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DEMONSTRATION OF COCONUT WOOD UTILIZATION IN PREFABRICATED HOUSING

SI/PHI/84/801

(R) PHILIPPINES

Technical report: Design, supervision and certification aspects of the demonstration coconut wood house project*.

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

Based on the work of Gregorio G. Sta. Maria,
Designing Architect and Consultant

Backstopping officer: R. M. Hallett, Agro-Based Industries Branch

United Nations Industrial Development Organization
Vienna

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EXPLANATORY NOTES

The monetary unit of the Republic of the Philippines is the Peso (P).

The current official rate of exchange of the Peso is P18.60-US$ 1,00

The following acronyms are used in this Report:

FAO	-	Food and Agriculture Organization, United Nations
PCA	-	Philippine Coconut Authority, A Philippine Government agency responsible for the coconut industry.
PEO	-	Provincial Engineer's Office
SPDA	-	Southern Philippine Development Authority
UNDP	-	United Nations Development Programme
UNIDO	-	United Nations Industrial Development Organization

A hypen between numbers (e.g. 1-5) indicates the full range involved, including the beginning and the end points.

A full stop(.) is used to indicate decimals.

A comma (,) is used to indicate thousands, millions, billions.

The following symbols and/or abbreviations are used in this Report:

BF	-	Board foot, a unit board measure 1" x 1' x 1'
B.I.	-	black iron
CHB	-	concrete hollow blocks
coco	-	coconut
cu.m.	-	cubic meter, metric unit of volume
CuSO4	-	Copper Sulphate, a chemical compound used to augment preservatives treatment of wood
mm	-	millimiter, 1/1000th of a meter
Na_2PCP	-	Sodium Pentachlorophenate, an anti-fungi compound
No.	-	number
pcs.	-	pieces, denoting unit of quantity
S2S	-	surfaced on 2 sides, referring to a board whose 2 faces have been planned smooth
S4S	-	surfaced on 4 sides, referring to a board whose 4 faces have been planned smooth
T&B	-	toilet and bath
T&G	-	Tongue and Groove, a system of joining wood flooring pieces.
V-cut	-	a system of joining wooden walling boards, characterized by beveled edges to form a V-shaped groove at the joined edges.

W	- watts (unit of power, English system)
'	- feet, English system of measure of length
ø	- diameter
/	- per, meaning "for each"
%	- percent, 1/100th part of a whole

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I. INTRODUCTION

1.1 PROJECT BACKGROUND

The Government of the Republic of the Philippines has embarked on a programme to replace existing coconut trees with more productive hybrid species. An average of 3,500,000 coconut stems are expected to become available annually when the program is in full swing. In order to avoid potential phyto-sanitary problems posed by unused coconut stems which are left to rot in the coconut farms, the United Nations through its implementing agencies - the FAO and UNIDO developed coconut wood processing technology.

The Philippine government has launched a complimentary program to identify further uses of coconut stems and make their utilization a part of the nations' economic development program. The use of coconut wood in housing development by the Philippine Coconut Authority Zambeanga Research Center (PCA-ZRC) during 1978 to 1982, and construction offers an immediate solution to the problems of disposing coconut stems cut during the replanting activities.

Low cost housing units have been designed and erected, en situ under the previous UNIDO projects (RAS/81/110 and SI/PHI/83/801). A design for prefabricated low cost housing units which maximizes the use of coconut lumber in combination with traditional wood materials and the construction of a prototype prefabricated housing unit are expected to be achieved in this project.

1.2 PROJECT OBJECTIVES

To demonstrate the feasibility of using coconut wood for a low-cost housing project in Lucena City, Quezon Province, Philippines, using pre-fabricated building components by erecting a prototype unit. The Quezon Province government has plans to build 500 low-cost housing units where the abundant supply of coconut stems poses as a source of cocowood for building materials. The technology developed by UNIDO in previous projects in the Philippines will be used and technology transfer will be very timely.

1.3 TERMS OF REFERENCE

1.3.1 Adjust the design of the coconut wood housing unit constructed under SI/PHI/83/801, on the basis of experience gained and introduce prefabrication and combine coconut wood with other locally available building materials considering local requirements.

1.3.2 Prepare architectural plans and erection manuals for the above;

1.3.3 Cooperate with consultant in coconut wood processing technology on;

- i - determination of components
- ii - setting up of system for prefabrication, and
- iii - optimization of the use of coconut wood and other building materials;

1.3.4 Supervise construction of a prototype housing unit in Quezon Province.

1.3.5 Provide certification of compliance with designs and building regulations - structural, electrical and sanitary;

1.3.6 Cooperate with the local consultant in the economic analysis and cost estimate for the proposed prototypes as well as low-cost housing project; and

1.3.7 Make recommendations with local consultant, to the Government of Quezon Province regarding the utilization of coconut wood in the proposed housing project including cost estimate.

II. ORGANIZATION AND MANPOWER PARTICIPATION

2.1 UNIDO CONSULTANTS ASSIGNED TO THE PROJECT

2.1.1 HORATIO P. BRION - Cocowood Processing Technology,
UNIDO Consultant Cost Analysis and Report

2.1.2 GREGORIO G. STA. MARIA- For Design, Construction
Project Designing Supervision and Certification
Architect and Consultant

Assisted by:

- i - Cesar A. Caliwara - Structural Engineer Consultant
- ii - Ernesto Villaos - Sanitary Engineer for Design

iii - Estelita Y. Gutierrez - Sanitary Engineer for Construction

iv - Jose Enriquez - Electrical Engineer Consultant

v - Edgar Hidalgo - Assistant to Designing Architect

vi - Remigio Nagayo - Documentation and Recorder

2.2 QUEZON PROVINCE MANAGEMENT TEAM COMPOSITION

2.2.1 ABELARDO RADOVAN - Project Officer-in-Charge
Provincial Engineer

Assisted by:

i - Staff of the Office of the Provincial Engineer

III. DESIGN AND ERECTION MANUAL

3.1 CONTRACT

Contract No. 84/117 between the United Nations Industrial Development Organization (UNIDO) and Gregorio G. Sta. Maria and Associates was executed last February 4, 1985 in Metro Manila under UNIDO Project No. SI/PHI/84/801 with Activity Code : SI/02/31.7.

3.2 SITE OF COCONUT WOOD HOUSING UNIT

The site is the Governor's Mansion Compound, Lucena City, Quezon Province selected by the Provincial Governor and approved by the Project Designing Architect and UNIDO representatives.

3.3 ARCHITECTURAL PLANS AND ERECTION MANUAL

Architectural and engineering plans were prepared based on the adjusted design of the coconut wood unit constructed under SI/PHI/83/801 and on the basis of experience gained in considering local requirements to introduce prefabrication and combine coconut wood with other traditional wood and locally available building materials.

Of the adjusted design of duplex type on concrete stilts, two (2) bedrooms will be used as quarters for male and female teachers/

trainers of the Quezon Province vocational school. Together with the architectural plans, the erection manual, bills of materials and specifications were submitted to UNIDO and to the Provincial Government of Quezon thru the Project Officer-in-Charge and concurrent Provincial Engineer in February 1985. UNIDO in Vienna received and accepted the architectural plans and erection manual and printed in English under V.85-29051, the basis of pre-fabrication and construction of the proto-type coco wood house in detail.

3.4 SCHEDULE OF WOOD MATERIAL USAGE, PROFILE AND TREATMENT

COMPONENT	SIZES	TYPE/GRADE* PROFILE	TREATMENT	REMARKS
Stakes, Batter Boards and Forms	Mixed Sizes	Green Cocowood	NaPCP	-
Posts	125mm x 125mm	Yakal,S4S AD	NaPCP Solignum	-
Floor Girts	50mm x 250mm	-do-	NaPCP	-
Floor Joists and Bridgings	50mm x 125mm	Cocowood Grade A S4S, AD	- NaPCP	-
T & G Flooring	25mm x 125mm	-do-	NaPCP	Profiled
Timber Corbel	50mm x 125mm	Yakal,S4S AD	NaPCP	
Roof Girts	50mm x 200mm	-do-	NaPCP	
	50mm x 150mm	-do-	NaPCP	
Trusses	50mm x 100mm	Cocowood Grade A S4S, AD	NaPCP	
	50mm x 125mm	-do-	NaPCP	
Purlins and Timber Blocks	50mm x 50mm	-do-	NaPCP	
Wood Shingle Roofing	10/20mm x 100mm	Cocowood Grade A,B & C, AD	CuSO Na2Cro4 As2O5, CCA	
Flashing	Ex 125mm x 125mm	Cocowood Grade A & B, AD	-do-	Profiled
Ridge Rolls	Ex125mm x 125mm	-do-	-do-	Profiled

Note: * Cocowood grades used in this schedule are converted to UNIDO accepted system as follows: "A" --- "Hard"; "B" --- "Medium" and "C" --- "Soft".

COMPONENT	SIZES	TYPE/GRADE PROFILE	TREATMENT	REMARKS
Canopy Braces	50mm x125mm	Cocowood Grade A, AD	CuSO Na2Cr04 As205, CCA	Profiled
Facia Board Nailers	50mm x 50mm	Cocowood Grade B, S4S, AD	-do-	
Facia Board	25mm x 100mm	Cocowood Grade A & B, AD	-do-	Profiled
Rafters	50mm x 125mm	Cocowood, S4S, AD	NaPCP	
Stair Carriage	50mm x 250mm	Yakal, S4S AD	CuS04, Na2Cro4 AS205	
Treads	50mm x 300mm	-do-	-do-	
Risers	25mm x 125mm	Cocowood, Grade A, AD	NaPCP, CuS04 Na2Cro4 AS205 CCA	
Kicker Plates	50mm x 125mm	-do-	-do-	
Stair Nosing	50mm x 100mm	-do-	-do-	
Balcony Handrail	50mm x 100mm	Cocowood, Grade A, KD	-dO-	Profiled
Rail Post	50mm x 100mm	-do-	-do-	Profiled
Balusters	Ex 75mm x 75mm	-do-	-do-	Profiled
Framing/Diagonal Vertical and Horinzontal Studs	50mm x 75mm	Cocowood Grade B & C AD	NaPCP	
Sidings/Paneling (Exterior)	19mm x 100mm	Cocowood, Grade B & C	NaPCP CUS04 Na3Cr04 As205	Profiled
Ceiling Joist	50mm x 50mm	Cocowood, Grade B, AD	NaPCP	
Ceiling Board	12mm x 100mm	Cocowood Grade B & C KD	NaPCP Boron 30% Sol.	Profiled
Door & Window Jambs	50mm x 100mm	Cocowood Grade A, KD	NaPCP CuS04 NaCr04 As205	Profiled
Canopy Baseplates	50mm x 150mm	Cocowood	CuSO Na2Cro4 As205,CCA	

COMPONENTS	SIZES	TYPE/GRADE PROFILE	TREATMENT	REMARKS
Kitchen Counter Baseboard	50mm x 100mm	Cocowood Grade A, KD	NaPCP 30% Boron Solution	
Kitchen Counter & Cabinet Frame	50mm x 75mm	Cocowood Grade A KD	-do-	
Kitchen Counter Nosing	25mm x 100mm	-do-	-do-	
Panel Boards	19mm x 100mm	Cocowood Grade A & B, KD	-do-	Profiled
Closet Baseboard	50mm x 100mm	Cocowood Grade A, KD	-do-	
Closet Frames	50mm x 75mm 50mm x 50mm	Cocowood Grade A, KD S4S	-do-	Profiled

IV. SUPERVISION OF CONSTRUCTION ACTIVITIES

4.1 PROJECT AND CONSTRUCTION TIMETABLE AND INTERNATIONAL SEMINAR

A project timetable for the coco wood house project was prepared by the UNIDO Consultant and approved by UNDP -Manila, Quezon Province and Project Designing Architect. Several stages of activities have been programmed in preparation for the International Seminar on Technology of Coconut Wood Processing and Utilization of Coconut Wood as Building Material scheduled from 20 - 22 February 1985 in Lucena City.

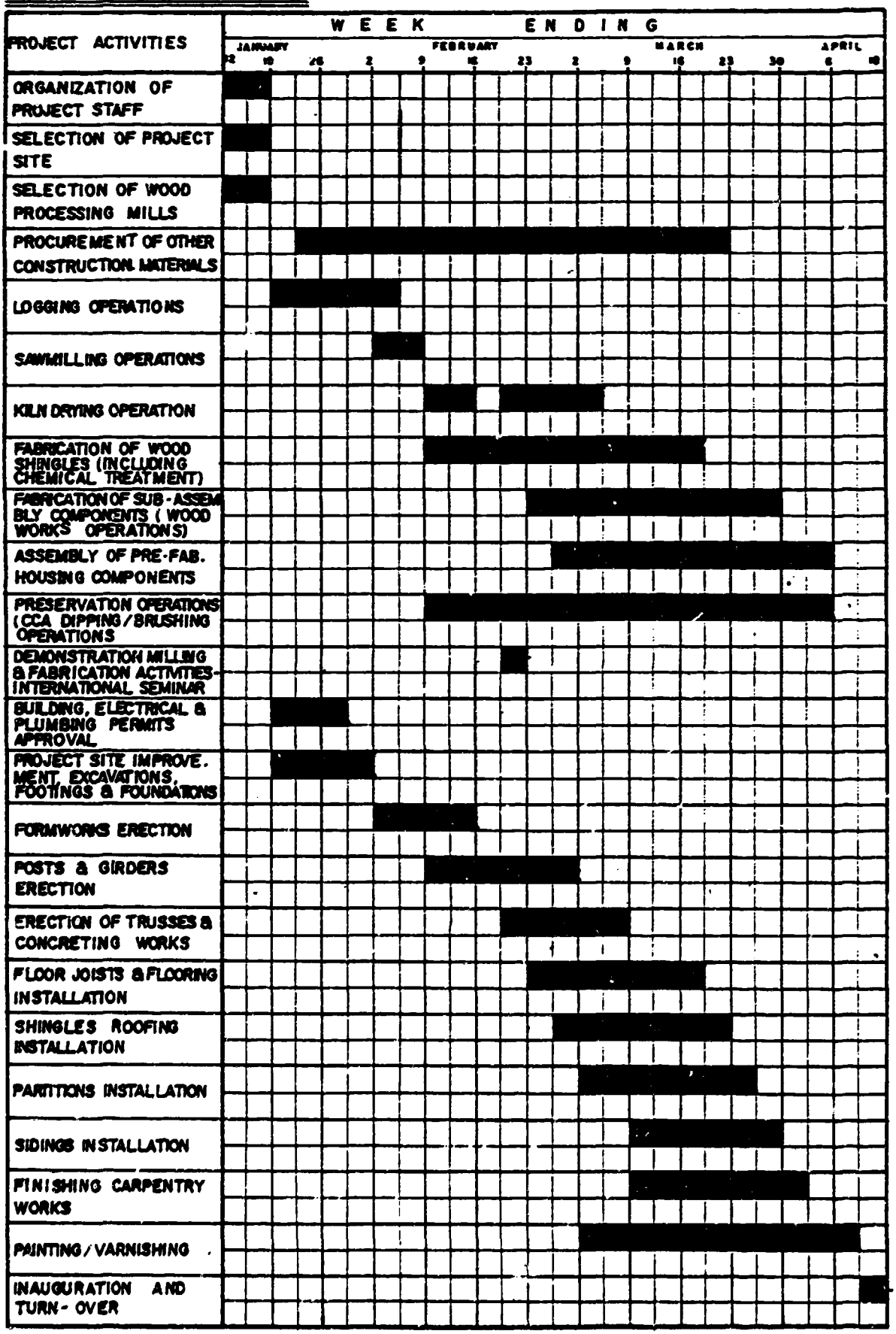
UNDP -Manila under Special Service Agreement contracted the Project Designing Architect to prepare and organize in conjunction with the Ministry of Human Settlements Regional Secretariat Network, RAS/82/012, the seminar and study tour for international participants based on the work of Projects SI/PHI/83/801 and SI/PHI/84/801. The support to insure success of the professional organizations like United Architects of the Philippines, Philippine Institute of Civil Engineers (PICE) and Philippine Constructors Association plus the Philippine Coconut Authority, Ministry of Public Works and Highways and other government agencies, private businessmen and industrialist were harnessed by the organizing committee.

DEMONSTRATION OF COCONUT WOOD UTILIZATION IN PRE-FABRICATED HOUSING

QUEZON PROVINCE - UNDP - UNIDO JOINT PROJECT (SI/PHI/84/801)

LUCENA CITY, QUEZON PROVINCE

PROJECT TIMETABLE



UNIDO was represented by Mr. Robert M. Hallett, Industrial Development Officer, Division of Industrial Operations, Vienna, Austria. Sixteen (16) foreign participants representing eight (8) countries in the Pacific basin, Southeast Asia and the Indian Ocean attended the international seminar. The seminar in Lucena City on 20 - 22 February 1985 was a considerable success.

4.2 FOUNDATION, CONCRETE STILTS COLUMNS AND YAKAL POSTS, GIRTS AND GIRDERS

On the third week of January 1985, construction of the duplex cocowood house commenced with Engineer Abelardo Radovan, Quezon Provincial Engineer, as Project Director and Mr. Felixberto Nierva as Project Engineer, who were responsible for the construction and all operational activities with the coordination of the UNIDO Consultant and Project Designing Architect.

Staking, excavation, footings and foundations were constructed. Reinforced concrete stilt columns followed with post straps. Anchor bolts were embedded in the concrete ready to receive girders, posts and girts of "yakal" traditional hardwood species specified in the architectural plans. All "yakal" in contact with concrete were painted with wood preservative, anchored and installed in place with post straps and machine bolts.

The "yakal" was structurally specified to be the major structural components to receive and carry all cocowood floor joists, roof trusses, prefabricated exterior and interior walls, prefab cocowood roofing shingles and other cocowood components to complete the house.

As of February 22, 1985 the following house components were erected and/or installed at the jobsite:

i - All concrete stilts and concrete foundations;
ii - Excavation for the septic vault;
iii - All wooden posts "yakal"
iv - All "yakal" floor and roof girts; and
v - Three (3) cocowood truss assemblies

The Project Designing Architect rejected the works due to faulty

layout, measurements, wrong truss construction, unplumbed and improperly installed wooden posts which made them unfit to receive prefabricated walls and roofing panels. Nail-on plate system of ccconut wood/truss construction joints were introduced to all exposed trusses per suggestion of Mr. Hallett of UNIDO. All trusses were taken down while damaged members were replaced and repaired.

Upon evaluation of the project staff during the period 4 February to 26 March 1985, Mr. Felixberto Nierva was replaced by Mr. Angelito Ayala as Project Engineer assisted by Ms. Eden Magtibay. Machinery breakdown and intermittent power failure caused the postponement of sawmilling thereby suspending the construction activities due to lack of cocowood materials. The project was delayed by eight (8) weeks as of 3 April 1985 with respect to approved Project timetable.

4.3 SOUTHERN PHILIPPINES SEMINAR ON COCONUT WOOD AS BUILDING MATERIAL, 11 - 13 APRIL 1985, DAVAO CITY, PHILIPPINES

The Project Designing Architect was the Chairman of the Executive Committee of the seminar and Rapporteur, Group B attended by architects, engineers, constructors, saw mill operators, developers, businessmen and government officials from the Southern Philippines as well as from the national government offices. During the report on the plenary session, the participants sounded the need for a wider and immediate dissemination of technical and commercial information on coco wood.

4.4 PREFABRICATION OF COCOWOOD COMPONENTS AND HOUSE CONSTRUCTION ACTIVITIES

4.4.1 Very slow progress in coco wood processing activities characterized the period 4 April to 18 May 1985 and the construction at the job site was virtually at a standstill. The project suffered another set-back due to the loss of about 82 pieces of coco boards allocated for floor joists and other principal components of the demonstration house. As of 13 May 1985, eight (8) trusses (bolted assembly) and three (3) truss units (nail-and-plate assembly) were fabricated. Another two (2) truss units (nail-and-plate assembly) were being fabricated.

4.4.2 Housing components prefabrication activities were fabrication of templates and assembling jigs and fixtures for sidings, partitions and roofing sections which were designed and were fabricated immediately after completion of truss assembling activites. Proto-type samples for purlins and purlin braces were prepared and approved by the UNIDO Project Consultant on 13 April 1985. The Project Director has decided that doors and window assemblies, as well as turned balusters will be sub-contracted to local joinery shops using coconut wood.

4.4.3 Sawmilling operations on 8 and 30 April 1985 completed deficiencies in 50 mm x 125 mm, 50 mm x 50 mm and 19 mm x 100 mm boards. Kiln-drying of about 800 pieces of 25 mm thinner boards was successfully dried on 17 April 1985 and the second kiln-drying of thick coco boards to follow.

4.4.4 Missing coco boards were confirmed on 13 May 1985 involving 59 pieces of 50 mm x 125 mm "Hard" grade for floor joists, doors and window jambs. Another 6 pieces of 125 mm x 125 mm "Hard/Medium" grade for ridge roll and eaves flushing and 17 pieces of 50 mm x 100 mm, "Hard" grade for floor hanger, stairs and balusters, railing, door, etc., with a total of 82 pieces were missing which were lost in the construction or sawmilling site.

4.4.5 On the same day in May 1985, the Project Director disclosed that the current major constraint of the project was inadequate funding. Other non-coconut wood construction materials (e.g., plumbing, electrical and bathroom fixtures) could not be procurred because they had to wait for the release of the balance of funds apportioned for the project. The loss of coco wood boards and lack of funds caused another long delay in the completion of the project.

4.4.6 May 14 to June 2, 1985 Prefabrication and House construction activities were roofing shingles fabrication, ridge roll and eave flushing fabrication, baluster turnings, purlins and

brace frames assembly for shingles roofing sections and truss assemblies completion.

4.4.7 ROOFING SHINGLES FABRICATION

Fabrication of coco roofing shingles commenced on 1 June 1985 with initial 800 pieces completed with a balance of about 8,000 pieces. Preservative treatment of the coco roofing shingles scheduled to follow.

4.4.8 RIDGE ROLL AND EAVE FLUSHING FABRICATION

Ridge rolls were cut from 125 mm x 125 mm coco boards with a total of 19 meters and eaves flashing of about 24 meters total length using table circular saw and a 400 mm blade chain saw. Preservative treatment specified were done after the open tenon and mortize joints at both ends of each piece were cut.

4.4.9 BALUSTER TURNINGS

Baluster turned from 75 mm x 75 mm x 920 mm coco board by the furniture shop in Pagbilao, Quezon Province were mostly rejected due to poor workmanship and inferior coco wood material used. Only 11 pieces out of the 33 turned balusters were accepted as satisfactory.

4.4.10 PURLINS AND BRACE FRAMES FOR SHINGLES ROOFING SECTIONS

All the seven (7) units of purlins and brace frames were rejected by the UNIDO Consultant because the coco board components were cracked or split in the areas where nails were driven, without pre-drilling proper pilot holes as specified. Said rejects were replaced and/or repaired.

4.4.11 PREFABRICATION OF SIDINGS AND PARTITION SECTIONS DOOR AND DOOR JAMBS, WINDOW FRAMES AND JALOUSIES

Kiln-dried coco boards required to prefabricate were not available. The Project Director decided on 30 May 1985 that doors and windows sub-assemblies will be fabricated at the PEO shop.

4.4.12 HOUSE CONSTRUCTION ACTIVITIES

As of June 1, 1985, eight (8) units of truss assemblies (bolted construction) and five (5) units, nail-on-plate truss assemblies have been completed and brought to the construction site. Trusses were installed beginning June 1, 1985 and the pace was slow due to very few experienced carpenters among the crew. This matter was brought to the attention of the construction engineer who promised that the whole crew will be replaced with experienced carpenters.

4.5 UNDP-MANILA MONITORING VISIT ON AUGUST 5, 1985

The UNDP -Manila team was composed of Messrs. N. Brown, Assistant Resident Representative (Programme), UNDP -Manila, H.P. Brion and Designing Architect. Observation during the monitoring visit are as follows:

4.5.1 That the accomplishment as of August 5, 1985 based on construction work only was 20 % in comparison to the project estimated construction cost. Accomplishment including coco wood processed and prefabricated works based on the UNIDO-Consultant's report, assuming all the materials are intact and in good conditions, was more or less 43%. Based on these figures the project was very slow as the six (6) months duration of the UNIDO Consultant contract expired on 31 May 1985.

The existing structures should be protected against exposure to elements and infestations otherwise in about 2 or 3 months coconut wood trusses and joists will deteriorate and deform.

4.5.2 PURLINS AND BRACE FRAMES FOR SHINGLES ROOFING SECTION

The seven (7) units of roofing frames previously rejected due to non-use of pilot holes for nailed joints have not yet been repaired, inspite of the UNIDO Consultant's instruction on the technique of repairing the split- and cracked joints. The roofing frames are therefore not structurally sound and below the design specifications so much so that they were rejected.

4.5.3 COCO WOOD ROOFING SHINGLES

The roofing shingles already installed on two frames sections were not properly treated with CCA preservative as specified. The same is true with all the shingles piled beside the assembling fixture in the area. A majority of the coco wood shingles (50 out of 70 pieces selected at random) have thicknesses which deviated from specifications as per sample approved by the UNIDO Consultant. These defects will shorten the life and will cause higher labor usage of the coco wood shingles as roofing material.

4.5.4 WINDOW AND DOOR JAMBS

All the window and door jambs inspected have poor joints and workmanship. Units inspected showed two (2) jamb members fabricated out of "Medium" and "Soft" grade coco boards instead of "Hard" grade (refer to pages 22 through 26, Erection Manual for the Demonstration of Coconut Wood Utilization in Prefabricated Housing, SI/PHI/84/801). The Project Director was properly notified and reminded to follow the Erection Manual (see Annex II).

4.5.5 T & G COCO BOARD FLOORING

All T & G coco boards are piled together, mixing "Hard" grade (for flooring) with "Medium" grade only good for shelves, closet boards, etc.

4.5.6 OBSERVATION AND REMARKS ON THE MONITORING VISIT

Based on the observation and the attitude of the implementing agency, the demonstration house will be erected not according to the approved plans, specifications and erection manual and that the principal objective was not pursued.

4.5.7 NO CONSTRUCTION ACTIVITY AT THE JOBSITE

There was not a single worker in the job site at the Governor's Mansion Compound. All the truss units had been installed, floor joists were not completed and the general appearance is just bare frames exposed to the elements.

Please refer to photos marked A, B, C, D and E and Project Designing Architect letter dated August 20, 1985 addressed to Mr. Nicholas Brown, UNDP - Manila, Annex III.

4.6 THE SECOND MONITORING VISIT ON 8 AND 9 NOVEMBER 1985

The construction of the coconut wood demonstration house in Lucena City was not in accordance with the plans, specifications and erection manual. Prefabrication system was completely ignored by the project implementing staff but instead done en situ as follows:

4.6.1 EXTERIOR SIDINGS AND PARTITIONS

All exterior V-cut siding boards have already been installed en situ including interior walls and partitions some of which was in progress during the visit.

4.6.2 FLOORING AND FLOOR JOISTS

Flooring T & G boards installed showed mixed "Hard" and "Medium" grades of coco wood boards instead of only "Hard" grade as specified. Springiness was felt while walking on the floor area of the living-dining area as well as on the two bed room wings. An inspection of the floor joists under the living-dining area showed that only 25% of the floor joists and bridgings used were of specified "Hard" grade and only 20% under the balcony floor were of "Hard" grade.

4.6.3 PREVIOUSLY REJECTED COMPONENTS NOT REPAIRED AND CORRECTED

Window and door jambs, purlins and brace frames for roofing shingles sections previously rejected were not corrected and repaired. The jambs with some sub-standard members were installed in the coco wood demonstration house.

4.6.4 ROOFING SHINGLES

All roofing shingles were rejected by the UNIDO Consultant and the Project Designing Architect for not conforming with the specifications. All roofing shingles have been brush-coated with a tar based product under the brand name "Weathercote" produced and commercially distributed by Shell Chemical Company on the insistence of the Project Director

who reported that they have no replacement of the CCA earlier purchased because they were thrown away and buried when adulterated by water during the typhoon.

4.6.5 PREFABRICATION ACTIVITIES

A visit to the prefabrication shop of the PEO at Pagbilao showed no prefabrication activities at all. Prefabrication jigs and fixtures as recommended by the UNIDO Consultant were not fabricated. These could only mean that all the remaining house components will be installed en situ. During the conference with the Project Director, he announced that specified prefabrication in the plans, specifications and erection manuals will not be followed but instead it will be constructed in conventional way. The primary objective of the project (SI/PHI/84/801) is to demonstrate the use of coconut wood as a material for prefabricated housing component.

4.7 THIRD MONITORING VISIT CONDUCTED ON 4 APRIL 1986

The team was composed of Messrs. G.L. Narasimhan, E. Bos, H. Brion, C. Caliwara and G. Sta. Maria. The following are the observations:

4.7.1 The demonstration house was found to be still incomplete and some errors were pointed out by the Designing Architect which the Project Director promised to correct later.

4.7.2 Sanitary and electrical works were not also completed though tileworks on the toilet and bath section has been completed.

4.7.3 Finishing works including panelings and ceiling had been partially completed.

4.8 PROJECT DESIGNING ARCHITECT'S INSPECTION

During the succeeding inspection visit made by the Project Designing Architect, it was observed that true to the decision of the Project Director, the construction proceeded in his conventional way, deciding for himself architectural and engineering changes and the Project Designing Architect to assert is an exercise of

futility. The Project Designing Architect even thought of going to court of justice to get injunction to stop construction but political and civic leaders of Quezon Province prevailed over the Architect's insistence. One of the purposes in going to court of justice is to detach the Designing Architect and Consultant from any civil and criminal liabilities that may happen during and after the construction wherein he has no control of the changes in the plans and specifications of the project under Philippine law.

Succeeding inspections showed substantial completion. UNIDO-Vienna instructed the local consultant and designing architect to prepare and submit terminal report.

Project Director/Engineer data submitted to the UNIDO Consultant were not accepted. Due to time constraint terminal report was prepared per UNIDO SIDFA instructions.

V. PHASE ONE - CONCRETE AND MASONRY CONSTRUCTION

5.1 STAKING AND EXCAVATION

Site layout and excavation was started on 21 January 1985 and was completed on 30 January 1985. Foundations were staked out with wooden stakes, batter boards and cross bracing. The top of the batter boards was leveled with the use of a spirit level and straight edge. The location of the excavation was determined by the actual measurements on the intersecting strings tied to conform with the layout as shown on the excavation staking plan. A plumb bob was used to transfer measurements from the string to the ground.

A minor revision was made on the layout based on the revised scheme of simulated coconut trunk finish for the concrete stilts which was originally designed to be simply square columns.

5.2 INSTALLATION OF REBARS FOR COLUMN FOOTINGS, WALLFOOTINGS AND COLUMNS

Reinforcement bars were installed with #16 G.I. tying wires at every intersection. Dowels were provided for wall footings anchored

to the column footing. Rebar installation pattern for the concrete column was revised based on the scheme of simulated coconut trunk finish-revised design for the concrete columns. Stone block spacers were provided to attain the required clearance between rebars and gravel fill.

5.3 MIXING AND PLACING OF CONCRETE FOR FOOTINGS

The type of concrete mix used was class A with the proportion: one bag cement (50 kilograms), 0.057 cubic meters of sand and 0.113 cubic meter of gravel mixed with about 23 to 27 liters of water. The materials was evenly mixed manually with the use of shovels until a uniform consistency was attained. Water was added intermittently while mixing for a uniform mixture. Concrete mix was finally placed to its final position and was manually compacted.

5.4 PLACING OF FORMS, DOWEL BARS AND STEEL STRAP PLATES

Formworks and scaffoldings were started to be installed on 31 January 1985.

The original design of square section for concrete columns was revised to conform with the simulated coconut trunk finish design for the concrete columns. Instead of using wood forms, G. I. sheets were used for flexibility in obtaining the circular section.

After installation of formworks dowel bars for CHB walls were mounted through the pre-drilled holes on the forms spaced at 400 mm on center. The hooked end of the dowel bars were inserted through the holes. Post strap plates and anchor bolts were placed over the formed structure where they are indicated in the plans.

5.5 MIXING AND POURING OF CONCRETE FOR COLUMNS

Class A mixture of concrete was used for all columns and was manually compacted with all the post steel straps in place.

Concrete columns were completed on 9 February 1985.

5.6 LAYING OF 150 mm THICK CONCRETE HOLLOW BLOCKS

Mortar mixture used was 0.085 cubic meter of sand for every bag of cement.

Concrete hollow blocks were laid layer by layer with the required reinforcing bars and spacing. Cells were filled with mortar and tamped until fully compacted. Rebars splicing was the minimum of 300 mm with three sets of wires along the splice lenght. All vertical bars were extended to the suspended floor slab of the toilet and bath room.

5.7 PLACING OF SCAFFOLDINGS, FORMS, REBARS AND ANCHOR BOLTS FOR THE CONCRETE TOILET AND BATH ROOM SLAB

Scaffoldings and forms based on the required sizes and lenght were constructed prior to rebar installation. Instead of providing anchor bolts and straps for the 50 mm x 250 mm floor girts along line C as originally planned, the girts were extended to rest on the concrete hollow blocks wall system to utilize the whole timber lenght delivered to site which was longer than the size required for the girts along that area and to save cost on anchor bolts and steel straps. Hence, the original design of the anchor bolt and strap system of girt anchorage was not followed.

After completing the formworks, reinforcing bars were installed over the accomplished toilet and bath floor slab forms. Then siding forms were installed along the floor slab periphery.

5.8 MIXING AND POURING OF CONCRETE FOR TOILET AND BATH FLOOR SLAB

The same class A mixture of concrete used on columns was used on the toilet and bath floor slab with the same procedure of mixing and placing applied.

5.9 LAYING OF 100 mm THICK CONCRETE HOLLOW BLOCKS

The same mortar mixture and procedures of installation as in the laying of 150 mm thick concrete hollow blocks was applied.

VI. PHASE TWO - FABRICATION AND INSTALLATION OF WOODEN COMPONENTS

6.1 POSTS, 125 mm x 125 mm YAKAL, S4S, AIR DRIED

Erection of posts was started on 11 February 1985 and was completed on 14 February 1985.

All posts erected were of the "Yakal" wood species which was structurally specified to be the major structural component. Portions of concrete columns in contact with the wooden posts as well as the surface of the wood post in contact with concrete were coated with "Solignum" commercial brand of creosote borne NaPCP.

Wooden posts were erected on the concrete columns using 2-19 mm Ø x 152 mm machine bolts with nuts and washers through the 6 mm thick x 50 mm steel anchor straps for anchorage. Posts were braced for lateral movements.

During an inspection visit made by the Designing Architect and Consultant, errors were noted on the layout of the wooden posts which he immediately brought to the attention of the Project Director for corrective actions. The Designing Architect further emphasized the need for accuracy in the installation of the wooden components since it is of utmost importance in the pre-fabricated system of construction.

6.2 FLOOR GIRTS, 50 mm x 250 mm, YAKAL, S4S, AIR DRIED

Erection of floor girts was started on 15 February 1985.

Being the major structural component to carry the load including the pre-fabricated wall panels, the species of wood specified was "Yakal".

The floor girts were connected to the "Yakal" wood posts with 2-16 mm Ø machine bolts with nuts and washers for each set of connection.

6.3 FLOOR JOISTS, COCO WOOD, "HARD" GRADE, S4S, AIR-DRIED, 50 mm x 125 mm

Joists location were marked on the floor girts, then joists were

temporarily nailed in place. To install permanently, every other marked joist was removed to give space for the pre-drilling of pilot holes and nailing of the joists in place. The same method applied in previous project (SI/PHI/84/801) whereby pilot holes are pre-drilled on the first board to penetrate the anchor board by at least 6 mm to 9 mm was applied prior to nailing.

The top level of the floor joists were checked by running a string across the installed floor framing system and by the use of a spirit level.

6.4 ROOF GIRTS, S4S, 50 mm x 25 mm YAKAL WOOD, S4S, AIR-DRIED

Installation of roof girts was started on 16 February 1985.

Prior to the installation of the roof girts, plumbness of the posts were checked first with the use of a plumb bob. Then, bracings were mounted and scaffoldings were erected to prepare for the installation of roof girts to wood posts. 50 mm x 200 mm "Yakal" roof girts were anchored to the wooden posts along the two sides of the building with 16 mm Ø x 220 mm machine bolts with nuts and washers. 50 mm x 125 mm x 150 mm "Yakal" wood corbels were mounted to the posts directly below the bottom of the girts to support the roof girts. The corbels were anchored to the wooden posts with 19 mm Ø x 203 mm machine bolts with nuts and washers.

To secure the girts and posts from lateral movements, 50 mm x 150 mm wood tie beams were installed at both ends of the building perpendicular to the roof girts. Tie beams were secured to the wood posts and roof girts with 6 mm x 76 mm x 76 mm x 200 mm and 6 mm x 76 mm x 76 mm x 150 mm steel angle straps with 16 mm Ø x 127 mm machine bolts with nuts and washers.

6.5 FABRICATION OF TRUSSES WITH MACHINE BOLT CONNECTIONS (T-1)

Trusses with machine bolt connections were fabricated from "Hard" grade, S4S, air dried coconut wood using 50 mm x 100 mm size for the bottom chords and web members and 50 mm x 125 mm size for the top chord.

Required lengths were cut and mounted by temporarily joining them with nails. Then pilot holes for the machine bolts were drilled.

It was noted by the Designing Architect during an inspection visit that portions of the truss members were chipped off to accomodate the head of the bolts and the nuts. This was expected to affect the structural strength of the truss. Through further investigation it was found out that the machine bolts used were shorter by 25 mm from the ones specified which is 178 mm long, hence the purpose of chipping off the portion to accomodate the heads of the bolts and nuts.

The Designing Architect formally rejected the fabricated trusses and ordered them replaced, with the ones fabricated as per erection manual and the furnished details.

6.6 FABRICATION OF TRUSSES WITH NAIL-ON PLATE CONNECTIONS

Per suggestion of Mr. Robert M. Hallet of UNIDO all exposed truss systems were done with the nail-on-plate construction. Five exposed trusses at the mid portion of the demonstration house were fabricated with the nail-on plate connections. This was done to make a comparison on the advantage of using nail-on plate connection vis-a-vis the use of machine bolts on truss joints.

The trusses were fabricated from "Hard" grade, S4S, air dried coconut wood using 50 mm x 100 mm sizes of web members and bottom chords and 50 mm x 125 mm size for the top chord as in the fabrication of trusses with the machine bolt connections. Only the bottom chord was reduced to one member and the use of splice blocks was eliminated.

The required lengths and sizes were cut and mounted with nails and wood blocks as temporary connectors. Then plates were mounted on the joints to be secured and pilot holes were pre-drilled for the nails. After checking all joints and dimensions, nails were driven through the plates to the pilot holes until all the truss joints were secured.

6.7 INSTALLATION OF PREFABRICATED ROOF TRUSSES

By 19 April 1985, the structural framework was ready to receive the fabricated truss systems.

Wooden ramps were installed to be used in lifting the trusses to their positions on 23 May 1985 and installation of trusses was started on 24 May 1985.

Positions of trusses on the roof girts were marked. Trusses were mounted on the roof girts and were provided with wooden bracing and temporarily nailed. Then holes were drilled for the machine bolts and strap anchorage system. Trusses were finally anchored to the girts with 4.5mm thick x 50mm x 300mm steel straps with 19mm ø x 178mm, 19mm ø x 127mm and 19mm ø x 75mm machine bolts with nuts and washers.

After an inspection visit made by the Designing Architect, installed trusses found to be defective were ordered taken down for replacement and/or repair.

6.8 PREFABRICATION OF ROOF PANELS

Roof panels were prefabricated at the fabrication shop of the Provincial Engineer's Office. During the inspection visit made by the Designing Architect to the fabrication shop, all the seven units of purlins and brace frame assembly completed were rejected due to cracks and splits on the portion where nails had been driven due to non compliance to the specified procedure of pre-drilling pilot holes prior to nailing on all coconut wood components. The components were rejected for replacement and/or repair.

After the monitoring visit on August 5, 1985, it was observed that the seven units of the roof panel frames previously rejected due to non usage of pilot holes for nailed joints had not been repaired despite the elaborate instruction of the UNIDO Consultant on the technique of repairing cracked and split joints. The coconut wood shingles already on the two frames were not properly treated with CCA preservative as specified. During the second monitoring visit on 8 and 9 November 1985, all roofing shingles were rejected by the

UNIDO Consultant and the Designing Architect. The rejected shingles were brush coated with "Weathercote", produced and commercially distributed by Shell Chemical Company which was not the specified preservative.

Prefabrication of roof panels was not pursued. What the project implementing staff did was to construct the roofing en situ which was made to appear as a simulated prefab construction affair.

6.9 COCO WOOD RIDGE ROLL AND FLASHING

Ridge roll and eave flashing were prefabricated from 125 mm x 125 mm coco wood blanks. The ridge rolls and flashing were installed with open mortise and tenon joints and attached to the roof framing system with galvanized iron straps with lead washers.

6.10 FLOOR BOARDS, COCO WOOD "HARD" GRADE, KILN DRIED, 25mm x 100mm, T&G

During the monitoring visit on August 5, 1985, it was observed that all T & G coco boards were piled together mixing "Hard" grade with "Medium" grade which led to the mistake of using "Medium" grade boards as flooring material.

On the monitoring visit made on 8 and 9 November 1985, after an inspection on the installed floor joists, "springiness" was felt while walking on the floor area of the living-dining areas, which was observed to be composed of mixed "Hard" and "Medium" grades of coco boards instead of the specified "Hard" grade boards.

6.11 FABRICATION OF DOORS, WINDOWS AND JAMBS

The original 50 mm x 125 mm requirement for door window jambs was replaced with 50 mm x 100 mm S4S coco boards. The Project Director decided to have the assemblies of the doors and windows fabricated at the fabrication shop of the Provincial Engineer's Office.

After a monitoring visit on August 5, 1985, the wood jambs inspected were all found to have poor mitered joints and two jamb members were found to be fabricated from "Medium" and "Soft" grade, other than the specified coconut wood "Hard" grade. On the second monitoring visit on 8 and 9 November 1985, the use

of sub-standard grade of coconut wood for window jambs as observed during the previous monitoring visit was not corrected and were already installed in the coco wood demonstration house.

6.12 FABRICATION AND INSTALLATION OF EXTERIOR WALL PANELS AND INTERIOR PARTITIONS

Plans to prefabricate wall panels and partitions and to install them as prefabricated components was not realized. The Project implementing staff installed all exterior walls and interior panels en situ with the conventional measure-cut and nail method, which they decided by themselves without the approval of the UNIDO Consultant and Designing Architect. Hence, all features of the structural framework intended to the prefabricated system of construction was denied of it's purpose.

The project implementing staff ignored the primary aim of this project which is to demonstrate the utility of coconut wood together with traditional wood species as prefabricated components in housing construction.

6.13 BALUSTERS, COCO WOOD, "HARD" GRADE, Ex 75 mm x 75 mm, AIR DRIED

Balusters were fabricated from Ex 75 mm x 75 mm coco wood blanks. The Project Director decided to have the balusters turned at a small joinery shop in the town proper of Pagbilao, Quezon Province after a sample baluster turned at the contractor's shop was approved by the UNIDO Consultant.

During the inspection visit the balusters turned from 75 mm x 75 mm x 920 mm coco wood by the furniture shop in Pagbilao, Quezon Province were mostly rejected due to poor workmanship and sub-standard coco wood materials used. Only fourteen (14) out of the thirty three (33) balusters turned were accepted as satisfactory.

VII. PLUMBING SYSTEM

7.1 GENERAL SCOPE OF WORK

The work done was the supply and installation of the complete plumbing system accomplished in conformity with the rules and regulations

of the National Building Code, the National Plumbing Code, the rules and regulations of Lucena City, Quezon Province and the specifications, drawings and erection manual prepared by the Project Designing Architect and UNIDO Consultant.

No major errors and corrections were done so far in the installation of the plumbing system based on the plans and details prepared by the Designing Architect.

A septic vault was constructed in conformity to the specifications and with all the necessary pipes and fittings complete and ready for service. Plumbing specifications and drawings and all plumbing fixtures complied with the requirements of the American Society for Testing Materials (ASTM), American National Standard Institute (ANSI), National Plumbing Code of the Philippines and American Water Works Association (AWWA).

VIII. ELECTRICAL SYSTEM

8.1 GENERAL SCOPE OF WORK

The work done included the furnishing, fabrication, installation and testing of the complete lighting system, including conduit wiring system, lighting fixtures, convenience outlets, power outlets, switches and lighting panel board for the complete electrical system of the demonstration house.

Detailed installation was in accordance with the latest edition of the Philippine Electrical Code (PEC).

Except for some minor corrections on the installed system, no major defect and/or corrections was done.

Conduit installation, boxes, fittings and accessories conformed to the requirements of the latest edition of the Philippine Electrical Code (PEC). Each run of conduit between boxes or equipment were electrically continous. Threads conform to the American Standards for Tapered Pipe threads cut with approved dies. All electrical devices such as panel boards, convenience and power outlet boxes,

fittings and accessories and safety switches were properly grounded to the nearest water pipe.

IX. ECONOMIC ANALYSIS PARTICIPATION

9.1 OTHER PROJECT ASPECTS

Comparative cost analysis between the Quezon Province and Davao City coco wood demonstration house projects is made impossible because the cost data as submitted by the Project Director were deemed unreliable, unrealistic and unacceptable (see Annex VIII).

X. CONCLUSIONS AND RECOMMENDATIONS

Based on the aims of the project and the terms of reference the following were achieved:

i - the design and erection manual of the coco wood housing unit constructed under SI/PHI/84/801 was adjusted to include traditional wood species "yakal" for the major structure like the posts and girts thereby eliminating tedious and wasteful process of fabricating built-up posts and processing big coco wood sections of 50 mm x 150 mm for girts when installed as it resulted in ugly deflections and required braces for extra support,

ii - the introduction and acceptance to architects, engineers, constructors, real estate developers, government and private sectors that coco wood is a building material if processed properly and a good substitute to traditional wood species ; and

iii - structural design innovations with the use of nail-On-plates on the pre-fabricated trusses proved to be practical and economical for fastening in reducing coco wood truss members.

the other objectives were not achieved and economic analysis not possible due to:

i - the Project implementor did not follow plans, specifications, erection manual and project documents as to pre-fabrication design and systems prepared and submitted by the UNIDO Designing Architect and Consultant, but instead constructed the coco wood demonstration house

on situ and in their own conventional way.

ii - supervision of construction and control is difficult. From the start, the project implementor could not follow the plan layout, could not measure accurately and erect posts in the right plumbness which were all rejected and never corrected. Changes were many and our objectives unimplemented.

iii - economic analysis could not be done because of the unrealistic project cost data submitted by the Project Director which were rejected by the UNIDO Consultants.

The prefabrication system of the coco wood demonstration house was not followed and the results and project data are unrealistic and therefore can not be compared to previous project as to advantages in the prefabrication system.

Recommendations based on the experience are the following:

i - Project proponent should be financially and technically capable before start of the project;

ii - Project proponent must be made fully aware of the importance of the exercise and convinced that as project implementor, plans, manual and project documents and techniques supplied by UNIDO consultants must be understood and followed to achieve realistic result;

iii - The use of appropriate equipment and tools in the prefabrication of components as well as for the installation is a must.

iv - the structural design of smaller, simpler, and lighter components to facilitate ease and accuracy in the assembly process should be introduced. This should be given emphasis especially in rural low cost housing projects where heavy equipment is not available.

v - complicated and thin sections of coco wood like blades and zig zag components of wood jalousies should be excluded but instead metal or aluminum sections should be introduced as the most practical material.

THIRD MONITORING VISIT

4 April 1986

FIGURE 1

View of the South East side of the coco wood house showing substantial completion.

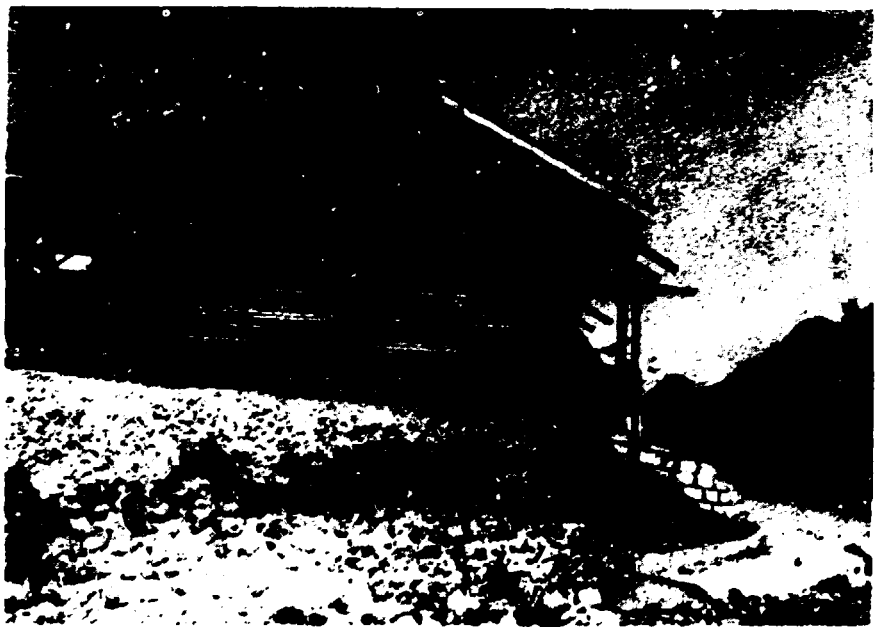


FIGURE 2

View of the West side of the coco wood house.

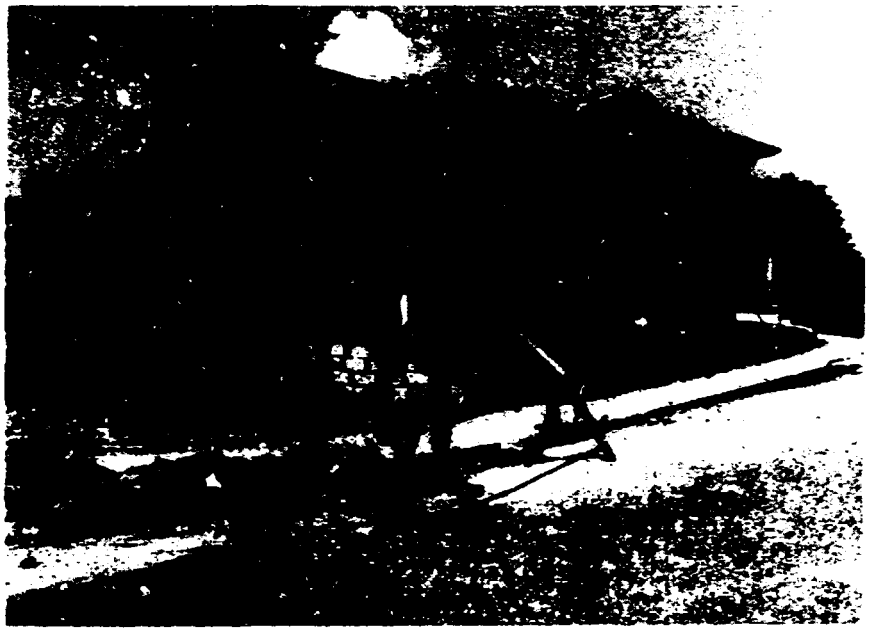


FIGURE 3

View of the South and West
side of the coco wood house

FIGURE 4

Interior view of the coco
wood house showing exposed
trusses with nail on plate connections

XI. CERTIFICATIONS

11.1 Designing Architect and Consultant

GREGORIO G. STA. MARIA & ASSOCIATES
ARCHITECTS • ENGINEERS

34 PITIMINI, PALTOK, SAN FRANCISCO DEL MONTE, QUEZON CITY, PHILIPPINES 3010
TELEPHONES: 97-57-53 • 98-65-28 • 99-11-71 • 99-14-40
CABLE ADDRESS: "STAMARIA" TELEX: (ITT) 40404 TX BOX NBR 2252

September 12, 1986

C E R T I F I C A T I O N

UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION

Project Title: SI/PHI/84/801 Demonstration of Coconut Wood Utilization in Prefabricated Housing

This document is the certification that as the Designing Architect and in charge of supervision of the above captioned project, I hereby certify that the structure has been designed and constructed in accordance with the Philippine National Building Code which is the basis of all building regulations in the Philippines.

This is to certify further that the Structural Engineer (licensed Civil Engineer), Sanitary Engineer and the Professional Electrical Engineer who designed and inspected the project have certified in writing that their respective design, construction and installation were executed in accordance with the plans, design and erection manual.

Written certifications of Cezar A. Caliwara, Structural Engineer; Estelita Y. Gutierrez, Sanitary Engineer; and Jose Enriquez, Professional Electrical Engineer are all attached herewith and formed part of this certification.

Quezon City, Metro Manila
Republic of the Philippines

GREGORIO G. STA. MARIA
Architect
Registration Certificate No. 1341
Professional Tax Receipt (License)
No. 859-B, dated January 10, 1986
Issued at Quezon City, Metro Manila

11.2 Structural Engineer Consultant

TECPHIL
THE ENGINEERS COLLABORATIVE PHILIPPINES
2ND FLOOR, DELTA BUILDING
QUEZON AVE., COR. WEST AVE., QUEZON CITY
PHILIPPINES

ENGINEERING SERVICES:
CIVIL WORKS
STRUCTURAL
MECHANICAL
ELECTRICAL
SANITARY

April 5, 1986

Architect Gregorio G. Sta. Maria
34 Pitimini Street, Paltok, SFDM
Quezon City, Metro Manila

Subject: DEMONSTRATION OF COCONUT WOOD UTILIZATION IN PREFABRICATED HOUSING UNIDO PROJECT SI/PHI/84/801 LUCENA CITY, QUEZON PROVINCE, PHILIPPINES

Dear Sir:

This is in connection with our inspection trip to the site of the prototype coconut wood house at Lucena City, Quezon Province, on April 4, 1986.

We are submitting herewith our observations and comments as follows:

1. The structures has been designed and constructed in accordance with the Philippine National Building Code which is the basis of all building regulations in the country.
2. The structural framework made of traditional wood (yacal) and coconut lumber was built in accordance with the plans not prefabricated but instead erected the coco wood demonstration house en situ.
3. Although there are visible defects in coco wood truss anchorage, it was immediately corrected by installing wood blocks to connect the truss to the roof girts firmly.
4. There are deflections in some floor joists and springy but these members are still structurally sound and can safely carry the required loads.

Should there be any further question, please do not hesitate to communicate with us.

Very truly yours,

CESAR A. CALIWARA
President
PRC Certificate No. 1781 Civil Engineer
PTR No. 198793 dated Jan. 30, 1986, QC

CAC:mip

11.3 **Sanitary Engineer Consultant**

April 4, 1986

ARCHITECT GREGORIO G. STA. MARIA
No. 34 Pitimini Street, Paltok,
San Francisco del Monte, Quezon City
Metro Manila

Dear Sir:

This is a letter certification in connection with the inspection of the project Demonstration of Coconut Wood Utilization in Prefabricated Housing in Lucena City, Quezon Province on April 4, 1986, as Consulting Sanitary Engineer.

I am certifying the following:

1. That the Plumbing System has been designed and constructed in accordance and following standards:

   1.a ASTM - American Society for Testing and Materials

   1.b ANSI - American National Standards Institute
   National Plumbing Code of the Philippines

   1.c AWWA - American Water Works Association

2. That the design and construction was done in accordance with the Erection Manual.

This certification was issued as the Consulting Sanitary Engineer of the project of UNDP and UNIDO.

LUCENA CITY, QUEZON PROVINCE
PHILIPPINES
April 4, 1986

Sincerely yours,

Estelita Y. Gutierrez
ESTELITA Y. GUTIERREZ
Sanitary Engineer

PROFESSIONAL REGULATION COMMISSION
Certificate No. 741

PROFESSIONAL TAX RECEIPT (LICENSE)
No. 934825 dated 21 July 1986
issued at Quezon City

II.4. Electrical Engineer Consultant

April 4, 1986

ARCHITECT GREGORIO G. STA. MARIA
No. 34 Pitimini Street, Paltok
San Francisco Del Monte, Quezon City
Metro Manila

Dear Sir:

This is a certification in connection with the inspection trip to the site of the Demonstration of Coconut Wood Utilization in Prefabricated Housing in Lucena City, Quezon Province, wherein I am the Consulting Electrical Engineer.

I am submitting herewith my observation and comments as follows:

1. The Electrical System has been designed and installed in accordance with the latest edition of the Philippine Electrical Code (PEC) which is the basis of all electrical regulations in the country.

2. The inspection shows that the electrical works was installed in accordance with the plans and erection manual.

This letter certification was issued as one of the requirements being the Consulting Electrical Engineer of the project.

Lucena City, Quezon Province
Philippines
04 April 1936

Very truly yours,

JOSE E. ENRIQUEZ
Professional Electrical Engineer

Professional Regulation Commission
Certificate No. 924

Professional Tax Receipt (License)
No. 12161 dated 2-28-86
issued at R.C.,
Metro Manila

ANNEX 1

JOB DESCRIPTION

POST TITLE	:	Designing Architect
DURATION	:	Five months
DATE REQUIRED	:	As soon as possible
DUTY STATION	:	Lucena City, Quezon Province
PURPOSE OF PROJECT	:	To demonstrate the feasibility of utilizing coconut wood for a low cost housing project in Quezon Province using prefabricated building components by erecting a prototype unit.
DUTIES	:	1. On the basis of experience, adjust the design of the coconut wood housing unit constructed under SI/PHI/83/801 to introduce prefabrication and combine coconut wood with other locally available building materials ; 2. Prepare architectural plans and erection manual for the above ; 3. Cooperate with consultant in coconut wood processing technology on : (a) determination of components, (b) setting up of systems for prefabrication, and (c) optimization of the use of coconut wood lumber and other building materials ; 4. Supervise construction of a prototype housing unit in Quezon Province ; 5. Provide certification of compliance with designs and building regulations - structural, electrical and sanitary ; 6. Cooperate with the local consultant in an economic analysis and cost estimates for the proposed prototypes as well as low-cost housing project ; and 7. Make recommendations, with local consultant, to the Government of Quezon Province regarding the utilization of coconut wood in the proposed housing project including cost estimates.

Annex I

QUALIFICATIONS : Architect, duly licensed to practice in the Philippines, with experience in the design and supervision of construction of housing units. Previous experience in housing units made of coconut wood is preferrable.

LANGUAGE : English and Pilipino

BACKGROUND INFORMATION : The government of the Republic of the Philippines has embarked on a programme to replace existing coconut trees with more productive hybrid species. An average of 3,500,000 coconut tree stems is expected to become available annually when the program is in full swing. In order to avoid potential phyto-sanitary problems posed by unused coconut stems left to rot in the coconut farms, the Philippine government has launched a complimentary program to identify further uses of coconut stems and make their utilization a part of the nation's economic development program. The use of coconut wood in housing and construction offers an immediate solution to the problem of disposing coconut stems cut during the replanting activities.

Low cost housing units have been designed and erected, en situ, under previous UNIDO projects. A design for prefab low cost housing units maximizing the use of coconut lumber, and the construction of a prototype prefab housing unit are expected to be achieved in this Project.

ANNEX II

Lucena City
March 11, 1985

Engr. Abelardo Radovan
Quezon Provincial Engineer and
Project Director
Demonstration of Coconut Wood Utilization
in Prefabricated Housing
United Nations Industrial Development Organization
PROJECT No. SI/PHI/84/801

Dear Sir:

In connection with our on going project captioned above, I wish to submit to you the following:

1. Erection Manual based on Architectural, structural design earlier submitted to your office and
2. One (1) set of Architectural, structural, electrical and Sanitary plans with actual dimensions obtained in the job site compared to the original dimensions in the plans.

New sets of plans also contain addendum as follows:

2.a Use of nail on plate system of connections of roof trusses construction along the living, dining and kitchen areas as suggested by Mr. Robert Hallet, UNIDO Industrial Field Adviser during his last visit to maximize prefabrication and modern timber/cocowood truss construction

2.b Deleting and removal of one (1) center post and roof girts as shown in the plans to demonstrate that by nail on plate system, center support is not necessary and yet structural stable.

Excess yacal girts will be used instead as additional stair treads (please refer to plans).

3. Balcony will be extended to 1.50 meters to make use of existing lengths of floor girts.

4. Extension of roof eaves along front elevation or balcony side (please refer to plans).

All roof trusses installed and constructed with machine bolts connection are rejected due to faulty construction wherein machine bolts head were recessed to the truss members thereby reducing its structural stability (recessed clearance for bolt heads and nuts). Plans not followed.

New trusses with machine bolts connection will only be used along bedroom areas (please refer to plans).

Adjust and correct mistakes in layout, right angles, levels, plumbs, alignment of wooden posts.

For your information and guidance.

Very truly yours,

GREGORIO G. STA. MARIA
Project Designing Architect
and UNIDO Consultant

ANNEX III

August 20, 1985

Mr. Nicholas Brown
Assistant Resident Representative
United Nations Development Programme -Manila
106 Amorsolo Street, Legaspi Village
Makati, Metro Manila

Dear Mr. Brown,

In connection with your note on August 12, 1985 together with the draft of the report re: Monitoring Visit 5 August 1985 to Lucena of the Project PHI/84/801 Demonstration of Coconut Wood in Pre-fabricated Housing, I wish to make the following report as the designing architect as follows:

1. That the accomplishment as of August 5, 1985 based on construction work is only 19.87% in comparison to the project estimated construction cost. Please refer to the photos marked A, B, C, D and E as well as the estimate sheets attached herewith;

   Accomplishment including coconut wood processing and prefabrication works based on Mr. H. Brien's reports and assuming all the materials are intact and in good conditions is more or less 42.60%.

2. Based on the above figures the status of the project is very slow as the 6 months duration of the project is over and UNIDO Consultant Mr. H. P. Brien's contract expired as of May 31, 1985 and therefore no UNDP and UNIDO assistance is available for wood processing and pre-fabrications;

3. That as the designing architect of the project, I will provide advisory services on the construction aspect and supervision together with my structural engineer consultant Engr. Cesar A. Caliwara;

4. Existing structures should be protected against exposure to the elements and infestation otherwise in about 3 to 4 months, coconut wood trusses and joists will deteriorate and deform.

5. Strongly recommending to assign coconut wood processing expert during the resumption of the project to insure that the technology will be transferred properly and attain the achievement of its objectives.

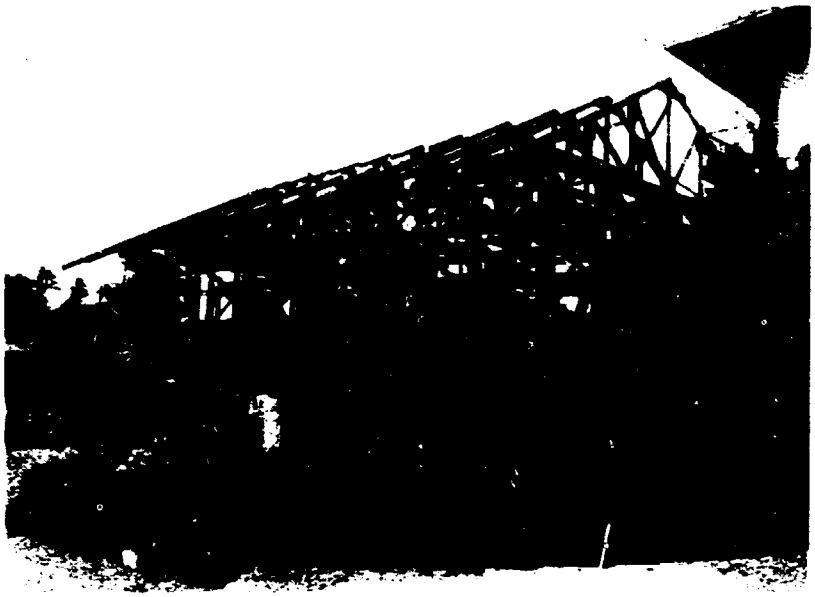
For your information and guidance.

Very truly yours,

GREGORIO G. STA. MARIA
Project Designing Architect
and Consultant

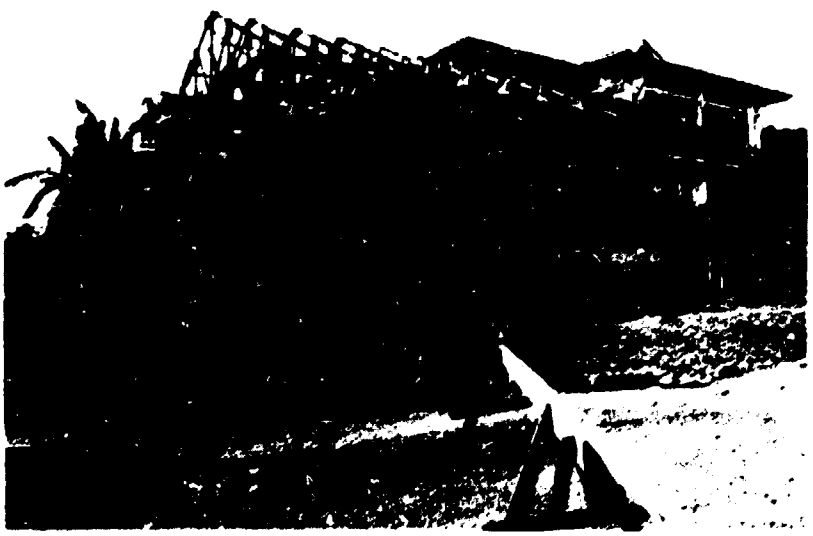
Annex III

A



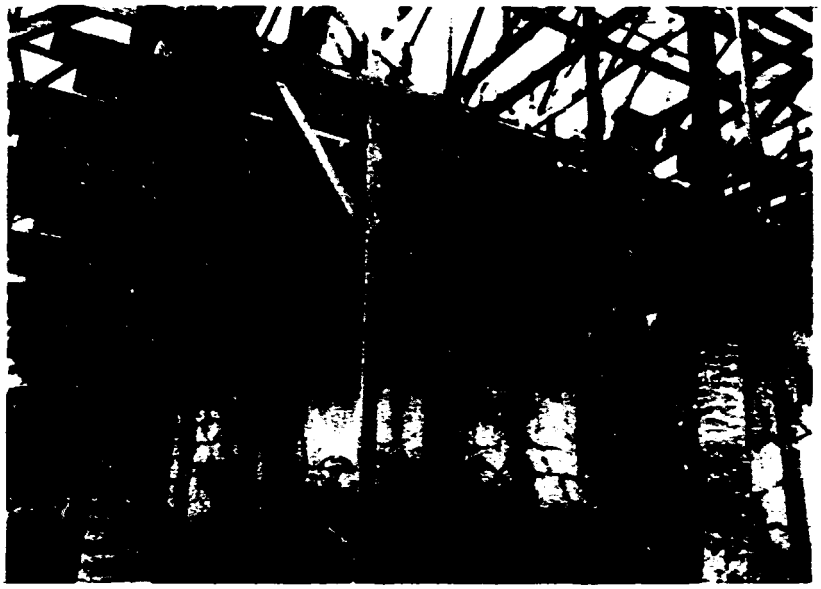
B

C



Annex III

D



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Annex III

PROJECT : SI/PHI/84/801 - DEMONSTRATION OF COCONUT WOOD UTILIZATION IN PRE-FABRICATED HOUSING

PREPARED BY : EDH

CHECKED BY : GGM

LOCATION : LUCENA CITY, QUEZON PROVINCE

DATE : AUG. 20, 1985

EVALUATION OF ACCOMPLISHMENT AS OF AUG. 5, 1985

ITEM NO.	DESCRIPTION	ACCOMPL. %		WEIGHTED %		EQUIV. %
1.	EXCAVATION	66.21		0.474		0.314
2.	BACKFILL	100.00		0.216		0.216
3.	CONCRETING & MASONRY WORKS	34.92		9.227		3.222
4.	REINFORCING STEEL	70.32		2.408		1.693
5.	FORMWORKS	95.00		1.672		1.588
6.	CARPENTRY WORKS					
	COCO LUMBER	*13.72 70.47		40.046		*5.494 28.220
	YAKAL	95.44		4.873		4.651
7.	HARDWARES (ROUGH)	44.79		6.026		2.699
	* ACCOMPLISHMENT BASED ON CONSTRUCTION WORK ONLY				*	19.877%
	ACCOMPLISHMENT INCLUDING MILLING & FABRICATION WORKS					42.603%

Annex III

PROJECT : SI / PHI / 84 / 801 - DEMONSTRATION OF COCO-WOOD UTIL. IN PRE-FABRICATED HOUSING
LOCATION : LUCENA CITY, QUEZON PROVINCE
PREPARED BY : EDH
CHECKED BY : GSm
DATE : AUG. 20, 1985

ITEM NO.	D E S C R I P T I O N	MATERIAL	LABOR	TOTAL		WEIGHTED %
1.	EXCAVATION	-	1166.00	1166.00		0.474
2.	BACKFILL	-	532.00	532.00		0.216
3.	CONCRETING & MASONRY WORKS	17452.20	5236.26	22688.46		9.227
4.	REINFORCING STEEL	5347.05	572.90	5919.95		2.408
5.	FORM WORKS	3161.58	948.47	4110.05		1.672
6.	CARPENTRY WORKS					
	COCO-WOOD	75742.42	22722.73	98464.55		40.046
	YAKAL	9216.76	2765.03	11981.79		4.873
	Sub-total			110446.34		44.919
7.	HARDWARES	11397.00	3419.10	14816.10		6.026
8.	FINISHING HARDWARES	14586.00	4375.80	18961.80		7.712
9.	PLUMBING WORKS					
	FIXTURES	12010.00	3603.00	15613.00		6.350
	ROUGHING IN	8000.00	2400.00	10400.00		4.230
10.	ELECTRICAL WORKS	17500.00	INCL.	17500.00		7.117
11.	WOOD PRESERVATION	10,000.00	3000.00	13000.00		5.287
12.	PAINTING & VARNISHING	8250.00	2475.00	10725.00		4.362
	TOTAL		P	245878.70		100 %

ANNEX IV

UNITED NATIONS DEVELOPMENT PROGRAMME
OFFICE OF THE RESIDENT REPRESENTATIVE
IN THE PHILIPPINES

NEDA SA MAKATI BUILDING
106 AMORSOLO STREET
LEGASPI VILLAGE, MAKATI
METRO MANILA
TELEPHONE NOS: 85-86-11 TO 25
REFERENCE:

P.O. BOX 7285 ADC
PASAY CITY
METRO MANILA
CABLE ADDRESS: UNDEV PRO MANILA
TELEX : RCA 7222298
EASTERN 63686

SSA No. 85/24

(P.SC) SPECIAL SERVICE AGREEMENT

MEMORANDUM OF AGREEMENT MADE THIS 1st day of February 19 85, between the UNITED NATIONS DEVELOPMENT PROGRAMME (hereinafter referred to as "UNDP") and Gregorio G. Sta. Maria (hereinafter referred to as "the subscriber") whose address is 34 Pitimini St., Paltok, San Francisco del Monte, Quezon City.

WHEREAS UNDP desires to engage the services of the subscriber on the terms and conditions hereinafter set forth, and

WHEREAS the subscriber is ready and willing to accept this engagement of service with UNDP on the said terms and conditions.

NOW, THEREFORE, the parties hereto agree as follows:

1. STATUS OF THE SUBSCRIBER

The subscriber shall be considered as having the legal status of an independent contractor. The subscriber shall not be considered in any respect as being a staff member of UNDP.

2. NATURE OF SERVICES

The subscriber shall perform the services described hereunder.

Duties	Work Schedule
(See attached)	1-18 Feb.: Invitations and Planning
	20-28 Feb.: Implementation

3. DURATION OF AGREEMENT

This agreement shall commence on the 1st day of February 1985, and shall expire on the satisfactory completion of the services described above, but not later than the 28th day of February, 1985, subject to the provision of Article 9 below.

/...

4. CONSIDERATION

As full consideration for the services performed by the subscriber under the terms of this agreement, and subject to the provision of Article 9 below, UNDP will pay the subscriber upon certification that the services have been satisfactorily performed the sum of ₱9,000.00
(in figures)

NINE THOUSAND PESOS
(in words)

No statement of earnings will be issued by UNDP to the subscriber. The subscriber is responsible for any taxes levied on the monies received under this agreement.

5. PARTICIPATION IN NATIONAL SOCIAL SECURITY SCHEME

UNDP shall make provision for payment of the employer's share of the contributions for the coverage of the subscriber under the national social security scheme, if any, and the subscriber shall be responsible for payment of his share of contributions, as required.

6. COMPENSATION FOR SERVICE-INCURRED INJURY

In the event of injury, illness or death attributable to the performance of service on behalf of UNDP under the terms of this agreement and for which no compensation shall be payable to the subscriber or his legal representative under the national social security scheme, the subscriber shall be eligible for compensation equivalent to that which would be payable under Appendix D to the Staff Rules of the UN to a staff member of UNDP of similar level; such compensation to be determined by UNDP on the basis of those Staff Rules.

7. RIGHTS AND OBLIGATIONS OF THE SUBSCRIBER

(a) The rights and obligations of the subscriber are strictly limited to the terms and conditions of this agreement. Accordingly, the subscriber shall not be entitled to any benefit, payment, subsidy, compensation or entitlement, except as expressly provided in this agreement.

(b) The subscriber shall be solely liable for claims by third parties arising from the subscriber's own negligent acts or omissions in the course of performing this agreement, and under no circumstance shall UNDP be held liable for such claims by third parties.

(c) The title rights, copyrights, and all other rights of whatsoever nature in any material produced under the provisions of this agreement shall be vested exclusively in UNDP.

/...

Annex IV

8. UNPUBLISHED INFORMATION

The subscriber shall not communicate to any person or other entity any unpublished information made known to him by UNDP in the course of performing his obligations under the terms of this agreement except upon authorization by UNDP.

9. TERMINATION

Either party may terminate this agreement at any time by giving the other party 5 day(s) notice in writing of its intention to do so. In the event of such termination the subscriber shall be compensated for the actual amount of work performed to the satisfaction of UNDP on a pro rata basis.

10. ARBITRATION

Any dispute arising out of or in connexion with this agreement shall be submitted to arbitration in New York by a single arbitrator agreed to by both parties, if attempts at settlement by negotiation will have failed. If the parties are unable to agree on a single arbitrator within thirty days of the request for arbitration, then each party shall proceed to appoint one arbitrator and the two arbitrators thus appointed shall agree on a third. Failing such agreement, either party may request the appointment of the third arbitrator by the President of the UN Administrative Tribunal. The arbitrator(s) shall rule on the costs which may be divided between the parties. The decision rendered in the arbitration shall constitute final adjudication of the dispute.

11. SPECIAL CONDITIONS

IN WITNESS WHEREOF, the parties hereto have executed this agreement.

UNITED NATIONS DEVELOPMENT PROGRAMME

Anders Frismark
Resident Representative a.i.

Gregorio G. [illegible] Maria
Subscriber

Allotment Account Number: BL-17, UC/RAS/84/267 (Cable 33416 from Vassiliev, UNIDO).

Annex IV

2. NATURE OF SERVICES

Duties

Prepare and organize in conjunction with the MHS Regional Secretariat Network, RAS/82/012, the seminar and study tour for international participants based on the work of projects SI/PHI/83/801 and SI/PHI/84/801, especially ensuring support of the professional bodies of architects, civil engineers and contractors plus influential persons in public service (Coconut Authority, Public Works, etc.).

ANNEX V

INTERNATIONAL SEMINAR ON TECHNOLOGY OF COCONUT WOOD PROCESSING AND UTILIZATION OF COCONUT WOOD AS BUILDING MATERIAL

organized by

The Government of Quezon Province, Philippines

in cooperation with

United Architects of the Philippines
Philippine Institute of Civil Engineers
Philippine Constructors Association
United Nations Development Programme
United Nations Industrial Development Organization

to be held in Lucena City, Quezon Province
20 – 22 February 1985

Venue: City Antigua Building

Mr./Ms._____
Participant/Guest

SCHEDULE OF ACTIVITIES

19 February	– Arrival of Foreign and Local Participants	
20 February		
9:00 AM	– Registration of Participants	
10:30 AM	– Opening Ceremonies	
	– Philippine National Anthem	
	– Welcome Remarks:	Mayor Mario L. Tagarao
	– Introduction of Guests and Participants ..	Engr. Cesar A. Caliwara
	– Opening Remarks:	Mr. Robert Hallett Industrial Development Officer UN Industrial Dev. Organization
	– Introduction of Keynote Speaker	Engr. Romeo L. Alcala Pres. PICE, Quezon Chapter and I Eng'ng District, MPWH
	– Address of the Keynote Speaker:	The Hon. Min. Aber P. Canlas Member of Parliament and Deputy Minister, Ministry of Public Works and Highway
	– Response:	Gov. Eladio A. Caliwara
12:30 PM	– L U N C H E O N – Host:	Dutch Boy Phils. Inc.
2:00 PM	– The Economics of Utilization and Processing of Coconut Wood Components for Low Cost Housing Construction Resource Person:	Mr. Horatio P. Brion Wood Processing Expert UN Industrial Dev. Organization
2:35 PM	– The Design, Capabilities and Potentials of Movable Sawmill for Small Scale Coconut Wood Processing Resource Person:	Mr. Antonio A. Salita Science Research Specialist II FPRDI, Los Banos, Laguna
3:10 PM	– Machining Properties of Coconut Wood Resource Person:	Mr. Arnold P. Mesteiro Senior Science Research Specialist FPRDI, Los Banos, Laguna

3:45 PM – Preservation of Coconut Wood
Resource Person: ..... Mr. Pelino K. Sibiran
Supervising Science Research Specialist
FPRDI, Los Banos, Laguna
COCKTAILS-FELLOWSHIP: Host ..... UAP, PICE and PCA Quezon Chapter

21 February
9:00 AM – Materials for Preservation, Treatment and Finishing of Coconut Wood and Traditional Lumber Species
Resource Person: ..... Mr. David D. Bonney
Senior Vice-President, Dutch Boy Phils, Inc.

9:35 AM – Air-and Kiln-Drying Properties of Coconut Lumber
Resource Person: ..... Mr. Melencio G. Laxamara
Senior Science Research Specialist
FPRDI, Los Banos, Laguna

10:10 AM – Industrial Application of Coconut Wood Processing Techniques
Resource Person: ..... Mr. Horatio P. Brion
Wood Processing Expert
UN Industrial Dev. Organization

10.45 AM – Basic Research Findings on the Structural Strength Characteristics of Coconut Timber and Boards
Resource Person: ..... Mr. Enrique B. Espiloy, Jr.
Senior Science Research Specialist
FPRDI, Los Banos, Laguna

11:20 AM – The Structural Design Aspects of Coconut Wood Utilization in Low Cost Housing Construction
Resource Person: ..... Engr. Cesar A. Caliwara
President, TECPHIL
Consulting Structural Engineer

12:30 PM – L U N C H E O N – Host: ..... Dutch Boy Phils. Inc.

FREE AFTERNOON

7:00 PM – D I N N E R – Entertainment and Cultural Presentation
Host: ..... Quezon Provincial Government

22 February
9:00 AM – Plant Visit and Demonstration
1. Tantuco Sawmill, Candelaria, Quezon
2. Tantuco Planning Mill, Sariaya, Quezon
3. Prefabrication Site, Pagbilao, Quezon
4. Demonstration of Coconut Wood Utilization in Prefabricated Low Cost Housing, Lucena City

12:30 PM – L U N C H E O N – Host: ..... Sawmill and Lumber Companies

2:00 PM – Experience in Coconut Wood Utilization Prior to Application of Current Coconut Wood Technology
Resource Person: ..... Archt. Aquiles C. Paredes
Fellow, United Architects of the Phils.

230: PM – Experience in Application of Coconut Wood Technology and Utilization at SPDA, Davao City 1984
Resource Persons: ..... Engr. Pio J. A. Velasco
Engr. Oscar C. Paradero

3:00 PM – Architectural Design and Construction Aspects in Low Cost Housing Using Coconut Wood as Building Material
Resource Person: ..... Archt. Gregorio G. Sta. Maria
Project Designing Architect and Consultant
UN Industrial Dev. Organization

4:00 PM – Closing Ceremonies
– Introduction of Guest of Honor and Speaker: ..... Atty. Pedro C. Pujalte, Jr.
Board Member, Quezon Province
– Address of the Guest of Honor and Speaker: ..... The Hon.Min. Rolando de la Cuesta
Chairman, Philippine Coconut Authority
– Acknowledgement, Awards and Recogni
– Closing Remarks: ..... Ivan E. Pluhar
Senior Field Adviser
UN Industrial Dev. Organization

Engr. Cesar A. Caliwara
Master of Ceremonies

Seminar Registration Fee ..... P300.00 Per Participant

Annex V.

INTERNATIONAL SEMINAR EXECUTIVE COMMITTEE

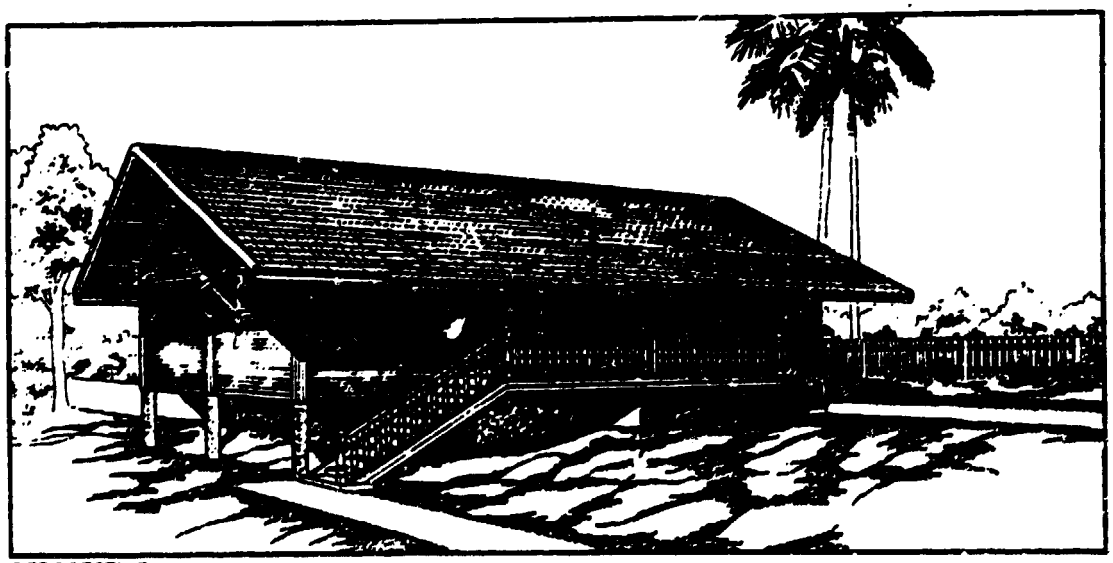
Engineer Cesar A. Caliwara
Chairman

Mr. Horatio P. Brion
Architect Gregorio G. Sta. Maria
Architect Cesar V. Canchela
Engineer Bernardo O. Armeña
Directors

Dr. Ivan E. Pluhar
Adviser

CHAIRMEN OF LOCAL COMMITTEES

Architect Gil A. Montes, President UAP, Quezon Chapter
Engineer Romeo L. Alcala, President PICE, Quezon Chapter
Mr. Jimmy T. So, President QCA, PCA, Quezon Chapter
Mr. Agapito M. Arazo, Quezon Provincial Development Administrator
Engineer Abelardo S. Radovan, Quezon Provincial Engineer
Mr. Amado D. Javellana, City Planning & Dev. Coordinator



PERSPECTIVE

Annex VI

SOUTHERN PHILIPPINES SEMINAR ON COCONUT WOOD AS BUILDING MATERIAL
Davao City, Philippines
SPDA Maharlika I Hall
10 - 13 April 1985

Sponsored by the

Southern Philippines Development Authority
and the
United Nations Industrial Development Organization

in collaboration with the

Philippine Coconut Authority
Ministry of Human Settlements
Coconut Federation of the Philippines

and the Davao Chapters of the

United Architects of the Philippines
Philippine Institute of Civil Engineers
Philippine Constructors Association

Mr./Ms. .....
Participant/Guest

SCHEDULE OF ACTIVITIES

Wednesday
10 April

8:00 a.m.	– Registration	
8:30 a.m.	– Opening Ceremonies	
	– Pambansang Awit	
	– Welcome Address	Hon. Elias B. Lopez Mayor, Davao City
	– Introduction of Guests and Participants	
	– Opening Remarks	Antonio N. Venadas Administrator, SPDA
	– Introduction of Guests of Honor and Speaker	
	– Address of the Guest of Honor and Speaker	Hon. Min. Rolando de la Cuesta Chairman, Philippine Coconut Authority
9:45 a.m.	– COFFEE BREAK	
10:00 a.m.	– Overview of Coconut Wood Potential and Use	Horatio P. Brion Wood Processing Expert, UNIDO
10:30 a.m.	– DISCUSSIONS/OPEN FORUM	
11:00 a.m.	– Coconut Stems Availability	Rodolfo M. Madrazo Center Manager, PCA-ZRC
11:30 a.m.	– DISCUSSIONS/OPEN FORUM	
12:00 noon	– LUNCH – Host: PHILIPPINE COCONUT AUTHORITY	
	– Guest Speaker	Lt. Col. Felix V. Duenas, Jr. Administrator, PCA
1:30 p.m.	– Visit to:	
	– SPDA Coconut Wood House Demonstration Projects	
	– Davao Gulf Lumber Corp. Sawmill at Matina Aplaya	
	– Davao Wood Preservation Co., Inc. Treatment Plant at Bunawan	
7:00 p.m.	– DINNER	

Thursday		
11 April		
8:30 a.m.	– Conversion of Coconut Logs – Large Scale Sawmill Operations	Antonio Arroyo, Jr. Plant Manager, Davao Gulf Lumber Corp.
	– Conversion of Coconut Logs – Small Scale Operations	Ruel Hontiveros Proprietor, BNH Lumber Co.
	– Marketing Prospects of Cocowood Lumber	Bienvenido Estanislao Vice-Pres., Davao Gulf Lumber Corp.
10:00 a.m.	– DISCUSSIONS/OPEN FORUM	
10:30 a.m.	– COFFEE BREAK	
10:45 a.m.	– Strength Properties of Coconut Sawn Wood	Enrique B. Espiloy, Jr. FPRDI, Los Banos, Laguna
11:15 a.m.	– DISCUSSIONS/OPEN FORUM	
11:45 a.m.	– LUNCH – Host: JARDINE DAVIES, INC. PRODUCT PRESENTATION	
1:00 p.m.	– Concepts, Techniques and Test Results: Seasoning and Preservation of Cocowood	Felino R. Siriban FPRDI, Los Banos, Laguna
1:30 p.m.	– Industrial Scale Pressure Preservation of Coconut Poles and Sawn Wood	Lito M. Lorenzana Vice-President & Resident Manager Davao Wood Preservation Co., Inc.
2:00 p.m.	– Preservative Materials for Coco Wood and Other Traditional Wood Species	Mr. W.F.P. Neill Chief Chemist Solignum Limited Jardine Davies, Inc.
2:30 p.m.	– DISCUSSION/OPEN FORUM	
3:00 p.m.	– COFFEE BREAK	
3:15 p.m.	– Design for Frame Construction, Traditional Filipino Styles, Fabrication and Building Aspects of Coconut Wood	Gregorio G. Sta. Maria, UAP Consultant, UN Industrial Development Organization
3:45 p.m.	– DISCUSSION/OPEN FORUM	
6:00 p.m.	– Cultural Presentation	
	– DINNER	
Friday		
12 April		
9:00 a.m.	– Concepts of Light Timber Framing Design and the Use of the Structural Component of Housing Design as a Basis for Insurance and Financing Purposes	Cesar A. Caliwara, PICE President, TECPHIL Consulting Structural Engineer
9:30 a.m.	– DISCUSSIONS/OPEN FORUM	
10:00 a.m.	– COFFEE BREAK	
10:15 a.m.	– Prefabrication Techniques and Building Erection Aspects	Horatio P. Brion Consultant, UN Industrial Dev. Organization
10:45 a.m.	– DISCUSSIONS/OPEN FORUM	
12:00 noon	– LUNCH – Host: JARDINE DAVIES, INC.	
	– Guest Speaker	Hon. Min. Rodolfo del Rosario Minister of Natural Resources
1:30 p.m.	– Organization of Working Groups:	
	– A. Coconut Wood Conversion	
	– B. Design and Construction	
2:00 p.m.	– Detailed Discussions, Workshop Groups A and B; Preparation of Group Reports	
	Chief Rapporteur	Horatio P. Brion, UNIDO
	– Group A Rapporteurs: C. Caliwara (PICE)	Group B Rapporteurs: G. Sta. Maria (UNIDO) UAP
	Group Leader A. Arroyo (DGLC) R. Jocon (ZRC) O. Paradero (SPDA) F. Siriban (FPRDI)	Group Leader E. Espiloy (FPRDI) R. Hontiveros (BNH) R. Romeral (MHS-BDC) P. Velasco (SPDA)
6:00 p.m.	– FREE EVENING	

Annex VI

Saturday
13 April

9:00 a.m.	– Presentation of Results – Working Group A	Cesar A. Caliwara PICE
9:30 a.m.	– Presentation of Results – Working Group B	Gregorio G. Sta. Maria, UAP UNIDO Consultant
10:00 a.m.	– General Observations and Action Recommendations Moderator	Horatio P. Brion UNIDO Consultant
11:00 a.m.	– Closing Ceremonies: – Introduction of Guest of Honor and Speaker – Address of Guest of Honor and Speaker – Presentation of Acknowledgements, Recognition and Awards	Antonio N. Venadas SPDA, Administrator
	– Closing Remarks	UNIDO/UNDP - MANILA
12:30 p.m.	– LUNCH	
2:00 p.m.	– Visit to: – Governor's Office Davao del Sur – Dipa Seminar Hall (Cocowood) – Cocoa Investment Inc. Plantation Digos, Davao del Sur – Guiling Agricultural Development Corp. Davao del Sur	

Miss Susan B. Palad
SPDA, CRMCS
Master of Ceremonies

Seminar Registration Fee P500.00/Participant

SOUTHERN PHILIPPINES SEMINAR EXECUTIVE COMMITTEE

Architect Gregorio G. Sta. Maria
Chairman

General Antonio N. Venadas
Co–Chairman

Mr. Horatio P. Brion
Engineer Cesar A. Caliwara
Architect Cesar V. Canchela
Engineer Bernardo O. Armeña
Directors

CHAIRMEN OF LOCAL COMMITTEES

Mr. Rodolfo H. Allado, President PCA, Davao Chapter
Mr. Uldarico Dumdum, President PICE, Davao Chapter
Architect Jaime P. Ansaldo, President UAP, Davao Chapter
Davao City Government

ANNEX VII

9 April 1986

NOTE FOR THE FILE

SI/PHI/84/801 Demonstration of Coconut Wood Utilization in Prefabricated Housing

1. A monitoring visit was undertaken to Lucena City in connection with the above project on 4 April 1986, together with Mr. Erik Bos, JPO, UNDP/UNIDO, Manila, Arch. G. Sta. Maria, Engr. C. Caliwara and Mr. H. Brion. Engr. A. Radovan was present at the site during the entire course of the visit and the discussions.

2. The immediate purpose of the visit was to find a professionally satisfactory rounding up project activities given the long delays that have already taken place and the fact that UNIDO funds on the project have already been over obligated.

3. We were informed by Engr. Radovan that work on the demonstration building had stopped since February 1986 when the Government budget was frozen and no expenditures could be incurred. No indications were forthcoming as to when the situation with regard to the Government counterpart funds would improve nor whether funds would be available for continuation of the activities towards the completion of the demonstration building in all aspects. Given the present fluid situation it is not possible to make any conjecture in this regard.

4. On inspection, however, it is my opinion that

a) all the structural members of the building have been erected and are in place;

b) the finishing work including wall panellings, ceiling boards, etc. have been completed in a part of the building;

c) sanitary works as well as electrical works are incomplete, however, the tiling of the toilet/bath section has been completed;

d) it was also found that some of the trusses were not properly fixed but it was understood this will be corrected at the first opportunity The present status with regard to the building construction definitely provides a reliable technical basis for making extrapolations with regard to both the technical and economic aspects of the completed building. Since the future programme for completion of the building is uncertain, it is recommended that the terminal technical and economic reports be completed on the basis of the experience so far available and data so far generated.

5. Everyone present during the visit namely, Arch. Sta. Maria, Engr. Caliwara, Mr. Brion and Engr. Radovan were in complete agreement with the above course of action.

Annex VII

Specifically, these involve:

a) Arch. Sta. Maria would proceed to prepare his terminal report based upon the experience and data so far available and drawing attention to the works still to be completed, the variations from the originally intended design and plan of action and providing perceptive conclusions on the various aspects for which this project was specifically designed, namely

   i) degree of prefabrication feasible

   ii) extent of use of non-coco timber in order to lead to optimal timber utilization

   iii) jointing details, etc.

b) Mr. Brion would, based upon data of cost so far incurred, estimate the cost for the completed building and make necessary cost comparisons with the Davao experience.

c) For the above purpose Engr. Radovan promised to make available the data of cost so far incurred in the next week or maximum 15 days and Engr. Caliwara undertook to follow up on this. Should for any reason the data of cost not be available within a reasonable time, it is suggested that the cost data should be constructed using extrapolations of man-hour estimates from Davao experience and applying local labor rates. Mr. Brion is in agreement with this suggestion.

It is felt that the above represents the only professional way of rounding up project activities given the extreme uncertainty with regard to further activities towards completion of the construction.

G. L. Narasimhan
SIDFA

cc: Mr. T. Mangun, RR/Manila
Mr. R. Hallett, AGRO/DIO, UNIDO/Vienna
Mr. H. Brion
Arch. G. Sta. Maria
Engr. C. Caliwara
Engr. A. Radovan

ANNEX VIII

3 July 1986

The Officer-in-Charge
Office of the Governor
Lucena City
Quezon Province

Subject : COCONUT WOOD DEMONSTRATION HOUSE,
UNIDO Project No. SI/PHI/84/801

Dear Sir :

We are in receipt of cost data on the above Project, which was jointly sponsored by UNIDO-Vienna and UNDP-Manila, in cooperation with your office. The cost data was submitted to the undersigned on 2nd May 1986, almost a year after the same data was requested from the Project Director, who is also the Provincial Engineer of Quezon Province. We have analyzed the cost data and would like to share with you our observations and findings on the data submitted to us by the Project Director :

(a) The total project cost amounted to about P647,000. This amounts to P6,470 per sq.m., which is approximately the cost of multi-storey condominiums or first class residential buildings in Dasmariñas Village or Forbes Park, in the Philippines' premiere town of Makati, Metro Manila.

(b) There is a charge of P237,360 for project supervision and administration. This amount is quite unrealistic. This is the first project we have handled under UNIDO sponsorship where the supervision and administration cost amount to 36.67% of the total project cost.

Among the charges under this item were : 1,032 man-hours each for the Project Engineer, the Foremen, the Timekeeper/ Record Clerk, and the Toolkeeper/Storekeeper Clerk. It may be possible for the Project Engineer and the Foremen to have spent 129 man-days each (1,032 an-hours) if they were on the job. However, the Consultants do not recall that the Project Engineer spent that much time during the construction of the Project. In fact, the first Project Engineer, Mr. Nierva, was relieved of his duties in this Project because of excessive absenteeism which led to mistakes in delineating the lay-out of the coco wood house. The post of Project Engineer was then assigned to Mr. Lito Ayala, who had to carry this responsibility in addition to his other multifarious duties at the office of the Provincial Engineer's Office and supervisor for coco wood preservation and prefabrication operations. This prevented him from devoting the stated length of time to the Project.

Furthermore, for each group of construction activities, as can be seen in the attached sheets, it will be noted that

there are charges for the services of Foremen and Civil Engineers. Therefore, there is no basis for charging another 1,032 man-hours or 129 man-days each for Project Engineer and Foremen. As far as the services of the Timekeeper and Toolkeeper are concerned, we believe that 1,032 man-hours for the job under the Project is too much! Had they really spent that much time working on the Project then this cost data would have been submitted to us at a much earlier date and in a more understandable and usable form!!!

The same odd situation is also reflected when the Project's unit construction cost and supervision and administration costs are compared to data from the local construction industry.

Among the more glaring discrepancies in the presentation of cost elements, we would like to call your attention to the following :

(c) ITEM 2.12 COST OF BUCKING COCO LOG BOLTS

Cost Element (iii) Cost of Equipment Usage: P10,431.50

The equipment used in bucking coco log bolts into desired lengths is the chainsaw. The chainsaw used in the Project is the short model having a sawblade length of about 20" or 50 cm. At the time the chainsaw was used in the Project it cost about P6,500. Therefore, it means that the Project was charged with the cost of about 1-1/2 times the original value of the equipment used. This is quite unrealistic and leads one to question the accuracy of the manner the cost data was generated.

(d) ITEM 2.14 COST OF LOADING AND UNLOADING COCO LOG BOLTS

Cost Element (iii) Cost of Equipment Usage: P33,920.00

An amount of P33,920 was charged for the cost of equipment used in loading and unloading coco log bolts. During actual observations of the loading and unloading operations in the course of the early stages of the Project, loading was principally done manually with the aid of a winch cable attached to the front of the six-by-six dump trucks. This method of loading coco log bolts on the dump trucks was never changed throughout the course of the Project. Unloading at the sawmill site was done by tilting the dump carriage of the dump truck and the job was done within a few minutes' time. In case the dump truck tilting mechanism did not operate while unloading coco log bolts at the mill site, the crane (equipped with grappling claws) belonging to the sawmilling contractor was used to unload the dump truck at no charge to the Project. This was done upon representation of this Consultant with the sawmill management. Unfortunately, no forklift or crane was observed during the visits to the coconut stem logging operations at Binaha-an, Pagbilao.

In the light of this observation, therefore, the amount of P33,920 could not be accepted as realistic.

(e) ITEM 2.15 COST OF HAULING COCO LOG BOLTS

Cost Element (iii) Cost of Equipment/Vehicle Usage: P26,550.00

This amount should be adjusted to deduct the cost of vehicle or equipment usage during one leg of the round-trip journey from coco log cutting site to the sawmill, or vice-versa, when the vehicle was used for other purposes (like hauling other forms of materials : rocks, cement, etc., which were needed by the Engineer's Office for other projects). There were a number of instances when this happened.

(f) ITEM 2.221 HAULING COST COMPONENT ALLOTED TO THE TRANSPORT OF MILLED LUMBER FROM THE SAWMILL TO SARIAYA, PAGBILAO OR THE JOB SITE IN LUCENA CITY

The cost report indicate a total of 181.28 cu.m. of milled coco lumber as having been transported at a total cost of P37,962. Records in the possession of this Consultant on the daily coco lumber production showed a total of approximately 66 cu.m. of milled lumber for the entire Project. It is therefore, impossible to have transported 181 cu.m. of lumber from the sawmill to any of the three (3) processing or utilization areas of the Project.

(g) ITEM 2.222 and ITEM 2.41 COST CHARGES ON CCA TREATED COCO WOOD

It is a fact, supported by pictures taken by these Consultants during the progress of the construction phase of the Project, and including the pictures taken during the monitoring visits in company with officials from UNDP-Manila, that there was no prefabrication activity involving the above-cited item-components of the coconut house. In fact, these items : shingles roofing, sidings and partitions were installed "en situ". Therefore, charges on the prefabrication of the above-mentioned three (3) components of the coco wood house are not acceptable.

Among other minor discrepancies in cost charges are the following :

i - It is not readily acceptable that the labour pay rate in the Philippines particularly in Lucena City is P30 per man-hour. This amounts to about P240 per day, which is unbelievable in the Philippines. Perhaps it was meant as P30 per day ?

ii - There is also a possible breach of professional regulation in connection with electrical installation works. There is a cost charge of P560 for the labour of a C.E. (Civil Engineer). If this Civil Engineer was used to supervise the electrical installation works then the Project management broke the professional regulation code requiring that an Electrical Engineer should supervise electrical installation works.

In view of the foregoing, your Consultants find it impossible to accept the coco wood project costs, dated 25 April 1986, as reported by the Provincial Engineer, who was concurrently the Project Director. We are,

Annex VIII

therefore, constrained by time limits to proceed with the completion of our respective reports without the use of the cost data submitted by the Project Director.

Very respectfully yours,

UNIDO Project Consultants :

HORATIO P. BRION
Secondary Wood Processing Consultant

GREGORIO C. STA.MARIA
Designing Architect

Attcht.: as stated.

cc: R. M. Hallett, UNIDO-Vienna
SIDFA, UNDP - Manila

B I B L I O G R A P H Y

Decena, A.S., B.J. Penid F.R. Siriban & F.N. Tamolang. "PRODUCTION COST OF COCONUT-LUMBER PRODUCTS I. TREATED STONE-CUT.**

Eala, R.C. & D.G. Quiñones. SAWMILLING OF COCONUT TRUNK.*

Eala, R.C. & F.N. Tamolang. SPECIAL TREATMENT OF SOFT COCONUT LUMBER**

Espiloy, E.B. & F.N. Tamolang. BENDING STRENGTH OF FULL-SIZED COCONUT TRUNK POLES**

Garcia, M.L., A.V. Reyes & F.N. Tamolang. EXPLORATORY TEST ON THE NATURAL SUSCEPTIBILITY OF COCONUT "WOOD" TO TERMITES**

Joson, R.A. LOGGING OF COCONUT PALMS, CWUT 310, PCA-Zamboanga Research Center, Zamboanga City, 1983.

Lauricio, F.M. & F.N. Tamolang. THE STRENGTH AND RELATED PROPERTIES OF COCONUT TRUNK**

Madrazo, R.M. & Joson, R.A. THE PRODUCTION OF COCONUT LUMBER, SAWING AND SAWING FACILITIES, CWUT 103, PCA-Zamboanga Research Center, Zamboanga City, 1983.

Medrano, R.N. & F.M. Lauricio. SPECIFIC GRAVITY AND SHRINKAGE OF COCONUT PALM TIMBER IN THE PHILIPPINES**

Mendoza, Alfonso M.R. HARVESTING COCONUT STEMS**

Mosteriro, A.P. & F.R. Siriban. COCONUT WOOD PRESERVATION IN THE PHILIPPINES**

Mosteriro, A.P. MACHINING PROPERTIES OF COCONUT WOOD**

Palomar, R.N. PRESERVATION TECHNIQUES FOR COCOWOOD, CWUT 120, PCA-Zamboanga Research Center, Zamboanga City, 1983.

Peñamora, L.J. PRODUCTION OF SHINGLES FROM COCOWOOD, CWUT 105, PCA-Zamboanga Research Center, Zamboanga City, 1983

Peñamora, L.J. COCOWOOD HANDICRAFTS, NOVELTIES AND CARVED PRODUCTS, CWUT 130, PCA-Zamboanga Research Center, Zamboanga City, 1983.

Peñamora, L.J. AIR AND KILN-DRYING OF COCOWOOD, CWUT 310, PCA-Zamboanga Research Center, Zambonaga City, 1983.

Sta. Maria, Gregorio G. DEMONSTRATION OF COCONUT WOOD UTILIZATION IN LOW COST HOUSING, DP/ID/SER. A/565 Vienna, 1985.

Sulc, V.K. COCONUT STEM UTILIZATION STUDIES, Philippine Coconut Research Center.

Sulc, V.K. MECHANICAL PROPERTIES OF COCONUT PALM WOOD, PCA-Zamboanga Research Center, Zamboanga City, 1983.