

AGENCY FOR INTERNATIONAL DEVELOPMENT
WASHINGTON, D. C. 20523
BIBLIOGRAPHIC INPUT SHEET

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BATCH 45

1. SUBJECT CLASSI- FICATION	A. PRIMARY Serials	Y-AK50-0000-GG50
	B. SECONDARY Food production and nutrition--Wood technology and industries--Tropics	

2. TITLE AND SUBTITLE
Utilization of secondary species from tropical forests; annual report, 1976

3. AUTHOR(S)
(100) Auchter, R.J.
(101) USDA/FS

4. DOCUMENT DATE 1976	5. NUMBER OF PAGES 20p.	6. ARC NUMBER ARC
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7. REFERENCE ORGANIZATION NAME AND ADDRESS
USDA/FS

8. SUPPLEMENTARY NOTES (*Sponsoring Organization, Publishers, Availability*)
(Research summary)

9. ABSTRACT

10. CONTROL NUMBER PN-AAC-884	11. PRICE OF DOCUMENT
12. DESCRIPTORS Hardwoods Wood products	13. PROJECT NUMBER
	14. CONTRACT NUMBER PASA TA(AG) 03-75 Res.
	15. TYPE OF DOCUMENT

7
AASA TACAG) 03-75 1585.
PNAAC-889

AID ANNUAL REPORT (1976)

By

RICHARD J. AUCHTER, Program Manager

Forest Products Laboratory,¹ Forest Service
U.S. Department of Agriculture

A. Summary

The research objective of this project is to develop a feasible and appropriate system to utilize the secondary species in the tropical forests for the production of pulp, paper, paperboard, fiberboard, and particleboard. In this second year of the project, all the work on the Philippine woods was completed with only one problem--corrugating medium runnability when made with neutral sulfite semichemical pulp (unresolved). Quality of products was generally good, and in many cases the product could compete on the world market. Ghanaian and Colombian woods are now being used to check various segments of the overall findings on the Philippine woods. Results thus far confirm the premise that what holds for the Philippine woods is directly applicable to similar mixtures from Ghana or Colombia. Thus, findings are universal to all hardwood tropical forests. Plans for an International Conference on Improved Utilization of the Tropical Forests have been initiated. The summation of this May 1978 Conference, along with specified regional economic data, will be presented at the World Forestry Congress in Djakarta in October 1978. This would be the first of three regional seminars to publicize and promote the findings of this project. The final report scheduled for early in 1978 will be patterned on the outline tentatively approved by the project's Steering Committee.

¹Maintained in Madison, Wis., in cooperation with the University of Wisconsin.

B. Project Objectives

This project covering the utilization of the secondary species in the tropical forests has two related objectives promoting full-scale production of a variety of forest products in the LDC areas of the world.

Objective No. 1: Through research, development, and pilot plant evaluation, arrange a technically and economically feasible processing system for making pulp, paper, and related products from the naturally occurring mixtures of tropical hardwoods. Residuals not acceptable for these forest products will be used to provide the energy requirements of the processing system.

Objective No. 2: Design and assemble the elements of a "preinvestment package" based on Objective No. 1 as applied to three or more LDC sites (Latin America, Southeast Asia, and Africa), and disseminate, publicize, and demonstrate it to potential investors by confirming the overall commercial viability of constructing and operating a mill based on the new approach of using the naturally occurring mixed tropical hardwood resource.

Benefits expected on achievement of the goal of an operating facility include (1) new skilled and unskilled jobs, (2) production of forest products useful in local and world markets, (3) stimulation of ancillary industries, and (4) sizable savings in foreign currency exchange.

C. Accomplishments (1/1/76 - 12/31/76)

Information from travel by our staff, visitors to the Forest Products Laboratory, and the literature reinforce the premises which formed the

basis for establishing the need for this project's results. Present users and plans in progress at this time continue to selectively exclude significant quantities of species and thereby reduce the wood volume harvested from the natural tropical forests. This exclusion is based on unsubstantiated fears that product quality would suffer or that processing problems are beyond the scope of present technology. Such practices limit the development of a wisely applied silvicultural plan, leave a forest of unwanted low-quality trees, and generally deter the achievement of the renewability of these resources via sound management techniques.

Wood supplies for our research and development studies were contracted for and shipped from three tropical hardwood forested regions. In sequence, we have received wood from the Philippines, Ghana, and Colombia. The general procedure was for two members of our staff to visit the country involved, indicate to a local contractor the kind and quantity of wood required, and develop a contract via the AID mission for the harvesting and shipment of the wood to the Forest Products Laboratory. Each contractor was provided a list of preferred species, along with specified alternates which could be substituted based on harvesting problems that might occur. Receipt of the wood at the Forest Products Laboratory was as follows:

- (1) Philippines - July 1975.
- (2) Ghana - June 1976.
- (3) Colombia - August 1976.

On receipt, the wood was sorted by species and sampled for specific gravity, moisture, fiber morphology, and specimens for the wood museum. Following this, each species was debarked, chipped, and stored separately until all woods from a geographical region were processed. As needed for the research, mixtures of chips from each region were prepared. One represented a uniform density distribution, a second had greater quantities of the high and ultrahigh density wood, and the third was skewed toward the medium density wood. In all cases, there was no intermixing of species from the different regions.

1. Findings

a. Philippine wood mixtures.--The results of the exploratory pulping, pulp evaluation, and fiberboard work were reported in the previous annual report and are the basis for the accomplishments to be reported for 1976. On the basis of this exploratory work with the three density distributions, a series of pilot runs on the larger scale pulping equipment, on the experimental paper machine, and on equipment at contractor facilities were undertaken to establish quality factors on a number of forest products. The chip mixture used for almost all of this work was that representing a uniform density distribution. If the thesis that climatic and geographic factors influence wood density distributions has merit, this mixture would be found in the tropical moist areas.

Bleached hardwood kraft of competitive quality for the world market can be produced. In fact, our data would indicate that the quality could be as good or better than the market grades now available from Scandinavia and North American pulpmills.

Tablet and other school papers are feasible using a furnish of 80 percent tropical hardwood kraft and 20 percent of a long-fibered sulfite or kraft. If thermomechanical pulp from tropical hardwoods is available, it can substitute for the bleached hardwood kraft up to about 20 percent.

Tissue, both facial and toilet, can also be made with high percentages of the bleached tropical hardwood kraft. Trial runs with 80 percent of the tropical hardwood kraft resulted in tissue properties similar to those in commercial grades available in the United States. Although toweling was not produced, the tissue results would indicate that toweling grades could be produced with substantial percentages of tropical hardwood kraft.

Chips from the light-colored woods were used to produce thermomechanical pulp for newsprint. Two mixtures of three and five species, respectively, were prepared for this application. Selection of the light-colored woods is desirable for the production of standard color newsprint so as not to incur excessive bleaching costs for the mechanical pulp, which makes up the major part of the furnish. Acceptable newsprint quality was made using 100 percent tropical hardwood pulps (70 percent bleached thermomechanical and 30 percent semibleached kraft). For special runnability cases, long-fibered pulp may be added to meet specifications.

Optical color sorting on the mixed tropical hardwood chips to select the light-colored wood for mechanical pulp appears to be technically feasible. The low production rate per unit of sorting surface, however, makes commercialization doubtful. Thus, we are abandoning further efforts along this line and would recommend log selection if it is necessary to direct the light woods to newsprint.

Bark analyses on the 50 Philippine species show large variations in ash, silica, and extractives. Values for each constituent range from a trace to as high as 30 percent. Wood-to-bark ratios of 85 to 96 confirm the observation that the bark layer is relatively thin as compared to U.S. woods. Usable fiber yields via kraft pulping seem attractive, but the generally high silica content precludes consideration of whole tree utilization concepts for fiber.

Wet- or dry-formed fiberboards made from each of the tropical hardwood mixtures easily meet the Voluntary Product Standards for regular hardboard. In addition, furniture core stock and exterior siding applications are possible when using the respective resin formulations necessary for such uses. In all cases, the fiberboards have excellent surface properties.

Linerboards using 50 percent tropical hardwood kraft and 50 percent west coast softwood kraft were somewhat better than the control in impact resistance, but significantly poorer in top-to-bottom compression strength. Surface sizing with starch corrected the latter deficiency. These linerboards were combined with the corrugating medium made from kraft rejects and performance of sample boxes evaluated.

Corrugating mediums made from different tropical hardwood mixtures by the neutral sulfite semichemical pulping process have thus far failed to run satisfactorily on the corrugator, even though the paper properties seem to be adequate. Reasons for this are being studied further in a series of experiments.

In particleboards, the hammermilled chips from the mixture having the largest quantity of high density wood had inferior properties to boards from the other two mixtures. Ring flaked material was generally superior to hammermilled chips or planer shavings. Competitive quality particleboards can be produced.

In summary then, except for the corrugating medium problem with neutral sulfite semichemical pulps, wood mixtures from Philippine species (specific gravity range of 0.236 to 0.793) are usable in the manufacture of pulp, paper, and building board products. The higher density woods can, if necessary, be rejected for fuel via air classification of the chips.

b. Ghanaian wood mixtures.--These wood mixtures were used to check some of the results obtained on the Philippine wood mixtures. Verification of those results would indicate a general application of the information to all regions of tropical hardwood forests.

Kraft pulping for bleached market pulp and for linerboard on the three mixtures of Ghanaian wood generally followed the Philippine results. Yields and quality as measured by handsheet evaluation followed the same trends. As a result of more pulping experiments, we might establish a significant but small quality edge for the kraft pulps from the Ghanaian woods. This could be the result of the somewhat lower specific gravity on the Ghanaian wood mixtures, the small difference in fiber morphology, or both.

Air classification was 75 percent efficient in separating mixed chips into two classes--one below 0.45 specific gravity and the other above

0.45 specific gravity. This compares to the 80 percent efficiency found for the Philippine woods. The improved strength properties for the lower specific gravity segment were verified in this work. Thus, this is a tool whereby pulp and forest product quality can be improved when working with a natural mixture of tropical hardwoods that may have too high a percentage of the high and ultrahigh density wood.

For newsprint, four light-colored species were mixed to make the thermomechanical pulp. This pulp, after bleaching with hydrogen peroxide, was mixed in a 70/30 furnish with semibleached kraft made from a mixture of all the Ghanaian woods. The respective pulp properties were somewhat better than their Philippine counterpart. The newsprint produced was generally in the range of North American commercial newsprints. Thus far, printing analysis is not complete.

Fiberboards have been produced from Ghanaian chip mixes, but testing is not as yet complete. Production procedures were similar to those used for the Philippine woods; no significant differences or problems were encountered.

In summary, the research work carried out and thus far evaluated indicates the validity of the premise that similar density distributions of woodchips from any natural tropical hardwood region will result in similar quality forest products.

c. Colombian wood mixtures.--As was the case with the Ghanaian woods, these woods were used to check specific segments of the Philippine results to establish whether universal application to all natural tropical hardwood regions is feasible.

In kraft pulping for bleached market pulp and for linerboard, the three mixtures reacted the same as for those from Philippine and Ghanaian woods. Pulp yield and quality differences between mixtures were again small, with values similar to those obtained with the Philippine mixtures.

Fiberboards have been produced from Colombian wood mixtures, but testing is still in progress. No significant differences in production procedures were required during the manufacture of these boards.

d. General.--In response to a question regarding the effect of including darker colored and higher specific gravity woods in making the pulp for newsprint, a mixture of 30 Philippine species up to a specific gravity of 0.560 was prepared and used to make the thermomechanical pulp. Bleaching was limited to the use of 0.75 percent peroxide, the same quantity used on the light-colored woods. Using this pulp as 70 percent of the furnish, the sheet properties, except for color, were equivalent to the newsprint where only the light-colored woods were used. The color was somewhat darker (creamy). Determination should be made as to whether this paper would be acceptable on the newsprint market.

The study on the effect of wood density on kraft pulp quality confirms that strength decreases as density increases. The differences are generally negligible up to 0.55 specific gravity. This confirms our decision to separate via air classification at 0.50 specific gravity and thus achieve a significant improvement in pulp quality.

While the reports on economic policies and environment have been submitted, a summation of findings for this report has not been made.

2. Operational Significance

The data thus far developed supports the general thesis that, if one knows the wood properties available from a regional resource of naturally occurring tropical hardwood forests, the quality of the forest products to be produced can be predicted. Furthermore, wood of similar properties from different regions will result in forest products of equivalent quality. This information reduces substantially the preliminary search for a site and a wood resource to produce specified forest products at competitive quality levels.

Problems in utilizing the tropical hardwoods for forest products manufacture have been highlighted in research on single and selected groups of species. The publicity on these problems has been a deterrent to broader utilization. It appears that these problems moderate greatly or even disappear when working with mixtures that represent the distribution of wood characteristics found in the wide range of species present in the natural tropical forests. This phenomena needs to be confirmed in commercial operation by systematic inclusion of more and more species.

3. Side Effects of the Work

As a result of a suggestion from the Steering Committee providing advice and counsel to this project, the results of this work, along with that of others working on tropical hardwood utilization, will be presented at an International Conference on Improved Utilization of the Tropical Forests to be held May 21-26, 1978, in Madison, Wis. The conclusions of this conference will be summarized for the World Forestry Congress in Djakarta in October 1978. This will serve as the first regional seminar on which all succeeding ones will be patterned.

4. Research Design

As previously noted under "1. Findings," the production of newsprint using mixed tropical hardwoods without regard for color and density is a major modification in the research plan. Its apparent success provides additional potential for effective utilization in making this and other papers for local consumption.

Because of the difficulties in making corrugating medium that runs satisfactorily while using neutral sulfite semichemical pulp, we will have to expand the research study in this area to find causes and make the necessary adjustments.

Our attempts at color sorting of chips to select wood for newsprint were technically but probably not commercially successful. This was an addition to our basic plan and will now be abandoned as a specific effort. In the light of the results with mixed woods, its need may not be as great as it once appeared to be.

We have contracts with the Forest Products Research and Industries Development Commission of the Philippines (FORPRIDECOM) to study (1) the deterioration of wood in chip piles and (2) the collection of forest products of interest to this research which are made or imported to the Philippines. The latter is to establish quality levels now on the market.

Recently, we executed a contract with the University of Minnesota to study the durability of hardboards and particleboards made from tropical hardwoods. This study will not be complete before this project terminates but will be reported as an addendum when the data is all in.

Other than the above, the proposed research plan is providing the information and data needed to meet the objectives of the project.

D. Dissemination and Utilization of Research Results

The research completed and still in progress provides both preliminary and fully developed information about the conversion of mixtures of tropical hardwoods into a variety of forest products such as pulp, paper, paperboard, fiberboard, and particleboard. All of the work is directed toward making the establishment of forest products enterprises in LDC areas of the world more viable.

Formal dissemination of the research results obtained thus far is premature. There are plans for this in the future via a final report and papers at the proposed conference on Improved Utilization of the Tropical Forests. Also, various segments of the final report will be directed to appropriate technical journals.

We have continued the policy of preparing informal reports of our completed work and giving them limited distribution to potential users and professionals for advice and comment. Reports that have been prepared and issued during this year are as follows:

(1) J. F. Laundrie and R. C. Koeppen. "Report on Travel of Europe and Africa." February 1976.

(2) J. F. Laundrie. "Exploratory Kraft and NSSC Pulping of Mixtures of 50 Philippine Hardwoods." AID Report No. 1. April 1976.

(3) H. E. Wahlgren and M. Chudnoff. "Report on Travel to Colombia." April 1976.

(4) J. F. Laundrie and D. J. Fahey. "Newsprint from Mixtures of Philippine Hardwoods." AID Report No. 2. April 1976.

(5) J. F. Landrie and D. J. Fahey. "Tablet Papers from Mixtures of Philippine Hardwoods." AID Report No. 3. May 1976.

(6) J. F. Landrie and D. J. Fahey. "Tissue and Toweling Papers from Mixtures of Philippine Hardwoods." AID Report No. 4. June 1976.

(7) G. C. Myers and D. J. Fahey. "Hardboards from Mixtures of Philippine Hardwoods." AID Report No. 5. June 1976.

(8) J. F. Landrie. "Bleached Kraft Pulp from Mixtures of Philippine Hardwoods." AID Report No. 6. September 1976.

(9) J. Ewel and L. Conde. "Potential Ecological Impact of Increased Intensity of Tropical Forest Utilization." September 1976.

(10) R. O. Gertjeansen, D. W. Haavik, H. F. Garino, S. P. A. Okoro, and H. J. Hall. "Properties of Particleboards from Mixtures of Philippine Hardwoods." October 1976.

(11) J. F. Landrie and R. C. Koeppen. "Report of Travel to the Philippines." November 1976.

We are aware that institutes and research organizations such as CTFT, CSIRO, PPRIC, and FORPRIDECOM are using the preliminary reports as guidance for their efforts just as we use their published information. Consulting firms active in feasibility studies for these regions of the world are using our reports as well as making direct contact with us. Most recently, we have had contacts with respect to active studies in Costa Rica, French Guiana, and Brazil.

E. Work Plan for the Coming Year

In general, the status of this research project as we enter the third year of activity is on schedule. The studies with the Philippine

woods are complete, and both the Ghanaian and Colombian woods are being used in studies checking segments of the Philippine results.

All of the proposed research--laboratory and pilot plant--will be completed in this third year, and the writing and arranging of the final report will be started and near completion. As indicated earlier, the durability study on fiberboard and particleboard will extend beyond the scheduled completion date for the project and will be added as an addendum to the final report early in 1980.

The planning for the International Conference on Improved Utilization of the Tropical Forests in May 1978, which is an outgrowth of this research, has been started and will be a prime concern of the Planning Committee for much of this year, as well as 1978. The format for the first of the regional seminars to be held in Djakarta during the World Forestry Congress in October 1978 will gradually unfold with the setting of the final program for the International Conference.

Thus, we see calendar year 1977 as a fairly busy year, even though the research activity will taper off about midyear. Specifically, the following activities will be carried out:

- (1) Prepare and distribute the preliminary reports on the bark study and the physical and chemical analyses of the wood species from the Philippines, Ghana, and Colombia. This work is essentially complete but needs to be assembled and reported (June 1977).

- (2) Analyze the data and report on the production of bleached market grade kraft pulp from the Ghanaian and Colombian woods (March 1977).

- (3) Prepare report on the production of newsprint from the Ghanaian woods (March 1977).

(4) Finish the testing and report on the production of fiberboard from the Ghanaian and Colombian woods (July 1977).

(5) Prepare fiberboard and particleboard from Ghanaian woods for the durability study, and arrange for placing the sample stakes in the ground at the test plot near Gulfport, Miss. This first part will be completed during the first half of 1977. The stakes will be inspected over a 3-year period; so the study will be completed by June 1980 and reported at that time.

(6) Produce and successfully run corrugating medium made via the neutral sulfite semichemical process (May 1977).

(7) Produce linerboard and corrugating medium from Colombian woods for combining and testing as containers (July 1977).

(8) Prepare the linerboard and corrugating medium report (September 1977).

(9) Let contract for the Preliminary Industrial Survey (May 1977).

The budget proposed to support the work in calendar year 1977 is as follows:

(1) Salaries and benefits	\$83,000
(2) Consultants, etc.	120,000
(3) Travel	6,000
(4) Material and supplies	5,000
(5) Other direct costs	10,000
(6) Overhead (ERS)	<u>11,000</u>
Total	235,000

Present schedule calls for all of the work pertaining to this project to be completed in the first quarter of 1978. This includes all of the research, the preliminary industrial survey, and the final report.

F. Involvement of Minority Personnel and Women

In connection with this project, two women in the Analytical Chemistry Laboratory used about 10 percent of their time this past year providing chemical analyses for the various wood and bark samples, for silica in the pulping liquors, and for specified tests on papers produced to help us find the cause of poor runnability of some corrugating mediums. One of the women is a grade 12 supervisory chemist and the other a grade 7 technician.

In the Center for Wood Anatomy Research, much of the anatomical data on the wood specimens has been gathered by using two college women part time. They spend 20 percent of their time measuring wood cells (length, diameter, and cell wall thickness), as well as locating occlusions of such materials as silica. One of the women works at the Forest Products Laboratory under the Disadvantaged Student Program. A full-time woman staff member, grade 11, works full time on this project.

In the Structural Laboratory, the testing of the hardboards has been done by two women. Approximately 5 percent of their time was involved.

G. Expenditures and Obligations--Calendar Year 1976

Funds from AID for this project are primarily channeled through the ERS division of the Department of Agriculture for which they receive 8 percent of the funds handled. Since the processing of the first PASA

which designates spending areas, AID has withheld certain funds for direct contracting by one or more of their missions located in the countries where the research may be applied. The collection of the wood supplies, the chip storage study, and the collection of market samples of forest products are examples where funding was established through an AID mission.

The expenditures and obligations reported below are those directly resulting from research activities in the United States by the Forest Products Laboratory staff or subcontractors. They include international travel by our staff in support of the project.

(1) Salaries and benefits	\$121,194
(2) Travel	11,640
(3) Consultants	25,500
(4) Supplies, other, etc.	<u>26,521</u>
Total for CY 1976	184,855

During this same period, the Forest Products Laboratory contributed \$131,979 in the form of technician, scientific, and administrative support.

APPENDIX A

ANNUAL REPORT SUMMARY STATEMENT

Secondary Woods Utilization, PASA TA(AG) 03-75

Project Title and Contract Number

Richard J. Auchter, Forest Products Laboratory (USDA/FS)

Principal Investigator and Contractor

P.O. Box 5130, Madison, Wisconsin 53705

Contractor's Address

January 7, 1975 - September 30, 1979
Contract Period (as amended) From-To

January 1, 1976 - December 31, 1976
Reporting Period From-To

*Total Expenditures and Obligations
Through Previous Contract Year*

\$250,252

*Total Expenditures and Obligations
For Current Contract Year*

223,560

Narrative Summary of Accomplishments and Utilization:

The research objective of this project is to develop a feasible and appropriate system to utilize the secondary species in the tropical forests for the production of pulp, paper, paperboard, fiberboard, and particleboard. In this second year of the project, all the work on the Philippine woods was completed with only one problem--corrugating medium runnability when made with neutral sulfite semichemical pulp (unresolved). Quality of products was generally good, and in many cases the product could compete on the world market. Ghanaian and Colombian woods are now being used to check various segments of the overall findings on the Philippine woods. Results thus far confirm the premise that what holds for the Philippine woods is directly applicable to similar mixtures from Ghana or Colombia. Thus, findings are universal to all hardwood tropical forests. Plans for an International Conference on Improved Utilization of the Tropical Forests have been initiated. The summation of this May 1978 Conference, along with specified regional economic data, will be presented at the World Forestry Congress in Djakarta in October 1978. This would be the first of three regional seminars to publicize and promote the findings of this project. The final report scheduled for early in 1978 will be patterned on the outline tentatively approved by the project's Steering Committee.

APPENDIX B

FORM APPROVED
GSA NO. 105-80002
EXPIRES 11/76

**SMITHSONIAN
SCIENCE INFORMATION EXCHANGE, INC.**
1730 M STREET, N.W. PHONE 202-381-5811
WASHINGTON, D.C. 20036

SIE NO.

NOTICE OF RESEARCH PROJECT

SUPPORTING AGENCY:		AGENCY'S NUMBER(S):	
Agency for International Development (AID) U.S. Department of State		Contract No: PASA TA(AG) 03-75 and/or Control No:	
TITLE OF PROJECT:			
Utilization of Secondary Species from Tropical Forests			
PRINCIPAL INVESTIGATOR, ASSOCIATES		School or Division	Department
Richard J. Auchter Forest Products Laboratory			U.S. Department of Agriculture Forest Service
RECIPIENT INSTITUTION:		PERIOD FOR THIS NRP:	
Name and Address:	U.S. Forest Products Laboratory P.O. Box 5130 Madison, Wisconsin 53705	Start Date:	January 1, 1976
Including Zip Code.		End Date:	December 31, 1976
		Annual Funding:	\$223,560
SUMMARY OF PROJECT: Be brief-200 word maximum: (Include Objective, Approach, Current Plans and/or Progress)			
<p>The research objective of this project is to develop a feasible and appropriate system to utilize the secondary species in the tropical forests for the production of pulp, paper, paperboard, fiberboard, and particleboard. In this second year of the project, all the work on the Philippine woods was completed with only one problem--corrugating medium runnability when made with neutral sulfite semichemical pulp (unresolved). Quality of products was generally good, and in many cases the product could compete on the world market. Ghanaian and Colombian woods are now being used to check various segments of the overall findings on the Philippine woods. Results thus far confirm the premise that what holds for the Philippine woods is directly applicable to similar mixtures from Ghana or Colombia. Thus, findings are universal to all hardwood tropical forests. Plans for an International Conference on Improved Utilization of the Tropical Forests have been initiated. The summation of this May 1978 Conference, along with specified regional economic data, will be presented at the World Forestry Congress in Djakarta in October 1978. This would be the first of three regional seminars to publicize and promote the findings of this project. The final report scheduled for early in 1978 will be patterned on the outline tentatively approved by the project's Steering Committee.</p>			

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	B. SECONDARY Secondary Wood Species	
2. TITLE AND SUBTITLE Utilization of Secondary Species from Tropical Forests		
3. AUTHOR(S) Richard J. Auchter		
4. DOCUMENT DATE February 2, 1977	5. NUMBER OF PAGES 17	6. ARC NUMBER ARC (For AID use only)
7. REFERENCE ORGANIZATION NAME AND ADDRESS Forest Products Laboratory, USDA - FS P. O. Box 5130, Madison, Wisconsin 53705		
8. SUPPLEMENTARY NOTES (Sponsoring Organization, Publishers, Availability)		
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12. DESCRIPTORS Secondary, Species, Forest Products, Pulp, Paper, Paperboard, Particleboard, Environment	13. PROJECT NUMBER	
	14. CONTRACT NUMBER	
	15. TYPE OF DOCUMENT Annual Report	