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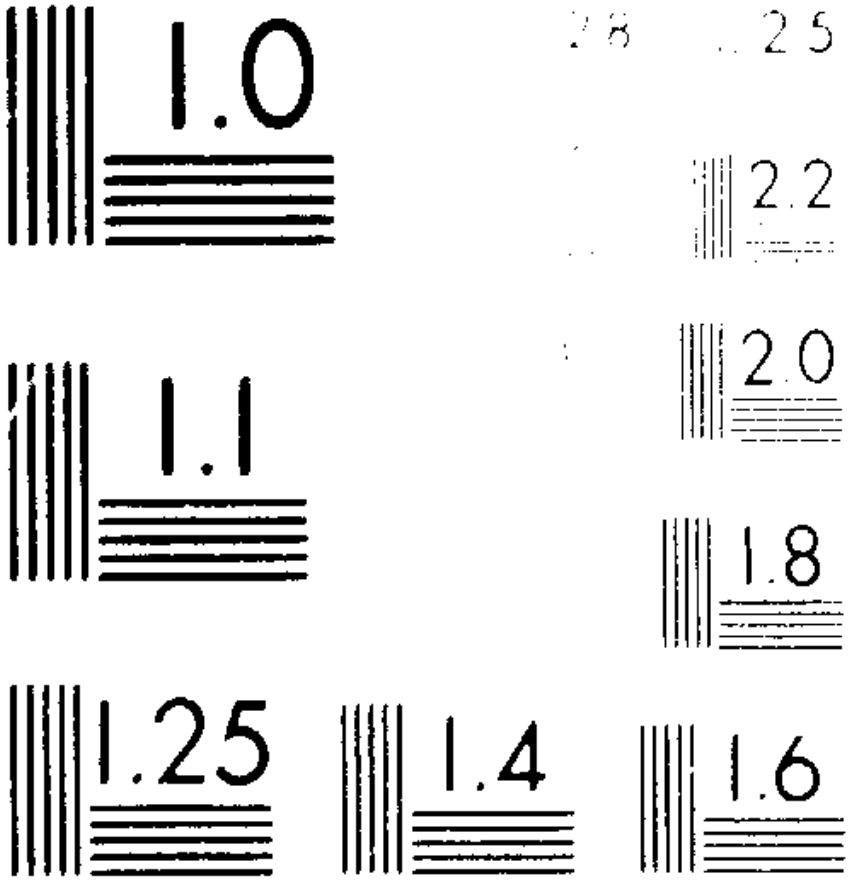
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PI/PT/CHR.A/305
27 July 1981
English

ASSISTANCE TO THE SECONDARY WOOD PROCESSING INDUSTRY

SI/PNG/79/808

PAPUA NEW GUINEA

Technical report: Draft project document furniture prototype/demonstration programme*

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

Based on the work of P. Borretti,
expert in the secondary wood processing industry

United Nations Industrial Development Organization
Vienna

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ABSTRACT - DRAFT PROJECT DOCUMENT

UNITED NATIONS DEVELOPMENT PROGRAMME

Project of the Government of Papua New Guinea

TITLE:	Furniture Prototype/Demonstration Programme
NUMBER:	
SECTOR:	(Government classification) (UNDP Classification and Code)
GOVERNMENT IMPLEMENTING AGENCY:	Works and Supply Department
EXECUTING AGENCY:	UNIDO
ESTIMATED STARTING DATE:	August 1981
GOVERNMENT INPUTS:	
UNDP INPUTS:	

1. A DEVELOPMENT OBJECTIVES:

1. To contribute towards a more efficient utilization of the forest resources in terms of finished wood products.

2. To contribute towards the improvement of living standards and a more efficient utilization of public funds by promoting the introduction of low-cost furniture of appropriate design and quality.

1. B IMMEDIATE OBJECTIVES:

The overall immediate objective of the project is to establish a furniture prototype/demonstration programme with the aim of providing the furniture industry - on a relatively short-time schedule - the necessary know-how for the efficient manufacture of low-cost furniture of appropriate performance.

The relevant transfer of technology will be accomplished by developing standard furniture modules, consisting of a complete know-how package for a selected range of standard designs.

The immediate objectives to be accomplished by the project may be more explicitly stated:

1. To introduce a standardized set of basic woodworking equipment suitable for the manufacture of low-cost furniture in small batches.

2. To design a range of school, office and residential low-cost wooden furniture in accordance with the requirements established by the Tender Board, and in addition to the furniture items already developed under project PNG/79/808.

3. To provide the following specifications and documentation of each item designed:
   a) Detailed working drawings;
   b) Detailed bill of materials;
   c) Flow of manufacturing operations;
   d) Sample of production jigs as required;
   e) Details of production methods;
   f) Estimation of operations time on the basis of minimum economic batch sizes (production volumes).

4. To produce prototypes and experimental batches of the main items designed.

5. To provide the industry with samples of each furniture item in an unassembled form.

6. To advise the industry in the selection of machinery, cutting tools and auxillary equipment required for the manufacture of the furniture developed under the programme.

7. To further enable the industry to produce efficiently the standardized furniture by conducting demonstration sessions and short-term in-service training, especially for factory personnel of those furniture factories awarded contracts by the Tender Board.

1.C SPECIAL CONSIDERATIONS:

Related activities:

A UNIDO project (PNG/79/808) was carried out in 1980 by a consultant to identify the needs of the secondary woodworking industry. An assessment of the situation and recommendations with respect to the development of low-cost furniture were presented in the interim report of the project in May 1980. The report proposed the establishment of a furniture prototype/demonstration unit which is the subject of this project.

Twelve individual items of furniture, a "hang-on" modular furniture system and a related prefabricated wall panel system were designed under the project. Working drawings and sketches were prepared in this connection. A prototype exercise was also carried out under the project consisting in the production of eight individual items of furniture and a prefabricated wall panel equipped with four items of "hang-on" furniture.

1.D BACKGROUND AND JUSTIFICATION:

1. It is estimated that 8.5 million hectares of Papua New Guinea's total land area consists of commercially exploitable forests, of which a high proportion is lowland rain forest containing a mix of some 200 timber species.

2. A total of approximately 1.2 million cubic metres of logs is extracted annually of which about 0.5 million cubic metres is exported as logs,

250,000 cubic metres is processed at the Jant chipmill, 100,000 m^3 are utilized by the plymill at Bulolo. The annual production of sawn timber has been estimated at 110,000 m^3 by the TIC. The export of sawn timber in 1977 was recorded at 58,000 m^3.

3. Although most of the available timber species are hardwoods unfamiliar to world markets, many of them are considered having properites equivalent to those of commercial species traditionally marketed by south east Asian countries. 1/

4. There are several species suitable for furniture making but there is no single predominent species available from the major logging operations, with the exception of Taun (Pometia spp.) which is processed by 11 of the 13 major sawmills operating in the country. Among the deluxe furniture timber species suitable for export rosewood (Pterocarpus indicus) has possibly the best marketing potential - its equivalent being Pterocarpus pedatus, a species widely utilized for furniture making in Japan and other overseas markets.

5. The utilization of lower timber species, as a raw material in the widespread use of timber frame buildings, is facilitated in Papua New Guinea by the fact that the majority of sawmills treat sawn timber by the dip-diffusion process. In fact, today Papua New Guinea is reputed as having the most highly developed wood preservation industry in the tropics.

6. The sawmill industry includes several export-oriented large scale units 2/ operated with the participation of expatriate groups. Sawn timber is supplied in standard sizes. From the wide mix of species converted, the Papua New Guinea mills produce a full range of sawn products, including construction timber, scantlings, dressed boards, and stock for moulding, joinery and furniture.

1/ See Annex II.

2/ Sawmills with largest annual output: 3 plants with an output of 50,000 m^3; two with 40,000 m^3; one with 30,000 m^3. (See map in Annex V showing major existing timber industry operations).

7. The Government has assigned high priority to the promotion of large scale export-oriented timber industry projects (initially to include primary woodworking activities only) by focussing on the development of selected forest areas. Foreign participation is very actively sought in this respect.

8. The major sector of the secondary wood processing industry in Papua New Guinea concerns joinery production related to building activities. Timber frame buildings of the pre-cut type and of simple, excellent structural design were first introduced in the post war period by the Australians. Today this building technique remains the main mode of construction throughout the country. It is being further refined and developed in an effort to substitute imported panel boards, i.e. asbestos sheets, with locally produced materials such as exterior-type plywood.

9. In addition to the prevalent use of the pre-cut building system an average of 450 housing units [1/] are produced annually in a full pre-fabricated form with a total turnover of about 900,000 units.

10. There are some fifty joinery workshops in the country many of which are part of building contractors facilities. The manpower of the joinery sector is estimated at 900 or 4.7 per cent of the total industrial manpower. The value of output is about 9 million kina at 2 per cent of the total industrial output.

11. The small size of population in Papua New Guinea - 2.9 million of which 90 per cent live in rural areas - accounts for the limited demand for furniture and, consequently, the small scale of the furniture industry sector. The main woodworking plants exclusively engaged in furniture making are concentrated in the capital itself, except for a plant established in 1978 in Lae.

Elsewhere furniture is mostly produced by joinery workshops - especially those operated by large building construction companies.

12. The total annual value of the furniture business is estimated at about 3 million Kina (US$ 4.2 million). [2/] The manpower of plants exclusively engaged in the manufacture of furniture is estimated at 200, and their

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1/ Manufactured by Timber Sales, Rabaul and Wewak Timber, Madang.

2/ Of which an estimated Kina 0.9 million is imported.

combined annual turnover at about Kina 1.2 million. An additional Kina 0.2 to 0.3 million worth of furniture is estimated to be produced by joinery workshops.

13. Only three of the furniture plants in operation in Papua New Guinea are geared - in terms of management, technical know-how and machinery - to produce quality furniture. Moreover, of the three only one plant (Poetzcher's) is engaged in manufacturing, on a line production basis, quality standard furniture which is comparable in quality, design and price with imported furniture.

14. Characteristically, all three leading furniture manufacturers are foreign-owned and managed and there seem to be no organized effort to develop the necessary woodworking managerial skills among national entrepreneurs.

15. However, even the only plant producing on an industrial scale is unable to utilize in full its capacity and compete effectively with imported products because of the inability to renew on a periodical basis the design of its products. As a result, about fifty per cent of quality furniture absorbed annually by the market is imported.

16. Market and distribution of furniture are complicated, as with all other consumer goods, by the extreme fragmentation of market outlets, lack of inland routes and high transportation costs. These infrastructure constraints combined to the high labour cost tend to inflate substantially furniture retailing prices. Consumers of low-cost furniture are the most affected in this respect. In fact, most manufacturers being unable to produce efficiently low-cost furniture end up in offering to the market unserviceable merchandise.

17. This occurs in a situation where the need for low-cost furniture is rapidly expanding to cater for the needs of two new particular consumer groups which are moving away from the traditional type of dwelling environment:

- Emerging small holder communities in rural areas who are gaining increasing purchasing power;
- Workers engaged in large scale projects such as Mosa Oil Plantation in West New Britain who are provided by the employers with unfurnished accomodation.

18. The furniture market is characterized by the fact that the National and Provincial Governments are the largest single buyers. A total of 1.3 million Kina - some 40 per cent of the whole furniture business - was budgeted by the Tender Board for the purchase of furniture in 1980.

19. Most of the furniture supplied on tender contracts by the manufacturers to the Board is of inappropriate construction and design and, as a result, fails to fulfill basic functional and durability requirements, that is:

- Dimensions and other practical characteristics of furniture are not properly chosen to fit the function;
- Framework, seats and other structural elements are such as not to stand normal usage strain;
- Constructional details are unnecessarily complicated, thus adding to the cost of the products.

20. The situation is so serious that as much as 10 per cent of some particular items are in fact unserviceable even before they reach the end users in the provinces. This is also reflected in the fact that some Kina 320,000 is spent annually on furniture replacement.

Furthermore, the inability of the manufacturers to offer proper products at the right price has resulted in some 130,000 Kina worth of metal beds imported each year by the Tender Board.

21. The Board finds itself helpless in correcting the situation because there seems to be no capability on the part of furniture manufacturers to develop soundly engineered products. In the meantime, over Kina 1 million of public money is recurrently spent each year in unsatisfactory merchandise.

22. The lack of appropriately designed and manufactured low-cost furniture on the market is not only a matter of wasted public money and of lost business opportunities for the furniture industry, it has deep social implications in that the great majority of civil servants, while working in furnished environments, live in houses designed according to a contemporary living concept but devoid of any furnishing facility.

1.E OUTPUTS: [1]

1. Three modules [2] of chairs whose designs are to be developed under the project, by June 1982.

2. Four modules of chairs whose designs were developed under project PNG/79/808, by June 1982.

3. Two modules of tables whose designs are to be developed under the project, by June 1982.

4. Two modules of tables whose designs were developed under project PNG/79/808, by June 1982.

5. Five modules of desks whose designs are to be developed under the project, by June 1982.

6. One module of office storage system of design to be developed under the project, by June 1982.

7. One module of chest of drawers of design to be developed under the project, by June 1982.

8. One module of dressing table of design to be developed under the project by June 1982.

9. One module of free-standing wardrobe of design to be developed under the project, by June 1982.

10. One module of sideboard, of design to be developed under the project, by June 1982.

11. Production of prototypes of newly designed items, by August 1983.

12. Revised and finalized specifications and documentation, by January 1984.

13. Experimental batch production, by August 1983.

1/ Detailed listings of furniture items is given in Annex I.

2/ Know-how packages to include specifications and documentation as outlined in 1.F.1

14. Production of 200 samples of each main design in unassembled form for distribution to the industry, by January 1984.

15. In-service training at the Programme's Workshop of 24 technicians from the industry on the production of the furniture developed, by July 1984.

16. Training at the Programme's Workshop of 3 processing supervisers (to start as soon as the project's equipment is installed), by June 1984.

17. One overseas training fellowship of an international architect to be undertaken in the form of attachment to the consultant who will develop the furniture modules, by June 1982.

1. F ACTIVITIES:

1.F.1 Development of Standard Furniture Modules

Sub-Contract 20-01 (7 months)

The activity is aimed at providing Papua New Guinea with a body of designs and related technology which will fulfill the needs for low-cost standard furniture of institutional and residential type.

The contractor will provide a complete know-how package (standard furniture modules) of each of the 15 furniture items listed in Annex I. In addition to it he will provide the required manufacturers specifications for 6 designs also listed in Annex I, which were developed up to the prototype stage under the project PNG/79/808. 1/

The modules content will involve the carrying out of the following tasks:

a) To develop the conceptual design input;
b) To prepare detailed working drawings to include: full scale drawings (where chairs are concerned), exploded view of components and individual drawings of critical components as required; 2/
c) To prepare bill of materials;

1/ All the work necessary in addition to the existing working drawings and prototypes (i.e. lists of materials, designs of jigs, production flow, estimation of operation time, etc.).

2/ Working drawings were prepared in the initial stage (and attached to the interim report) and were subsequently revised after the completion of the prototypes. The originals of the revised working drawings were left with the Labour and Industry Department.

d) To prepare overall flow chart of processing steps indicating sequence of operations for each component (based on the equipment marked with an asterisk on pages 16 to 19).

e) To estimate standard production time (based on production batches of 50 units) for each operation including: 1) net production time taking into account productivity in the industry in Papua New Guinea; 2) additional time for unavoidable delays and 3) set up time.

Design and construction [1/] shall be such as to minimize the complexity and number of processing operations. For example, joints shall be set at a 90° angle; while time-consuming shaping and moulding operations shall be avoided.

The aim of this approach is to allow a profitable production, by small-scale plants, of standard low-cost furniture in limited batches, with the minimim of capital outlay and operating cost, as it will be the case in far away provinces with limited market demand. In this connexion the contractor shall also ensure that constructional details of furniture be such as to allow manufacture on a limited range of basic woodworking equipment. [2/]

To allow for maximum processing simplicity joints shall preferably be limited to the dowel type (dowels available locally).

The contractor shall delegate a representative to visit Papua New Guinea for a period of three weeks to study in detail with the Tender Board the requirements of the furniture to be developed in terms of design, function and performance.

The actual development work shall be carried out at the contractor's own research facilities. The elaboration of the furniture modules shall be completed within seven months from the date the contract is awarded.

Invitation to bid shall be limited to woodworking development establishments which are currently and directly involved in design development work for the furniture industry such as the Danish Teknologisk Institute at Taastrup.

1/ Construction to be of knock-down type as far as possible.

2/ Such basic equipment is identified by an asterisk in the list of non-expendable equipment (see 1.G.2 UNDP Inputs).

1.F.2 Furniture Production

- Woodworking expert - Post 11-01 (24 m/m);
- Associate expert, Woodworking specialist (24 m/m).

The furniture production activity concerns the establishment and the actual operation - for the duration of the project - of the woodworking workshop of the Furniture Prototype/Demonstration Programme.

The activity will cover the performance of the following tasks:

1. To prepare the plant layout of the production equipment to be provided as are external input to the project.

2. To assist in the installation of the production equipment in the existing woodworking facilities of the Works and Supply Department at Port Moresby; or, alternatively, within the existing warehouse facilities of the Tender Board itself.

3. To produce prototypes of all furniture items developed under subcontract to the project.

4. Based on the experience of the prototypes, revise if necessary the original furniture specifications.

5. To undertake experimental batch production as well as production of samples of furniture in unassembled form for the industry.

6. To conduct counterpart training and in-service training (see output 15) to include, in addition to production methods, tool and equipment maintenance and industrial safety.

1.F.3 Wood Finishing Activity

- Consultant in Surface Finishing - Post 11-02 (1 m/m);
- Expert in Surface Finishing - Post 11-03 (3 m/m).

The wood finishing activity aims at enabling the furniture programme to determine the alternative wood finishing methods and materials most suitable for the local timber species expected to be utilized in the course of the project.

The implementation steps concerning this particular activity include:

1. Samples of the furniture species to be sent by the Tender Board to the **consultant.**

2. On the basis of the species characteristics, the **consultant will** recommend a selection of materials as well as appropriate finishing equipment (spray gun, spraying booth, etc.) to be provided as an external input to the project.

3. Once the material is delivered to the project **an expert will be** delegated by the **contracted** to undertake a three-month mission to Papua New Guinea to carry out the experimental work itself in the field.

In selecting finishing materials due consideration should be given to the fact that no furniture plant is equipped with dust-free rooms - a facility indespensable when using slow-drying lacquers.

In view of the low-cost aspect of the furniture to be developed under the project, the possibility should also be investigated of using easy-to-apply and inexpensive oil finishes.

The finishing material to be supplied as an external input will be in a quantity sufficient to conduct experimental work only; while finishing material needed in the actual production of furniture by the project shall be provided by the Tender Board.

I.G INPUTS

I.G.1 Description of Government Inputs

		Period	Kina
10.	National Staff		
11.	Counterpart Staff		
	-3 trainers counterparts [1/] (full-time)	July 1982 January 1984	
	-3 machine operators (full-time)	November 1982 January 1984	
13.	Support Personnel [2/]		
	- driver/mechanic	August 1982 January 1984	
19.	Total cost of Personnel Component		
30.	Training		
	- Salary of national architect on project's fellowship overseas	January 1982 June 1982	
39.	Total cost of training component		

1/ Preferably graduates from the Timber Industry Training Centre, Lae.

2/ The project is expected to make use of the existing typing and draughting facilities of the Works and Supply Department.

I.G.1 Description of Government Inputs (Cont.)

40. Government-Provided Building and Equipment

41. Production/maintenance materials and general supplies

- timber, plywood hardboard, etc.
- glue 1/
- upholstery material
- hardware 1/ (knock-down fittings, hinges, etc.)
- finishing materials 1/ (lacquers, varnishes, thinners, etc.)
- sanding paper for hand sanding and sanding belts 2/
- standard hand tools 3/
- spares for equipment not supplied by the UNDP project
- general operating supplies

42. Non -expendable equipment 4/

- 6 working benches
- 6 tool cabinets
- 6 lockers
- 3 factory trolleys
- complete office for secretary, accountant and two experts (desks, filing cabinets, calculator, chairs, etc.)

43. Buildings

The government will provide workshop and of premises required for the proper implementation of the project, and will be responsible for any necessary addition to and/or modification of the existing facilities of the Works and Supply Department, as required. The workshop area will be of at least 360 m^2.

49. Total cost of materials and building component

1/ Except for glue, hardware and finishing materials which will initially be needed for testing and prototype purpose. Provision will be made for them under the UNDP budget.

2/ Except for twelve pieces each of sanding belts of grit 60,80 and 120 to be supplied with the sanding machine as above.

3/ Except for four complete sets of cabinet-making carpenters tools to be supplied as above.

4/ Fitting to be supplied by the project.

I.G.1 Description of Government Inputs (Cont.)

50. Miscellaneous

51. Operation and maintenance of equipment

The cost of operation and maintenance of the UNDP-supplied machinery and vehicle will be borne by the Government for the duration of the project, as well as labour costs.

The cost of utilities related to the use of project premises (workshop and office) and the operation of the UNDP-supplied equipment will be borne by the Government.

53. Sundry

Sundry expenses related to the operation of the workshop will be borne by the Government with the exception of those expenditures which would normally be borne under the UNDP contribution.

59. Total cost of miscellaneous component

99. Government Contribution

I.G.2 Description of UNDP Inputs

10. Personnel		Starting Date	Duration m/m	US$
(Duty Station: Port Moresby)				
Post No.				
11-01	Woodworking Expert/ Team Leader	August 1982	24	151,200

Job Requirements:
All-round experience in the operation and management of furniture plants; will carry out substantive work related to production and training activities, and will also be responsible for supervising the work of the other international personnel in the project.

I.G.2 Description of UNDP Inputs (Cont.)

		Starting Date	Duration m/m	US$
10.	Personnel			
	(Duty Station: Port Moresby)			
	Post No.			
	11-02 Consultant in Surface Finishes	September 1982	1	6,300
	Job Requirements: All-round experience in a wide range of surface finishing products and methods used in furniture and joinery. He will be expected to advise on the systems best suited to local conditions taking into account skills, availability of materials, properties of species, size of series, investments, etc.			
	11-03 Expert in Surface Finishing	June 1983	3	18,900
	Job Requirements: Industrial experience in finishing furniture and joinery. He will introduce the system proposed by the consultant.			
	11-04 Associate Expert	August 1982	24	p.m.
	Job Requirements: Experience in the operation and maintenance of basic woodworking machines; will be responsible for actual operation of production equipment and maintenance of cutting tools, and will assist the Team Leader in related training.			
15.	Expert Travel			7,800
16.	Mission Costs - Tripartite Review			7,000
19.	Total Cost of Personnel Component			191,200
20.	Subcontract			
	20-01 Development of Furniture Modules	December 1981	7	
	Contract Requirements: The Contractor shall be a wood working research body with specific experience in carrying out design development work for the furniture industry			30,000

I.G.2 Description of UNDP Inputs (Cont.)	Starting Date	Duration m/m	US$
29. Total cost of subcontract component			30,000
30. Training			
31. Fellowship in Design Development 1/	January 1982	6	8,400
39. Total cost of training component			8,400
40. Equipment			
41. Expendable equipment			
- workshop supplies 2/			
- office supplies			2,000
Subtotal expendable equipment			2 000
42. Non-expendable equipment 3/			
42-01 Surface planer 4/			
- capacity: 500 to 600 mm			5,500
- recommended model and supplier: BAUERLE (Federal Republic of Germany)			
42-02 Thicknesser planer *			
- capacity 500 to 600 mm			
- with table rollers			
- recommended model and supplier: Mod. BT-630 WADKIN-BURSGREEN (United Kingdom)			6,000
42-03 Stroke belt sander *			
- with disk and bobbin sanding attachment			
- sanding width: 15 cm			
- recommended model and supplier: Mod. BGAO WADKIN-BURSGREEN (United Kingdom)			6,000

1/ In conjunction with the sub-contract.

2/ See notes to item 41 of Government contributions

3/ No equipment supplied by UNDP except spray and stapling equipment shall include pneumatic operation. Asteriks indicate the minimum range of production machinery the Consultant should bear in mind when developing furniture structural details.

4/ With slot-mortising/boring attachment.

I.G.2 Description of UNDP Inputs (Cont.)	Starting Date	Duration m/m	US$
42-04 Multi-purpose m/c circular saw/ spindle moulder/tenoner *			
- with sliding table to be provided with 'bridge' type			
double-clamping device as per recommended model			
- recommended model and supplier: Mod. CT 1300 WADKIN-BURSGREEN (United Kingdom)			9,000
(Only models with double clamping devices can be acceptable because of the particular requirements of the project).			
42-05 Radial saw			
- with expanding grooving head for grooves 17.5 mm to 32 mm			
- with router cutters attachment			
- recommended model and supplier: Mod. BRA - 14 WADKIN-BURSGREEN (United Kingdom)			4,000
42-06 Automatic feed roller attachment			
- for planers and multi-purpose machine			
- recommended model and supplier: Mod. 904 V PERTICI (Italy)			600
42-07 Automatic knife grinder			
- grinding length: 600 mm			
- for simultaneous sharpening of up to 4 knives at a time			
- recommended model and supplier: Mod. V6C LOROCH (FRG)			3,500
42-08 Universal grinding machine			
- for sharpening of circular saws, cutters, boring bits			
- recommended Mod. and supplier: Mod. MFSZ /WIDMA (FRG)			6,000
42-09 Boring machine			
- for horizontal and vertical boring			
- with multiple-centres boring head			
- recommended model and supplier: Mod. DBSH / EUGEN MAYER (FRG)			6,000

* Refers to the minimum range of production machinery the Consultant should bear in mind when developing furniture structural details.

I.G.2	Description of UNDP Inputs (Cont.)	Starting Date	Duration m/m	US$
42-10	Stapling equipment *			
	- for cabinet work:			
	one light-duty stapler			
	one medium-duty stapler			
	one heavy-duty stapler			
	one air compressor			
	air line with filters and regulator			
	- recommended model and supplier: Mod. BOSTICH (Papua New Guinea)			3,000
42-11	Two Dowelling jigs * 1/			
	- for large boards up to 460 mm wide			
	- with sliding rods of 30 amd 460 mm			
	- six drill bushings each size			
	- eight bushing carriers			
	- recommended model and supplier: Mod. 01D40-R			
	WOODCRAFT SUPPLY CORPORATION (313 Montvele Avenue, Woburn, Massachusetts, United States of America, 01888)			450
42-12	Two Dozen Brad point drills *			
	- to be supplied with dowelling jigs			
	- recommended model and supplier: Mod. 07 H32-W (supplier as above)			165
42-13	Dowelling jigs * 1/			
	- for stock up to 50 mm thick			
	- six additional bushing sets			
	- recommended model and supplier: Mod. 09Q51-EA (supplier as above)			175
42-14	One Drill press *			
	- adjustable speed (from 800 to 2500 RPM)			1,500

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* Refers to the minimum range of production machinery the Consultant should bear in mind when developing furniture structural details.

1/ These inexpensive dowelling jigs (see Annex II) will be provided to the project to demonstrate the possibility of producing good quality dowel joints by using simple equipment (dowelling jig and standard boring machines, standard power, etc.) whenever conditions do not justify the purchase.

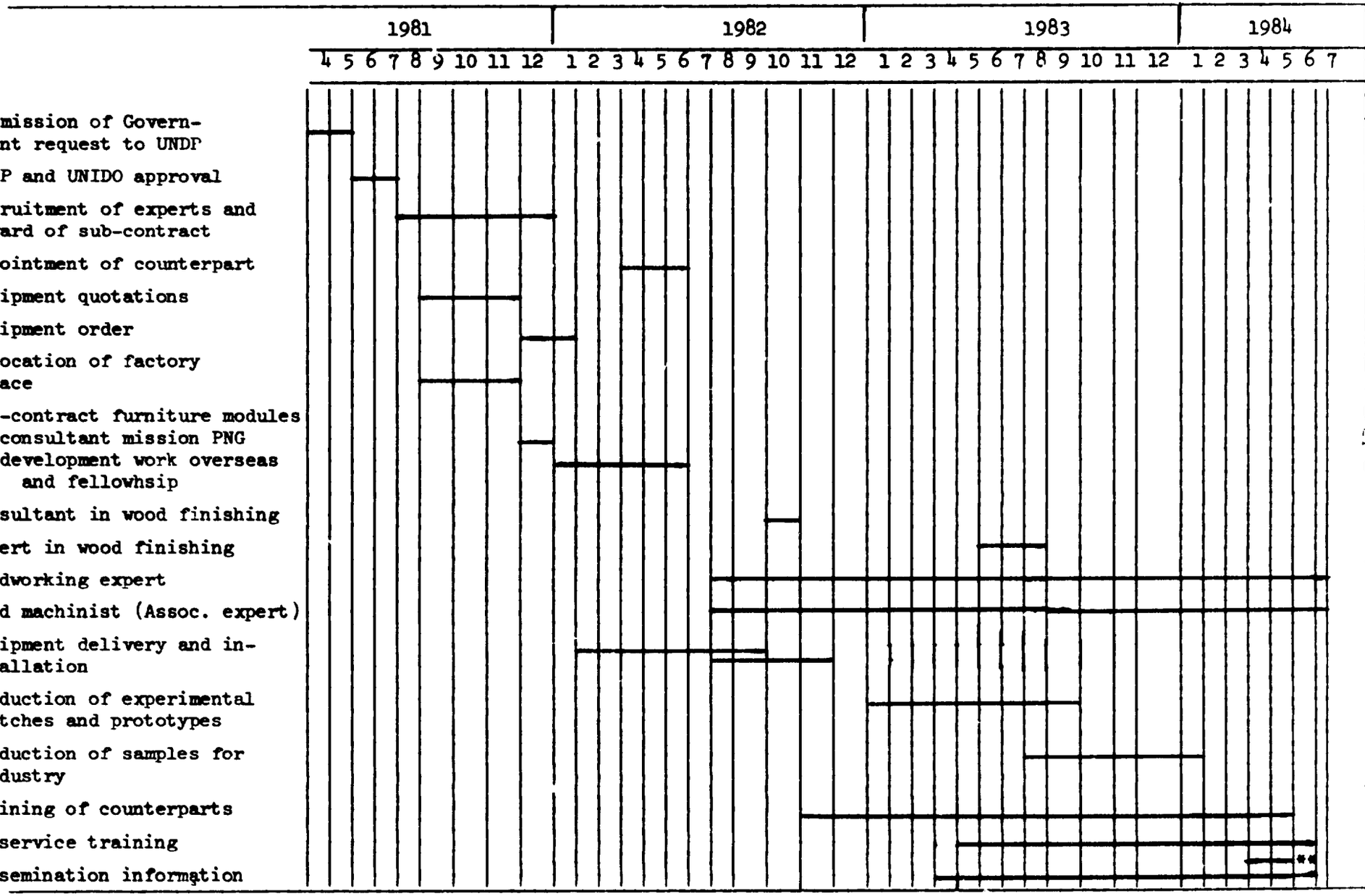
I.G.2	Description of UNDP Inputs (Cont.)	Starting Date	Duration m/m	US$
42-15	One Set Spray room equipment			
	- spray gun, compressor			
	- spraying room equipment with exhaust fan and locally-made water curtain			6,000
42-16	Ancillary workshop equipment *			
	- 12 extra length cramps			
	- 12 medium-size cramps			
	- 12 light-duty cramps			
	- 6 sets, fittins for working benches			
	- 4 sets, cabinet-making hand tools			
	- 2 heavy-duty power hand routers			
	- 2 light-duty power drills			
	- miscellaneous equipment			5,000
42-17	One Pick-up van			13,000
42-18	Equipment supplies and spares for two-year operation (15 per cent of US$ 75,890 - cost of equipment)			11,383
	Sub-total Non-expendable equipment			87,273
43	Building			
	- Electrical supplies for the installation of workshop equipment (10 per cent of US$ 63,000 - cost of workshop equipment)			6,300
	Sub-total Building component			6,300
	Transport and insurance of the above			8,506
49	Total cost of equipment component			102,079
50	Miscellaneous			
51.	Operation and maintenance of UNDP-supplied equipment			1,500
52.	Reporting costs 1/			2,500

* Refers to the minimum range of production machinery the Contractor should bear in mind when developing furniture structural details.

1/ Including reproduction of information material.

I.G.1	Description of UNDP Inputs (Cont.)	Starting Date	Duration m/m	US$
53.	Sundry			2,000
59.	Total cost of miscellaneous component			6,000
99.	TOTAL UNDP CONTRIBUTION			337,679

PART 1.H WORK PLAN



** Final report

I.I. INSTITUTIONAL FRAMEWORK:

The project will be organized and executed by the Tender Board of the Works and Supply Department with the participation in an advisory role of the Forestry Industry Council.

The choice of the Tender Board as the executing Government agency is based on the following considerations.

1. The Tender Board have a most direct interest in the development of low-cost furniture being the largest buyers of furniture in the country with annual purchases amounting to about US$ 1.9 million.

2. The Works and Supply are involved in desigining and executing a major share of housing projects throughout Papua New Guinea, and are therefore closely familiar with the requirements of the market in terms of furniture.

3. The project would share the Works and Supply's existing woodworking premises at Port Moresby thus minimizing the capital investment in the project on the part of the Government.

The participation of the Timber Industry Council in the project will ensure a close relationship of its activities with the requirements of the industry.

I.J. PRIOR OBLIGATIONS AND PREREQUISITES:

The Government in consultation with the Forest Industry Council will take the following preparatory steps in advance of the implementation of the project, and in particular prior to the reporting to the duty station of the woodworking expert/team leader.

1. Allocate the necessary funds for the establishment and the operation of the project.

2. Define the adivsory role of the FIC in the implementation of the project.

3. Ensure that the required workshop and office space is made available

to the project within the existing woodworking unit of the Works and Supply at Port Moresby.

4. Appoint the required three full-time counterparts with technical school background - possibly graduates from TITC, Lae.

5. Engage three full-time semi-skilled workers for the operation of the project facilities.

I.K. FUTURE UNDP ASSISTANCE:

Depending on the results of the project in terms of the practical impact, consideration may be given by UNDP to extending the project duration to provide systematic extension services 1/ to the small scale furniture industry engaged in the manufacture of low-cost furniture - especially to workshops located in the provinces.

II. SCHEDULES OF MONITORING, EVALUATIONS AND REPORTS:

Tripartite monitoring reviews by UNDP, the Papua New Guinea Government and UNIDO will be undertaken at the completion of the first year of operation of the project.

A complete tripartite technical evaluation of the project will be undertaken six months prior to the completion of the project.

Semi-annual progress reports will be issued by the UNIDO team leader to provide a periodical overall review of project activities.

A terminal report will be prepared at the end of the project to provide a comprehensive review of project activities, and a detailed assessment of its result combined with long-term recommendations.

1/ In addition, sawdoctoring servicing units could be set up in this respect within the existing Works and Supply workshops in the provinces for the benefit of the industry.

ANNEX I.

ITEMS OF FURNITURE MODULES TO BE DEVELOPED UNDER THE PROJECT

01. Chairs

- 01.1 General purpose chair [1/] (for dining junior officer desk, etc.)
- 01.2 General purpose folding chair
- 01.3 General purpose armchair (for dining, senior officer desk, etc.)
- 01.4 General purpose stool (mainly for dressing table)
- 01.5 Folding lounge chair [2/]
- 01.6 Lounge chair [3/]
- 01.7 Three-seater settee [4/]

02. Tables

- 02.1 General purpose table [5/] (for dining, office use, etc.)
- 02.2 Coffee table [6/]
- 02.3 Side table [7/]
- 02.4 Folding table (patrol type)

03. Desks [8/] and Office Storage

- 03.1 Folding desk [9/]
- 03.2 Typing desk
- 03.3 Secretarial desk
- 03.4 Junior officer desk
- 03.5 Senior officer desk
- 03.6 Office storage system for standard files, hanging files, documentation and books

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1/ Item designed under project PNG/79/808 - Reference drawing UNIDO 02

2/ " " " " - " UNIDO 09

3/ " " " " - " UNIDO 04

4/ To be based on lounge chair design UNIDO 04

5/ " " " UNIDO 08

6/ Item designed under project PNG/79/808 - Reference drawing UNIDO 06

7/ Design to match item 02.2

8/ Items 03.3, 03.4 and 03.5 to be designed as components of a desk system

9/ Item designed under PNG/79/808 - Reference drawing UNIDO 013

04. Bedroom Furniture

04.1 Chest of drawers

04.2 Dressing table

04.3 Free-standing wardrobe

05. General Purpose Cabinets

05.1 Sideboard (to match chest of drawers item 04.1)

ANNEX II - FURNITURE PURCHASED

WOODEN DOMESTIC FURNITURE		PRICE (K)	ANNUAL - USAGE					TOTAL QTY	TOTAL PRICE
[illegible]	Item		Badili	Lae	Mandang	Wewak	Rabaul		
[illegible]179	Bench, complete	19.37	156	228	48	48	168	648	12,551.76
701378	Bench seat *	4.16							
[illegible]1252	Bench legs *	8.33							99.96
[illegible]1[illegible]6	Chairs, dining	18.65	3540	1908	240	180	1212	7080	132,042.00
[illegible]1219	Chair, lounge, wooden w/cushions	31.44	1512	552	108	72	240	7453	234,332.32
[illegible]1237	Chair, lounge, wooden	27.91	240	12	24	168	12	456	12,726.96
[illegible]121	Chest of drawers	98.17	204	36	24	24	72	360	35,341.20
[illegible]140	Cupboard, clothing - low cost	51.14	300	264	60	84	180	888	45,412.32
[illegible]155	Dressing table	133.02	72		12			84	11,173.68
[illegible]250	Sideboards	105.11	168	24	12	12	48	264	27,749.04
[illegible]1	Safe, kitchen	55.18	168	528	60	72	144	972	53,634.96
[illegible]2	Stool, dressing table	8.67					300	300	2,601.00
701[illegible]4	Table, general purpose	38.12	156	132		12	48	348	13,265.76
[illegible]1	Table, legs - set *	12.71	84		24	12		120	1,525.20
[illegible]3	Table, top *	28.73	12		24	12		48	1,379.04
[illegible]	Wardrobe	105.71		12				12	1,268.52
	TURNOVER SUB-TOTAL (Domestic Furniture)								586,093.72

* Metal Furniture

ANNEX II - FURNITURE PURCHASED

WOODEN DOMESTIC FURNITURE		PRICE (K)	ANNUAL - USAGE					TOTAL QTY	TOTAL PRICE
			Badili	Lae	Mandang	Wewak	Rabaul		
711117	Chair, folding, camp	9.86	348	336	120	120	324	1248	12,305.28
711124	Chair, folding, desk type	11.85	72	144	12		48	276	3,270.60
711382	Stretcher, folding, camp	19.34	144	300	96	180	492	1140	22,047.60
711399	Table, folding, patrol	42.74	72	120	24	36	60	312	13,334.88
711090	Chair, Clerical*	37.54	1067	384	132	276	84	1943	72,940.22
711131	Chair, general purpose*	19.91	1644	768	264	612	648	3936	78,365.76
711454	Chair, Sub-executive*	63.53	216	168	36	120	36	576	36,593.28
711148	Chair, typist	28.88	288	48	36	120	36	528	15,248.64
711234	Desk, office	158.85	732	264	60	120	60	1236	196,338.60
711241	Desk, typist	166.86	156	48	36	144	60	444	74,085.84
711409	Tables, office, general	31.90	480	24	12	120	12	648	20,671.20
711416	Table, office, side	51.90	252	72	12	36	36	408	21,175.20
	TURNOVER SUB-TOTAL (Domestic and Office Furniture)								566,377.10
		Total Local - Purchased Furniture K 1,151,470.00							
		Imported Metal Beds 138,348.00							
		GRAND TOTAL FURNITURE PURCHASED 1,289,818.00							

* Metal Furniture

ANNEX III

TABLE OF TIMBER SPECIES SUBSTITUTES [1/]

TIMBER	SPECIES	P.N.G. SUBSTITUTE
afara, limba	Terminalia superba	yellow terminalia
bintangor	Calophyllum spp.	calophyllum
bubinga	Guibourtia ivorensis	PNG walnut
idigbo, framire	Terminalia ivorensis	yellow terminalia
jelutong	Dyera costulata	labula
kapur	Dryobalanops spp.	malas, water gum, hopea PNG beech, kamerere, kwila
keruing	Dipterocarpus spp.	malas, water gum, hopea PNG beech, kamerere, kwila
iroko	Chlorophora excelsa	kwila, kamarere
meranti	Shorea spp.	calophyllum, kamarere, taun red planchonella, red-brown terminalia
merbau	Intsia spp.	kwila
mersawa	Anisoptera spp.	mersawa
mutenye	Guibourtia arnoldiana	PNG walnut
nyatoh	Sapotaceae	red planchonella, pencil cedar
obeche	Triplochiton scleroxylon	amberoi, labula, yellow terminalia
okoume	Aucoumea klaineana	erima
ramin	Gonystylus spp.	labula, yellow terminalia
sapele	Entandrophragma cylindricum	kamarere
taluto	Pterocymbium tinctorium	amberoi, labula
teak	Tectona grandis	kwila
walnut (dao)	Dracontomelon dao	PNG walnut

INFORMATION: There are a number of publications on PNG timbers, much research has been carried out by the Forest Products Research Centre, Port Moresby as well as by the CSIRO, Melbourne, Australia. All information and a list of Major Forest Products/producers can be obtinaed from the following addresses:

(a) The Executive Officer, Forest Industries Council, P.O. Box 3498, Port Moresby.

(b) The Director of Forests, Office of Forests P.O. Box 5055, Boroko.

(c) The Forest Products Research Centre, P.O. Box 1358, Boroko.

(d) The National Investment and Development Authority, P.O. Box 5053, Boroko.

1/ Source: Timber Industry Council

ANNEX IV

NOTES ON PAPUA NEW GUINEA TIMBERS

The following notes describe some of the more common species which are currently available for export and which will become available in greater quantities as new forests are developed.

Taun (Pometia pinnata, P. tomentosa, P. coriacea) is one of the most widespread and abundant of the coastal species. The tree has medium sized buttresses and a merchantable bole up to 20 metres in length and 1.4 metres in diameter above the buttress. The timber varies in colour from light pink to dark red, is of medium texture, and is generally free of common defects, with the exception of a tendency to become brittle in the heart section. The timber seasons well, finishes well and is used for veneers, domestic flooring, joinery, furniture, mouldings and interior finish.

Density (air dried)	689 kg/m^3 (43 lb/cu ft)
Strength Group 2/	4
Durability Class	3
Shrinkage-	
Radial	3.4%
Tangential	5.6%

Kwila (Intsia bijuga, I. palembanica) -this species generally occurs scattered through the lowland rain forest, but predominates in the Madang and Vanimo areas on the north coast of New Guinea. The tree has medium buttresses and a merchantable bole up to 15 metres and a diameter up to 1.2 metres above the buttress. The timber varies in colour from pale brown when first cut to a rich golden brown. It is known as Merbau in Malaysia. The timber is readily distinguished by a yellow crystalline substance in the pores. It is valued for its durability and is used for heavy construction, flooring, sills, boat building, bridge and wharf superstructure and decking, steps, truck bodies, carving, turnery, posts, poles, furniture and bench tops.

Density (air dried)	833 kg/m^3 (52 lb/cu ft)
Strength Group	2
Durability Group	1
Shrinkage-	
Radial	1.2%
Tangential	2.6%

Kamarere (Eucalyptus deglupta) -grows mainly in New Britain and is confined to dense patches along the banks of streams and on volcanic coast areas. This is a large tree frequently reaching 61 metres in height with a merchantable bole of up to 30 metres and diameter up to 2.4 metres. The timber is of medium density and varies in colour from pink to rich red-brown. In appearance it is not unlike Karri from Western Australia. It saws well, seasons readily and

1/ Source: Timber Industries Council.
2/ Australian Classes: 1 is strongest and 8 is the weakest.

ANNEX IV Cont.

Kamarere Cont.

is used for furniture, heavy construction, scantling, flooring and boat building.

Density (air dried)	689 kg/m^3 (43 lb/cu ft)
Strength Group	4
Durability Class	3
Shrinkage-	
Radial	3.0%
Tangential	5.1%

Malas (Homalium foetidum) -is a medium sized tree widely distributed in the lowland rain forests of New Britain. Its merchantable bole which is usually of straight cylindrical form, attains heights up to 26 metres, with a bole diameter above the buttress of up to 1.4 metres. It is used for heavy construction, wharf and bridge decking, flooring, ship building, scantling and turnery.

Density (air dried)	848 kg/m^3 (56 lb/cu ft)
Strength Group	1
Durability Class	2-3
Shrinkage-	
Radial	2.6%
Tangential	4.6%

Timber Mill, Lae

Timber Felling,

ANNEX IV Cont.

Amberoi (Pterocymbium beccarii) -large tree scattered throughout the lowland rain forest. It attains heights up to 45 metres with merchantable boles up to 33 metres and diameters of 1.4 metres above the buttress. The bole is cylindrical above the buttress which rarely extends to more than 1.5 metres. The cream coloured timber is used for veneer, interior finish, formwork and packing cases.

Density (air dried)	368 kg/m^3 (23 lb/cu ft)
Strength Group	7
Durability Class	4

Light Hopea (Hopea papuana, H. forbessii) -
the tree boles are of unbuttressed cylindrical form reaching heights of 31 metres with diameters up to 1.07 metres. This timber known as Gian in the philippines, is light to dark brown in colour and evenly textured. It is hard, durable in the ground and saws readily but is difficult to season. It is used for heavy construction, wharf and bridge superstructure, flooring, poles, boat building, scantling, window and door framing, sills, cladding, steps, rails, decking, furniture and panelling, sleepers and crossarms.

Density (air dried)	Light 704 kg/m^3 H (44 lb/cu ft)
Strength Group	Light 3
Durability Class	2
Shrinkage-	
Radial	2.0%
Tangential	5.7%

Anisoptera (Anisoptera polyandra) -is a tall cylindrical tree reaching heights of 65 metres with merchantable boles up to 35 metres in length and diameters up to 1.4 metres. The timber varies in colour from light straw to light brown with occasional pink streaks. It has a medium silica content but seasons, saws and machines well. The species is marketed in Malaysia as Mersawa. It is used for veneer, construction, moulding, flooring, window frames, vehicle bodies, interior finish and furniture.

Density (air dried)	640 kg/m^3 (40 lb/cu ft)
Strength Group	5
Durability Class	3
Shrinkage-	
Radial	2.0%
Tangential	5.3%

Further information may be obtained from the following addresses:

a) Department of Forests
Konedobu
Port Moresby
Papua New Guinea

b) Department of Trade and Industry
P.O. Box 612
Port Moresby
Papua New Guinea

ANNEX IV Cont.

About 40.5 million hectares of Papua New Guinea are covered with forests of which at least 12 million hectares may be developed economically. Most of the readily accessible millable timber is in the lowlands. Large areas are being opened up for development.

The total log production of the Papua New Guinea industry in 1971-1972 was 853,000 cubic metres. It was then projected that by 1974-1975 total log production would have risen to 1.6 million cubic metres.

To meet such targets, the Government of Papua New Guinea released more areas to timber operators. The timber resources of these areas have been surveyed and, where necessary, hydrographic surveys of possible harbour sites have been carried out.

The following are some of the areas available or under development for large scale logging operations and integrated forest industries:

Vanimo Timber Area is located in the northwest corner of New Guinea. The volume of merchantable timber is estimated at 14.2 million cubic metres in a productive area of 240,800 hectares.

Principal species: Intsia bijuga, I. palembanica 23.6%; Pometia pinnata, P. tomentosa 12.6%; Terminalia spp. 5.8%; Homalium foetidum 4.1%; Canarium spp. 3.3%; Planchonella torricellencis 3.2%.

Madang Timber Area contains over one million cubic metres of merchantable timber in a productive area of 62,200 hectares.

Principal species: I. bijuga, I. palembanica 34.7%; Alstonia 7.2%; Sterculia 5.5%; Celtis 4.6%; Terminalia app. 31.%; Eutenia 2.2%.

Open Bay Timber Area is south of Rabaul on New Britain and contains an estimated seven million cubic metres of merchantable timber in a productive area of 104,000 hectares.

Principal species: P. Pinnata, P.tomentosa 25.2%; Eucalyptus deglupta 11.1%; Calophyllum spp. 5.6%; Spondias dulcis 5.0% Pterocymbium beccarii 4.8%; Homalium foetidum 4.0%.

Sagarai-Gadaisu Timber Area is in the southeast corner of Papua and contains an estimated 2.5 million cubic metres of merchantable timber in a productive area of 58,300 hectares.

Principal species (Sagarai): Hopea 13.9%; Anisoptera 10.1% Terminalia 7.7%; Eugenia 4.9% Planchonia 4.4%; Pterocarpus 4.0%.

Principal species (Gadaisu): P. tomentosa 10.8%; Anisoptera 9.1%; P. pinnata 7.1%; Octomeles 6.7%; Terminalia spp. 6.2%; Pterocarpus 6.1%.

ANNEX IV Cont.

Kumusi Timber Area is west of Holnicote Bay on the north coast of Papua and contains an estimated 1.9 million cubic metres of merchantable timber in a productive area of 26,100 hectares.

Principal species: Pometia spp. 13.3%; Burckella spp. 7.2%; Celtis spp. 6.5%; Palaquium 5.6%; Cryptocarya 4.9%; Anisoptera 4.3%.

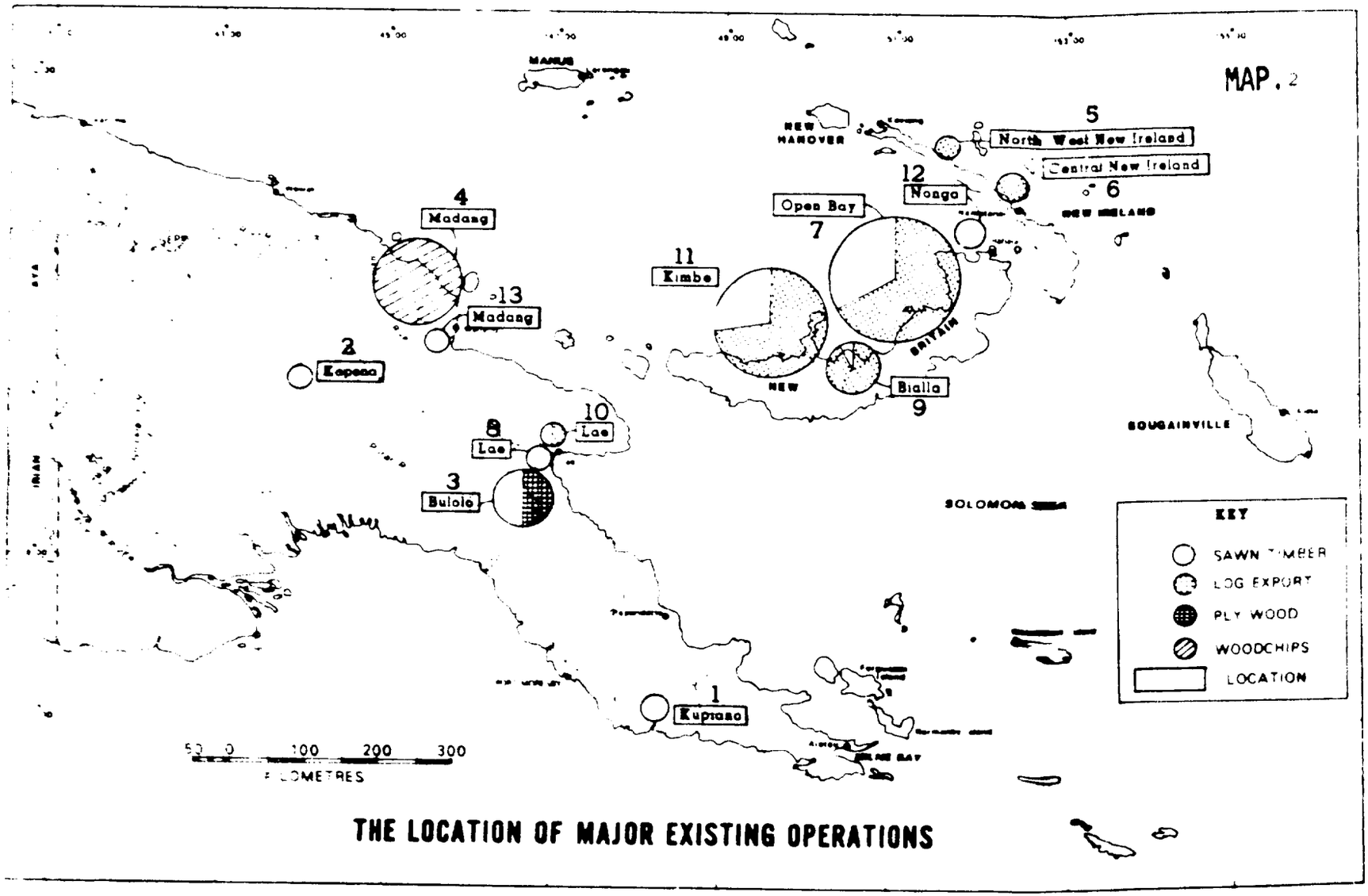
Kapiura Timber Area located south Commodore Bay, West New Britain, contains an estimated 2.3 million cubic metres of merchantable timber in a productive area of 52,000 hectares.

Principal species: Pometia spp. 28.9%; Homalium foetidum 19.2%; Calophyllum spp. 4.8%; Terminalia spp. 4.1%; Spondias dulcis 4.2%; Pterocymbium Beccarii 4.0%.

Note: The volumes given are gross rather than net and allowances should be made to allow for defect and logging losses. Merchantable timber refers to logs with girths greater than 1.52 metres at breast height.

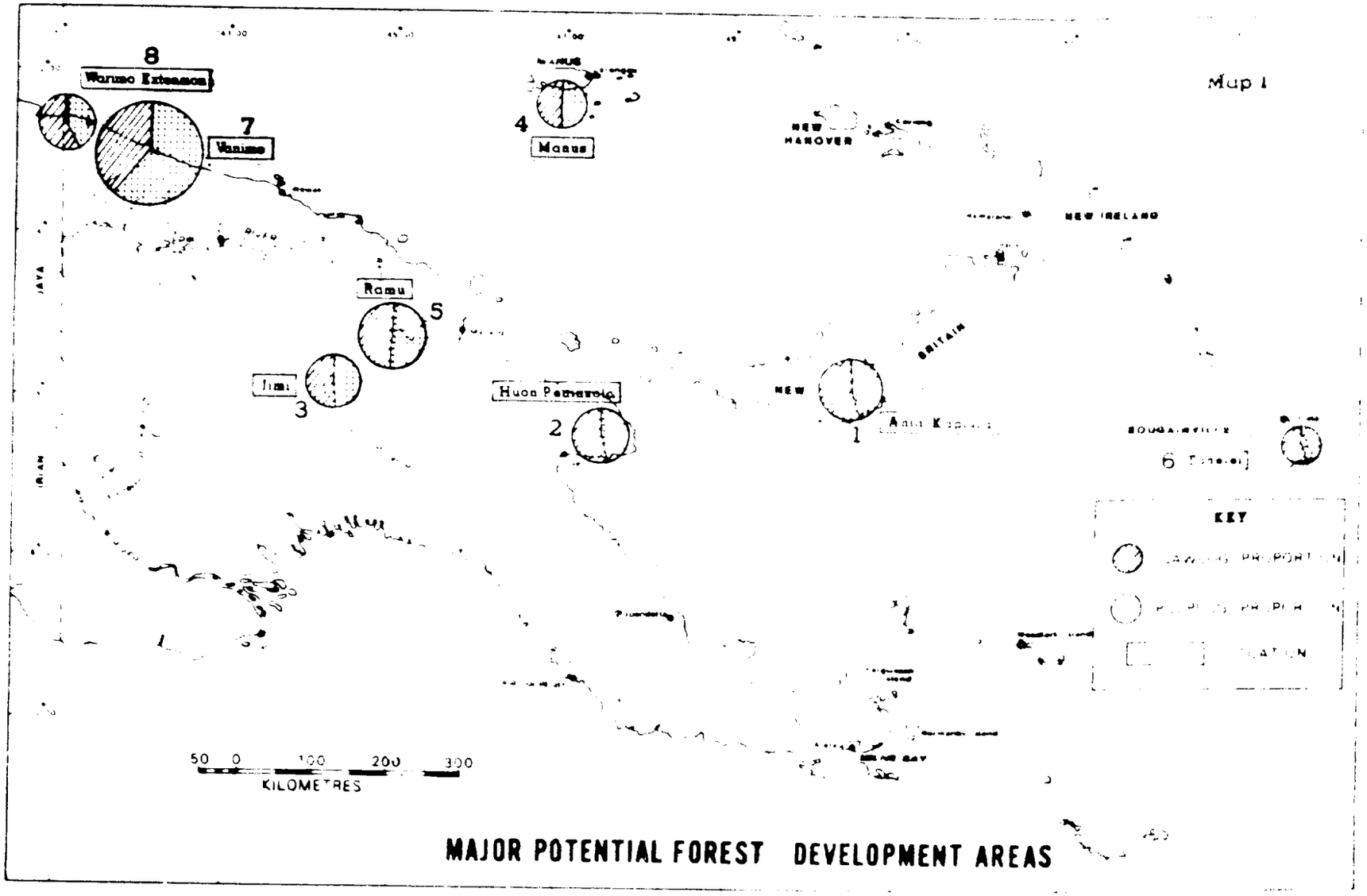
Goroka Forest Nursery

ANNEX V



THE LOCATION OF MAJOR EXISTING OPERATIONS

ANNEX VI



Map 1

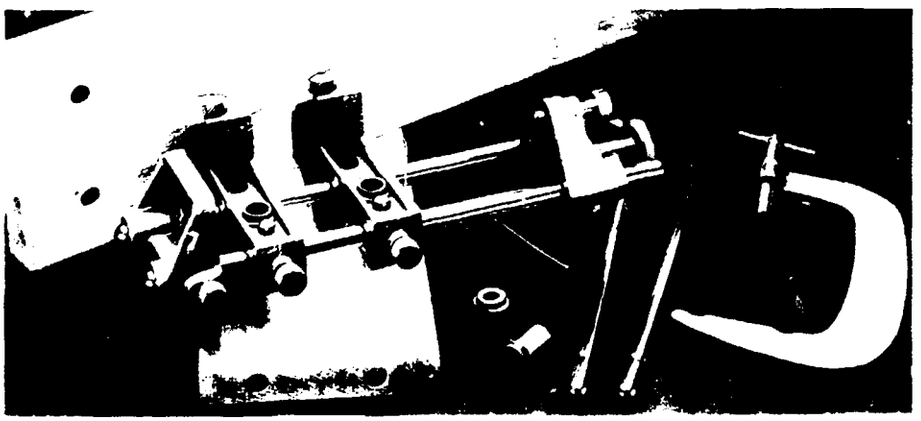
MAJOR POTENTIAL FOREST DEVELOPMENT AREAS

ANNEX VII

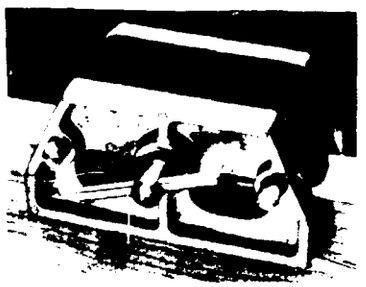
DOWELLING **

(1) Dowelling Jig: The most versatile joiner's quality dowelling jig available. Its unique design permits limitless variations of dowel positions on boards up to 18 inches wide (with optional long slide rods). It sets up quickly and with a minimum of marking out. Standard frame and carcase joints such as the corner, tee, leg and miter are possible as well as producing holes for adjustable shelving and accurately aligned holes for edge gluing. The jig includes 2 bushing carrier assemblies, 2 pair of hardened steel drill bushings, 1/4" and 3/8", a "C" clamp, and slide rods for stock up to 6" wide. Fully illustrated instructions explain the many uses of this tool.

01D40-R $61.35 ppd.



(1)



(2)

(2) Improved Dowl-It: Most dowelling operations require exact centering of dowl holes on the edge or ends of the component parts. The Dowl-It self-centering jig accomplishes this task quickly and easily on parallel sided or round stock up to 2 inches thick. The improved version of this very popular jig features two threaded holes to accommodate screw-in removable bushings. These bushings permit the drilling of two or three holes in sequence without moving the entire jig. The 7/16" and 1/2" holes are permanently drilled in the center guide. The bushings and guide are made of hardened drill steel and plated for rust protection. Three bushings (1/4", 5/16" and 3/8") are included with the Improved Dowl-It. Additional bushing sets are available for using matched pairs.

09Q51-EA $36.30 ppd.

Additional bushing set includes one each of sizes 1/4", 5/16" and 3/8".

09Q61-EA $ 5.50 ppd.

** Taken from the catalogue of the Woodcraft Supply Corporation, 313 Montvale Avenue, Woburn, Massachusetts, 01888, U.S.A.

ANNEX VII Cont.

DOWELLING

(3) Brad Point Drills: These are precision, double spur bits preferred by cabinetmakers for their clean boring and accuracy, which makes them the right choice for use with all styles of dowelling digs. The ground spiral edges are relieved so that only an 1/8" polished edge actually touches the inside of the hole or bushing. This reduces friction making the hole easier to bore and reducing the possibility of overheating. The high carbon tool steel assures a long lasting cutting edge and makes resharpening possible. Each bit has a 1/4" shank and a 3" long twist. Set of four: 1/4", 5/16", 3/8" and 1/2".

07H20-W	Set of four	$20.35 ppd.

These drills also available individually:

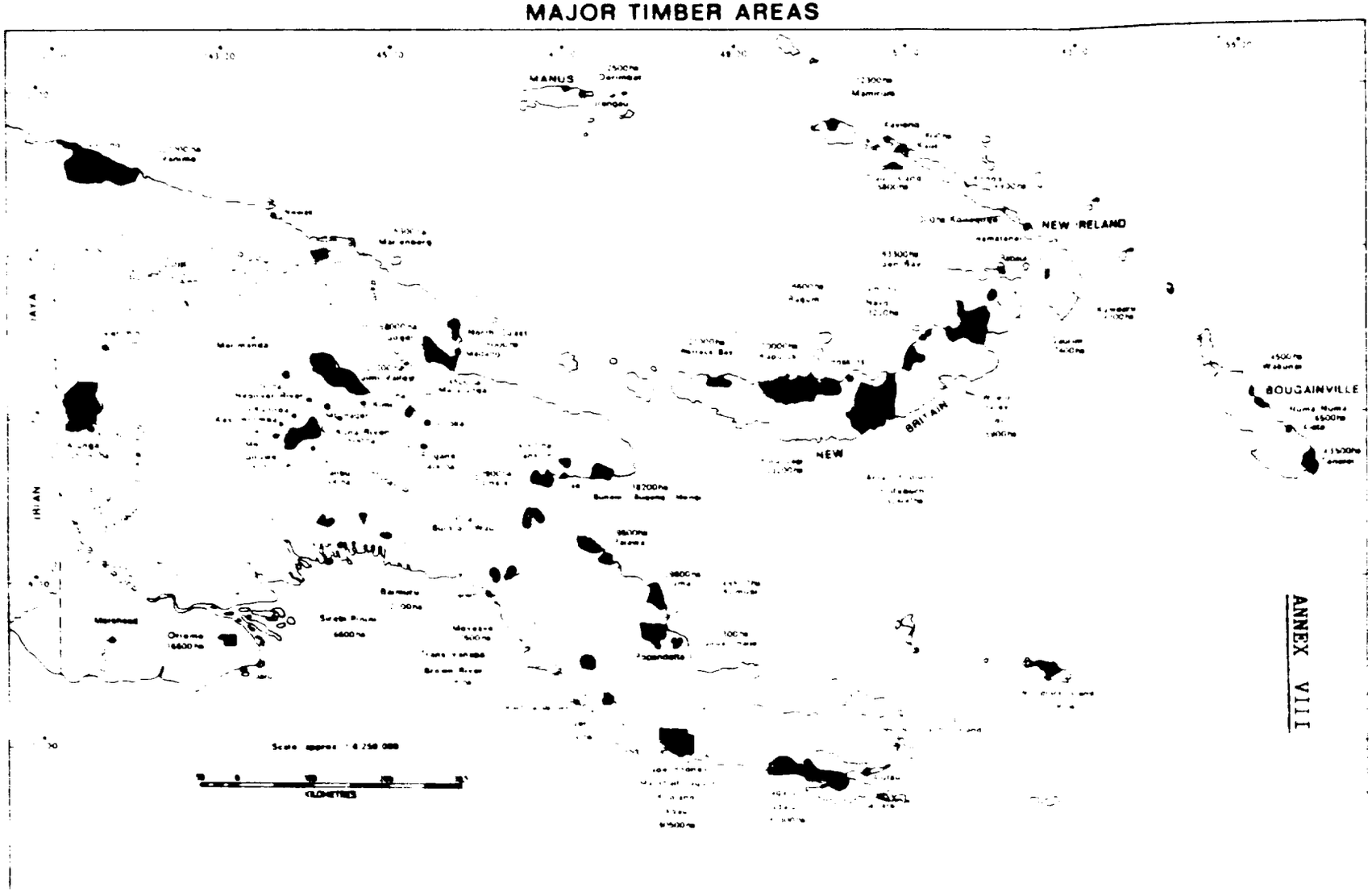
07H23W	1/4"	$ 4.95 ppd.
07H31W	5/16"	$ 5.45 ppd.
07H32W	3/8"	$ 5.65 ppd.
07H34W	1/2"	$ 5.85 ppd.

Also available (shank size equals diameter for 1/8" and 3/16"):

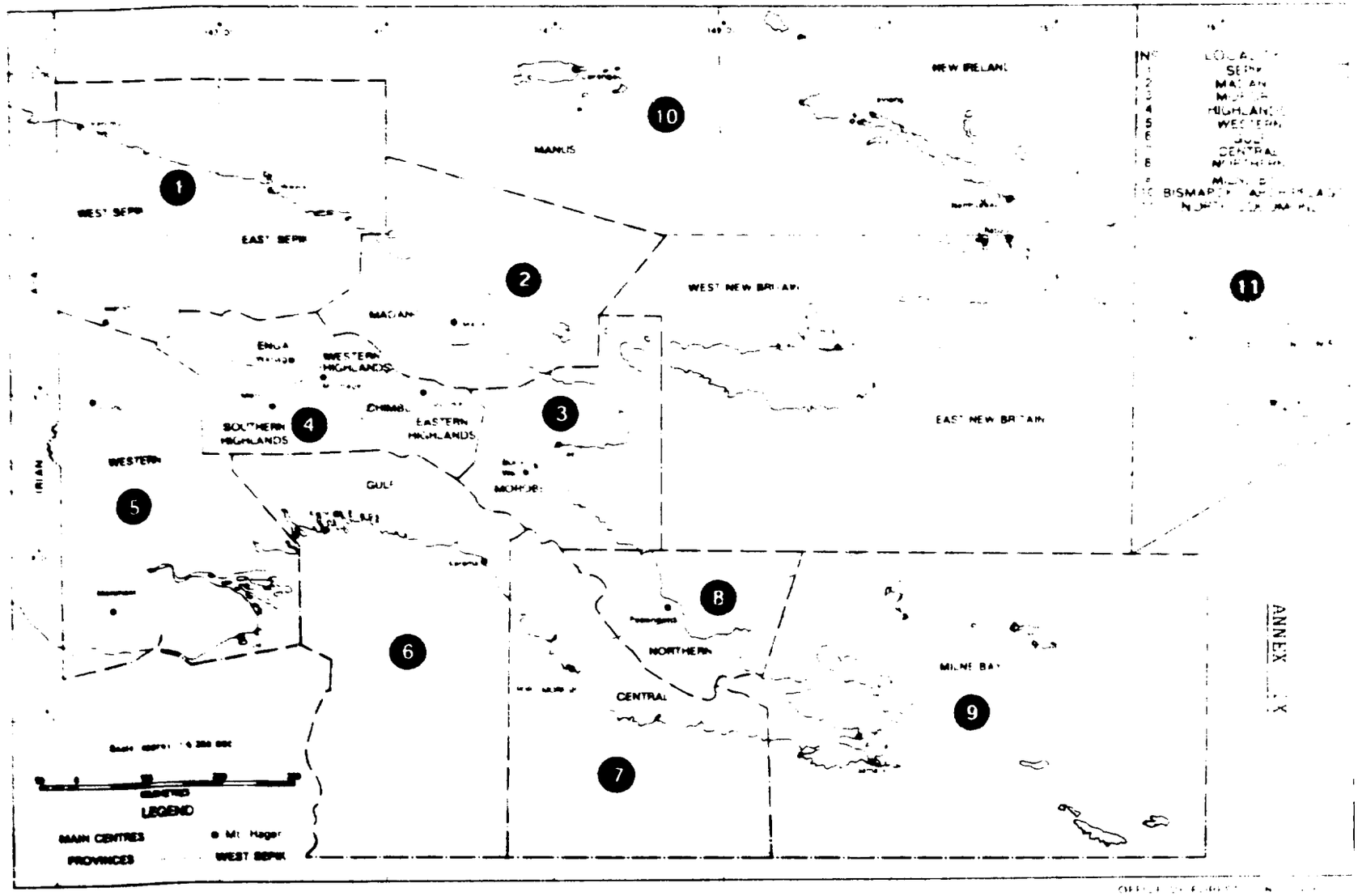
07H21W	1/8"	$ 7.10 ppd.
07H22W	3/16"	$ 7.10 ppd.
07H33W	7/16"	$ 5.75 ppd.

ANNEX VIII

MAJOR TIMBER AREAS



LOCALITY REFERENCE



ANNEX [illegible]