as a building material)

The first concerns surface preparation and finishes for internal use, the second the permanence of finishes on timber exposed to the weather.

This suggests two lines of activity.

- Experimentation on the mechanical preparation of surfaces for high-class furniture components to enable them to accept high quality finishes. Problems may be connected with cross-grain, extractives, proper preparation of tools (moulders, sanders, etc.) and possibly anatomical features such as pore size or rays.
- Experimentation on the durability of exterior finishes under Peruvian conditions which will involve, at least initially, setting up and observation of exposure tests.

Much time may have to be spent on elementary technical assistance to improve the conditions of application of finishes, although this will probably not be immediate as few if any finishing installations exist in Loreto.

Methods

The two initial experimental projects are implicit in the programme.

Equipment

Advice to be sought from established laboratories of the specialty.

5.3.4 Division of Timber Products

5.3.4.1 General Remarks

The INDUPERU Feasibility Study (1979) makes no reference to activities on timber products, either in the area of experimentation or promotion.

However, the consultant considers strongly that such a Division is required. This opinion is based on

- his own observations
- the report of the supervising UNIDO Expert (Eldag 1979) who states:

(p.5) "The scope of the Centre has to be outlined in view of the wood processing industry"

(p.6) "... the proposed centre cannot be justified when used for research work only.

and again (p. 5)

"The development of the Centre has to cover all industry branches"

Eldag goes on to say that this should cover carpentry, joinery, furniture.

- his UNIDO terms of reference, particularly point 2 (see p. 1 of the present report).

Cutline recommendations for the work of this Division have already been given by Eldag (1979), and the consultant is in full agreement with these.

In the framework of the present report, it is not possible to present a complete programme of experimentation and a list of equipment for the Timber Products Division. Furthermore, to provide such a programme and such a list would be in contradiction with the consultant's philosophy that they should be drawn up by the Chief of the Division, together with his senior officers, once they have been appointed.

The discussion in the present Section will therefore be limited to general considerations regarding the work the Division should undertake. Programme, methods and equipment will be examined together for each laboratory.

5.3.4.2 Joinery Laboratory

Experience in various South American countries has shown that joinery items such as flush doors, mouldings can constitute profitable export lines. A number of European countries are experiencing some difficulty in obtaining durable timber for windows, and where they can be obtained, tropical timbers (from Africa or South East Asia) are often preferred.

There is no a priori reason why it should not be possible to export joinery components such as parts for window frames, interior trimmings, exterior louvres or various types of doors from Pucallpa, provided the product is of competitive quality

and can be placed on overseas markets at a competitive price.

The main lines of activity in this area, to be carried out in very close cooperation with the Promotion Division, could be

- Instal equipment for remanufacture including moulders, shapers, borers, routers, turning lathes etc. as outlined in Eldag (1979) p. 11

This equipment should fulfill three purposes:

- Experimentation of "workability" of local species in order to advise industry on their best use.
 - Training of industry operators.
 - Actual manufacture of prototype items of mouldings, joinery, window frames, etc. for presentation on overseas markets. If necessary, this manufacture could progress to the stage of pilot operations to supply markets in their initial period of exploitation
- In cooperation with the Quality Control Section, set up testing procedures and help with the implementation of standards to establish and maintain a high quality for the items produced. This will involve installation of (Eldag 1979, p. 12)
 - door testing equipment
 - window testing equipment

The writer has some slight reservations on the installation of noise testing equipment, except to reduce or control noise produced by the processing machines. On the other hand, particular attention must be paid to the accuracy of dimensions, and suitable equipment must be provided.

- The control of the moisture content of manufactured items for export is likely to cause some problems and must be given special attention. The equilibrium moisture content at Pucallpa being probable between 15 and 18 per cent, it is imperative to find a way of ensuring that export items can be conditioned before despatch to the approximate moisture content of the receiving locality in order to avoid dimensional changes or, worse, distortion and splitting. This problem is likely to provide the major applied research project of the Timber Products Division, as it is of equal importance for furniture.
- The design of joinery items in terms of customer requirements may spell the difference between success or failure of the operation. Design ideas should be one feature of marketing surveys by the Promotion Division, and attention should be paid to the development of modular components which can be assembled at the destination. This facilitates shipping and reduces costs but makes specially high demands on dimensional accuracy.

5.3.4.3 Constructional Components Laboratory

The general philosophy concerning the Constructional Components Laboratory is similar to that outlined for Joinery.

In this area, a distinction should be made between local and export markets.

For local markets, if the subject is approached correctly, there may be an interesting possibility of introducing prefabricated (or site-constructed) timber housing. With the projected intensive development of the Loreto Department and the Trans-Andean region generally, and the abundant forest resources available throughout the area, a simple, cheap design for a timber house guaranteed to last for at least 20 years may well prove attractive.

Timber has the advantage of high thermal insulation but low heat capacity and is therefore an ideal material for humid tropical regions. It is easily worked, does not require transport (in the Loreto situation) over long distances, transformations after construction can be easily carried out by the householder, and timber houses are easily individualized.

The main problem is a psychological one, Latin Americans being used to housing of heavier materials and having the idea that a timber house is a "poor man's house".

The design of timber houses poses no problem at all. The main points are to fix an admissible price for each category of house (e.g. a worker's house in the Amazon region should not cost more than about US\$5000, i.e. about 8 years of the minimum wage, with Government low interest loans), and then design to meet this price.

The most important technical consideration is durability, and if non-durable species are used, preservation must be applied.

In the present report it is not possible to enter into all aspects of timber housing for the Amazon, but a very considerable amount of information on the subject exists, based on experience in other tropical areas.

Other items for local markets could be, as suggested by Eldag (1979), bridge construction, jetty building, and in addition use of round timber for simple rural construction. The use of nail-glued elements should be given attention.

For export markets, relatively small building components are possibilities if of requisite quality and price. Such items as studs, joists, battens might find acceptance in North America.

From the above considerations, the following main projects for the Construction Laboratory might be recommended:

Timber Housing for the Amazon Region

In cooperation with experienced overseas consultants, develop designs for several types of timber houses to predetermined cost limits.

Set up specifications for the manufacture of these houses from suitable local timber, including preservation.

Construct a number of demonstration houses in key localities.

Launch a publicity campaign aimed at creating a market for these houses.

Building components for export

Request the Promotion Department to study North American markets regarding quality standards and prices judged acceptable.

Investigate local timbers and production methods to determine whether these requirements can be met.

Start manufacturing prototype and pilot lots for initial marketing trials.

Assembly methods

Investigate the applicability in the local industry of methods such as

- finger jointing
- automated truss manufacture
- lamination.

The equipment required is fairly similar to that recommended for the joinery department, except that a number of larger items (resaws, assembly rigs) are required.

The problems to be solved are in the area of marketing and promotion, and only to a small extent in the area of technology.

5.3.4.4 Furniture Laboratory

The requirements of the Furniture Laboratory have been very well outlined by Eldag (1979) on pp. 5, 10 and 12, and this consultant has little to add.

The main factors governing the sale of furniture are, simplifying a little,

- design
- quality
- price

It is recommended that once a decision is made to incorporate a Furniture Laboratory in the Centre, the services of one or more first-class designers are sought to examine how the beauty of the local timbers can best be put into effect.

There are several companies in Lima now exporting furniture of tropical Peruvian timbers, often in the luxury class, and this appears to be a very feasible business proposition. If the

manufacture is sufficiently industrialized to keep costs to reasonable levels, there is no reason why this should not be possible in the Pucallpa region.

The main activities of the furniture laboratory should be:

Design

With the aid of international specialists, develop designs having in mind European and North American markets.

Production

As far as possible, plan production on a modular basis to save shipping and transport costs.

Dimension and quality control

Institute high levels of control, including for moisture content.

Finishing

Cooperate with the Finishing Laboratory in the project outlined on p. 49.

Moisture conditioning

Cooperate with the Joinery Laboratory in the project on moisture conditioning outlined on p. 51.

In the initial stages, it is advisable for the Furniture Laboratory to manufacture pilot lines of high quality in an attempt to conquer overseas markets. At the same time, technical assistance must be provided to local industry so that private enterprise can eventually take over. If this should prove impossible, the establishment of a manufacturing plant in connection with the Centre, but run as a separate company, might be considered.

The equipment necessary for manufacture and testing has been outlined by Eldag (1979). A complete list and design of the laboratory is outside the scope of this report.

5.3.5 Division of Promotion

5.3.5.1 General Remarks

The activities of the Division of Promotion have already been anticipated, to some extent, in the earlier discussion. It will therefore be sufficient, in this sub-section, to outline the general plan of action which, in the consultant's opinion, it should follow.

It must also be kept in mind that Promotion, like research, is a creative activity. Whilst one can indicate challenges, objectives and goals, one should refrain from telling the man appointed to look after promotion (presumably because he is competent) how he should do his job.

The philosophy of promotion from the Pucallpa region has been summarized in section 5.2, p.26. Following on from this, and repeating to some extent points made in the present Chapter, one may state the following principles:

- In an initial phase, the Centre must concentrate on the improvement of quality. This should be done through technical assistance "on the spot" and some laboratory experimentation, as explained in this Chapter.

As soon as adequate quality can be guaranteed in a sufficient number of plants to satisfy the volume requirements of national and/or international markets, the Centre should take a lead in contacting buyers and arranging for placing sample shipments.

- Simultaneously, the Centre should introduce methods for increasing the added value in the form of products that can be easily transported (e.g. plywood, fancy veneer, solid wood furniture).

If necessary, the Centre should take the lead in manufacturing these products itself and placing initial runs of products on overseas markets (e.g. through European furniture fairs). When sufficient interest has been established, commercial companies should be encouraged to take over. However, care must be taken to make contingency plans in order to maintain supplies if commercial companies do not respond quickly enough. If this is not done, not only will the market in question be irretrievably lost, but the reputation of Perú as a reliable supplier will be severely damaged.

- Right from the start, the Promotion Division should cooperate with ITINTEC and the various national standards committees to promote the creation and application of Peruvian standards.

However, promotion must be customer-directed, and for export, the standards to be applied must be those that the overseas customer demands.

- Where it is not possible to produce to an existing standard, or where no standard exists, the Centre should set up its own quality control.
- In a second phase, after the activities outlined above have become well established, the Centre may create its own Quality Labels in areas where the creation of a standard is not appropriate. Needless to say, there is no point in creating quality labels unless their control and observation are rigidly enforced.

The control and enforcement will probably have to be done by the Division's Quality Control Section, although on principle, the consultant would prefer this to be done by an industry association (on the pattern, for instance, of the American Plywood Association).

On the basis of these principles, the activities of the various Sections may be summarized:

5.3.5.2 Quality Control Section

- Create quality control rules in cooperation with each specialist laboratory.
- If successful, convert these rules into Quality Labels. Each label would require statutes to be subscribed by an Executive Committee that includes representatives of the industry concerned, and of ITINTEC.
- If necessary, carry out the supervision and enforcement of the Quality Label, with the help of the laboratory concerned.

5.3.5.3 Standards Section

- Cooperate with ITINTEC in the setting up and definition of standards in all areas affecting the Industry Department, calling on the specialists of the laboratories where necessary.
- Coordinate all activities related to standards in the Industry Department.
- Attend, as far as possible, to requests by ITINTEC in the area of standards for forest products.

5.3.5.4 Marketing Section

- Carry out the marketing studies, surveys and promotional activities outlined in the preceding Sections of this report.
- Take all reasonable initiatives required to increase the international markets for Peruvian forest products
- Investigate national patterns of timber consumption in an endeavour to find new uses for Peruvian forest products

5.3.6 Auxiliary Sections of the Industries Department

5.3.6.1 Sample Preparation

A small workshop on the lines of the "Apoyo" area proposed in INDUPERU 1979, p. III-132a and 136 a to 138 will be attached to the Industries Department, under the Control of the Director.

The purpose of this workshop will be the preparation of specimens for the different experiments carried out in the laboratories.

However, the workshop will not require the logging equipment listed on p. 132a, since logs are to be obtained through the Harvesting Division of the Forestry Department. Also, as far as possible, equipment of the sawmilling and joinery laboratories will be used. However, care must be taken not to upset experiments by doing standard carpentry or joinery for sample preparation on the same machine.

5.3.6.2 Information Officer

The rôle of the Information Officer, responsible to the Director, is

- to act as a first filter for telephone calls and visitors who do not address themselves to a particular person or laboratory. The information officer must take care not to constitute a barrier between the public and the laboratories, but he may be able to answer directly some simple enquiries.
- to organize participation of the Industry Department in Fairs, Exhibitions and other public manifestations wherever appropriate
- to help maintain liaison with other institutions working in the forest products area (e.g. the universities, DGFF, Junta del Acuerdo de Cartagena, etc.)

It is obvious that this list is not exhaustive.

5.3.6.3 Custom Work and Training

On p.27, it was pointed out that the Industry Department should endeavour to undertake custom activities such as saw sharpening, drying of timber on behalf of an industry, impregnation with preservatives, manufacture of joinery, furniture, etc. that would generate income and help increase quality standards. This is also very strongly recommended by Eldag (1979).

Equipment in the various laboratories must be selected with this activity in mind, but one should take care not to create "white elephants" before one can be sure that such custom work will actually be entrusted to the Centre. It will be the responsibility of Laboratory Heads to negotiate this type of work with their respective industries. Overall coordination and administrative support will be provided by the Technical Services Division of the Department of Administration (see p.21).

Similarly, training courses will be arranged by Heads of Laboratories and coordinated by Technical Services.

6. PERSONNEL AND FINANCIAL ASPECTS

6.1 TIMETABLE of IMPLEMENTATION

In Section 3.2 on p.8, we referred to the two alternatives for the establishment of the Centre discussed in the INDUPERU study, i.e.

- "modular establishment" over a period of 10 years
- "rapid" establishment in 27 months.

The consultant considers, with respect, that neither alternative is entirely realistic.

INDUPERU has presented an excellent case for a Wood Technology Centre. The evidence given in their report shows that the Centre is required now, not in ten years. In particular, if the Peruvian Government considers that forestry production should be increased (ORDELORETO 1979, Vol. I, p.5), then it is urgent that industry be given the technical assistance that the Centre will provide.

On the other hand, establishment of the Centre in 27 months as a "turn-key" operation would not be in harmony with the present Peruvian situation in regard to personnel with the right professional education and experience. We have insisted in this Report that the professional men and women who are going to run the various departments of the Centre must participate in its establishment, if a coherent operation is to be achieved.

This consultant therefore recommends that

"the Industry Department of the proposed Centre be established over a period of five years, giving priority to the Divisions and Laboratories that will provide direct assistance to industry in the areas of technical development and promotion of products, and taking account of the recommendations on the administrative and organizational structure made in Section 3.4 and Chapter 4 of this report."

A timetable for the implementation is proposed in Table 2.

It will be noted that high priority is being given to sawmilling, drying, preservation and marketing, with veneer and plywood, joinery, constructional uses, quality control and physical-mechanical properties as the second highest priority.

In every case, the senior officer of the department, division and laboratory should be appointed in the year prior to the ordering of equipment, and two years before his laboratory is expected to become operational. This will enable him to participate in the planning of layouts, selection of equipment, and to judge what training is required for himself and his future staff.

Table 2. Timetable for implementation
(Consultant's Proposal)

(Compare with INDUPERU proposal,
INDUPERU 1979, III-194)

Department Division Laboratory	Year					
	- 1	0	1	2	3	4
President	Op					
Admin. Coun.	Op					
Dir. Gen.		P, Op				
<u>Admin. Dept.</u> Director		P, Op ⁺				
Admin. Div.		P, Op ⁺				
Tech. Div.			Op			
<u>Forestry Dep.</u> Director		P, Op ⁺				
Divisions		To be coordinated with existing projects under the responsibility of ORDELORETO (see Appendix 2).				
<u>Industry Dep.</u> Director		P, Op ⁺				
		Transition arrangements to be made to coordinate present activities of CIFF and INDUPERU with proposals of this report				
<u>Primary Conv.</u>						
Sawmilling		P	B,E,T	Op		
Veneer, Ply.			P	B,E,T	Op	
Panels					To be determined	
<u>Proc. Tech.</u>						
Properties			P	B,E,T	Op	
Drying	P		B,E,T	Op		
Preservation	P		B,E,T	Op		
Cluing				P	B,E,T	Op
Surface Ttmts				P	B,E,T	Op
<u>Timber Prod.</u>						
Joinery			EP	B,E,T	Op	
Construction			P	B,E,T	Op	
Furniture				P	B,E,T	Op
<u>Promotion</u>						
Quality Control			P	E,T	Op	
Standards				P	E,T	Op
Marketing		P	E,T	Op		

KEY Op = Department (Div, Lab) to become operative
 Op⁺ = To become operative in the second semester of the year
 P = Appoint senior staff, plan operation
 B,E,T = Terminate buildings, order equipment, carry out training

6.2 PERSONNEL

We have emphasized throughout this report that the most important factor determining the success or failure of a technical institution is its personnel.

It is not good enough to plan on paper a complete technological institute, establish it like a factory as a turn-key proposition while having technical personnel trained elsewhere, and then expect it to become operative by bringing the established laboratories and the trained personnel together.

The personnel must grow together with its laboratory and with the industry it is to serve.

In accordance with the organizational structure proposed in Chapter 4, a plan has been drawn up for the technical and administrative personnel that the consultant considers necessary to carry out the technical programmes suggested in Chapter 5. This plan is presented in Table 3. For comparison, Table 4 summarizes the INDUPERU proposal given in Vol. II of their study.

The following explanatory remarks should be made:

- The total personnel of the Administrative Department has been increased from 39 to 47. However, in the Consultant's proposal, this department is responsible for the overall administrative services to both the Forestry and the Industry Department. In addition, it takes over some of the functions attributed by INDUPERU to the "Services" department which has been suppressed by the consultant (Coordination Section in the Technical Services Division).

The increase by 8 persons is thus very moderate.

- A clerk has been added to the Director-General's department, as it is considered that the D.G. will require office assistance beyond that provided by his secretary.
- The number of class "A" professional officers has been increased by one, and of class "B" by seven, whereas class "C" has been reduced by two. It is considered that the addition of gluing, surface, joinery, construction and furniture laboratories amply justifies this increase which, incidentally, should be regarded as an absolute minimum.
- The number of secretaries has been increased from five to twelve. If the Centre is really as successful in providing assistance to industry as the INDUPERU study predicts, then the number of five secretaries would be grossly inadequate to cope with the writing of letters, reports, manuals etc. involved, apart from general administrative work. Naturally, the secretaries should be recruited gradually as the work arises.
- By judicious redistribution, the number of labourers including clerks has been kept more or less to the same level as proposed by INDUPERU:
- The Chiefs of a number of Divisions of the Industries Dept.

Table 3. Staffing-consultant's proposal

N.B. This Table gives the full establishment to be reached by Year 5

Department (Division, Labor.)	Professional Staff				Secre- taries	Labourers Clerks		TOTALS	
	A		B	C		Skill- ed	Un- skill	Labs. etc	Dep
	Chiefs/ Heads	Other							
<u>Director-Gen.</u>	1	1 (Legal)	-	-	1	1	-	4	4
<u>Administr.</u>									
<u>Director</u>	1	-	-	-	1	-	-	2	
<u>Technical</u>									
Chief	1	-	-	-	1 ^(*)	-	-	2	
Maintenance	-	-	1	3	-	6	4	14	
Transport	-	-	-	1	-	4	1	6	
Document.	-	-	1	1	1	2	-	5	
Public.	-	-	1	1	-	2	-	4	
Coordin.	-	-	1	-	1	1	-	3	
<u>Adminis.</u>									
Chief	(+)	-	-	-	1 ^(*)	-	-	1	
Accounting	-	-	1	1	-	1	-	3	
Personnel	-	-	1	1	-	1	-	3	
Purch, Sales	-	-	1	1	-	1	1	4	47
<u>Forestry</u>	Not considered in this Table								
<u>Industry</u>									
<u>Director</u>	1	-	-	-	1	-	-	2	
<u>Primary Conv.</u>									
Chief	1	-	-	-	1 ^(*)	-	-	2	
Sawmilling	(+)	-	1	3	-	3	2	9	
Veneer, Ply	-	1	1	2	-	3	2	9	
Panels (**)	-	-	1	2	-	2	1	6	
<u>Proc. Techn.</u>									
Chief	1	-	-	-	1 ^(*)	-	-	2	
Properties	-	-	1	2	-	2	-	5	
Drying	(+)	-	1	2	-	2	2	7	
Preservation	-	-	1	1	-	2	1	5	
Gluing	-	1	1	1	-	1	-	4	
Surface Ttmt	-	-	1	1	-	1	-	3	
<u>Timber Prod.</u>									
Chief	1	-	-	-	1 ^(*)	-	-	2	
Joinery	(+)	-	1	2	-	3	1	7	
Construction	-	-	1	1	-	3	2	7	
Furniture	-	-	1	2	-	4	2	9	
<u>Promotion</u>									
Chief	1	-	-	-	1 ^(*)	-	-	2	
Quality Con.	-	1	1	2	-	4	-	8	
Marketing	(+)	-	1	2	-	2	-	5	
Standards	-	-	1	1	-	2	-	4	
<u>Sample Prep.</u>	-	-	-	1	-	2	1	4	
<u>Inform. Office</u>	-	-	1	-	1	-	-	2	104
									<u>TOTAL</u> <u>155</u>

KEY (+) Position filled cumulatively by Chief of Division
 (*) Secretary serving the whole Division
 (**) Installation of the Panels Lab. may be deferred beyond the 5th year.

SUMMARY OF FIGURES SEE NEXT PAGE

SUMMARY OF FIGURES

Department	Professional Staff				Secre- taries	Labourers Clerks		TOTAL
	A		B	C		Skill- ed	Un- skill.	
	Chiefs Heads	Other						
Dir.-Gen.	1	1	-	-	1	1	-	4
Administr.	2	-	7	9	5	18	6	47
Industry	5	3	15	25	6	36	14	104
TOTAL	8	4	22	34	12	55	20	155
	12							

Table 4. Staffing INDUPERU proposal

N.B. The Table gives the full establishment of staff to be reached in Year 10 (Alternative I) or Year 3 (Alternative II). The figures are taken from various tables in INDUPERU 1979, Vol. II, see "Ref."

Department	Ref. P	Professional Staff				Secre- taries	Workers		TOTAL
		A		B	C		Skill- ed	Un- skill.	
		Chiefs Heads	Other						
Dir. Gen.	162	2	-	-	-	1			3
Administr.	162	1	-	7	12	3	16	-	39
Services	157	1	3	3	2	1	-	-	10
Support (Sample Prep.)	141	-	-	1	2	-	7	6	16
Experimental									
Sawmilling	58	1	-	1	3	-	4	-	9
Properties) Anatomy)	33	1	-	1	6	-	10	-	18
Plywood	94	1	-	1	5	-	11	-	18
Drying) Preserv.)	133	1	-	1	6	-	6	8	22
TOTALS		8	3	15	36	5	54	14	135
		11							
N.B. <u>Sub-Totals</u>									
D.G. + Admin		3	-	7	12	4	16	-	42
Services) Support)		1	3	4	4	1	7	6	26
Experimental		4	-	4	20	-	31	8	67

(Primary Conversion, Processing Techniques, Timber Products and Promotion) will each double as Head of one of the laboratories of their respective Divisions. The Director of the Administrative Department will double as Chief of the Administrative Services Division.

This arrangement is justified at least during the initial years of operation of the Centre and is a common one in many research institutes. It might be reviewed at a later date.

- The secretaries to be employed for the Divisions are listed as being attached to the Division's Chief, but will in fact serve all officers of their respective Divisions.
- The Forestry Department has not been considered in detail, as its organization is outside the scope of this report. However, its organization and the distribution of staff must be duly established within the framework of the overall structure of the Centre. This will probably bring the total staff to about 250.

In the present proposal, if the Forestry Department is giving similar staffing to that of the Industry Department, about 20 % of total staff and a little over 20 % of professional staff would be employed in administration, including the D.G.'s office, which is considered a reasonable proportion.

Naturally, the staff will be recruited gradually over the five years of implementation. Table 5 presents a proposal for the timetable of recruitment of senior staff, in accordance with the considerations outlined above.

It will be noted that practically all the grade "A" professionals and the majority of the class "B" professionals are to be recruited during year 0 and 1.

The consultant does not consider it useful to provide a timetable for the recruitment of technicians (grade "C"), secretaries and labourers/clerks. This personnel should be obtained as the need arises. This will depend on a number of factors which it is impossible to foresee (arrival of equipment, progress of buildings, demand for technical assistance, etc.). In each case, recruitment should be authorized when required by the Director General, on the recommendation of the Chief of Division concerned.

The first person to be appointed should be the President of the Centre (see p13). As soon as his appointment is confirmed, the Administrative Council should be formed. The Administrative Council will then proceed to appoint the Director-General (beginning of Year 0), and the Director General will then select his senior officers and recommend their appointment to the Council.

In practice, the timetable might proceed thus:

Year (-1)	Month	1	-	Appointment of President
	"	4	-	Appointment of Administrative Council
Year 0	"	1	-	Appointment of Director-General
		6	-	Start of appointment of senior officers

Naturally, the intervals might be shorter, if possible.

Table 5. Timetable for recruitment of senior staff

(Professionals A and B
Consultant's Proposal)

(See Table 3 for total establishment)
(See Table 4 for INDUPERU proposal)

Departments Positions etc	YEAR													
	- 1		0		1		2		3		4		5	
	Number of professionals													
	A	B	A	B	A	B	A	B	A	B	A	B	A	B
President Admin. Council	1													
	All members in year - 1													
Director-Gen. Legal Adviser			1 ⁺											
<u>Administration</u> Director			1 ⁺											
Tech. Div.			1 ⁺	1 ⁺		3								
Admin. Div.				2 ⁺		1								
<u>Forestry</u>	Not considered in this Table, but Director must be appointed in second semester of year 0.													
<u>Industry</u> Director			1 ⁺											
<u>Primary Conv.</u> Chief Sawmilling Veneer, Ply. Panels			1 ⁺			1		1						1
<u>Proc. Tech.</u> Chief Properties Drying Preservation Gluing Surface Ttmt:			1 ⁺			1 1 1		1		1				
<u>Timber Prod.</u> Chief Joinery Construction Furniture					1	1 1				1				
<u>Promotion</u> Chief Quality Con. Marketing Standards			1 ⁺		1	1 1			1					
<u>Sample Prep.</u> <u>Info. Officer</u>			No position A or B											
			1											
TOTALS	1(*)		8 ⁼	4 ⁼	3	12	1	4		1				1

KEY (+) Officer to be appointed during second semester of Year 0
 (*) In addition to President, Admin. Council to be appointed
 (=) In Year 0, 7 "A" and 3 "B" appointed in 2nd semester

6.3 TRAINING of PERSONNEL

In INDUPERU 1979, p. IV-13, a list of institutions is suggested for the training of personnel of the Centre.

Although the institutions listed are excellent, the choice appears a little narrow for the purpose intended.

In addition, the periods suggested for each institution (3 to 4 months) are not useful. A professional officer visiting a technological centre or laboratory should either stay a few days (maximum two weeks) to discuss problems of research and technical assistance with the officers concerned, or he should stay for a minimum of six months so that he can take part in a technological or research project.

None of the institutions listed is a teaching establishment. They will accept students or trainees who join them to undertake a well-defined experimental project, but their officers do not have the time to organize a training course of the kind that the Centre would require.

The following suggestions are made:

- The Director General should be a person who has had previous experience in directing a technological department or institute either in the public service or in industry. He should preferably be a forest engineer, but an engineer of another specialty, if well qualified, should be accepted. Previous knowledge of wood technology is desirable but not essential.

With this background, he should visit a number of established wood technology centres, spending between two days and two weeks at each, rather than spend three months at any one. These centres should include those located in

Mérida, Venezuela
Sao Paulo, Brasil and Brasilia, Brasil
Concepción, Chile
Medellín, Colombia
The ICAITI, Guatemala
Madison, Wis, United States
Laguna, Philippines
Melbourne, Australia
Rotorua, New Zealand
Bogor, Indonesia
Kuala Lumpur, Malaysia
Hamburg and Munich, Federal Republic of Germany
Vienna, Austria
Paris, France
Princes Risborough and TRADA, U.K.

to name but the most important ones.

- The officers named on p. IV-13 (or their equivalents in the organization proposed in this report) should each spend six months at one laboratory rather than three months at each of two laboratories.

The laboratories should be carefully selected for each specialty, for instance

- for sawmilling, C.T.F.T. Paris (M. A. Chardin)
CSIRO Melbourne (Mr. M.W. Page)
with a short visit of two weeks to Mérida,
Venezuela
- for veneer and plywood
C.T.B., Paris (M. Jaudon)
(M. Fondronnier)
CSIRO, Melbourne (Mr. B. McCombe)
- for drying, N.Z. Forest Service,
Rotorua (Dr. J. Kininmonth)
CSIRO, Melbourne (Mr. F.J. Christensen)
Mérida, Venezuela (Dr. J. Conejos)
- for preservation
Sao Paulo, Brasil (Dr. A. Freitas)
C.T.F.T., Paris (M. M. Fougrousse)
Hamburg, Federal (Prof. W. Liese
Republic of Germany and Dr. Willeitner)

and so on.

This list is purely indicative and by no means exhaustive.
Further details can be provided if desired.

6.4 FINANCIAL IMPLEMENTATION

The economic and financial implementation of the Centre has been studied extensively by INDUPERU (1979) in Vol. II, Chapter V. Detailed calculations of income and expenditure, cash flow and of annual and cumulative balances have been carried out, and the results can be found in the Tables of that Chapter, for the first 13 years of operation of the Centre.

These calculations provide an order of magnitude of investments and current expenditure in terms of January, 1979 price levels. They are useful as a basis for planning, but it is obvious that they cannot be used to estimate the actual magnitude of disbursements.

The Cash Flow for the consultant's proposal of implementation in five years has been calculated in general terms and is given in TABLE 6. It will be noted that

- Total investments exceed the figure advanced by INDUPERU (404 million Soles) by 180 million Soles, due mainly to the provision of joinery, construction and furniture laboratories
- The cost of personnel (including social charges) has been increased from INDUPERU's 97 million Soles (for 135 staff) to 110 million Soles (for 155 staff), the general operating expenses from 41 to 45 million, and a 10 million Soles per annum has been added for Promotion of timber products. In addition, provision has been made for a continuing investment at the level of 10 million Soles per annum, as the Centre must continuously renew its equipment and purchase new machinery and instruments to keep up with development. (10 million Soles is, in fact, a bare minimum for this purpose.)

Table 6. Cash flow, first five years
(Consultant's Proposal)

N.B. The figures given in this Table must be regarded purely as a guideline for purposes of comparison with the INDUPERU proposals. Considering the rapid evolution of the cost of equipment and services, they must not be taken as representing the actual magnitude of disbursements.

See Table 7 for a year-by-year comparison with the INDUPERU figures.

Item	Year							TOTAL
	Prior to 0	0	1	2	3	4	5	
	Millions of Soles							
<u>Investments</u>								
General (incl. Admin)	29	80	40	20	20	20		209
Sawmilling) Sawdoctoring)			50					50
Veneer, Ply.				80				80
Properties					25			25
Drying			20					20
Preservation			20					20
Gluing					20			20
Surface Tmt.					10			10
Joinery				30		10		40
Construction				20				20
Furniture					30	20		50
Miscellaneous			10	10	10		10	40
	TOTAL INVESTMENTS							<u>584</u>
<u>Operation</u>								
Personnel (incl. social charges)		20	50	80	100	110	110	470
Gen. operation		5	15	25	45	45	45	180
Promotion			2	5	5	10	10	32
	TOTAL OPERATION							<u>682</u>
GRAND TOTALS	29	105	207	270	265	215	175	<u><u>1266</u></u>

- N.B. - Investments are entered for the year when equipment is to be ordered (cf. Table 2).
 - Equipment for panel products lab. not included
 - Costs are given for January, 1979 levels.
 1 US\$ = 250 Soles (approx.)

- As a result, the permanent budget attained after five years is 175 million Soles/annum, 43 million higher than INDUPERU's 132 million (attained in year 13 for alternative I, in year 7 for alternative II).

A comparison of the consultant's cash flow scheme with those proposed by INDUPERU for their two alternatives is given in TABLE 7.

No allowance has been made in Table 7 for income earned by the Centre, as the consultant considers that operational and investment expenses during the initial years should be guaranteed from Government Treasury sources (Recommendation 9., p. 15).

The additional laboratories recommended in this Report may, however, be reasonably considered as potential good revenue earners. If successful, the activities of the furniture and joinery departments, and income from fees levelled for quality control and standards work, may be expected to add very substantially to the total receipts of the Centre.

In the INDUPERU calculations, the income of the Centre, after an induction period, levels out

- for Alternative I at 120 M. Soles after 13 years
- for Alternative II at 120 M. Soles after 5 years

Judging from the experience of other institutions, it would not seem unreasonable to expect revenue from quality control, standards, joinery, furniture and eventual technical assistance on gluing to be of the same order as that earned by technical assistance and courses to the sawmilling, veneer and plywood and drying industries. This would mean that the addition of these departments could eventually double the Centre's income.

If we accept the figures of INDUPERU given above, and if we make the conservative assumption that the full revenue-earning capacity will not be reached before Year 10, with intermediate figures from Year 3 to 9, we have the following picture:

Cumulative balances at end of Year 13

	INDUPERU Proposal		Consultant's Proposal
	Alt. I	Alt. II	
Total Expenditure	1534	2048	2666
Total Income	884	1368	1710
	<hr/>	<hr/>	<hr/>
BALANCE (to be provided by Government Treasury)	<u>650</u>	<u>680</u>	<u>956</u>

If we look at the annual balance after Year 13, we find:

Table 7. Comparison of cash flows
(Consultant's and INDUPERU's Proposals)

N.B. As in Table 6, the figures given are purely guidelines for the purpose of comparing the different proposals. They must not be taken as the actual magnitude of disbursements.

Year	Investments			Expenditure (Operation, Personnel, Working Capital)			Totals		
	INDUPERU		Cons.	INDUPERU		Cons.	INDUPERU		Cons.
	Alt.I	Alt.II		Alt.I	Alt.II		Alt.I	Alt.II	
Millions of Soles									
Prior to 0	29	29	29	-	-	-	29	29	29
0	76	363	80	3	12	25	79	375	105
1	-	-	140	38	103	67	38	103	207
2	75	-	160	38	108	110	113	108	270
3	-	-	115	64	122	150	64	122	265
4	-	-	50	64	124	165	64	124	215
5	-	-	10	64	130	165	64	130	175
6	71	-	10	75	133	165	146	133	175
7	46	-	10	96	132	165	142	132	175
8	-	-	10	101	132	165	101	132	175
9	-	-	10	105	132	165	105	132	175
10	97	-	10	114	132	165	211	132	175
11	-	-	10	121	132	165	121	132	175
12	-	-	10	125	132	165	125	132	175
13	-	-	10	132	132	165	132	132	175
TOTALS	394	392	664	1110	1656	2002	1534	2048	2666

N.B. - Equipment for the Panel Products Laboratory has not been included in the consultant's proposal.

-Costs are given for January, 1979 levels.
1 US\$ = 250 Soles (approx.)

Ref. INDUPERU 1979, Vol. II
pp. V-10, 37, 38)
Tables 5.2, 5.16, 5.17) etc.

Annual Balance after Year 13

	INDUPERU Proposal		Consultant's Proposal
	Alt. I	Alt. II	
	(Millions of Soles)		
Annual Expenditure	132		175
Annual Income	<u>120</u>		<u>240</u>
BALANCE	<u>- (12)</u>		<u>+ 65</u>

In other words, after reimbursing the investment at constant 1979 prices, the Centre would, after some 30 years, produce a nett profit.

However, it must be emphasized that this type of calculation is highly speculative and does no more than indicate possibilities.

It is impossible to predict just what the level of income will be, as it is impossible to foresee, with sufficient accuracy, the economic situation in years to come.

We therefore consider that

- the decision for or against the establishment of the Centre should be taken on the grounds of export promotion, a greater contribution of the forest resource to the gross national product, and generation of employment, and not in terms of profit and loss of the operation of the Centre itself.

6.5 CONTRIBUTION BY INTERNATIONAL ORGANIZATIONS

As stated on p. 7 of the present Report, the existing CIFF at Pucallpa is being supported by FAO, the Andean Pact and Swiss bilateral cooperation.

On the other hand, the INDUPERU proposal for a "CTM" has received some support from UNIDO through the provision of a consultant and arrangement of a study tour for the officer responsible.

The consultant wishes to recommend that,

"If the Peruvian Government, through the National Planning Office and at the joint request of the Ministry of Industry and the Ministry of Agriculture, approaches the United Nations Development Programme with a proposal for assistance with the establishment of a joint Forestry and Wood Technology Centre, this proposal should receive favourable consideration."

It is further recommended that,

"If a proposal such as outlined above is approved by UNDP for inclusion in the Country Programme, a meeting of responsible officers of UNIDO and FAO should be convened to discuss a joint approach of both organizations to providing the technical assistance required."

This technical assistance might take the following form:

General Objective

To assist the Peruvian Government, and in particular the Forest and Wildlife Service (DGFF) and the National Standards Technological Institute (ITINTEC) to set up a Centre having the Mission (stated on p. 25 of this Report):

"To increase the contribution of Peru's tropical forest resource to the national economy by

- establishing forest management patterns that produce maximum yield and ensure the conservation of the resource,
- promoting the utilization of as wide a range of species as possible for local and export markets."

Executive Responsibility

UNIDO - responsibility for the Industry Department
FAO - responsibility for the Forestry Department

A suitable mechanism of coordination, either by a joint Project Coordinator or by a Committee should be set up.

Duration

The technical assistance should be planned for five years, with critical reviews after the second and fourth years.

International Experts

The main assistance under this heading should be provided in the form of brief but repeated visits by consultants of recognized expertise. The areas of consultancy for the Industry Department are considered below. The Forestry Department will not be further discussed in this Report.

To coordinate the activities of these consultants, there are two possibilities, depending on the funds made available by UNDP:

- (i) Administrative coordination only by the resident FAO and UNIDO officers in Lima.
- (ii) Technical coordination by the allotment of two experts, one in Forestry (FAO) and one in Industry (UNIDO), resident at Pucallpa, to take up duties at the beginning of Year 1 (i.e. after implementation by the Peruvian Government has effectively started).

Total expert time: 2 x 4 man years, i.e. 8 m.y.

Studentships

A number of studentships to be provided as below (only those for the Industry Department are given).

- Year 0: Director General
6 months visits to wood technology
and forestry institutions
- 1: Director of Industry
3 months visits to wood technology
institutions
- Director of Forestry
3 months visits to forestry institutions
(In accordance with the discussion on p. 62,
these visits should be to a number of institut-
ions in different countries, staying between
2 days and 2 weeks in each).
- Chief of Primary Conversion
6 months in a wood technology laboratory,
concentrating on sawmilling
- Chief of Processing Techniques
6 months in a wood technology laboratory,
concentrating on drying, preservat:
- 2: 4 six-months studentships for Heads of
laboratories to be selected, but including
veneer and plywood, and marketing.

Total Year 0 to 2: 4 studentship-years

Situation to be reviewed before approving any
studentships for 3rd and following years.

Consultants

Provision for five years, subject to review after
second year:

29 man-months as follows:

Sawmilling	4	man-months
Veneer and Plywood	4	"
Drying, Pres.	2	"
Joinery	3	"
Construction	3	"
Furniture	3	"
Marketing	2	"
Quality Control	2	"
Technical Management	2	"
Other subjects (to be determined)	4	"

29

The consultants' visits should preferably not exceed one month,
i.e. four one-month visits at different times are considered
more efficient than one four-month visit. It must also be
recognized that it is extremely difficult to obtain competent
consultants for periods exceeding about four weeks.

Equipment

The consultant considers that the technical assistance should not include provision of equipment through United Nations funds, although the experts and consultants will be expected to advise on the selection of equipment and assist with its installation.

Other items

Provision should be made for a moderate fund to assist officers of the Centre with travel to approved international conferences or training courses.

Timetable of implementation

The consultant recommends that a document for Preliminary Assistance be signed as soon as the Peruvian Government approves the establishment of the Centre.

As mentioned before, the main Project Document should not come into force until the Year 1, i.e. after the actual implementation of the establishment has begun, the senior national personnel appointed and the Law (or Decree) creating the Centre has been promulgated.

6.6 THE CENTRE TECHNIQUE DU BOIS, PARIS

In the INDUPERU (1979) Feasibility Study, reference has been made a number of times to the French Centre Technique du Bois, as well as in instruction 1. of the INDUPERU Plan de Trabajo (p. 1).

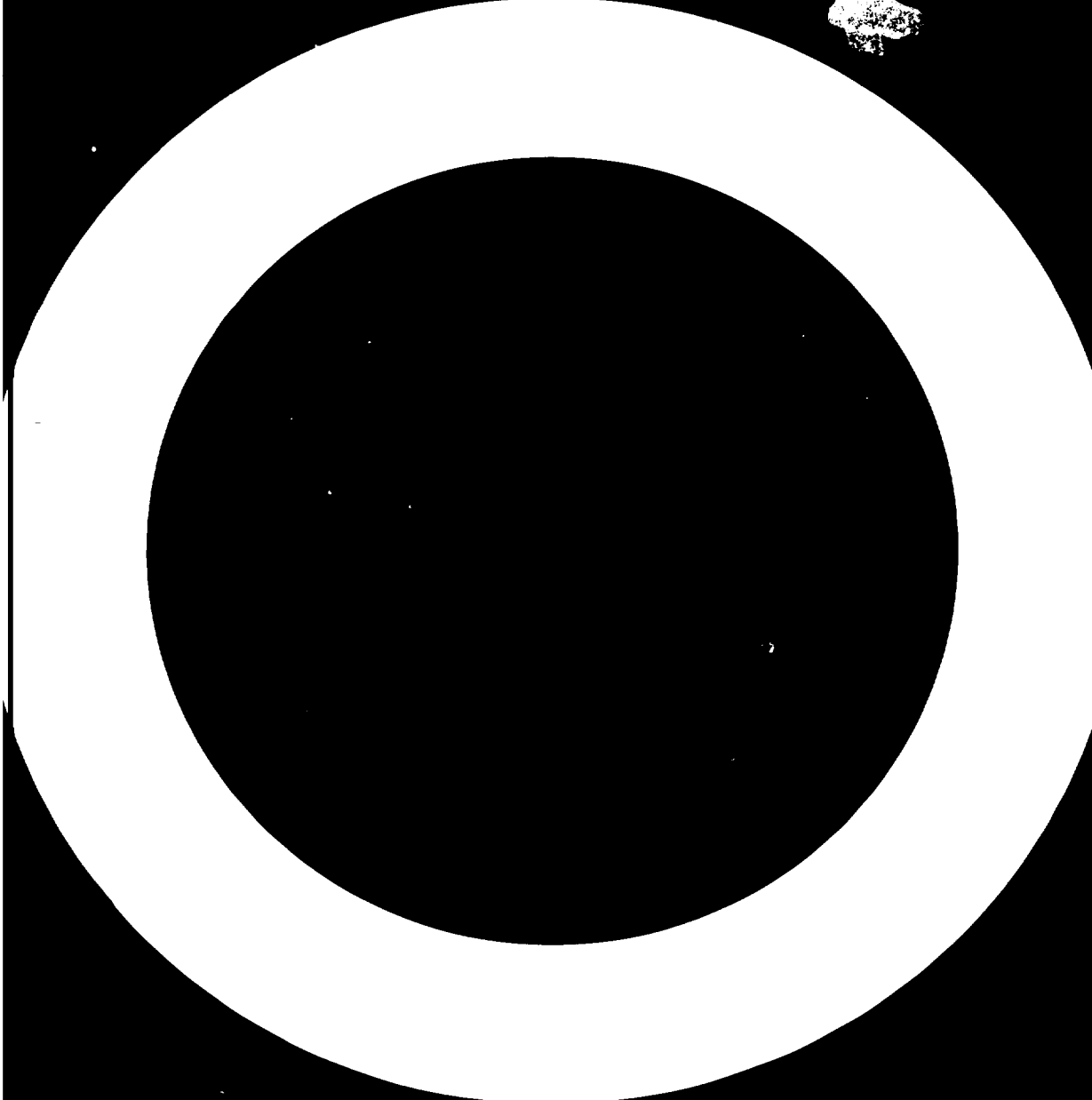
Whilst the consultant believes that great care should be exercised in transposing structures found useful in a given country, to a different environment, there is no doubt that some aspects of the experience of the French Centre Technique du Bois may be of interest to Peru.

In particular, he draws attention to the joint tutelage of the Ministries of Industry and Agriculture through the Administrative Council (copy of Statutes attached to this report) and to the interpenetration of research and technical assistance.

If the Peruvian authorities wish to make further reference to the Centre Technique du Bois, it is suggested that an official approach be made to the Director General to obtain the information required. The Centre Technique du Bois is, of course, an institution set up to serve the needs of French industry and not an organization for providing technical assistance to other countries. Under certain circumstances, however, the Centre accepts to undertake training and contract research projects. Any proposals in these areas must be addressed to the Director General.

7. REFERENCES

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APPENDIX 1

SUMMARY of CONSULTANT's VISITS

(November, 1979)

Nov.

- 11 Sun pm arrival Lima
First discussions with UNIDO supervising expert.
Mr. H. ELDAG
- 12 Mon am Visit to INDUPERU Offices, La Molina
Ing. Jorge GRIEVE, President
Ing. RAMIREZ, Manager of Projects
Ing. David LLARENA García, Manager, Amazon Project
Ing. Oscar MORELLO Ruiz, Manager, CTM Project
- pm Visit UNDP Office
Junta del Acuerdo de Cartagena
Ing. Marcelo TEJADA, Jefe, Grupo Tecnológico,
Proyectos PADT
- 13 Tue am At INDUPERU Offices, La Molina
- p.m Visit to Furniture Manufacturing Companies
(a) Ferrini y Schoeler, S.A., Jiron Callao 850
Ing. Ernesto FERRINI G.
(b) DERISA, Minerales 685
Mr. Luis LOPEZ Guerra F.
- 14 Wed am Dir. Gen. Forestal (DGFF) and INIA
Ing. Luis CUETO Aragón, Director General
Ing. J. Ed. JENSSEN Salazar, Director of Logging
Ing. Raúl E. ROMERO Mejía, Director, INIA
- ITINTEC
Ing. Jorge VEGA, Director de Tecnología
Ing. Carlos VILLAGARCIA, Chief, Special Projects
Ing. Luis RIVERA, responsible for CTM Project
Ing. Juan ARTEAGA
- pm Universidad Nacional Agraria, La Molina
Departamento de Industrias Forestales
Ing. Jorge BUENO Zárate, Director
- 15 Thu am At INDUPERU Offices, La Molina
- pm Visit UNDP Office
Visit Junta del Acuerdo de Cartagena for technical
discussions.
- even Transfer to Iquitos by air
- 16 Fri am ORDELORETO, Iquitos
Ing. Carlos GARCIA, Director Adjunto a la
Dirección Técnica
Ing. Alfredo Rojón, Director (a.i.) Planificación
Ing. Henry Cárdenas, Director Industria y Turismo
- Industrial Loreto, S.A., Iquitos
Ing. Mauro SCAVINO, Chief of Production, Sawmill
Ing. Samuel REINA, Chief, Veneer and Plywood Plant
Ing. Carlos GAYOSO Velasquez, Chief, Maintenance

Nov

16 Fri pm Universidad Nacional de la Amazonia Peruana, Iquitos
(cont'd) Departamento de Ingenieria Forestal
Ing. Jorge DIAZ Reátegui, Director of Academic
Programme
Ing. David LLUNCOR Mendoza, Professor
Ing. José TORRES Vásquez, Assistant Professor
Experimental Station, Río Almendras
Visit of installations

17 Sat am Transfer Iquitos - Pucallpa by air
Visit Centro de Investigación Forestal y de Fauna
(CIFF)
to Ing. Mario QUEVEDO, Director
and Staff
pm (also brief meeting with the
Minister of Agriculture and Food
who was visiting CIFF at the same
time)

even. Transfer to Lima by air

FORMALLY END OF MISSION

Further Discussions

20 Tue even.) Ministerio de Industria and INDUPERU
and) Ing. Julio AZPILCUETA, Director de la Oficina
24 Sat pm) Sectorial de Planificac
Ing. Fernando GALVAN, Asesor externo, INDUPERU
Ing. Pedro PALOMINO, Profesional, INDUPERU
Ing. David LLORENA) see above, 12 Mon.
Ing. Oscar MORELLO)

21 Wed even) INDUPERU
26 Mon pm) Ing. Adrian FAJARDO Christen, General Manager

26 Mon am INIA
Ing. Federico ANAVITARTE Condemarín
President, INIA Administrative Council
Ing. Carlos VALVERDE Suarez
Asst. Executive Director, INIA
Ing. Raúl ROMERO,
Director, Forestry Research, INIA
Ing. Luis CUETO Aragón,
Dir.Gen., DGFF

In addition, ad hoc discussions were held with a number of Peruvian officials, scientists and industry officers interested in the objectives set out by INDUPERU for the CTM, and with officers of the French Embassy in Paru.

APPENDIX 2

FORESTRY DEVELOPMENT PROJECTS

UNDER THE AUSPICES

OF

ORDELORETO

As stated in the main text (pp. 11 and 12), the regional development authority "ORDELORETO" was set up under the Peruvian Government's decentralization scheme to assume responsibility for the development of the Department of Loreto.

In executing this function, ORDELORETO coordinates the action of the Ministries responsible for the different sectors of the economy. In addition, ORDELORETO has its own budget ("el pliego ORDELORETO") which may be used to reinforce actions considered to be of particular urgency, either by financing them in their entirety ("Proyectos ORDELORETO") or by granting special credits to projects carried out by various ministries.

Details of the planning and execution of these development projects may be found in the Regional Development Plan (ORDELORETO 1979).

For the purpose of the present report, it is of interest to summarize the projects related to forestry and forest products development. A summary is presented in Table 3.

The following additional remarks are of interest.

The slow progress of agricultural activities, including forestry, is attributed to "the absence of an aggressive policy and the lack of resources for its implementation" (ORDELORETO 1979, Vol. 1, p. 4). The first point among the criteria for a short term development policy is stated as "Greater investment and increase in production in agriculture and forestry" (loc. cit. p. 5).

The objectives of the projects summarized in Table 2 are given as)loc. cit. Vol. 2):

Seedbank

To establish a seedbank to provide forest seeds of optimum genetic quality and germinating and sanitary properties, in order to assist reafforestation being carried out in the country, by means of selection and plantation of trees, arboretums and seed orchards.

Technological Development of Tropical Forest Resources

To undertake studies of timbers of different species existing in the tropical forests, in order to determine their utilization and disseminate the technology of their conversion, orienting them towards constructional uses, especially for dwellings.

Development of the Alexander von Humboldt National Forest

Attain an adequate utilization of the forest resources in the area of influence of the National Alexander von Humboldt forest, promoting its development which will contribute to the country's economic development.

Wood Technology Centre (CIFI)

Establishment and implementation of a research centre that should bring about an integral and rational utilization of the tropical forest resources and in this manner create our own technology, furthermore, promote the techniques of production of seedlings and plantations and improve and orient the rational use of the forest soil resource.

National Forest Inventory

Evaluate qualitatively and quantitatively the forest resource of Perú, with the objective of providing for the relevant authorities a documented technical basis that may enable them to take decisions on the basis of real knowledge of what exists in their respective localities.

Forest Market Study

The project is oriented towards the identification of the basic structure of the market for forest products which are being studied and of the channels for their distribution; their relations with the production and consumption sectors, and (has the aim of) recommending an adequate policy regarding production, supply, marketing and import substitution in relation to these products.

Amazon Project

This project, managed by INDUPERU, has three sub-projects which have been given separately in Table 3.

Thermomechanical Pulp Mill, Pucallpa

The installation of a thermomechanical pulp mill which will produce 22,000 tonnes/annum during a first phase and 45,000 t/a in a second phase.

(INDUPERU was authorized in 1979 to enter into contractual agreements with consulting firms, and finance for a study of the project was approved through BID).

Industrial Complex, Iquitos

The installation of a Forest Industry Complex comprising a chemical pulp mill with 230,000 tonnes/annum capacity intended for export markets, and 160,000 m³ production of "finished products", presumably timber.

(An area of 322,214 ha in the Río Napo area was set aside in coordination with MinAgr and DGFF to supply raw material for this project. INDUPERU was authorized to underwrite contracts with the same consultants, and finance was approved in 1979 for a study of the project, through BID).

Humboldt Forest Project, San Alejandro (Pucallpa)

The establishment of a forest industry complex for the mechanical transformation of timber, with an estimated annual capacity of 115,000 m³ of converted products and 2000 t/a charcoal, using the resources of the Humboldt forest.

(A contract was signed with MinAgr for the exploration and evaluation of the forest resources of 129,600 ha of the Alexander von Humboldt national forest which have been set aside as a supply area of raw material for this complex. Marketing, engineering and organizational studies for the project were carried out, and the feasibility study was presented to "MICTI" for its evaluation.)

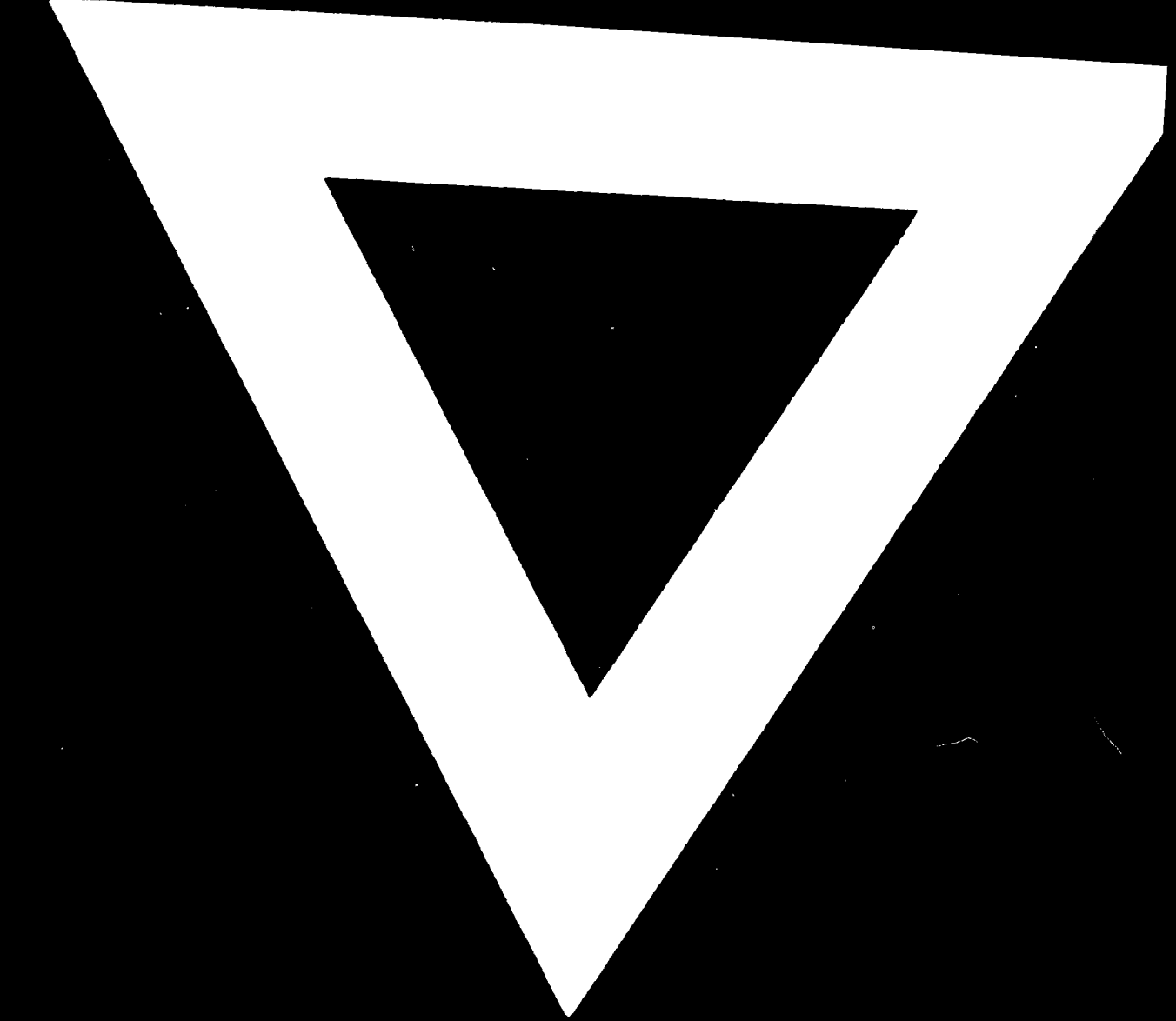
Table 3. ORDELORETO development projects
in the forestry area

Source: Plan Nacional de Desarrollo 1979 -1980
Programa de Desarrollo Regional LORETO

Title	Location	Auth- ority respon- sible	Investments (Million Soles Jan 79 Prices)					Evaluatio		
			Total Pro- ject	Until 1978	1979			Implement ation 2nd Sem. 1979		
					Financed by			Finan-	Phy-	
					Nat. Budg. +Debt	In- come	Total	cial %	sica %	
Seedbank	Crel. Portillo	DGFF	9.3	0.6	-	-	0.8	8.6	-	
Tech. Dev. Tropical For.Prod.	Callarí	DGFF	44.4	11.5	7.5	-	7.5	42.7	20.0	
Developmt. Humboldt Forest	Callarí Honoría	DGFF	176.7	104.5	13.0	1.0	14.0	27.5	-	
CIFF	Pucallpa	DGFF	253?	3.9	+12.7	20.0	+32.7	8.9	-	
National Forest Inventory	Dept. Loreto	DGFF	303.9	0.5	2.6	-	- 2.6	-	-	
For.Prod. Market Study	Iquitos Callarí	DGFF	0.9	-	0.9	-	0.9	-	-	
Thermo- mech. Pulp Mill	Pucallpa	INDU- PERU	5000.0	}	47.7	47.7	-	47.7	68.1	-
Chemical Pulp Mill and Timber Industry	Iquitos	INDU- PERU	52000.0							
Mechanical Timber Industry Complex	Pucallpa (San Alejandro)	INDU- PERU	3000.0							

+ includes 8 M. Soles provided from the ORDELORETO budget





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