GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

No action as of 08

Date: December 8, 1977

Project Title: A Timber Processing Complex and Wood Energy Center in Georgia

Project No: A-2084

Project Director: T. I. Chiang

Sponsor: Georgia Forestry Commission

Agreement Period: From 11/4/77 Until 11/3/78

Type Agreement: Std. Industrial Agreement dtd. 11/4/77.

Amount: $55,000

Reports Required: Quarterly Progress Reports; Final Technical Report.

Sponsor Contact Person (s):

Technical Matters

Mr. A. R. Shirley
Georgia Forestry Commission
P.O. Box 819
Macon, Georgia 31202

Contractual Matters
(thru OCA)

Defense Priority Rating: N/A

Assigned to: Technology & Development Laboratory (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director—EES
Accounting Office
Procurement Office
Security Coordinator (OCA) ✓
Reports Coordinator (OCA)

Library, Technical Reports Section
EES Information Office
EES Reports & Procedures
Project File (OCA)
Project Code (GTRI)
Other

:A-3 (3/76)

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION

Date: November 15, 1979

B 330

oject Title: "A Timber Processing Complex & Wood Energy Center in Ga"

oject No: A-2084

oject Director: T.I. Chiang

onsor: Georgia Forestry Commission

fective Termination Date: 6/30/79

arance of Accounting Charges: 6/30/79

ant/Contract Closeout Actions Remaining:

None

_ Final Invoice and Closing Documents
_ Final Fiscal Report
_ Final Report of Inventions
_ Govt. Property Inventory & Related Certificate
_ Classified Material Certificate
_ Other _____

gned to: ED/AR (School/Laboratory)

Library, Technical Reports Section
EES Information Office
Project File (OCA)
Project Code (GTRI)
Other _____

DUE TO NARROW MARGINS IN THE GUTTER, WE WERE UNABLE TO SEW. A NEW METHOD OF GLUING WAS USED FOR THIS ITEM.

Project A-2084

A TIMBER PROCESSING COMPLEX AND A WOOD ENERGY CENTER IN GEORGIA

First Quarterly Progress Report to
Georgia Forestry Commission
December 1, 1977 to February 28, 1978

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
Technology & Development Laboratory
Economic Development Division
Atlanta, Georgia 30332
March 5, 1978

This research project consists of two tasks. Task I deals with a timber processing complex in north Georgia. Task II is concerned with a wood energy center. Major steps to be taken and staff involved in both tasks are included in Appendix 1 on Staff and Responsibility for Georgia Forestry Commission Project. Since no work has been done on Task II during this reporting period, this progress report covers only Task I.

JOBS COMPLETED OR IN PROGRESS

1. Study Area

Several meetings were held to discuss the size of the geographical area to be covered in this study. Personnel from the Georgia Forestry Commission (GFC), the Limestone Valley RCSD, and Georgia Tech participated. Twenty-five north Georgia counties in the Appalachian Region have been designated as the base area for this study program. (See map in Appendix 2.) This 25-county area is relatively homogeneous in terms of wood species and topography.

2. Timber Resources

Timber resources data dealing with commercial forest land, forest type, ownership, stand-size class, wood species, volume of growing stock and sawtimber, annual growth, removals, mortality, seedlings planted, and sawmill production in the 25 counties were collected. These data were obtained from the U. S. Southeastern Forest Experiment Station through the Georgia Forestry Commission. Currently tabulated tables on these data are available on the 25-county area and on the Limestone Valley's six-county area. Data on any grouping of these 25 counties can be tabulated if such a need arises later.

3. Survey of Loggers

As a first step to evaluate the potential timber supplies to a proposed timber processing complex in the study area, it was decided to survey loggers working in the area. A questionnaire was designed and tested. (See Appendix 3). These questionnaires were given to GFC field personnel from the Rome, Canton, and Gainesville districts during a meeting on January 12, 1978. Instructions on field interviews were given. It is expected that over 30 completed questionnaires will be returned for final evaluation.

4. Survey on Land Owners

Since over 70% of commercial forest land is in the hands of private land owners, a survey of these private land owners concerning their intention to sell their timber in the future can be an important step in the evaluation of future timber supplies. Through the efforts of Mr. Druid Preston, Chief of Forest Management, GFC, lists of land owners in the 25 counties were obtained from the Agricultural Stabilization and Conservation Service (ASCS). These lists contain approximately 30,000 names and addresses of land owners.

At the present time, no cost effective plan to survey the large number of land owners has been developed.

A questionnaire for the survey of land owners was drafted and tested in the field by GFC personnel. About 75 completed questionnaires are expected to be returned for evaluation. A revised questionnaire will be prepared, if a final decision to go ahead on the proposed survey is made.

WORK PLANNED FOR NEXT PERIOD

Tabulating and Evaluating Survey Results

Completed questionnaires from the survey of loggers will be edited and tabulated. Results of the tabulation will be evaluated as to what significance can be drawn from the survey.

Contacting Companies

Compiling a list of companies with an interest in starting a new wood processing facility in the study area is in progress. Interviews will be conducted with these companies in order to find out their plans. It is possible to cooperate with these companies in carrying out a certain portion of this research project. The information and data generated under this study program would be beneficial to the cooperating companies in their future planning. Also, it is highly desirable that this study program have practical goals.

Designing a Timber Processing Complex

The design of the proposed timber processing complex will involve decisions on product mix, scale of operation, plant location, and investment requirements.

The constraints of the proposed complex are the timber-resources base in the study area, the supply conditions, market outlets for chosen end products, and research budget. It is hoped that by the end of the next reporting period, a general idea of the major components of the complex will be known.

STAFF AND RESPONSIBILITY FOR GEORGIA FORESTRY COMMISSION PROJECT

RC - Project Funds
imber Processing Complex/
ood Energy Center

Task	Description	Bulpitt	Chiang	Clifton	Gibson	Loggins
1.0	Timber Processing Complex (Task Director)		X			
1.1	Survey of Timber Resources		X			X
1.2	Design of Timber Processing Complex		X			
1.3	Choice of a Location		X			
1.4	Investment Requirements		X			
1.5	Examine Market Potentials		X			
1.6	Project Costs and Returns		X			
1.7	Quarterly Report		X			
1.8	Final Report		X			
2.0	Wood Energy Center (Task Director)			X		
2.1	Design Market Evaluation System			X	X	
2.2	Investigate Market Potentials			X	X	
2.3	Assess Market Barriers			X	X	
2.4	Evaluate Investment Industry			X	X	
2.5	Quarterly Report			X	X	
2.6	Final Report			X	X	


TASK I STUDY AREA
TWENTY-FIVE ARC COUNTIES
CATOOSA
MURRAY
FANNIN
UNION
TOWNS
RABUN
WHITFIELD
GILMER
WHITE
HABERSHAM
GORDON
LUMPKIN
STEPHENS
PICKENS
HALL
DAWSON
BANKS
FRANKLIN
HART
FLOYD
BARTOW
CHEROKEE
FORSYTH
JACKSON
MADISON
ELBERT
POLK
COBB
GWINNETT
BARROW
CLARKE
OGLETHORPE
PAULDING
WILKES
WALTON
OCONEE
LINCOLN
DEKALB
DOUGLAS
ROCK-DALE
MORGAN
GREENE
CARROLL
FULTON
COLUMBIA
CLAYTON
NEWTON
TALIAFERRO
HENRY
COWETA
FAYETTE
WARREN
JASPER
PUTNAM
HANCOCK
HEARD
MC DUFFIE
SPALDING
BUTTS
RICHMOND
GLASCOCK
JEFFERSON
BURKE
TROUP
MERIWETHER
PIKE
LAMAR
MONROE
JONES
BALDWIN
WASHINGTON
UPSON
JENKINS
SCREVEN
WILKINSON
HARRIS
BIBB
TALBOT
CRAWFORD
TWIGGS
JOHNSON
EMANUEL
TAYLOR
LAURENS
PEACH
BULLOCH
MUSCOGEE
MARION
HOUSTON
EFFINGHAM
MACON
BLECKLEY
CANDLER
TREUTLEN
CHATTAHOOCHEE
DODGE
PULASKI
MONT-GOMERY
TOOMBS
EVANS
SCHLEY
DOOLY
STEWART
WHEELER
BRYAN
CHATHAM
SUMTER
WEBSTER
WILCOX
TELFAIR
TATTNALL
CRISP
LONG
LIBERTY
QUITMAN
RANDOLPH
TERRELL
LEE
JEFF DAVIS
APPLING
BEN HILL
WORTH
TURNER
WAYNE
CLAY
IRWIN
COFFEE
BACON
MC INTOSH
CALHOUN
DOUGHERTY
TIFT
EARLY
BERRIEN
WARE
PIERCE
BAKER
ATKINSON
BRANTLEY
GLYNN
MITCHELL
COLQUITT
COOK
MILLER
CLINCH
CAMDEN
LANIER
SEMINOLE
DECATUR
GRADY
THOMAS
BROOKS
LOWNDES
CHARLTON
ECHOLS

Appendix 3

QUESTIONNAIRE

Timber Supply Study

Company: _____

Location: _____
City County

Address: _____

Responding Person _____ Position _____

Years in Business: _____

Average Number of Employees: _____

Your Cutting or Logging Area is within _____ miles of _____
City

and it is operating in _____, _____, _____, _____,

_____, _____, and _____ counties.

1977 Delivered Volume:

Kind	Major Species	Volume Delivered	Type of Customer
Softwood	_____	_____	_____
Hardwood	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

1977 Log Data:

Kind	Major Species	Average DIB* (inches)	Average Length of Log (feet)
Softwood	_____	_____	_____
Hardwood	_____	_____	_____
	_____	_____	_____
	_____	_____	_____

* Diameter inside bark at the small end of the log.

Price Paid to Landowner:

Hardwood Stumpage

Sawtimber_____ Pulp_____ Veneer_____ Firewood_____

Scale _____ Scale_____ Scale_____ Scale_____

Softwood Stumpage

Sawtimber_____ Pulp_____ Veneer_____ Firewood_____

Scale_____ Scale_____ Scale_____ Scale_____

Price Received at Millyard or Concentration Yard:

Hardwood Stumpage

Sawtimber_____ Pulp_____ Veneer_____ Firewood_____

Scale _____ Scale_____ Scale_____ Scale_____

Softwood Stumpage

Sawtimber_____ Pulp_____ Veneer_____ Firewood_____

Scale_____ Scale_____ Scale_____ Scale_____

Average Haul Distance by Product:

Pulp_____miles

Sawtimber_____miles

Veneer_____miles

Firewood_____miles

How do you find out about availability of timber for sale?_____

_____

Based on your experience in the area, do you expect any problem in log supply in the future?

_____

_____

_____

_____

_____

Do you think the timber supply condition in your area could support a new primary wood processing complex (either softwood or hardwood or both)?

QUESTIONNAIRE EXPLANATION

1. Company: Show full company name.

2. Location: Give actual location of headquarters or office.

3. Address: Mailing address

4. Responding Person/Position: Name and title

5. Years in Business: Give number of years

6. Employee: Average number of employees

7. Cutting or Logging Area: Give a radius in miles of your operating base and counties in which you actively operate

8. 1977 Delivered Volume and Log Data:

   a. Give best estimates on softwood and/or hardwood volume delivered to customers in 1977 and type of your buyers.

   b. Give softwood and/or hardwood delivered in terms of log diameter inside bark (DIB) at the small end of the log. If in doubt, measure a representative sample. Record to the nearest inch. Ask about average length of log and record to the nearest foot.

   c. Define price paid either by MBF, cord or weight and by scale, i.e. Doyle, Scribner, or International.

   d. Define price received in same manner as (c).

   e. Haul distance from site of harvest to mill or concentration yard.

   f. Determine how timber for sale is located; for example, word of mouth, company buyer, consulting foresters, etc.

   g. Try to identify any problem concerning timber or log supply in your cutting area (tree conditions, landowner attitude, logging conditions, labor, equipment, etc.).

   H. Determine if they feel there is enough potential hardwood, softwood, or both in the area to justify a new timber processing complex.

Project A-2084

A TIMBER PROCESSING COMPLEX AND A WOOD ENERGY CENTER IN GEORGIA

Second Quarterly Progress Report to
Georgia Forestry Commission

March 1, 1978 to May 31, 1978

GEORGIA INSTITUTE OF TECHNOLOGY
ENGINEERING EXPERIMENT STATION
Technology & Development Laboratory
Economic Development Division
Atlanta, Georgia 30332

June 6, 1978

This research project consists of two Tasks. Task I deals with a timber processing complex in North Georgia. Task II is concerned with a wood energy center. Since no work has been done on Task II during this reporting period, this progress report covers only Task I.

JOBS COMPLETED OR IN PROGRESS

1. Survey of Land Owners

There are 27,814 land owners in the 25-county study area. Based upon the number of land owners in each county and amount of commercial forest acreage in the county, a stratified random sample of 1,500 land owners (see Attachment A) was constructed for conducting a mail survey. The main purposes of the survey are to learn from these land owners their planning in future timber sales and their attitudes concerning timberland leasing and management. Cover letters, questionnaires, and self-addressed and stamped envelopes were prepared (see Attachment B). These survey materials are being sent to the 1,500 randomly selected land owners in the study area during the first week of June 1978.

2. Contacting Major Wood-Using Companies

The ultimate purpose of this research program is to attract wood-using industries into the study area. By contacting a number of major wood-using companies during the course of this study program, their interests in the study area can be sounded out. A list of 123 major companies was compiled (see Attachment C). A letter, accompanied by summarized timber resource data in the study area as well as the results of two test surveys on timberland owners and loggers conducted previously, was sent to the presidents of these companies during the first week of May 1978 (see Attachment D). Only seven companies have responded thus far. One major company has shown interest in our research project. A meeting with their management personnel has been set up to be held in June. Another company is interested in building a pine plywood plant but it is outside of our study area.

3. Survey Tabulations

Two previously conducted test surveys on timberland owners and loggers were completed. Sixty-one survey returns of timberland owners and 55 survey returns of loggers were tabulated. Partial, tabulated results are given in Attachment D.

4. Timber Resources Analysis

Based on tabulated timber resource data on wood species, timber volume, and growth-removal relationship, various trends of these timber statistics in the study area are under review. The study on timber resources together with the survey results of timberland owners and loggers should provide meaningful information concerning the future stumpage supplies in the study area.

WORK PLANNED FOR NEXT PERIOD

1. Planning and Designing a Timber Processing Complex

The planning of a timber processing complex in the study area has been delayed partly because of the waiting for responses from the 123 major wood-using companies contacted. The 25-county study area, according to our investigation, is in short supply of high quality and large diameter sawlogs. The planning of the proposed timber processing complex may have to emphasize the utilization of low quality and small diameter timber supplies. Product mix, processing technology, scale of operation, and plant location will be determined according to important factors such as timber availability and end-product market potentials.

2. Investigating Investment Elements and Costs

Exhaustive investigations will be carried out in order to ascertain the fixed investments of the proposed complex together with needed working capital. Various input-output relationships of the production, elements of the production and costs, and projected returns will be examined.

3. Collecting Markets and Marketing Data

Markets and marketing data concerning product mix will be collected. Direct interviews and a literature search will be conducted.

ATTACHMENT A

Number of Timberland Owners

Sampled by District

District #1 Rome

County	No. Samples
Bartow	91
Catoosa	19
Chattooga	71
Dade	16
Floyd	125
Gordon	70
Walker	95
Total	487

District #2 Canton

County	No. Samples
Whitfield	38
Murray	46
Fannin	86
Gilmer	97
Cherokee	140
Pickens	51
Towns	20
Union	68
	546

District #14 Gainesville

	No. Samples
Banks	38
Hall	96
Davison	17
Forsyth	45
Franklin	77
Stephens	18
Habersham	37
Rabun	56
White	34
Lumpkin	49
	467

District #1	487
District #2	546
District #4	467
	1500 Total

ATTACHMENT B

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

June 1, 1978

The Economic Development Division, Technology and Development Laboratory, Georgia Institute of Technology in conjunction with the Georgia Forestry Commission, is conducting a timber supply study in the Appalachian region of Georgia. The main purpose of this study is to investigate the possibility of establishing a new timber processing complex in the area.

We understand that the area's forestry activity has been less than in any other part of the state. The result is a depressed stumpage price at the expense of timber owners in the area. The study is funded by the Appalachian Regional Commission as a part of the economic development efforts in the area. The results of this study may bring new timber users into North Georgia or new customers to you.

Would you please spend a moment of your time in answering the few simple questions posted in the questionnaire? If your land contains no forest, please indicate so and return the blank questionnaire to us. We urge all timber landowners to do their best in answering the questions posted.

All your answers will be kept in strict confidence. Because of the limited time imposed upon the study, I would appreciate your response at your earliest convenience. Please return completed questionnaires in the enclosed stamped, self-addressed envelope.

Sincerely yours,

[redacted]

Tze I. Chiang
Principal Research Scientist

TIC/jcd

cc: Mr. Tom Loggins
Georgia Forestry Commission

Enclosure

TIMBER LANDOWNERS SURVEY

NAME:_____

ADDRESS:_____

1. What is your current occupation?_____

2. Are your presently living on a tract? Yes____ No____

3. Location of Property (County): _____

4. How many total acres on property? _____ acres

5. How many acres of forestland on property? _____ acres

6. About how many acres are in pure pine? _____ acres

7. About how many acres are in pure hardwood trees? _____ acres

8. About how many acres are in mixed pine and hardwood trees? _____ acres

9. If pine is growing on your land, about how many acres of it have been planted? _____ acres

0. About how many acres have you obtained for the purpose of growing timber as a business investment? _____ acres

1. Have you ever sold timber before?

   Yes____(go to #12) No____(go to #13)

2. If yes:

   a. When was the last timber sale made (year)? _____

   b. What products were sold? (please check)

      (1) hardwood firewood ____

      (2) hardwood pulp ____

      (3) hardwood saw timber ____

      (4) hardwood veneer log ____

      (5) pine firewood ____

      (6) pine pulp ____

      (7) pine saw timber ____

      (8) pine veneer log ____

   c. How did you find a buyer (please check one):

      (1) he came to you ____

      (2) through a friend ____

      (3) consulting forester ____

      (4) other (please specify) ____

d. What type of buyer?

(1) independent logger ____

(2) company purchase agent ____

(3) timber broker ____

(4) other (please specify) ____

e. Do you feel the price you received for your timber was satisfactory?

Yes ____ No ____

f. What was the average price you received for your forest products from your last timber sale?

(1) price received per 1,000 board feet of saw timber: $_____

(2) price received per cord of pulpwood: $_____

13. Reasons for not selling timber before (please check):

a. timber too small ____

b. stumpage price too low ____

c. not fitting in future land ownership plan ____

d. other (please specify)

14. Are you willing to sell timber in the next five years?

Yes____ No____

If no, why not?

a. timber too small? ____

b. stumpage price too low ____

c. not fitting in future landownership plan ____

d. other (please specify) ____

15. Have you spent any money to improve your timber during the past?

a. 1-5 years: Yes____ No____

b. 6-10 years: Yes____ No____

c. 11-15 years: Yes____ No____

16. What range of stumpage prices do you expect to receive if you do decide to sell your timber?

a. hardwood sawtimber $_____ per thousand board feet in log scale of

(1) International ___, (2) Scribner ___, or (3) Doyle ____.

b. hardwood pulpwood $_____ per _____ in scale:
(1) cord (128 cu. ft.) ____, or (2) unit (168 cu. ft.) ____

c. hardwood firewood $_____ per _____ scale (standard cord)

d. pine sawtimber $_____ per thousand board feet in log scale of:
(1) International ____, (2) Scribner ____, or (3) Doyle ____

e. pine pulpwood $_____ per _____ scale:
(1) cord (128 cu. ft.) ____, or (2) unit (168 cu. ft.) ____

f. pine firewood $_____ per _____ scale (standard cord)

17. How do you perceive the market demand for your timber? (Please check only one in each time period).

	Low	Medium	High
a. last 5 years	( )	( )	( )
b. current	( )	( )	( )
c. next 5 years	( )	( )	( )

18. Are you interested in a possible contractual agreement with a wood-using company for leasing or managing your timberland?

Yes ____ No ____

Comments: _____

_____

_____

_____

ATTACHMENT C

CORPORATION MAILING LIST

Mr. J. Stanford Smith
Chief Executive Officer
International Paper Company
220 East 42nd Street
New York, NY 10017

Mr. E. E. Ellis
Vice President
International Paper Company
Southern Kraft Division
P. O. Box 2328
Mobile, AL 36601

Mr. R. Hellendale
President
Great Northern Paper Company
75 Prospect Street
Stamford, CT 06901

Mr. Bruce Ellen
President
Great Southern Plywood Corp.
P. O. Box 215
Cedar Springs, GA 31732

Mr. Robert S. Hatfield
President
The Continental Group, Inc.
633 Third Avenue
New York, NY 10017

Mr. Clinton G. Ames
President
Inland Container Corp.
151 North Delaware
Indianapolis, IN 46206

Mr. W. L. Batts
President
Mead Corporation
Courthouse Plaza, N. E.
Dayton, OH 45463

Mr. J. H. Binns, President
Armstrong Cork Co.
Liberty & Charlotte Sts.
Lancaster, PA 17604

Mr. E. V. McSwiney
President
Georgia Kraft Company
Executive Offices 320, Suite 105
Interstate Parkway
Atlanta, GA 30339

Mr. John P. Hayes
President
National Gypsum Company
4100 First International Building
Dallas, TX 75270

Mr. William M. North
Senior Vice President
National Gypsum Company, Inc.
325 Delaware Avenue
Buffalo, NY 14202

Mr. James A. Cobb
Vice President, Primary Operations
Forest Product Division, Pkg. Grp.
Owens-Illinois, Inc.
P. O. Box 1035
Toledo, OH 43666

Mr. Richard J. Walters
President
Diamond International Corp.
733 Third Ave.
New York, NY 10017

Mr. Charles E. Anderson
President
ITT Rayonier Inc.
605 Third Avenue
New York, NY 10016

Mr. W. J. Maroney
President
Southern Wood Piedmont Company
P. O. Box 5447
Spartanburg, SC 29304

Mr. T. Marshall Hahn, Jr.
President
Georgia-Pacific Corporation
900 Southwest Fifth Avenue
Portland, OR 97204

Mr. John K. Barrow, Jr.
Vice President
Timber and Products, Southern Division
Georgia Pacific Corporation
P. O. Box 1808
First National Bank Building
Augusta, GA 30903

Mr. Randolph Gregory
Amax Forest Products
P. O. Box 549F
Whitehouse Rural Station
Jacksonville, FL 32220

Mr. William S. Woodside
President
American Can Company, Inc.
American Lane
Greenwich, CT 06830

Mr. J. T. Guyol
President
American Forest Products
2740 Hyde Street
San Francisco, CA 94109

Mr. C. C. Blalock
President
Appalachian Trail Company
P. O. Box 428
Cleveland, GA 30528

Mr. John B. Fery
President
Boise Cascade Corporation
One Jefferson Square
Boise, ID 83728

Mr. Robert Herdman
President
Bowaters Carolina Corporation
P. O. Box 7
Catawba, SC 29704

Mr. Clifton R. Jones
President
Bradley Plywood Corporation
P. O. Box 1408
Savannah, GA 31402

Mr. R. F. Burgin, Jr.
President
Burgin Lumber Company
P. O. Box 60
Cuthbert, GA 31740

Mr. Andrew C. Sigler
President
Champion International Corporation
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Stamford, CT 06921

Mr. Paul B. Barringer
President
Coastal Lumber Company
Elm Street
Weldon, NC 27890

Mr. R. Harper Brown
President
Container Corporation of America
One First National Plaza
Chicago, IL 60670

Mr. Charles Raymond Dahl
President
Crown Zellerback Corporation
P. O. Box 7809
San Francisco, CA 94119

Mr. Charles Gilman, Jr.
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Gilman Paper Company
111 West 50th Street
New York, NY 10020

Mr. T. A. Gutherie
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P. O. Box 299
Greensboro, GA 30642

Mr. Albert F. Duval
President
Hammermill Paper Company, Inc.
P. O. Box 1440
Erie, PA 16533

Mr. Howell H. Howard
President
Edward Hines Lumber Company, Inc.
200 South Michigan Avenue
Chicago, IL 60604

Mr. Harry J. Sheerin
President
Kimberly-Clark Corporation
North Lake Street
Neenah Street, WI 54956

Mr. Douglas Grymes
President
Koppers Company, Inc.
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Pittsburgh, PA 15219

Mr. Willard G. Egan
President
Larkin Industries, Inc.
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Swainsboro, GA 30401

Mr. Mac Hedges
Log Crafters, Inc.
101 Aster Avenue
Chattanooga, TN 37241

Mr. Robert N. Rasmus
President
Masonite Corporation
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Chicago, IL 60606

Mr. John D. Mullens
President
Olinkraft, Inc.
P. O. Box 488
West Monroe, LA 71291

Mr. Richard B. Madden
President
Potlatch Corporation
P. O. Box 3591
San Francisco, CA 94119

Mr. William R. Haselton
President
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New York, NY 10017

Mr. R. L. Meek
President
Scott Lumber Company
253 North Lincoln Avenue
Bridgeport, OH 43912

President
South Carolina Industries, Inc.
P. O. Box 4000
Florence, SC 29501

Mr. H. V. Thompson
President
H. V. & T. G. Thompson Lumber Company
P. O. Box 159
Ailey, GA 30410

Mr. Alexander Calden, Jr.
Chief Executive Officer
Union Camp Corp.
1600 Valley Road
Wayne, NJ 07470

Mr. E. W. Duffy
President
United States Gypsum Company
101 South Wacker Drive
Chicago, IL 60606

Mr. David L. Luke, III
President
Westvaco Corporation
299 Park Avenue
New York, NY 10017

Mr. George H. Weyerhaeuser
President
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Tacoma, WA 98401

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Riceboro, GA 31323

Mr. Donald Belgrad
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Schnadig Corporation
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Madison, GA 30650

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Mr. Jack W. Warner, President
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Mr. Gerard E. Veneman, President
Nekoosa Edwards Paper Co., Inc.
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President
Angelina Hardwood Sales Co.
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Lufkin, TX 75901

President
Bankhead Forest Industries, Inc.
Box DD
Grayson, AL 35562

President
P. E. Barnes Lumber Co.
Box 7, Rt. 3,
Hamburg, AR 71646

President
Bearden Lumber Co.
Box 155
Bearden, AR 71720

President
Bellgrade Lumber Co.
1216 1st Nat'l. Bank Bldg.
Memphis, TN 38103

President
J. W. Black Lumber Co.
Box 107
Corning, AR 72422

President
Armour C. Bowen Sawmill Co.
Box 9275
Memphis, TN 38107

President
Buchanan Hardwoods, Inc.
Box 960
Selma, AL 36701

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Calion Lumber Co.
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Calion, AR 71724

President
Cathey-Williford-Jones Co.
1216 1st Nat'l. Bank Bldg.
Memphis, TN 38103

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Chicago Mill & Lumber Co.
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Greenville, MS 38701

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Coastal Lumber Co.
Box 829
Weldon, NC 27890

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Cornelius Lumber Co.
Box 186
Middleton, TN 38502

President
Cowikee Lumber Co.
Box 42
Eufaula, AL 36027

President
Coxe Lumber Co., Inc.
Box 526
Darlington, SC 29532

President
Curtner Lumber Co.
Box 617
Newport, AR 72112

President
Faust Band Saw Mill, Inc.
Box T
West Helena, AR 72390

President
Frizzell Lumber Co., Inc.
Drawer C
Gurdon, Ar 71743

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Fuller Forest Products, Inc.
Drawer Z
Kinder, LA 70648

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Griffith Lumber Co.
Madison
AR 72359

President
J. H. Hamlen & Son, Inc.
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Little Rock, AR 72203

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Harrison Lumber Co.
Box 427
Ferriday, LA 71334

President
Holly Ridge Lumber Co., Inc.
Box 115
Holly Ridge, LA 71248

President
Jackson Saw Mill Co., Inc.
Box 1903
Jackson, TN 38301

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J. M. Jones Lumber Co., Inc.
Box 1368
Natchez, MS 39120

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Keadle Lumber Enterprises, Inc.
Rt. 2, Box 321
Thomaston, GA 30286

President
L. D. Kellogg Lumber Co., Inc.
Box 626
Alexandria, LA 71301

President
Kitchens Brothers Mfg. Co.
Box 217
Utica, MS 39175

President
Laurel Hill Lumber Co., Inc.
Drawer 1174
Woodville, MS 39669

President
J. P. Lester Sawmill, Inc.
Box 155
Glenwood, AL 36034

President
Linden Lumber Co., Inc.
Box 506
Linden, AL 36748

President
Esper Marionneaux Lumber Co.
Box 8
Livonia, LA 70755

President
Marsh Plywood and Lumber Corp.
Box 247
Pamplico, SC 29583

President
Roy O. Martin Industries, Inc.
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Alexandria, LA 71301

President
McGehee-Burkley Lumber Co., Inc.
Box 1586
Natchez, MS 39120

President
McGraw-Curran Lumber Co.
Box 450
Yazoo City, MS 39194

President
J. M. McMillan Sawmill, Inc.
Box 79
Stockton, AL 36579

President
Memphis Hardwood Flooring Co.
Box 7253
Memphis, TN 38107

President
Miller & Patterson Lumber Co., Inc.
Box 310
Des ARc, AR 72040

President
Fred Netterville Lumber Co.
Rt. 1, Box 855
Woodville, MS 39669

President
Palmetto Hardwood Corp.
Box 441
Mullins, SC 29574

President
W. E. Parks Lumber Co, Inc.
Box 248
Newellton, LA 71357

President
Potlatch Corp.
Box 390
Warren, AR 71671

President
Powell Tie & Timber Co.
Box 89
Brownsville, TN 38012

President
Reed & Sons Hardwoods, Inc.
Box 113
Monroe, LA 71201

President
Ricks Lumber Co., Inc.
Box 1323
Natchez, MS 39120

President
Rogers Brothers Lumber Co., Inc.
Box 352
Ferriday, LA 71334

President
Roundwood Corp. of America
Box 13269
Florence, SC 29504

President
S & G Lumber Co., Inc.
Box 277
Tchula, MS 39169

President
Selma Timber Co., Inc.
Rt. 4, Box 90
Monticello, AR 71655

President
E. Sondheimer Co.
Sondheimer,
LA 71276

President
The Southern Star Lumber Co.
Box 429
McKenzie, TN 38201

President
Storey Sawmill & Lumber Co., Inc.
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Troy, TN 38260

President
Sullivan Lumber Co.
Preston
GA 31824

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T & S Hardwoods, Inc.
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Milledgeville, GA 31061

President
Tallahatchie Hardwoods, Inc.
Box 70
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President
Temple-Chattanooga
Box 10
Savannah, TN 38372

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Tolleson Lumber Co., Inc.
Drawer E
Perry, GA 31069

President
Townsend Co.
Box 571
Stuttgart, AR 72160

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Whitson Lumber Co., Inc.
Box 90274
Nashville, TN 37209

President
Williams Lumber Co., Inc.
Drawer 4198
Rocky Mount, NC 27801

President
Woodard-Walker Lumber Co., Inc.
Taylor
LA 70180

President
Woods Lumber Co., Inc.
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Memphis, TN 38108

Mr. Ira Liberman, President
Duke Lumber Co.
P. O. Box 25807
Albuquerque, New Mexico 87125

ATTACHMENT D

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

The Technology and Development Laboratory (TDL) of the Georgia Institute of Technology is conducting a research program to develop a timber processing complex in a 25-county north Georgia area (see attached map). TDL's end purpose is the creation of jobs in the study area.

We intend to cooperate with any potential investors who have an interest in expansion in the north Georgia area. The cooperation would be mutually beneficial because TDL's staff time and research capability are available without charge for approved project tasks. The fruit of this research project would inevitably benefit the cooperating company in its future planning. TDL, on the other hand, could bring a prospective investor to the study area and, therefore, benefit by the association with a cooperating company.

Project tasks may include the investigation of product mix, timber supplies, labor availability, production-investment requirements, potential plant locations, markets and marketing practices associated with chosen end products, etc. A mutually beneficial, detailed project plan can be developed.

TDL is one of eight major operating units of the Engineering Experiment Station of the Georgia Institute of Technology. TDL's staff consists of 73 professional research personnel. The Economic Development Division, one unit of TDL, has completed over 50 research projects related to timber and wood products in the past 20 years. Because of these reports, a number of plants located in Georgia.

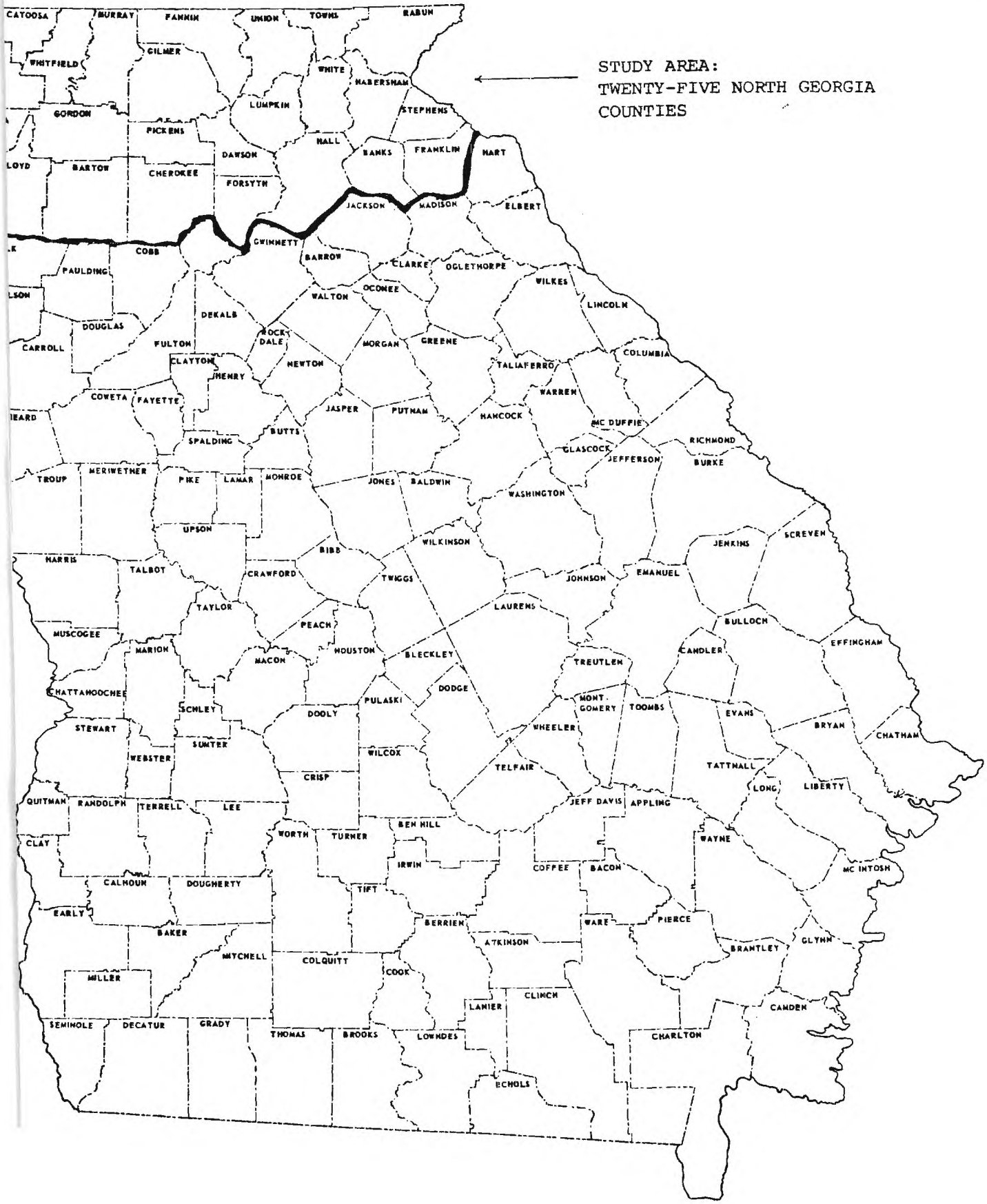
Enclosed are tables summarizing the timber resource base in the study area together with the results of two test surveys on timberland owners and loggers in the area. These are preliminary results prepared for your review. Your response is sincerely appreciated. Should you be interested in this research program, please do not hesitate to contact us.

Very truly yours,

[redacted]

Tze I. Chiang
Principal Research Scientist
Technology and Development Laboratory

Enclosures


STUDY AREA:
TWENTY-FIVE NORTH GEORGIA
COUNTIES
CATOOSA
MURRAY
FANNIN
UNION
TOWNS
RABUN
WHITFIELD
GILMER
WHITE
HABERSHAM
GORDON
LUMPKIN
STEPHENS
PICKENS
HALL
DAWSON
BANKS
FRANKLIN
HART
BARTOW
CHEROKEE
FORSYTH
JACKSON
MADISON
ELBERT
COBB
GWINNETT
BARROW
CLARKE
OGLETHORPE
PAULDING
WALTON
OCONEE
WILKES
LINCOLN
DEKALB
DOUGLAS
ROCK-DALE
MORGAN
GREENE
CARROLL
FULTON
CLAYTON
NEWTON
TALIAFERRO
COLUMBIA
HENRY
COWETA
FAYETTE
JASPER
PUTNAM
WARREN
HANCOCK
MC DUFFIE
SPALDING
BUTTS
GLASCOCK
JEFFERSON
RICHMOND
BURKE
TROUP
MERIWETHER
PIKE
LAMAR
MONROE
JONES
BALDWIN
WASHINGTON
UPSON
WILKINSON
JENKINS
SCREVEN
HARRIS
TALBOT
CRAWFORD
BIBB
TWIGGS
JOHNSON
EMANUEL
TAYLOR
LAURENS
PEACH
BULLOCH
MUSCOGEE
MARION
MACON
HOUSTON
BLECKLEY
CANDLER
EFFINGHAM
TREUTLEN
CHATTAHOOCHEE
DODGE
PULASKI
MONT-GOMERY
TOOMBS
EVANS
SCHLEY
DOOLY
WHEELER
BRYAN
CHATHAM
STEWART
SUMTER
WILCOX
TATTNALL
WEBSTER
TELFAIR
LONG
LIBERTY
CRISP
QUITMAN
RANDOLPH
TERRELL
LEE
JEFF DAVIS
APPLING
BEN HILL
WORTH
TURNER
WAYNE
CLAY
IRWIN
COFFEE
BACON
MC INTOSH
CALHOUN
DOUGHERTY
TIFT
EARLY
BERRIEN
WARE
PIERCE
BAKER
ATKINSON
BRANTLEY
GLYNN
MITCHELL
COLQUITT
MILLER
COOK
CLINCH
CAMDEN
LANIER
SEMINOLE
DECATUR
GRADY
THOMAS
BROOKS
LOWNDES
CHARLTON
ECHOLS

I. Timber Resource Base in the Twenty-Five-County Area

1. Total land area and forest area, 1972

All land	4,942,900 acres
Commercial forest	3,631,700 acres
Percent	73.5%

2. Ownership of Commercial forest land

Ownership	Thousand Acres	Percent
All ownership	3,631.8	100.0
Public	786.2	21.6
Private farm	1,010.0	27.8
Other private	1,561.1	43.0
Forest industry	268.1	7.4
Forest industry lease	6.4	0.2

3. Volume of sawtimber on commercial forest land

Species	Thousand Board Feet	Percent
All species	9,762,079	100.0
Pine	3,811,029	39.0
Other softwood	782,182	8.0
Soft hardwood	1,040,437	10.7
Hard hardwood	4,128,431	42.3

4. Volume of growing stock on commercial forest land by diameter

Diameter Class	Softwood	Hardwood	Total
	(in thousand board feet)		
All classes	1,766,453	2,030,953	3,797,406
5.0 - 6.9	305,007	187,197	493,204
7.0 - 8.9	416,348	265,378	681,726
9.0 - 10.9	374,622	329,398	704,020
11.0 - 12.9	282,080	343,594	625,674
13.0 - 14.9	159,695	301,634	461,329
15.0 and larger	227,701	607,946	835,647

5. Net annual growth and removals of growing stock on commercial forest land

Species	Net Annual Growth	Annual Removals
	(in thousand cubic feet)	
All species	206,624	108,609
Softwood	129,206	70,385
Hardwood	77,418	38,224

6. Net annual growth and removals of sawtimber on commercial forest land

Species	Net Annual Growth	Annual Removals
	(in thousand board feet)	
All species	613,369	342,824
Softwood	378,945	219,207
Hardwood	234,424	123,617

II. The Results of a Test Survey of Timber Landowners in the 25-County Study Area

1. Sample size: 61 landowners
Total landowners in the 25-county area: Approximately 30,000

2. Track size

Forest Acreage	No. of Landowners
Under 100	17
100- 499	27
500-1,499	10
1,500-4,999	6
5,000 and above	1
Total	61

3. Acreage under forest type

Forest Type	Total Acres	Percent
Softwood	14,030	45
Mixed soft and hardwood	14,062	45
Hardwood	3,152	10
Total	31,244	100

4. Acreage under type of timber

Type of Timber	Total Acres	Percent
Hardwood sawtimber	4,319	14
Hardwood pulp	5,723	19
Hardwood sapling	2,328	7
Pine sawtimber	8,229	26
Pine pulp	8,454	27
Pine sapling	2,191	7
Total	31,244	100

5.

Type of Timber Sold	No. of Responses	Percent
Hardwood firewood	2	3
Hardwood pulp	4	5
Hardwood sawtimber	16	20
Hardwood veneer	1	1
Pine firewood	0	0
Pine pulp	26	32
Pine sawtimber	31	39
Pine veneer	0	0
Total	80	100

6. Willing to sell in next five years

	No. of Responses	Percent
Yes	54	89
No	7	11
	61	100

7. Stumpage prices willing to accept

Timber Type	Scale	Range	Average
Hardwood sawtimber	MBF/International	$20-100	$69.0
	MBF/Scribner	20- 75	43.0
Hardwood pulp	Cords	2- 10	5.0
Hardwood firewood	Cords	2- 20	7.6
Pine sawtimber	MBF/International	45- 80	64.0
	MBF/Scribner	30-125	63.0
Pine pulp	Cords	5- 25	8.5
Pine firewood	Cords	2-7.6	4.8

8. Perceived future demand for timber in the area

	No. of Responses	Percent
Low	24	43
Medium	26	46
High	6	11
Total	56	100

III. The Results of a Test Survey of Loggers in the 25-County Area

1. Sample size: 55 loggers

2. Number of employees

Range	No. of Responses	Percent
1- 5	41	80
6-10	7	14
11-15	2	4
16-20	1	2
Total	51	100

3. 1977 delivered volume

Kind of Wood	Sawtimber (MBF)	Pulpwood (Cords)
Softwood	30,311	220,500
Hardwood	8,275	22,665

4. 1977 log data

	Average DIB* (inches)	Average Length of Log (feet)
Sawtimber		
Hardwood	12.7	12
Softwood	11.0	14
Pulpwood		
Hardwood	5.3	5.3
Softwood	5.9	5.3

* Diameter inside bark at the small end of the log.

5. Price paid to landowner

Log Type	Scale	Price Range	Average	No. of Responses
Hardwood				
Sawtimber	MBF/Internl.	$25- 35	$28	3
	MBF/Scribner	20-100	36	22
	MBF/Doyle	20- 40	30	4
Pulpwood	Cord	3.8-5	4	7
Firewood	Cord	30	30	1
Veneer	MBF/Doyle	60- 75	67.5	2
Softwood				
Sawtimber	MBF/Internl.	$42.5	$42.5	1
	MBF/Scribner	35-105	45	28
	MBF/Doyle	50	50	2
Pulpwood	Cord	3.8-8	5.8	21
Veneer	MBF/Doyle	65- 70	67.5	2

6. Price received at yard or sawmill

Log Type	Scale	Price Range	Average	No. of Responses
Hardwood				
Sawtimber	MBF/Scribner	$ 50-200	$ 83	23
	MBF/Doyle	75- 90	82.5	2
Pulpwood	Cord	15- 22	20.9	12
Firewood	Cord	35	35	1
Veneer	MBF/Doyle	65-150	125	5
Softwood				
Sawtimber	MBF/Scribner	$ 60-200	$ 96	27
Pulpwood	Cord	19- 30	22.88	14
Veneer	MBF/Doyle	135	135	1

7. Distance hauled (one way)

Type of Log	Distance in Miles					Average Miles
	1-10	11-20	21-30	31-40	41 & Above	
	(No. of responses)					
Sawtimber	0	18	8	6	5	31
Pulpwood	2	12	6	3	1	23
Veneer	0	1	1	0	3	37
Firewood	0	1	0	0	0	12

8. Expect any problem in log supply in the future?

	No. of Responses	Percent
Yes	14	31
No	31	69
Total	45	100

9. Can a large wood processing complex be supported in the area?

	No. of Responses	Percent
Yes	28	62
No	17	38
Total	45	100

A-2084

Task I: A TIMBER PROCESSING COMPLEX IN NORTH GEORGIA

JOBS COMPLETED OR IN PROGRESS

1. Survey of Landowners

Based on timberland acreage and the number of landowners in each county, a stratified number of landowners was determined for each of the 25-county study area. Based on the number of landowners given for each county, names were randomly selected for a the survey. A total of 1,500 questionnaires were sent, of which 1,448 were delivered and 225 responded. Among the 225 responding, 134 of them do have timber on their land. A detailed tabulation of data, based on the response of the forest landowners, has been completed.

2. Cooperation With A Major Wood-Using Company

After a series of contacts with several major wood using companies, it was decided to coordinate this research program with one of the companies contacted. This company has a serious interest in setting up a Chip-N-Saw operation in the study area. An arrangement was made for the woodland-division manager of the company to make a tour of the study area and to talk to local forestry related people (GFC personnel, forest consultants, loggers, and landowners). The tour was completed in three days during August 1978. The manager acknowledged that there are substantial timber resources in the area. He wanted to spend more time investigating supply conditions. Timber resource data together with survey tabulations completed under this study program have been provided to him. A meeting with the company's personnel to review the status of both sides is scheduled on September 14, 1978.

2. Planning and Designing A Timber Processing Complex

A product mix of the proposed processing complex should be compatible with timber resources and supply conditions of the area. Since small diameter logs are dominant of the supplies in North Georgia, a Chin-N-Saw operation can be regarded as suitable. Other products such as pine plywood, particleboard, medium-density board, corrugated medium board, etc., were considered and discarded for various reasons. A likely candidate product would be Com-Ply which is under our intensive review.

4. Investigating Investment Elements and Costs

Considerable data on investment requirements and the costs of production elements have been collected for a Chip-N-Saw system. Detailed input versus output relationships have been finalized.

5. Collecting Markets and Marketing Data

Large volumes of trade statistics and literature have been gathered on various wood products in order to review each product's potential. Interviews with trade people will be conducted in order to obtain markets and marketing data.

WORK PLANNED FOR NEXT PERIOD

1. Continued Collecting Data on Investments, Production, and Markets

Many areas of cost elements concerning investments and production for a Chip-N-Saw system are waiting to be investigated. Marketing information on constructural lumber needs also have to be explored.

2. Continued Coordination With A Major Wood-Using Company

Coordination and contacts with the company previously mentioned will be continued. The coordination will cause some delay of the completion date of this study program because a new-venture investigation of a big corporation follows certain procedures, especially on a large project. However, the results of this study program would be much more rewarding with the company participating. A request for an extension of this project time will be made later pending future development.

Task II: A MARKET STUDY ON WOOD ENERGY

JOBS COMPLETED OR IN PROGRESS

1. Completing A Work Outline

This task was delayed in order to conduct a joint research effort with another project (the feasibility of wood energy utilization) which was not started until April 1978. Inputs from the feasibility study are required before the market study can be conducted. After several internal meetings,

an outline for this task was tentatively fixed as follows:

- o The potential southeastern market for wood fired boilers
- o The market for wood fired boilers in the Appalachian area of Georgia
- o Market barriers
- o Government incentives for overcoming market barriers

2. Data Obtained

Visits and contacts were made with major wood boiler manufacturers in the nation as well as the American Boiler Manufacturers Association. Useful data were obtained from the Department of Energy. A statistical series on new boilers ordered in the nation, a national boiler inventory, and a list of large boiler owners in seven southeastern states were gathered from different agencies.

WORK PLANNED FOR NEXT PERIOD

1. A Survey of Boiler Users in the Appalachian Area of Georgia

The purpose of the survey will be to assess the potentials of substituting fossil fuels with wood fuels in boilers. A list of boiler users by industry will be compiled and a questionnaire designed. Economics on wood boilers compared with non-wood boilers will be constructed and used in the survey.

2. Estimating the Market Potentials of Wood Energy on Boilers in the Southeast

The results of the survey on boiler users in Georgia will be used to make an estimate on the market potentials of wood boiler fuels in the Southeast. A list of boiler population by class in the region has to be compiled.

Project A-2084

A TIMBER PROCESSING COMPLEX AND A WOOD ENERGY CENTER IN GEORGIA

Fourth Quarterly Progress Report to
Georgia Forestry Commission
September 1, 1978 to November 30, 1978

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Technology and Development Laboratory
Economic Development Division

December 4, 1978

TASK 1: A TIMBER PROCESSING COMPLEX IN NORTH GEORGIA

JOBS COMPLETED OR IN PROGRESS

1. Discontinued Cooperation with A Major Wood-Using Company

The company interested in a Chip-N-Saw operation in North Georgia was the Owens-Illinois Company. As reported previously, an arrangement was made for the woodland-division manager of the company to make a tour of the study area, accompanied by a GFC personnel, and to talk to local forestry related people between August 16-19, 1978. The purpose of the tour was to provide a first-hand knowledge about timber resources and supply conditions to the Owens-Illinois personnel. After lengthy discussions with the company after the tour, a meeting was set up at the GFC Macon Headquarters on September 14, 1978, to review the results of the tour. Personnel from Owens-Illinois, GFC, and Georgia Tech participated. In the meeting, Owens-Illinois personnel announced that their company will not build a Chip-N-Saw plant in the study area because of the following reasons:

a. It is difficult to procure 40 to 50 million board feet of southern pine timber a year without taking in hardwoods in the area.
b. Transportation is difficult in the area.
c. Too much speculation on land in the area.
d. It's cheaper to build a plant in a location where Owens-Illinois already has facilities.

It is decided to drop the Chip-N-Saw operation from this study program.

2. Searching for A New Product Mix

Com-ply, a newly developed wood product, has been under our intensive study for several months. Com-ply products are composite sandwich construction with particleboard core between double layers of veneers. Com-ply products include studs, joists, and panels. This study program will concentrate on com-ply panels only because of the consideration of market outlets. The main uses of com-ply panels are for sheathing and underlayment purposes in housing construction.

The characteristics of com-ply manufacturing are most adaptable to the needs of North Georgia. These characteristics are given below:

a. Both softwood and hardwood timber can be used.
b. The volume of timber requirements for com-ply production is within the supply range of the study area.
c. The production would require about 180 people.
d. Com-ply technology would up-grade the wood working industry in the study area.

The Potlach Corporation, which is the only company engaged in the production of Com-ply products, has a plant in Louistance, Idaho. The Georgia-Pacific Corporation is building a 200-million square feet com-ply panel plant in Dudley, North Carolina. Several other com-ply plants are currently under planning.

3. Investigating Investment and Production Data

Visits were made to the Forestry Science Laboratory, Athens, Georgia and the Georgia-Pacific Corporation in Augusta, Georgia, for the purpose of obtaining information on investment and production requirements. Publications on Com-ply products were obtained as a result of a literature search. Finally a prototype Com-ply panel plant with annual capacity of 126,720,000 square feet, CD ½-inch thickness, has been adopted. All investment and production costs were calculated and finalized.

4. Planning Marketing Strategy

Since com-ply panels are used in the place of softwood plywood panels, an intensive study on southern pine plywood markets has been carried out. Data on marketing shipments of softwood plywood were obtained from the American Plywood Association and analyzed. A marketing strategy for the proposed Com-ply panel plant in North Georgia has been worked out.

WORK PLANNED FOR NEXT PERIOD

1. Analyzing Timber Resource and Utilization Data

A large body of timber resource and utilization data have been collected for this study program. These data need to be analyzed, tabulated, and selected for final uses.

2. Writing a Draft Final Report

A final report will be prepared on the basis of timber resources and utilization, survey of loggers and timberland owners, outline of a prototype Com-ply panel plant, projected production costs and returns, and markets and marketing. Each section will contain data, tables, and figures.

TASK II: A MARKET STUDY ON WOOD ENERGY

JOBS COMPLETED OR IN PROGRESS

1. Investigating Current Boiler Markets

Two approaches have been taken to investigate the current boiler market. The first approach is obtaining data from EPA which is constantly monitoring boiler users for polution purposes. Detailed data on number of boilers, capacities, fuel types, etc., in the 8-state southeastern area were obtained and tabulated. Wood boilers and non-wood boilers were tabulated separately.

The second approach was taken by obtaining data from the American Boiler Manufacturers Association . Data on new boiler sales in the 8-state southeastern area from 1969 to 1978 were obtained and tabulated. Again wood boilers and non-wood boilers were tabulated separately.

2. Investigating the Future Market Potentials of Wood Energy

A list of boiler owners in the 8-state southeastern area is under compiling. Based on a 5% precision at 95% confidence, a sampling survey on all boiler users will be conducted. The purpose of the survey is to find out the potential uses of wood boilers and wood gasification equipment in the future.

A concise statement on the investment and production requirements on wood boilers and gasification equipment is under way.

WORK PLANNED FOR NEXT PERIOD

1. A Survey of Boiler Users in the 8-State Southeast

A mail survey of boiler users concerning their potential uses of wood boilers or wood gasification equipment in the future will be carried out. Questionnaire together with a concise statement on wood boilers and gasification equipment will be used in the survey.

2. Preparing a Final Report on Wood Energy Market Potentials

Based on the results of a mail survey mentioned previously, a report on wood energy potentials will be prepared.

A-2084

Project A-2084

A TIMBER PROCESSING COMPLEX AND A WOOD ENERGY CENTER IN GEORGIA

Fifth Quarterly Progress Report to
Georgia Forestry Commission
December 1, 1978 to February 28, 1979

GEORGIA INSTITUTE OF TECHNOLOGY

Engineering Experiment Station
Technology and Development Laboratory
Economic Development Division

March 5, 1979

TASK 1: A TIMBER PROCESSING COMPLEX IN NORTH GEORGIA

JOBS COMPLETED OR IN PROGRESS

1. Completed a Draft Final Report

A draft final report has been completed and edited and is in the process of final typing. The report, entitled "A Com-ply Panels Processing Complex in Appalachian Georgia - An Economic Feasibility Study," contains five major parts. They are (1) Review of Timber Resources and Utilization, (2) Survey of Loggers and Timberland Owners, (3) Outline of a Prototype Com-ply Panel Plant, (4) Projected Production Costs and Returns, and (5) Markets and Marketing.

WORK PLANNED FOR NEXT PERIOD

1. Sending For Outside Review

The completed final report will be sent to an outside source for review. Minor changes may be needed as a result of the review.

2. Report Distribution

Twenty-five copies of the final report will be submitted to the Georgia Forestry Commission according to our research contract.

TASK II: A MARKET STUDY ON WOOD ENERGY

JOBS COMPLETED OR IN PROGRESS

1. A Survey of Boiler Owners in the 8-State Southeast

A questionnaire designed to collect data and opinions concerning wood boilers and wood gasifiers was drafted and revised several times for the survey of boiler owners in Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee. A listing of boiler owners containing names and addresses in the 8-State area was compiled from EDA data files through lengthy and rigorous efforts. Finally 2,335 questionnaires together with cover letters and self-addressed and stamped envelopes were sent to companies and institutions where boilers are in the 8-State area on February 15, 1979. Responses are beginning to come back. Attached are a copy of questionnaire and a cover letter.

WORK PLANNED FOR NEXT PERIOD

1. Tabulating Survey Results

Returned questionnaires will be studied and results will be tabulated. Tables will be prepared to show the results of the survey.

2. Preparing a Final Report

A final report will be prepared to include the results of the survey together with various data collected in the past year.

GT EES
ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

February 15, 1979

Gentlemen:

Since the energy crisis in 1974, national efforts have been made to conserve energy or to replace imported fuels with domestic fuels. The Engineering Experiment Station at the Georgia Institute of Technology has undertaken a number of projects of this nature. One aspect of our effort is to identify the potentials of wood as an energy source, particularly as boiler fuel.

Your experience and opinions are important to us in this study. A questionaire is enclosed for your convenience in sharing this information with us. Please answer all questions as well as you can. Your cooperation is essential for assessing the potentials as well as problems associated with wood materials as boiler fuel.

Naturally data supplied by individual respondents will be kept in strict confidence. Only aggregate figures from combined data will be used.

We welcome your opinions, comments, or suggestions concerning this survey. Because of the time limit imposed upon this survey, we would appreciate your completion and return of this questionnaire by March 8, 1979.

Truly yours,

[redacted]

Tzé I. Chiang
Principal Research Scientist

TIC:jes

Enclosures

WOOD ENERGY SURVEY

Company Name _____

Address _____

Check One: Urban location ( ) or Rural location ( )

Type of Business _____

Name of Person Responding to Questionnaire _____

Title _____ Telephone _____

Boiler Characteristics

(1) Number of boilers in place _____

	Boiler Capacity	Fuel Type	Boiler Utilization
a.	_____H.P. ( ) or lbs/hr ( )	_____	___hrs/day_____days/yr
b.	_____H.P. ( ) or lbs/hr ( )	_____	___hrs/day_____days/yr
c.	_____H.P. ( ) or lbs/hr ( )	_____	___hrs/day_____days/yr

(2) How much boiler capacity do you expect to install either as replacement for existing boilers or for expansion?

	Boiler Capacity
a. 1979-1980	_____H.P. ( ) or lbs/hr ( )
b. 1981-1985	_____H.P. ( ) or lbs/hr ( )
c. 1986-1990	_____H.P. ( ) or lbs/hr ( )

(3) Please indicate your fuel cost as accurately as possible because your cost data will be used as the basis for deciding whether or not wood can be used as the replacement for your current fuel. Your fuel cost should be f.o.b. the plant. (Your cost data will be kept in strict confidence.)

	Fuel Type	Per Unit Cost of Fuel (dollars)	Units (million BTUs, gallons, etc.)
a.	_____	_____	_____
b.	_____	_____	_____
c.	_____	_____	_____

Wood Energy *(Important: Please read the following before answering the remaining questions)*

Wood energy can be used either as primary fuel or as a secondary (backup) fuel depending upon the type of boiler you have now. If you have a coal boiler, you may be able to use wood fuel in the place of coal without any modification. If you have a gas/oil boiler, wood fuel can be used as a primary or secondary fuel when you install a wood gasifier. An old gas/oil boiler can be scrapped and replaced with a new wood boiler.

Shown below are the capital costs for new wood boilers as well as wood gasifiers. For comparison the capital costs for gas and coal boilers are also presented.

Capacity	Wood Boiler*	Wood Gasifier**	Gas Boiler*	Coal Boiler*
100 H.P.	$ 187,000	$ 96,000	$ 24,000	$ 215,000
300 H.P.	260,000	153,000	72,000	299,000
500 H.P.	335,000	220,000	121,000	385,000
1,000 H.P.	465,000	358,000	242,000	535,000
50,000 lb/hr.	550,000	410,000	250,000	633,000
100,000 lb/hr.	1,600,000	750,000	500,000	1,840,000

*Turn-key installation not including building or foundation but including limited fuel handling equipment for coal and wood boilers.
**Turn-key retrofit to existing gas/oil boiler. Includes limited wood handling equipment.

(4) Are you interested in retrofitting your existing boiler with a wood gasifier?

Yes_____ No_____

If yes, would you be using the energy provided by the gasifier as a

Primary fuel_____or secondary (backup) fuel_____?

(5) Are you interested in installing a wood boiler either as a replacement for existing boilers or for future expansion?

Yes_____ No_____

(6) Shown above are the prices for wood boilers and wood gasifiers.

a. Are wood boilers attractive at their current prices?

(1) Yes _____ (2) No _____

If no, what percentage reduction on wood boiler prices would be necessary to interest you?

Percent reduction _____

b. Are wood gasifiers attractive at their current prices?

(1) Yes _____ (2) No _____

If no, what percentage reduction in wood gasifiers would be necessary to interest you?

Percent reduction _____

(7) Would you be interested in a wood gasifier or a wood boiler if the price of the delivered wood fuel for the same amount of energy was above or below (as indicated below) your current delivered fuel cost per unit (e.g., gallon, Btu, etc.)?

Percentage Below Current Fuel	Wood Gasifier Yes	Wood Gasifier No	Percentage Below Current Fuel	Wood Boiler Yes	Wood Boiler No
40%	____	____	40%	____	____
30%	____	____	30%	____	____
20%	____	____	20%	____	____
10%	____	____	10%	____	____
Same	____	____	Same	____	____
Percentage Above Current Fuel					
10%	____	____	10%	____	____
20%	____	____	20%	____	____
30%	____	____	30%	____	____
40%	____	____	40%	____	____

(8) Please circle the number which most accurately indicates your opinion of each statement. Circle number six if you strongly agree with the statement or number one if you strongly disagree. Or, circle any number in between that you feel is most appropriate.

	Strongly Disagree					Strongly Agree
a. Wood fuel materials are available in my area.	1	2	3	4	5	6
b. Storage of sufficient quantities of wood materials as fuel at my plant would be difficult.	1	2	3	4	5	6
c. The technology has not been sufficiently developed that would allow the utilization of wood as a supplemental fuel in oil or gas boilers.	1	2	3	4	5	6
d. Wood boilers have been considered in the past but were rejected because of high initial cost.	1	2	3	4	5	6
e. A new wood boiler will be considered in the future if the costs of oil and gas continue to rise.	1	2	3	4	5	6

(9) What kind of incentives would be required to interest you in installing a wood gasifier or a new wood boiler?

_____ Tax write-offs

_____ Capital loan

_____ Assurance of wood fuel supply

_____ Improved technology in handling, feeding, and storage of wood.

_____ Others (please specify) _____

_____.

(10) What wood supply situation would have to exist before you would consider wood as a fuel? (Check one)

a. _____ Long-term contract for assured supply at known price.

b. _____ Spot market where sufficient supply can be obtained but at unknown price.

c. _____ Other, Specify _____

(11) Are there sawmills, pulpmills, or logging operations in the vicinity of your plant?

a. _____ Yes

b. _____ No

(12) What is the maximum number of years over which you would be willing to wait to recover your capital investment in a wood boiler or gasifier through possible fuel cost savings?

Payback period of _____ years.

Please return this questionnaire in the enclosed envelope to:

Dr. Tze I. Chiang
EDD/EES
Georgia Institute of Technology
Atlanta, GA 30332

A-2084

FINAL REPORT
PROJECT NO. A–2084

MARKET POTENTIALS OF WOOD FUEL IN THE SOUTHEAST

By
Tze I. Chiang and David S. Clifton, Jr.

Prepared for
GEORGIA FORESTRY COMMISSION

Under sponsorship of
APPALACHIAN REGIONAL COMMISSION

Technology and Development Laboratory
Economic Development Division

June 1979

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
Atlanta, Georgia 30332

1979

Project A-2084

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Prepared for

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Tze I. Chiang
Principal Research Scientist
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Acknowledgments

The authors are grateful to several major assistance efforts by individuals and institutions during the course of this year-long study. Mr. J. Barry Gilbert, U.S. Environmental Protection Agency, Region IV, offered basic data concerning boiler inventory in the eight-state Southeast. Without this information, a survey of boiler owners in the study area would have been impossible. A second major data base came from the American Boiler Manufacturers Association. With ABMA's information, the past trends of boilers (number, capacity, and fuel type) became known. Several gentlemen helped to obtain the ABMS's data. They are Mr. Paul Goggins, President, Industrial Boiler Company; Jerry Hatten of McBurney Corporation; and Richard C. Wright of Industrial Combustion, Inc. Mr. Bill Rankin, Director of Resources Application, U.S. Department of Energy, Region IV, provided many useful leads in gathering information.

Summary

Since 1973, escalating fuel prices have forced more and more Americans to rediscover wood as a heating fuel. In 1977, U.S. shipments of wood stoves totaled 234,000 units; that was 2.72 times the 86,000 units shipped in 1972. In 1970, about one third of the nation's wood-fuel heated housing units were located in the South Atlantic states. In the same year, more than 24% of the occupied housing units in the 10 Georgia counties with the lowest median family incomes used wood as the principal heating fuel, as compared with less than one percent in the 10 most affluent counties.

The forest products industry is the major user of wood fuel because it has a large annual energy requirement, it has access to wood fuel, and it possesses the expertise and technology required to use wood fuel effectively. Energy self-sufficiency within the forest product industry is about 40% to 50% for pulp and paper mills, 20% to 40% for saw mills, and 50% for plywood and veneer mills. The Southeast leads the nation in pulp and paper products, and it is a major producing area of lumber and veneer products.

In 1978, wood-fired industrial boilers constituted about 7.7% of all boilers in number and about 3.6% in aggregated boiler capacity in eight southeastern states. Wood-fired boilers constituted less than one percent of all boilers for institutional uses in the same region. Wood-fired boilers, new ordered, increased from 1.4% of all boilers in 1972 to 9.9% in 1978 in the eight-state Southeast. In aggregated capacity, the increase was from 0.5% to 2.4% in the same period.

A survey was conducted in the eight-state Southeast concerning potential interests in installing new wood boilers and wood gasifiers among existing boiler users in 1979. About 11% of the 2,171 questionnaires delivered were returned. A total of 770 boilers were reported. Major findings are given below:

1. Oil-fired constituted 42%; gas, 38%; coal, 11%; wood, 7%; and other, 2%.
2. Between 1979 and 1990, aggregated new boiler capacities which survey respondents are expecting totaled 10,050 HP and 7,604,500 lbs./hr.

3. Average fuel costs per million Btu: oils, $3.21; gas, $2.58; propane, $4.57; coal, $1.97; wood, $1.79; electricity, $9.15; and other, $2.38.
4. About 14% of the respondents were interested in retrofitting their existing boilers with wood gasifiers.
5. About 25% of the respondents were interested in installing new wood boilers.
6. About 23% of the respondents indicated that listed capital cost of a new wood boiler interested them, while 16% were for wood gasifiers for the same reason. It would require about 10% to 100%, with an average of 50%, reduction of capital cost in order to be attractive to non-interested respondents.
7. The majority of respondents would be interested in a wood boiler or a wood gasifier only if wood fuel costs were substantially below their current fuel costs -- 40% to 30% below.
8. Payback period for a wood boiler or a wood gasifier for which respondents are willing to wait ranges from one to 25 years, with an average of six years.

Major market barriers for installing wood boilers or gasifiers are equipment-fuel technology, storage of wood material, high capital cost, wood-fuel supplies, and availability of competing fossil fuels. The most important incentives for overcoming these market barriers are improved technology in wood fuel and assurance of wood fuel supply. Tax write-offs and capital loans are far less important incentives than the first two mentioned. In terms of wood fuel supply, an overwhelming majority of survey respondents preferred long-term contracts for an assured supply at known prices.

INTRODUCTION

The potentials of wood as fuel in the future will be affected by wood-fuel technology, fossil fuel costs, assured supply of wood as fuel, and government policy. Wood-fuel technology and the availability of wood as an energy source have been explored extensively by the Energy and Engineering Division, Technology and Development Laboratory, Engineering Experiment Station, under a separate project. The objectives of this project are to assess the current status of wood fuel in the Southeast, to investigate the market potentials of wood boilers and wood gasifiers in the region, to identify market barriers, and to evaluate incentives for overcoming market barriers.

This report is organized into six sections. The first three sections deal with the status of wood fuel in domestic heating, in the forest products industry, and in industrial and institutional uses. The fourth section concerns a survey of potential markets for wood boiler and wood gasifiers in the Southeast. Tabulated survey results are presented. The fifth section identifies market barriers of wood-fuel equipment, and the final section provides an evaluation of possible incentives for overcoming market barriers.

WOOD FUEL FOR DOMESTIC HEATING

Since 1973, escalating fuel prices have forced more and more Americans to rediscover wood as a heating fuel. Not only is wood in plentiful supply and a renewable resource, it also is relatively cheap. In terms of heating capacity, it is estimated that a cord of hardwood burned in a sound stove will deliver as much heat as 160-170 gallons of #2 fuel oil, or 260 therms of natural gas, or 6,300 kilowatt hours of electricity. With hardwood selling for less than $60 per cord in much of the U.S., this could constitute a substantial savings in winter fuel costs.

As a result of this recent back-to-wood movement, domestic demand for wood-burning stoves, for many years on the decline, is currently booming. Bureau of the Census data show that in 1977 U.S. shipments of wood-burning stove-type residential heating devices totaled 234,000 units -- 2.72 times the 86,000 units shipped in 1972 (see Table 1). Table 1 also shows that the expanded demand for wood burners has been at the expense of other types of burners (mostly oil and gas). Wood burners as a percent of all-type burners increased from 6.5% in 1972 to 15.2% in 1977. The cost differentials between wood and other fuels are becoming too disproportionate. Wood as a domestic fuel is expected to continue to increase, especially in rural locations.

Bureau of the Census data for 1970 show that there were 793,908 occupied housing units in the U.S. in which wood is used as the "principal" heating fuel. Of this number, almost one-third (254,618) were located in the South Atlantic states. Georgia led the region and the nation by burning wood in 66,604 housing units.

The low cost of readily available firewood in Georgia has kept wood the "poor man's" fuel. In 1970, more than 24% of the occupied housing units in the 10 Georgia counties with the lowest median family incomes used wood as the principal heating fuel, as compared with less than one percent in the 10 most affluent counties (see Table 2). Percentage of occupied dwellings heated with wood fuel was substantially lower in 1970 than in 1960, both in the United States and in Georgia (see Table 2). However, it is believed that wood as a domestic heating source is currently back to the level of 1960.

Table 1

U.S. SHIPMENTS OF NONELECTRIC
DOMESTIC HEATING STOVES

(In Thousands of Units)

Year	A Wood Burning	B All Fuels	A as % of B
1959	394	2,648	14.9
1960	335	2,191	15.3
1961	291	1,977	14.7
1962	281	2,112	13.3
1963	279	2,218	12.6
1964	227	1,935	11.7
1965	203	1,618	12.6
1966	147	1,629	9.0
1967	144	1,518	9.5
1968	167	1,587	10.5
1969	111	1,573	7.1
1970	103	1,454	7.1
1971	94	1,393	6.7
1972	86	1,317	6.5
1973	88	1,284	6.8
1974	124	982	12.6
1975	129	1,097	11.8
1976	118	1,121	10.5
1977	234	1,542	15.2

Source: Current Industrial Reports, Selected Heating Equipment, MA-34N, 1959 to 1977, U.S. Department of Commerce, Bureau of the Census, Washington, D.C.

Table 2

THE PERCENTAGE OF OCCUPIED DWELLINGS
IN SELECTED GEORGIA COUNTIES
HEATED WITH WOOD, 1960 AND 1970

Georgia County	Median Family Income (a) 1970	Percentage of Occupied Dwellings Heated with Wood (b) 1970	1960
Catoosa	$ 8,630	1.1	2.5
Clayton	10,960	1.2	2.0
Cobb	11,247	0.3	2.7
DeKalb	12,135	0.1	0.8
Douglas	9,287	1.4	12.2
Fayette	9,429	2.7	23.8
Fulton	9,358	0.3	2.2
Gwinnett	9,629	2.5	14.1
Houston	9,355	2.1	12.3
Rockdale	8,881	2.8	8.7
Average	$ 9,891		
Atkinson	$ 4,381	19.8	64.6
Baker	3,947	22.9	74.3
Brooks	4,783	15.9	46.9
Burke	4,480	27.1	55.5
Calhoun	4,135	18.1	53.1
Clay	3,375	38.4	53.0
Hancock	4,801	32.9	64.1
Miller	4,263	15.3	61.1
Quitman	3,968	33.8	68.7
Webster	4,419	52.0	62.2
Average	$ 4,255		
Georgia	8,165	4.9	17.0
U.S.	9,586	1.2	11.5

Sources: (a) County and City Data Book, 1972. A Statistical Abstract Supplement, U.S. Department of Commerce, Bureau of the Census.

(b) Housing Characteristics for States, Cities and Counties, U.S. Department of Commerce, Bureau of the Census, Washington, DC, 1972.

It should be noted that when reference is made to wood appliances used for "principal heating," that does not include wood stoves used as a secondary or emergency heat source. The figures show that the majority of wood stoves sold today are installed in houses which already have a principal heating source (gas, electric, or oil). This produces a gray area of users which may supply most of their heat with wood, but already have a "principal" heat source.

For the most part, owners of wood-burning heaters can anticipate many years of adequate fuel supplies. U.S. Department of Agriculture, Forestry Service, data indicate the area of commercial timberland in the U.S. to be about 500 million acres, a volume which is expected to remain relatively stable plus or minus 5% into the 21st century. In Georgia, the area devoted to commercial timberland is 25 million acres, the most of any state in the U.S. These commercial forest lands are well distributed throughout the state.

The output of fuelwood (primarily roundwood products) in Georgia for 1971 was about 12.6 million cubic feet, a figure substantially below the 104.6 million cubic feet produced in 1952. Fuelwood consumption has dropped sharply in the past 30 years because of the substitution of oil, gas, and electricity for domestic purposes. Recently, however, considerable demand has been developing, in both rural and urban areas, for fireplace wood or fuelwood for secondary heating sources. These markets are expected to grow with population and residential construction.

It would appear that as heating costs rise and wood becomes increasingly attractive as an economical heating fuel, the market for wood-burning heaters will continue to expand. This should be especially true in rural Georgia and other low-income areas where fuelwood is plentiful and readily accessible.

WOOD FUEL FOR THE FOREST PRODUCTS INDUSTRY

The forest products industry is the major user of wood fuel because it has a large annual energy requirement, it has access to wood fuel, and it possesses the expertise and technology required to use wood fuel. This section is extracted largely from several published materials, including a report prepared by the Mitre Corporation for the Department of Energy.[1/]

It has been estimated that energy self sufficiency within the forest products industry is about 40% to 50% for pulp and paper mills, 20% to 40% for sawmills, and 50% for plywood and veneer mills. The industry uses about three quads of fuel annually and has been purchasing about 50% of this total in recent years. Nearly three-fourths of the self-generated fuel is produced from process wastes, principally pulping liquor. The remainder is wood and bark. Most of the fuel is burned to produce process heat and steam.

The forest products industry purchased 1.8 quads of energy in 1974. A total of 1.3 quads were in the form of oil and natural gas (see Table 3). This purchased energy can be replaced by wood fuel which is potentially available in the near term. This wood is available from several sources which include:

- 17 quads of "non-commercial timber" growing on commercial forest land
- 2.0 quads of forestry residues, annually
- 1.7 quads of surplus annual growth, and
- 0.5 quad of mill residue, annually.

1/ Near-Term Potential of Wood as a Fuel, Metrels Division of the Mitre Corporation, McLean, Virginia, Mitre Technical Report MTR-7860, July 1978.

Table 3

FUEL AND ELECTRICITY PURCHASED BY THE FOREST PRODUCTS INDUSTRY IN 1974

(in 10^{15} Btu - Quads)

Fuel Type	Pulp and Paper	Wood Products	Total
Fuel Oil	0.54	0.18	0.72
Natural Gas	0.51	0.08	0.59
Coal	0.29	0.01	0.30
Electricity	0.12	0.05	0.17
Total	1.46	0.32	1.78

Source: D.C. Junge, "Energy Alternatives for the Forest Products Industry," Wood Residue as an Energy Source, Forest Products Research Society, Madison, Wisconsin, 1976.

The Southeast is the leading region in the production of pulp and paper products, and it is one of three major timber regions in the nation. The Southeast constitutes 38.5% of commercial forest land acreage, 46.4% of annual growth of timber, and 26.1% of standing timber inventory in the nation (see Tables 4 and 5). The region is obviously a major candidate for energy self-sufficiency in the forest products sector.

Table 4

COMMERCIAL FOREST LAND ACREAGE AND OWNERSHIP IN THE UNITED STATES, 1974

(in million acres)

		Land Ownership				
Region	Acreage	Federal	State and Local	Industry	Farm	Private
Northeast	177.9	12.3	19.6	17.6	51.0	77.4
Southeast	192.5	14.3	3.0	35.3	65.1	74.8
West	129.3	80.6	6.4	14.4	15.0	12.8
Total	499.7	107.2	29.0	67.3	131.1	165.0

Source: C. C. Burwell, "Solar Biomass Energy: An Overview of U.S. Potential," Science, Volume 199, March 10, 1978.

Table 5

STEMWOOD INVENTORY AND ANNUAL GROWTH WITH ESTIMATED BTU CONTENT IN THE UNITED STATES, 1974

Region	Total Production			Per Acre	
	Cubic Feet	Btu[1/]	% of Softwood	Cubic Feet	Btu
		Stemwood Inventory			
Northeast	174.4×10^9	57.6×10^{15}	25	980	323×10^6
Southeast	184.5×10^9	55.4×10^{15}	49	959	287×10^6
West	355.6×10^9	99.4×10^{15}	93	2,770	777×10^6
Total	714.5×10^9	212.4×10^{15}	67	1,430	430×10
		Annual Growth			
Northeast	5.5×10^9	1.8×10^{15}	25	31.1	10.3×10^6
Southeast	8.6×10^9	2.6×10^{15}	63	44.6	13.4×10^6
West	4.4×10^9	1.2×10^{15}	88	34.2	9.6×10^6
Total	18.5×10^9	5.6×10^{15}	57	37.1	11.1×10^6

[1/] Hardwood basis, 8,000 Btu/lb. at 44 pounds per cubic foot; value typical for dry oak, hickory and maple.

Softwood basis, 8,400 Btu/lb. at 32 pounds per cubic foot; value typical for dry fir and pine.

Source: C. C. Burwell, "Solar Biomass Energy: An Overview of U.S. Potential," Science, Volume 199, March 10, 1978.

Recent developments in machinery for whole-tree chip harvesting, the densification of wood pellets, and various burners for efficient combustion of wood for steam generation and space heating have contributed to greater utilization of wood fuel as a substitute for fossil fuels. The forest products industry has been the first beneficiary of these developments. As the technologies of wood fuel supply, handling, and burning improve, they will create a greater acceptance of wood fuel not only by the forest products industry but in non-wood-related economic sectors as well.

WOOD FUEL FOR INDUSTRIAL AND INSTITUTIONAL MARKETS

Fuels consumed by industrial and institutional users can be represented by boilers, which are the main consumers of all types of fuel. Two series of data used in this section will demonstrate the status of wood as boiler fuel in the industrial and institutional sectors. The first data series was compiled from the U.S. Environmental Protection Agency (EPA) concerning boilers in the eight southeastern states of Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee. Data were tabulated under boiler number, capacity, and fuel type for industrial users and institutional users. It should be noted that EPA data dealt only with boilers having capacities above 1,000,000 Btu per hour. Although the data are not complete, they do include the major portion of boiler population in the Southeast.

A summary of the tabulation based on EPA data is given in Table 6 for industrial boilers. Boiler capacities are given in different range groups with number of boilers and aggregated capacity. The purpose of the tabulation is to show wood fired boilers as a percentage of all boilers. It is clear from the table that the smaller the range of boiler capacity, the higher the ratio of wood fired boilers becomes. In terms of number, wood fired boilers constitute 7.7% of all boilers in the Southeast. However, within the 1-30 million Btu/hr capacity range, wood boilers constitute 9.6%. In terms of aggregated capacity, the wood boilers constitute only 3.6% of all boilers. As in boiler number, the ratio of wood fired boilers becomes progressively less when the capacity range increases.

The tabulation on institutional boilers in the Southeast is given in Table 7. These boilers are operated by schools, hospitals, military services, and governments. It is clear from the table that the ratio of wood fired boilers is insignificant in this sector. Wood fired boilers constitute only about one% in terms of number and one fifths of one percent in terms of aggregated capacity. (See details in Table 7).

A second series of boiler data was supplied by the American Boiler Manufacturers Association concerning new boilers ordered in the eight southeastern states from 1968 to 1978. Those boilers with capacities over 100,000 lbs./hr. are given in Table 8, and those under 100,000 lbs./hr.

Table 6

INDUSTRIAL BOILERS IN THE EIGHT SOUTHEASTERN STATES 1/, 1978

Capacity Range 2/	Number			Aggregated Capacity 2/		
	All Boilers	Wood Fired	Percent of Wood Fired	All Boilers	Wood Fired	Percent of Wood Fired
1-30	2,369	228	9.6	24,955	2,180	8.7
31-60	532	36	6.8	23,827	1,552	6.5
61-90	255	14	5.5	19,202	993	5.2
91-120	161	6	3.7	17,101	634	3.7
121-150	147	5	3.4	19,926	609	3.1
151-180	81	1	1.2	13,584	170	1.3
181 and over	301	7	2.3	112,020	2,164	1.9
Total	3,846	297	7.7	230,615	8,302	3.6

1/ Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

2/ Boiler capacity in 1,000,000 Btu/hour.

Source: Compiled from data provided by the U.S. Environmental Protection Agency, Atlanta Regional Office, Georgia, 1978.

Table 7

INSTITUTIONAL BOILERS IN THE EIGHT SOUTHEASTERN STATES 1/, 1978

Capacity Range 2/	Number			Aggregated Capacity 2/		
	All Boilers	Wood Fired	Percent of Wood Fired	All Boilers	Wood Fired	Percent of Wood Fired
1-20	1,248	13	1.0	4,978	36	0.7
21-40	94			2,746		
41-60	31			1,575		
61-80	35			2,567		
81-100	8			695		
101 and over	36	—		6,048	—	
Total	1,452	13	0.9	18,609	36	0.2

1/ Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

2/ Boiler capacity in 1,000,000 Btu/hour.

Source: Compiled from data provided by the U.S. Environmental Protection Agency, Atlanta Regional Office, Georgia, 1978.

are given in Table 9. The tabulation reveals that the ratio of wood fired boilers ordered has significantly increased since the energy crisis in 1973 both in number and in aggregated capacity. In terms of boiler number, the ratio increased from 1.4% in 1972 to 9.9% in 1978 for over 100,000 lbs./hr. capacity (Table 8) and from 2.5% to 4.9% in the same period for under 100,000 lbs./hr. capacity (Table 9). In terms of aggregated capacity, the ratio increased from 0.5% to 2.4% for over 100,000 lbs./hr. capacity (Table 8) and from 3% to 5.2% for under 100,000 lbs./hr. capacity (Table 9).

It is obvious from the above data that wood as boiler fuel has been increasing, especially in small boiler capacities and in industrial applications. The trend will continue in the near term (five years) considering the current state of persistantly increasing fossil fuel costs.

Table 8

NEW BOILERS ORDERED IN THE EIGHT SOUTHEASTERN STATES 1/
WITH BOILER CAPACITY OVER 100,000 LBS./HOUR ONLY,
1968 TO 1978

	Number			Aggregated Capacity		
Year	All Boilers	Wood Fired	Percent of Wood Fired	All Boilers (in 1,000	Wood Fired lbs./hr.)	Percent of Wood Fired
1978	151	15	9.9	157,498	3,850	2.4
1977	171	10	5.8	125,762	1,769	1.4
1976	158	6	3.8	75,715	1,830	2.4
1975	204	5	2.5	127,616	2,235	1.7
1974	455	10	2.2	338,810	2,390	0.7
1973	458	15	3.3	310,318	2,815	0.9
1972	281	4	1.4	196,020	980	0.5
1971	369	3	0.8	176,172	412	0.2
1970	340	3	0.9	286,943	870	0.3
1969	338	7	2.1	154,414	2,020	1.3
1968	322	6	1.9	239,118	962	0.4

1/ Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

Source: Compiled from data supplied by the American Boiler Manufacturers Association, Washington, D.C.

Table 9

NEW BOILERS ORDERED IN THE EIGHT SOUTHEASTERN STATES 1/
WITH BOILER CAPACITY UNDER 100,000 LBS./HOUR ONLY
1968 TO 1978

	Number			Aggregated Capacity		
Year	All Boilers	Wood Fired	Percent of Wood Fired	All Boilers (in 1,000 lbs./hr.)	Wood Fired	Percent of Wood Fired
1978	350	17	4.9	15,508	807	5.2
1977	374	18	4.8	14,717	888	6.0
1976	298	7	2.3	11,559	340	2.9
1975	382	7	1.8	15,366	372	2.4
1974	538	28	5.2	24,292	1,287	5.3
1973	780	52	6.7	33,314	2,228	6.7
1972	645	16	2.5	27,323	807	3.0
1971	605	10	1.6	26,554	543	2.0
1970	666	4	0.6	28,643	155	0.5
1969	796	11	1.4	127,074	446	0.4
1968	714	3	0.4	22,960	144	0.6

1/ Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee.

Source: Compiled from data supplied by the American Boiler Manufacturers Association, Washington, D.C.

A SURVEY OF POTENTIAL MARKET FOR WOOD BOILER AND WOOD GASIFIER IN THE SOUTHEAST

Introduction

A survey was conducted in the eight southeastern states in a two-month period in February and March, 1979, to find out the extent of interest in purchasing wood-fired boilers or wood-fired gasifiers as primary fuel or as secondary fuel. A list of boiler owners was compiled from EPA boiler files, excluding those with wood-fired boilers. The reason for the exclusion was the fact that they were already known to own and operat boilers designed for wood fuel. It should be noted again that EDA files include boilers primarily with large capacities (1,000,000 Btu hr.). However, survey results indicate that both small and large boilers are owned and operated by respondents.

A summary of questionnaires sent, delivered, and returned is given in Table 10. One questionnaire was intended for one company or institution which may own one or more boilers. There were 2,333 questionnaires sent, 2,171 delivered, and 231 responded. The response rate was about 11%. Of the 231 responding questionnaires, 186 of them were in usable condition. The balance of 45 were classified as "unusable" because the firm was out of business, or uncooperative, or no meaningful information was provided. The distribution of the questionnaires in the eight southeastern states is given in Table 10, and a questionnaire is provided in the Appendix.

The completed usable questionnaires were tabulated, and the results are presented in this section in the order in which the questions appeared on the questionnaire.

Location and Type of Business

Of the 186 returned questionnaires, 104 indicated that they are located in urban areas, 73 are in rural areas and nine did not specify their location.

Respondents' types of businesses were tabulated according to the Standard Industrial Classification (SIC) published by the U.S. Department of Commerce. Major groups are chemicals and allied products, textile mill products, educational services (schools), lumber and wood products, furniture and fixtures, food and kindred products, etc. Detailed numbers of responses in each SIC is given in Table 11.

Table 10

THE DISTRIBUTION OF SURVEY QUESTIONNAIRES IN THE EIGHT SOUTHEASTERN STATES

	Questionnaire Number					
State	Sent	Not Delivered	Delivered	Responded	Unusable	Usable
Alabama	36	1	35	3	1	2
Florida	318	56	262	18	3	15
Georgia	87	2	85	30	6	24
Kentucky	338	19	319	22	4	18
Mississippi	64	4	60	5	0	5
North Carolina	558	29	529	42	16	26
South Carolina	283	18	265	39	4	35
Tennessee	649	33	616	61	8	53
State Unknown	0	0	0	11	3	8
Total	2,333	162	2,171	231	45	186

Table 11

SIC DISTRIBUTION OF SURVEY RESPONDENTS

Number of Respondents	Percent of Respondents	SIC	Description
26	14.0	28	Chemicals and Allied Products
19	10.2	22	Textile Mill Products
19	10.2	82	Educational Services
17	9.2	39	Miscellaneous Manufacturing Industries
16	8.6	24	Lumber and Wood Products, Except Furniture
11	5.9	25	Furniture and Fixtures
10	5.4	20	Food and Kindred Products
10	5.4	26	Paper and Allied Products
8	4.3	80	Health Services
6	3.3	23	Apparel & Other Finished Products Made From Fabrics & Similar Materials
5	2.7	21	Tobacco Manufacturers
5	2.7	32	Stone, Clay, Glass, and Concrete Products
5	2.7	89	Miscellaneous Services
4	2.2	37	Transportation Equipment
3	1.6	33	Primary Metal Industries
3	1.6	92	Justice, Public Order, and Safety
2	1.1	49	Electric, Gas, and Sanitary Services
2	1.1	97	National Security and International Affairs
1	.5	14	Mining and Quarrying of Non-Metallic Minerals, Except Fuels
1	.5	15	Building Construction-General Contractors and Operative Builders

Table 11 (continued)

Number of Respondents	Percent of Respondents	SIC	Description
1	.5	27	Printing, Publishing, and Allied Industries
1	.5	29	Petroleum Refining and Related Industries
1	.5	30	Rubber and Miscellaneous Plastics Products
1	.5	36	Electrical and Electronic Machinery, Equipment, and Supplies
1	.5	40	Railroad Transportation
1	.5	52	Building Materials, Hardware, Garden Supply, and Mobile Home Dealers
1	.5	54	Food Stores
1	.5	76	Miscellaneous Repair Services
1	.5	91	Executive, Legislative, and General Government, Except Finance
4	2.2	Unspecified	
TAL 186	100.0		

Number of Boilers, Capacity, Fuels, and Utilization

A total of 770 boilers were reported. Each respondent may own one to 44 boilers with an average of four. Boiler capacity is expressed either in HP or in lbs./hr. In terms of HP, the range is 7.5 HP to 800 HP, with an average of 311 HP. In terms of lbs./hr., the range is 5,000 to 1,000,000, with an average of 89,752.

Fuels used for these boilers are oils, gas, coal, bark and wood, electricity, black liquor, hydrogen, and unspecified by-product. Oils and gas are the dominant fuels. Other fuels are trailing far behind. Oils include all grades. Detailed fuel type, number of boilers, and%-age of each fuel type are given in Table 12.

Table 12

BOILER FUELS REPORTED BY SURVEY RESPONDENTS

Fuel Type	Number of Boilers	Percent
Oils	281	42
Gas	259	38
Coal	76	11
Bark and Wood	47	7
Electricity	4	*
Black Liquor	7	1
Hydrogen	1	*
By-product	1	*
Total	676	100

*Combined one percent.

Most of these boilers are operated 24 hours a day and over 300 days a year. The details of utilization are given in Table 13.

Table 13

TOTAL NUMBER OF BOILERS REPORTED BY UTILIZATION

Hours/Day	Number	Days/Year	Number
1-5	19	51-100	21
6-10	32	101-150	61
11-15	13	151-200	39
16-20	20	201-250	55
21 up	339	251-300	38
Total	423	301-365	180
		Total	394

New Boiler Capacity To Be Installed

New boiler capacity expected to be installed either as replacement for existing boilers or for expansion is given in Table 14. Of the 186 respondents, 82 of them are expected to install new boilers between 1979 and 1990. Boiler capacity is given either in HP or in lbs./hr., and it is given in three succeeding periods.

Table 14

NEW BOILER CAPACITIES EXPECTED BY SURVEY RESPONDENTS

1979 to 1990

Period	Number of Respondents	Aggregated New Boiler Capacity	
		H. P.	Lbs./Hr.
1979-1980	25	1,885	2,346,000
1981-1985	37	9,185	2,628,500
1986-1990	20	2,980	2,630,000
Total	82	14,050	7,604,500

Fuel Costs

Fuel costs (f.o.b. plant) are presented in Table 15. They are given by fuel type, by number of respondents, and by cost in dollars per 1,000,000 Btu. These costs were calculated on the basis of f.o.b. plant, Btu content of each fuel, and estimated boiler efficiency. Oils include all grades. Wood and bark include both self-generated and purchased. "Others" includes black liquor and unspecified by product.

Table 15

FUEL COSTS BY TYPE ON PER MILLION BTU BASIS

Fuel Type	Number of Respondents	Fuel Costs in Dollars Per 1,000,000 Btu	
		Range	Average
Oils	136	1.41-4.68	3.21
Gas	107	1.58-4.18	2.58
Propane	9	3.20-5.66	4.57
Coal	25	1.16-2.86	1.97
Wood and Bark	11	0.24-3.85	1.79
Electricity	5	8.67-10.11	9.15
Others	4	1.67-3.06	2.38

Retrofitting Existing Boilers with Wood Gasifiers

After reviewing capital cost data for wood gasifiers provided in the questionnaire, 26 respondents indicated that they were interested in retrofitting their existing boilers with wood gasifiers. Negative answers were 145. Affirmative answers constituted 14% of the total respondents.

It appears that location may have some effect on the utilization of wood fuel. Of 97 respondents located in urban areas, 11 gave an affirmative answer, while 86 were negative. In contrast, of 65 respondents located in rural areas, 14 gave an affirmative answer, while 51 were negative.

Affirmative answers in rural areas were 21.5% of the total, while affirmative answers in urban areas were 11.3%.

Of those giving affirmative answers, 18 indicated that they would use wood gasifiers as a primary fuel source, while seven indicated that they would use them as secondary fuel sources.

Installing New Wood Broilers

Of the total 186 respondents, 47 indicated that they were interested in installing wood boilers either as replacements for existing boilers or for further expansion, and 123 gave a negative answer. The affirmative answers constituted 25% of the total responses.

Respondents located in rural area showed a greater interest in new wood boilers than those located in urban area. The affirmative ratio was 32% in rural and 27% in urban.

Attractiveness of Equipment Prices

Capital costs for new wood boilers as well as wood gasifiers were shown in the questionnaire. Respondents were asked about price attractiveness to them concerning these two types of wood burners. Affirmative answers were 42 for wood boilers or 23% of the total respondents, and 30 for wood gasifiers or 16%.

Those giving negative answers were asked what percentage reduction on equipment prices would be necessary to interest them. Answers for wood boilers were in the range of 15% to 100% reduction, with an average of 48%. For wood gasifiers, the reduction range was 10% to 100% with an average of 51% (See Table 16).

Table 16

PRICES ATTRACTIVENESS OF WOOD BOILERS AND WOOD GASIFIERS
AND PERCENT REDUCTION OF PRICES NECESSARY

Price Attractiveness	Wood Boiler	Wood Gasifier
Yes	42	30
No	120	123
Price Reduction Necessary	(in percent reduction of price for negative answer)	
Range	15-100	10-100
Average	48	51

Price of Wood Fuel as Basic Consideration

Respondents were asked about their interest in a wood gasifier or a wood boiler if the price of the delivered wood fuel for the same amount of energy was above or below their current delivered fuel cost per unit. A majority of the respondents indicated that they would be interested in a wood gasifier or a wood boiler if the price of delivered wood fuel can be substantially below their current fuel costs. To the majority, 30% to 40% below their current fuel costs would be necessary. To some, 20% below, 10% below, or the same cost would be sufficient to interest them. Only a few would be interested in wood burners even if the price of delivered wood fuel was above their current fuel cost per unit. The number of affirmative respondents for wood gasifiers and for wood boilers is very close. Details are in Table 17.

Table 17

LEVEL OF WOOD FUEL PRICE BELOW/ABOVE CURRENT FUEL COST FOR INTEREST IN WOOD-FIRED EQUIPMENT

(in number of "yes" responses)

Below Current Fuel Cost (%)	Wood Gasifier	Wood Boiler
40	74	74
30	48	49
20	30	31
10	11	12
Same	4	7
Above Current Fuel Cost (%)		
10	2	2
20	1	1
30	1	1
40	1	1

Current fuel costs per million Btu were tabulated separately for those who were interested in a wood gasifier and those who were interested in a wood boiler. These tabulated current fuel costs were adjusted according to the level of necessary reduction indicated by respondents. These reduced costs reflect delivered wood fuel costs which would interest them for installing a wood gasifier or a wood boiler. Details are in Table 18. It is clear from the table that the costs of current fuels vary significantly according to fuel type. As a result, acceptable wood fuel prices also vary with different current fuel users for installing a wood gasifier or a wood boiler.

Table 18

ADJUSTED WOOD-FUEL COSTS IN RELATION TO THEIR FUEL COSTS ACCEPTABLE TO SURVEY RESPONDENTS FOR INSTALLING A NEW WOOD-FIRED BOILER OR GASIFIER

	Wood Gasifier		Wood Boiler	
Fuel Type	Avg. Current Delivered Fuel Cost	Adjusted Avg. Cost of Wood Fuel Acceptable	Avg. Current Delivered Fuel Cost	Adjusted Avg. Cost of Wood Fuel Acceptable
	(in dollars per million Btu)			
Gas	2.64	1.91	2.66	1.94
Oils	3.04	2.28	3.00	2.27
Coal	1.86	1.43	2.06	1.53
Wood	1.97	1.40	1.70	1.37
Propane	4.43	3.55	4.40	3.55
Others	6.05	4.14	6.05	4.34

Payback Period

A question concerns the maximum number of years over which respondents would be willing to wait to recover their capital investment in a wood boiler or gasifier through possible fuel costs savings. Answers ranged from one year to 25 years, with an average of six years.

MARKET BARRIERS

Several market barriers to the installation of wood boilers or wood gasifiers were considered and tested with respondents in the survey mentioned in the previous section. These barriers are wood fuel availability, storage problems, wood burning technology, high capital costs, and oil and gas prices. Respondents were asked to circle number six if he strongly agreed with a statement or number one if he strongly disagreed, or to circle any number in between which seemed to be most appropriate. The results are summarized in Table 19.

Table 19

AGREE OR DISAGREE TO STATEMENT CONCERNING MARKET BARRIERS

(in number of respondents)

Statement	Strongly Disagree				Strongly Agree	
	1	2	3	4	5	6
a. Wood fuel materials are available in my area.	10	20	37	30	24	57
b. Storage of sufficient quantities of wood materials as fuel at my plant would be difficult.	22	20	19	22	31	64
c. The technology has not been sufficiently developed that would allow the utilization of wood as a supplemental fuel in oil or gas boilers.	24	19	26	33	32	33
d. Wood boilers have been considered in the past but were rejected because of high initial cost.	61	16	16	23	14	24
e. A wood boiler will be considered in the future if the cost of oil and gas continue to rise.	27	15	19	38	22	44

Concerning the availability of wood fuel materials, the majority of respondents agreed with the statement (62% agreed and 38% disagreed). This means, of course, that wood fuel materials are available to the majority of respondents in their respective areas. The majority agreed with the storage problem statement (66% agreed and 34% disagreed). This means that the storage of wood fuel materials is a difficult problem to the majority. Concerning the technology of wood burning, the majority agreed with the negative statement (59% agreed vs. 41% disagreed). This means that wood burning technology needs to be further improved in order to gain a greater degree of acceptance.

The high initial capital cost is not a major reason for rejecting wood boilers by the majority of respondents (only 40% agreed with the negative statement). However, the majority will consider a wood boiler if the costs of oil and gas continue to rise (63% agreed with statement "e").

INCENTIVES FOR WOOD ENERGY

Several incentives to interest respondents in installing new wood gasifiers or new wood boilers were listed in the survey. These incentives aim at overcoming the market barriers mentioned in the previous section. The incentives are tax write-off, capital loan, assurance of wood fuel supply, improved technology in handling, feeding, and storage of wood, and others. The survey results are summarized in Table 20.

Table 20

INCENTIVES FOR INSTALLING WOOD ENERGY EQUIPMENT

Type of Incentive	Number of Responses	Percent of Responses
Tax Write-Off	69	18
Capital Loan	17	5
Assurance of Wood Fuel Supply	108	29
Improved Technology	124	33
Other*	56	15
Total	374	100

*Adequate return on investment, current fuels not available, fuel costs savings, and larger boiler capacity.

Improved technology and assurance of wood fuel supply are by far the two most important incentives which survey respondents wanted. Tax write-offs and capital loans are surprisingly low incentive items. It means that the private sector can do more to improve technology and wood fuel supply than governments can do on tax incentives and capital loan guarantees for installing wood energy equipment. Recent developments in wood pellets may have some favorable effect on overcoming the problems associated with wood fuel supply, handling, and feeding. However, the government could play a major role in providing funds to do basic research

work concerning improved technology and wood fuel economics. Other incentives, such as adequate return on investment, current fuels not available, furl cost savings, and larger boiler capacity, were also mentioned as possible incentives for instlling wood-fired boilers or gasifiers.

Since the assurance of a wood fuel supply plays such an important role in deciding on the installation of wood energy equipment, a question concerning preferred supply situations was asked in the survey. The choices of supply were long-term contract for assured supply at known prices, spot market where sufficient supply can be obtained but at unknown prices, and other. Of 165 responses, 118 preferred long-term contract with known prices, 12 opted for spot market with unknown prices, and 35 chose other sources such as captive supply, sawmills within a certain radius, etc.

Another question concerned sawmills, pulpmills, or logging operations in the vicinity of the respondent's location. Of 175 responses, 128 gave an affirmative answer while 47 gave a negative answer. It appears that wood fuel materials are generally available to the majority of respondents. However, supply conditions, such as long-term contracts with known prices, have to be assured.

REFERENCES

1. Birchfield, Jerry L., "Wood Energy: The Promise and The Problem," TOPS, November 1978.

2. Burwell, C. C., "Solar Biomass Energy: An Overview of U.S. Potential," Science, Vol. 199, March 10, 1978.

3. Diamond, Harvey, Wood-Burning Heaters, Economic Development Division, Technology and Development Laboratory, Engineering Experiment Station, Georgia Institute of Technology, an unpublished paper, September 1978.

4. "Energy Tax Act of 1978," Senate Conference Report, No. 95-1324, 95th Congress 2nd Session, October 11, 1978.

5. Putnam, A. A., E. L. Kropp, and R. E. Barrett, Evaluation of National Boiler Inventory, Battelle Columbus Laboratories, EPA-600-2-75-067, Columbus, Ohio, October 1975.

6. Sales Report, Watertube Boilers or Heat Recovery Boilers, American Boiler Manufacturers Association, Washington, D.C., 1968 to 1978.

7. Salo, D., L. Gsellman, D. Medville and G. Price, Near-Term Potential of Wood as a Fuel, Metrek Division of the Mitre Corporation, Project No. 15640, McLean, Virginia, July 1978.

8. State Emissions Inventory System, Environmental Protection Agency, Atlanta, Georgia, June 1977.

9. Taras, Michael A., Biomass of Southern Pines and Their Product Yields, a paper presented at the Symposium on Complete-Tree Utilization of Southern pine, Mid-South Section, Forest Products Research Society, New Orleans, Louisiana.

10. Tillman, David A., Wood as an Energy Source, Academic Press, New York, New York, 1978.

11. Wood Energy Data Base, Feasibility Study, Ultrasystems, Inc., Contract No. E1-78-X-01-4951, McLean, Virginia.

12. Wright, Richard C., Wood Fuel for Industry, Industrial Combustion, Inc., Monroe, Wisconsin, an unpublished paper, August 15, 1978.

APPENDIX

SURVEY QUESTIONNAIRE

WOOD ENERGY SURVEY

Company Name _____

Address _____

Check One: Urban location ( ) or Rural location ( )

Type of Business _____

Name of Person Responding to Questionnaire _____

Title _____ Telephone _____

Boiler Characteristics

(1) Number of boilers in place _____

	Boiler Capacity	Fuel Type	Boiler Utilization
a.	_____ H.P. ( ) or lbs/hr ( )	_____	___hrs/day_____days/yr
b.	_____ H.P. ( ) or lbs/hr ( )	_____	___hrs/day_____days/yr
c.	_____ H.P. ( ) or lbs/hr ( )	_____	___hrs/day_____days/yr

(2) How much boiler capacity do you expect to install either as replacement for existing boilers or for expansion?

	Boiler Capacity
a. 1979-1980	_____ H.P. ( ) or lbs/hr ( )
b. 1981-1985	_____ H.P. ( ) or lbs/hr ( )
c. 1986-1990	_____ H.P. ( ) or lbs/hr ( )

(3) Please indicate your fuel cost as accurately as possible because your cost data will be used as the basis for deciding whether or not wood can be used as the replacement for your current fuel. Your fuel cost should be f.o.b. the plant. (Your cost data will be kept in strict confidence.)

	Fuel Type	Per Unit Cost of Fuel (dollars)	Units (million BTUs, gallons, etc.)
a.	_____	_____	_____
b.	_____	_____	_____
c.	_____	_____	_____

Wood Energy *(Important: Please read the following before answering the remaining questions)*

Wood energy can be used either as primary fuel or as a secondary (backup) fuel depending upon the type of boiler you have now. If you have a coal boiler, you may be able to use wood fuel in the place of coal without any modification. If you have a gas/oil boiler, wood fuel can be used as a primary or secondary fuel when you install a wood gasifier. An old gas/oil boiler can be scrapped and replaced with a new wood boiler.

Shown below are the capital costs for new wood boilers as well as wood gasifiers. For comparison the capital costs for gas and coal boilers are also presented.

Capacity	Wood Boiler*	Wood Gasifier**	Gas Boiler*	Coal Boiler*
100 H.P.	$ 187,000	$ 96,000	$ 24,000	$ 215,000
300 H.P.	260,000	153,000	72,000	299,000
500 H.P.	335,000	220,000	121,000	385,000
1,000 H.P.	465,000	358,000	242,000	535,000
50,000 lb/hr.	550,000	410,000	250,000	633,000
100,000 lb/hr.	1,600,000	750,000	500,000	1,840,000

*Turn-key installation not including building or foundation but including limited fuel handling equipment for coal and wood boilers.
**Turn-key retrofit to existing gas/oil boiler. Includes limited wood handling equipment.

(4) Are you interested in retrofitting your existing boiler with a wood gasifier?

Yes_____ No_____

If yes, would you be using the energy provided by the gasifier as a

Primary fuel_____or secondary (backup) fuel_____?

(5) Are you interested in installing a wood boiler either as a replacement for existing boilers or for future expansion?

Yes_____ No_____

(6) Shown above are the prices for wood boilers and wood gasifiers.

a. Are wood boilers attractive at their current prices?

(1) Yes _____ (2) No _____

If no, what percentage reduction on wood boiler prices would be necessary to interest you?

Percent reduction _____

b. Are wood gasifiers attractive at their current prices?

(1) Yes _____ (2) No _____

If no, what percentage reduction in wood gasifiers would be necessary to interest you?

Percent reduction _____

(7) Would you be interested in a wood gasifier or a wood boiler if the price of the delivered wood fuel for the same amount of energy was above or below (as indicated below) your current delivered fuel cost per unit (e.g., gallon, Btu, etc.)?

Percentage Below Current Fuel	Wood Gasifier Yes	Wood Gasifier No	Percentage Below Current Fuel	Wood Boiler Yes	Wood Boiler No
40%	____	____	40%	____	____
30%	____	____	30%	____	____
20%	____	____	20%	____	____
10%	____	____	10%	____	____
Same	____	____	Same	____	____
Percentage Above Current Fuel					
10%	____	____	10%	____	____
20%	____	____	20%	____	____
30%	____	____	30%	____	____
40%	____	____	40%	____	____

(8) Please circle the number which most accurately indicates your opinion of each statement. Circle number six if you strongly agree with the statement or number one if you strongly disagree. Or, circle any number in between that you feel is most appropriate.

	Strongly Disagree					Strongly Agree
a. Wood fuel materials are available in my area.	1	2	3	4	5	6
b. Storage of sufficient quantities of wood materials as fuel at my plant would be difficult.	1	2	3	4	5	6
c. The technology has not been sufficiently developed that would allow the utilization of wood as a supplemental fuel in oil or gas boilers.	1	2	3	4	5	6
d. Wood boilers have been considered in the past but were rejected because of high initial cost.	1	2	3	4	5	6
e. A new wood boiler will be considered in the future if the costs of oil and gas continue to rise.	1	2	3	4	5	6

(9) What kind of incentives would be required to interest you in installing a wood gasifier or a new wood boiler?

_____ Tax write-offs

_____ Capital loan

_____ Assurance of wood fuel supply

_____ Improved technology in handling, feeding, and storage of wood.

_____ Others (please specify) _____

_____.

(10) What wood supply situation would have to exist before you would consider wood as a fuel? (Check one)

a. _____ Long-term contract for assured supply at known price.

b. _____ Spot market where sufficient supply can be obtained but at unknown price.

c. _____ Other, Specify _____

(11) Are there sawmills, pulpmills, or logging operations in the vicinity of your plant?

a. _____ Yes

b. _____ No

(12) What is the maximum number of years over which you would be willing to wait to recover your capital investment in a wood boiler or gasifier through possible fuel cost savings?

Payback period of _____ years.

Please return this questionnaire in the enclosed envelope to:

Dr. Tze I. Chiang
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Georgia Institute of Technology
Atlanta, GA 30332

A-2084

FINAL REPORT
PROJECT NO. A–2084

A COM–PLY PANELS PROCESSING COMPLEX IN APPALACHIAN GEORGIA

AN ECONOMIC FEASIBILITY STUDY

By
Tze I. Chiang

Prepared for
GEORGIA FORESTRY COMMISSION

Under sponsorship of
APPALACHIAN REGIONAL COMMISSION

Technology and Development Laboratory
Economic Development Division

June 1979

GEORGIA INSTITUTE OF TECHNOLOGY
Engineering Experiment Station
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A COM-PLY PANELS PROCESSING COMPLEX IN APPALACHIAN GEORGIA

AN ECONOMIC FEASIBILITY STUDY

Prepared for

The Georgia Forestry Commission

by

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Summary

The timber resources in a 25-county area of Appalachian Georgia are roughly evenly divided between softwoods and hardwoods. About 73.5% of the land area is under commercial forest. Sawtimber on commercial forestland comprised 9,762 million board feet, while the volume of growing stock on commercial forestland was estimated at 3,797 million cubic feet in the area. The timber volume within a 100-mile radius of Ellijay, Georgia, is about double that of the volume given for the 25-county area.

In the 25-county area, net annual growth of growing stock was 207 million cubic feet vs. annual removals of 109 million cubic feet, with an annual excess of growth over removals of 98 million cubic feet. On sawtimber, the annual excess growth over removals was 111 million board feet. These volumes would be doubled if the base area considered is the 100-mile radius of Ellijay, Georgia.

The utilization of timber resources in the area is highly tilted to softwoods (mostly southern pine) rather than hardwoods. In 1977, softwood lumber constituted about 80 percent of all lumber produced, and softwood pulpwood comprised 83 percent of all round pulpwood produced in the 25-county area.

The results of a logger survey in the area reveal that the average diameter of logs delivered was 11 inches, d.i.b., for pine logs to 12.7 inches, d.i.b., for hardwood logs. Delivered prices on average were $83/MBF on hardwood sawtimber (Scribner), $125/MBF on hardwood veneer logs (Doyle), $96/MBF on softwood sawtimber (Scribner), and $135/MBF on softwood veneer logs (Doyle) in 1978.

The results of a timberland-owner survey reveal that about 60 percent of timber holdings in the area are mixed softwoods and hardwoods, while pine forest and hardwood forest constitute 20 percent each. About 61 percent of the timberland owners have sold timber before, and about 53 percent of responding owners intend to sell timber in the next five years. Most timberland owners are expecting stronger demand for their stumpage with higher prices in the future.

A COM-PLY panel plant with an annual capacity of 126,720,000 square feet, ½-inch thickness, is recommended for the area. COM-PLY panels are composite sandwich construction with a particleboard core between double layers of veneer. The proposed production would up-grade the woodworking industries in the area. Also, it would extend the timber resources because of whole-tree utilization and high yield of the product.

Annual log requirements for the proposed plant would be 21,549,000 board feet of southern pine, International rule, and 14,217,000 board feet of hardwoods, Doyle rule. Payments for these timber materials would be $4 million a year. The plant would employ 188 direct laborers with an annual payroll of $2,842,500.

Capital investment for the proposed plant would be $27,929,000, of which $21,199,000 would be for fixed investments and $6,330,000 for working capital. Projected production costs would be $19,870,501 in a normal year, or $156.81 per thousand square feet, ½-inch thickness basis. Projected annual returns would be $29,399,040 on the basis of 126,720,000 square feet, AB (20%) and CD (80%), ½-inch thickness, or $232 per thousand square feet. On the basis of 1978 cost-return estimates, net profit before taxes would be $8,058,587 and net profit after taxes would be $3,706,950. The profitability of the proposed venture can be indicated by several ratios: after-tax internal rate of return, 32.97%; profit margin, 13.27% return on total assets, 13.47% and the rate of return on common equity, 58.54%. The payout period would be 4.75 years. These indicators strongly suggest that the proposed production is an excellent opportunity for investment purposes.

COM-PLY panels are used in the place of softwood plywood for sheathing and underlayment purposes in housing construction. The production of softwood plywood in the nation increased from 1,200 million square feet in 1945 to 19,376 million square feet in 1977, a growth of 9.1 percent a year. It is projected to reach 22,000 million square feet by 1983. The South's share of the national production increased from 3.2 percent in 1965 to 38.4 percent in 1977, and it is projected to increase to 41 percent by 1983. Nearly 60 percent of the projected growth in the nation in the next five years will take place in the South. The phenomenal growth of production in the South has been caused by two factors -- nearness to major markets and the growth of timber resources in the region.

In order to gain maximum transportation advantages, it is proposed to sell the production as close to the designated plant location as possible. First-choice destinations would be Atlanta, Chattanooga, Charlotte, Birmingham, Knoxville, Jacksonville, and Nashville. Second-choice destinations would be Richmond, Tampa, Washington, D. C., Charleston, Cincinnati, Miami, and Mobile. Third-choice destinations would be Columbus, Memphis, New Orleans, Indianapolis, Cleveland, and New York.

INTRODUCTION

The main purpose of this study is to introduce a timber processing complex which could use a substantial volume of local timber resources and would provide job opportunities in the Appalachian region of Georgia. Com-ply is chosen for the following reasons:

1. It is a new product but based on well established technology.
2. It is used in construction and housing with expanding markets.
3. End-use performance of Com-ply is equal to or exceeds the standards set for plywood and lumber.
4. The production requires intensive capital outlay, high-level technical know-how, and a large pool of labor.
5. It is a high-yield product with virtually no wasted material.
6. Both softwoods and hardwoods can be used as raw material so that its production is compatible with the timber resources in the area.

In the Appalachian region of Georgia, there is not a single plant engaged in the production of wood particleboard, pine plywood, or lumber produced by chip-n-saw operations. These types of manufacturing represent a newer generation of wood products with a higher level of capital and technical know-how requirements. COM-PLY[1/], the newest wood product, can be used in the place of softwood plywood and lumber in many end uses. The introduction of COM-PLY would provide an up-grading opportunity to the woodworking industries in the area.

COM-PLY can be made into panels, studs, and joists. This study is concerned only with COM-PLY panels. COM-PLY panels are composite sandwich construction with a particleboard core between double layers of veneer. The main uses of COM-PLY panels are for sheathing and underlayment purposes in housing construction.

Currently there is only one plant engaged in the production of COM-PLY products. It is owned by the Potlach Corporation in Louistance, Idaho. The Ellingson Lumber Company runs a pilot COM-PLY plant in Baker, Oregon. The Georgia-Pacific Corporation is building a COM-PLY panel plant with an annual

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1/ COM-PLY is a registered trademark of the American Plywood Association.

capacity of 200 million square feet in Dudley, North Carolina. On-stream date is expected to be 1979. Several other COM-PLY plants are reported under planning.

This study deals with the economic feasibility of building a COM-PLY panel plant in north Georgia. Twenty-five north Georgia counties in the Appalachian region have been designated as the base area for this study program (see Map 1 in next section). The 25-county area is relatively homogeneous in terms of wood species and topography.

The results of this study are organized into five major parts. Part one provides a review of timber resources in the area. Part two presents the findings of two major surveys conducted under this program. Part three gives an outline of a prototype COM-PLY plant, including detailed investment requirements. Part four involves projected production costs and returns of the model plant. Part five illustrates the markets and marketing potentials for the model production.

This study provides guidelines for an investment opportunity in COM-PLY panels in north Georgia. A serious investor should investigate further on plant design, equipment adopted, and production requirements of a scale suitable to his own needs. The U. S. Forest Sciences Laboratory, Athens, Georgia, could provide some assistance in these areas.

REVIEW OF TIMBER RESOURCES AND UTILIZATION

Present Timber Resources

Timber resources in a given area play an important role in shaping the type of wood manufacturing industries and the scale of operations to be found in the area. Two timber resource base areas are used in this study for the purposes of illustrating their respective acreages, forest types and volume, and growth-cut relationship. These two timber base areas are the 25-county study area and the Georgia portion of a 100-mile radius of Ellijay, Georgia. Georgia counties included in the two base areas are given below:

Twenty-five north Georgia counties - Banks, Bartow, Catoosa, Chattooga, Cherokee, Dade, Dawson, Fannin, Floyd, Forsyth, Franklin, Gilmer, Gordon, Habersham, Hall, Lumpkin, Murray, Pickens, Rabun, Stephens, Towns, Union, Walker, White, Whitfield.

The Georgia portion of a 100-mile radius of Ellijay, Georgia - Banks, Barrow, Bartow, Butts, Carroll, Catoosa, Chattooga, Cherokee, Clarke, Clayton, Cobb, Coweta, Dade, Dawson, DeKalb, Douglas, Elbert, Fannin, Fayette, Floyd, Forsyth, Franklin, Fulton, Gilmer, Gordon, Gwinnett, Habersham, Hall, Haralson, Hart, Heard, Henry, Jackson, Jasper, Lumpkin, Madison, Morgan, Murray, Newton, Oconee, Oglethorpe, Paulding, Pickens, Polk, Rabun, Rockdale, Spalding, Stephens, Towns, Union, Walker, Walton, White, Whitfield.

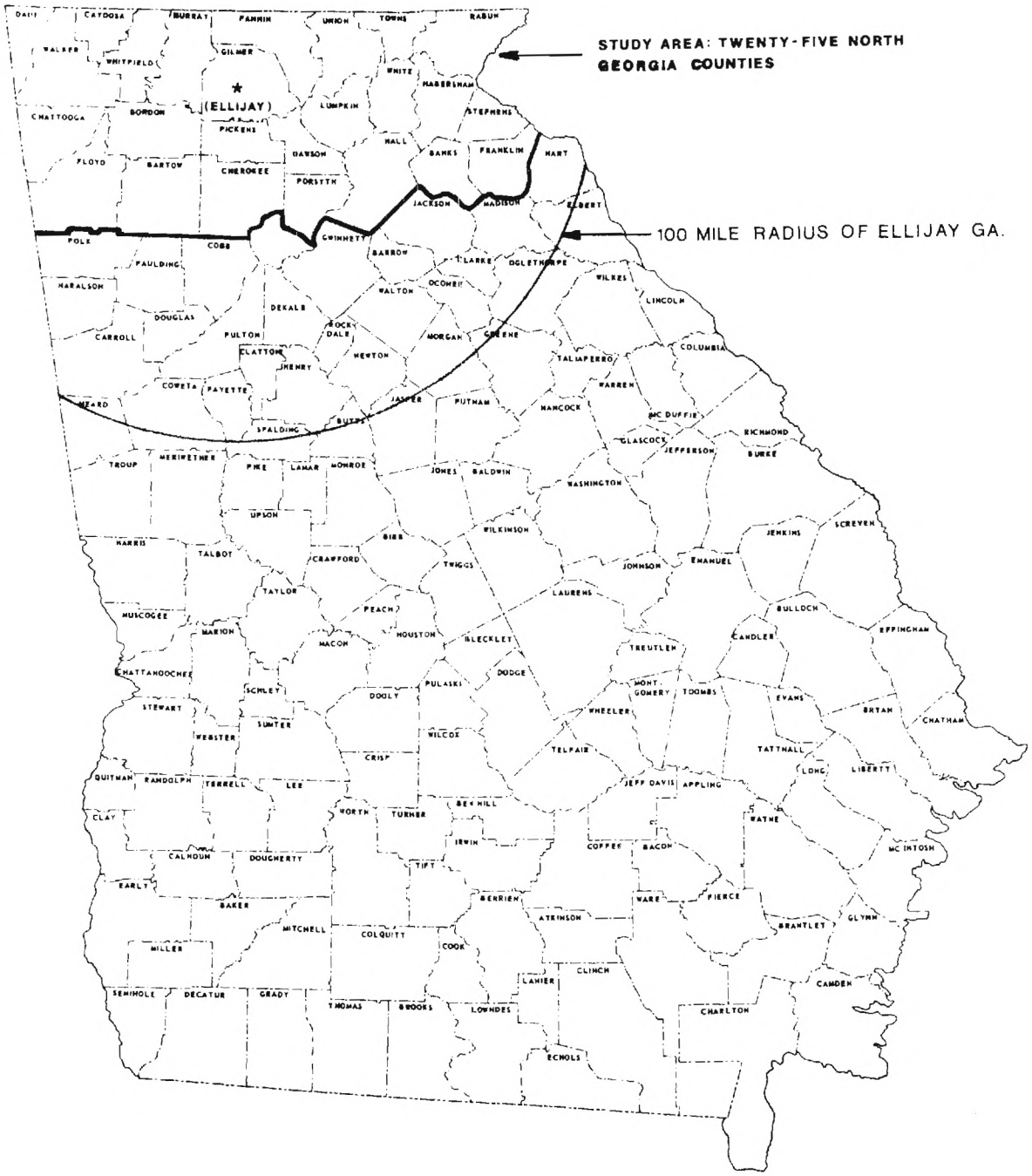
These two timber resource base areas, together with counties included in each area, are presented in Map 1.

The Chattahoochee National Forest constitutes a significant portion of the timber base in both areas mentioned above. Timber resources in the Chattahoochee National Forest will be presented separately.

Acreage. The total land area within the 25-county study area is 4,942,900 acres, of which 3,631,800 acres (73.5%) are classified as commercial forestland. Within a 10-year span, 1962 to 1972, 105,500 acres were removed from the commercial forestland status, a decrease of 2.8%. The ownership

MAP 1

TIMBER RESOURE BASE AREA



pattern within the area is broken down into three major categories as indicated in Table 1. Private lands constituted over 70%; public-owned lands, 22%; and forest industry-owned and leased lands, about 8%.

Table 1

ACREAGE OF COMMERCIAL FORESTLAND BY OWNERSHIP,
THE 25-COUNTY AREA, 1972

	Acreage	% of Total Commercial Forestland
Private	2,571,477	70.8
Public	786,115	21.6
Forest Industry	267,815	7.4
(Industry Leased)	6,359	.2
Total	3,631,766	100

Source: Compiled from data supplied by Management Division, Georgia Forestry Commission, July 1978.

The total land area within the Georgia portion of a 100-mile radius of Ellijay is 10,443,200 acres. Commercial forestland accounts for 7,152,056 acres or 68.5% of the total land area. Between 1962 and 1972, 181,000 acres were removed from commercial forestland within the 100-mile radius. This is a 2.5% decrease. Again, the ownership pattern is separated into three major categories as indicated in Table 2. Commercial forestland in the 100-mile radius is about twice the size of the 25-county area. Private lands in the radius constituted 78%; public lands, 12%; and forest industry-owned and leased lands, 10%.

Table 2

ACREAGE OF COMMERCIAL FORESTLAND BY OWNERSHIP,
100-MILE RADIUS OF ELLIJAY, GEORGIA

	Acreage	% of Total Commercial Forestland
Private	5,602,809	78.4
Public	844,398	11.8
Forest Industry	646,115	9.0
(Industry Leased)	58,734	.8
Total	7,152,056	100

Source: Compiled from data supplied by the Management Division, Georgia Forestry Commission, July 1978.

Areas of commercial forestland by stand size and by ownership are given in Tables 3 and 4 for the 25-county area and for the 100-mile radius, respectively. Pole timber constituted the major portion of the acreages in both areas, about 45%; followed by sawtimber, about 37%; sapling/seedling, approximately 16%; and nonstocked acreage, about 1 to 2%. Detailed distribution of those acreages by ownership is given in the two tables.

Table 3

AREA OF COMMERCIAL FORESTLAND BY STAND SIZE AND OWNERSHIP,
THE 25-COUNTY AREA, 1972

Stand Size Class	All Ownership	Public	Private	Forest Industry	Industry Leased
	Acres				
Sawtimber	1,385,388	499,177	810,345	75,866	-
Poletimber	1,680,191	244,905	1,343,156	85,771	6,359
Sapling/Seedling	549,179	42,033	403,767	103,379	-
Nonstocked	17,008	-	14,209	2,799	-
All Classes	3,631,766	786,115	2,571,477	267,815	6,359

Source: Compiled from data supplied by the Management Division, Georgia Forestry Commission, July 1978.

Table 4

AREA OF COMMERCIAL FORESTLAND BY STAND SIZE AND OWNERSHIP,
100-MILE RADIUS OF ELLIJAY, GEORGIA, 1972

Stand Size Class	All Ownership	Public	Private	Forest Industry	Industry Leased
	Acres				
Sawtimber	2,712,374	545,934	1,933,445	215,563	17,432
Poletimber	3,180,077	256,241	2,680,221	211,520	32,095
Sapling/Seedling	1,207,314	42,223	952,291	203,593	9,207
Nonstocked	52,291	-	36,852	15,439	-
All Classes	7,152,056	844,398	5,602,809	646,115	58,734

Source: Compiled from data supplied by the Management Division, Georgia Forestry Commission, July 1978.

Forest Types and Volume. In the 25-county area there were 9,762,079 MBF (thousand board feet) of sawtimber in softwood and hardwood on commercial forestland in 1972. The majority of the volume was grown on private lands, which constituted 60.5% of the volume in the area or 5,905,380 MBF. Public land was second with 3,384,303 MBF or 34.7% of the total volume. Forest industry land made up the balance with 472,396 MBF or 4.8%.

In the same area, pine constituted 39% of the total sawtimber volume; other softwood, 8%; soft hardwood, 11%; and hard hardwood, 42%. Detailed board-feet volumes for each species group by ownership class are given in Table 5.

Table 5

VOLUME OF SAWTIMBER ON COMMERCIAL FORESTLAND BY OWNERSHIP
CLASS AND SPECIES GROUP, THE 25-COUNTY AREA, 1972
(Thousand Board Feet)

Ownership Class	All Species	Pine	Other Softwood	Soft Hardwood	Hard Hardwood
Public	3,384,303	824,797	519,979	368,765	1,670,762
Private	5,905,380	2,743,598	246,231	633,404	2,282,147
Forest Industry	472,396	242,634	15,972	38,268	175,522
Total	9,762,079	3,811,029	782,182	1,040,437	4,128,431

Source: Compiled from data supplied by the Management Division, Georgia Forestry Commission, July 1978.

In the 100-mile radius area, the distribution of sawtimber by ownership changed somewhat because public timberlands in the two areas remained about the same. Public lands constituted 3,768,175 MBF or 19% vs. 34.7% in the 25-county area. Private lands accounted for 14,738,194 MBF or 73% vs. 60.5% in the 25-county area. The forest industry owned and leased 8% of the total volume vs. 4.8% in the 25-county area.

The distribution of sawtimber volume by species group in the 100-mile radius differed to some degree from the 25-county area. The pine ratio increased from 39% to 50%, and the hard hardwood ratio decreased from 42% to 31%. Other softwood constituted 4% in the radius while it was 8% in the 25-county area. Soft hardwood volume in the radius increased nearly three times compared with the 25-county area. As a whole, total sawtimber volume in the 100-mile radius was about twice that in the 25-county area. Detailed volumes are given in Table 6.

Table 6

VOLUME OF SAWTIMBER ON COMMERCIAL FORESTLAND BY OWNERSHIP CLASS AND SPECIES GROUP, 100-MILE RADIUS OF ELLIJAY, GEORGIA, 1972
(Thousand Board Feet)

Ownership Class	All Species	Pine	Other Softwood	Soft Hardwood	Hard Hardwood
Public	3,768,175	1,134,048	522,764	404,569	1,706,794
Private	14,738,194	7,994,215	249,206	2,325,265	4,169,508
Forest Industry					
Owned	1,595,599	926,059	15,972	278,106	375,462
Leased	164,796	132,761	-	8,666	23,369
Total	20,266,764	10,187,083	787,942	3,016,606	6,275,133

Source: Compiled from data supplied by the Management Division, Georgia Forestry Commission, July 1978.

Volumes of growing stock on commercial forestland by species and diameter class in the 25-county area and in the 100-mile radius are presented separately in Table 7 and Table 8. Net volumes in cubic feet of growing-stock trees 5.0 inches diameter at breast height (d.b.h.) and over are included in the tables. Yellow pine alone constituted 42% of all species in the 25-county area and 49% in the 100-mile radius area. White and red oaks comprised about 34% of all species in the 25-county area and 26% in the 100-mile radius. Hickory constituted about 7% in the 25-county area and 5% in the 100-mile radius. Soft hardwood, such as yellow poplar, maple, sweet gum, tupelo, and black gum, shared about 12% in the 25-county area and 17% in the 100-mile radius. The volume of white pine is the same in both areas. It means that white pine exists only in the 25-county area. Detailed volume on each species group is given in the two tables.

The tree diameter class ranges from 5.0 inches and up in the two timber-base areas are given in Tables 7 and 8. The distribution of timber volume in each diameter class is very close between the two areas. Five to six inches class constituted 13% to 14%; 7-8 inches, 18%; 9-10 inches, 18% to 19%; 11-12 inches, 16% to 17%; 13-14 inches, 12%; and 15 inches and over, 21% to 22%. Detailed volumes in thousand cubic feet are given in the two tables.

COM-PLY panel production could use tree diameters from 10 inches and upward. About 58% of these growing-stock trees given in the tables can be used for the COM-PLY production.

Growth-Cut Relationship. The timber growth-removals ratio in a given area could reveal to a great extent the balance of timber resources in that area. Under sustained-yield forest management practice, removals are generally not to exceed net growth, so that the timber resource base in a given area can be maintained for long-lasting utilization. Net annual growth and removals of growing stock on commercial forestland by species in the 25-county area and in the 100-mile radius area are presented in Table 9. In all species, removal constituted about 53% of annual net growth in the 25-county area and 51% in the 100-mile radius. Annual net growth in excess of removals was 98,015 MCF (thousand cubic feet) in the 25-county area and 238,850 MCF in

Table 7

VOLUME OF GROWING STOCK ON COMMERCIAL FORESTLAND BY SPECIES AND DIAMETER CLASS IN THE 25-COUNTY AREA, 1972
(Thousand Cubic Feet)

Species Group	All Classes	Diameter Class-Inches At Breast Height					
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0 & Larger
Softwood-							
Yellow Pine	1,594,277	295,235	405,881	356,915	263,408	145,394	127,444
White Pine	152,954	8,844	8,393	13,769	17,347	13,484	91,117
Other Softwoods	19,222	1,928	2,074	3,938	1,325	817	9,140
Total Softwoods	1,766,453	306,007	416,348	374,622	282,080	159,695	227,701
Hardwood-							
White Oak	683,934	54,563	85,514	113,130	112,110	106,783	211,834
Red Oak	605,022	45,343	65,798	96,866	101,799	90,245	204,971
Ash	18,280	2,158	4,627	5,946	3,771		1,778
Hickory	258,950	22,978	37,325	38,576	47,772	44,613	67,686
Yellow Poplar	236,539	21,309	31,772	33,470	41,895	39,204	68,889
Maple	66,129	14,121	15,094	12,254	10,143	4,806	9,711
Sweetgum	62,616	9,626	11,722	10,946	11,763	3,448	15,576
Tupelo & Blackgum	30,763	4,596	4,968	9,006	4,536	2,907	4,750
Other Hardwoods	68,720	12,503	8,558	9,204	9,805	9,628	22,751
Total Hardwoods	2,030,953	187,197	265,378	329,398	343,594	301,634	607,946
All Species	3,797,406	493,204	681,726	704,020	625,674	461,329	835,647

Source: Compiled from data supplied by the Management Division, Georgia Forestry Commission, July 1978.

Table 8

VOLUME OF GROWING STOCK ON COMMERCIAL FORESTLAND BY SPECIES AND DIAMETER CLASS IN THE 100-MILE RADIUS OF ELLIJAY, GEORGIA, 1972
(Thousand Cubic Feet)

Species Group	All Classes	Diameter Class - Inches at Breast Height					
		5.0-6.9	7.0-8.9	9.0-10.9	11.0-12.9	13.0-14.9	15.0 & Larger
Softwood-							
Yellow Pine	3,756,773	654,224	822,628	782,267	638,520	423,442	435,692
White Pine	152,954	8,844	8,393	13,769	17,347	13,484	91,117
Other Softwoods	23,815	3,530	3,515	4,947	1,866	817	9,140
Total Softwoods	3,933,542	666,598	834,536	800,983	657,733	437,743	535,949
Hardwood-							
White Oak	944,470	88,270	121,065	156,555	148,628	138,545	291,407
Red Oak	1,017,862	103,060	132,171	165,739	157,295	140,896	318,701
Ash	68,969	5,111	12,049	12,035	13,284	8,486	18,004
Hickory	390,177	41,504	59,670	57,928	69,015	61,168	100,892
Yellow Poplar	531,932	43,461	60,697	78,329	100,200	77,751	171,494
Maple	136,212	22,611	22,215	25,039	21,910	10,888	33,549
Sweetgun	399,878	55,969	73,174	80,772	66,049	48,556	75,358
Tupelo & Blackgum	65,158	8,654	10,154	16,401	9,970	6,470	13,509
Other Hardwoods	161,608	22,976	25,629	20,344	26,660	22,952	43,047
Total Hardwoods	3,716,266	391,616	516,824	613,142	613,011	515,712	1,065,961
All Species	7,649,808	1,058,214	1,351,360	1,414,125	1,270,744	953,455	1,601,910

Source: Compiled from data supplied by the Management Division, Georgia Forestry Commission, July 1978.

the 100-mile radius area. Taking 40% discount on the excess volume for tree diameters under 10 inches, the remaining excess annual net growth volume in the 25-county area could support nine plants of the size given for a model production of COM-PLY panels later. In the 100-mile radius, the discounted annual net growth could support 22 plants of such production.

In softwoods, excessive growth over removals was much larger than hardwoods in both areas. It may indicate that softwoods (mostly yellow pine) can be applied in a greater ratio than hardwoods for the making of Com-ply panels in the study area. Among the hardwoods, yellow poplar and white oaks have the most excess growth. Detailed cut-growth relationship and excessive net growth for each species are given in Table 9.

Net annual growth and removals of sawtimber on commercial forestland by species in the 25-county area and in the 100-mile radius are given in Table 10. The excess growth over removals on each species follows the same pattern as in Table 9. However, sawtimber trees are at least 9 inches in diameter at breast height (d.b.h.) for softwoods and 11 inches d.b.h. on hardwoods. On annual excess growth over removals, 270,545 MBF were estimated in the 25-county area and 655,122 MBF were in the 100-mile area. It could mean that the 25-county area could support seven COM-PLY plants of the size given for a model production in a later section and the 100-mile radius could support 18 plants of such model production. Detailed statistics on annual net growth, removals, and excess volume for each species of sawtimber are given in the table.

Industrial Utilization of the Timber Resources

Types of Usage. Timber usage in a given area can be indicated by the types of primary wood-using concerns located in that area. In the 25-county area, there are 102 primary wood-using concerns classified into six major categories. These categories are sawmills, veneer and plywood, treating plants, other round timber processors, pulp and paper, and pulpwood. Sixty-eight sawmills in the area constitute the backbone of woodworking operations. Most of them are small with less than 10 employees. These sawmills produce both softwood and hardwood lumber, and they supply dressed lumber as well as rough lumber to various secondary woodworking concerns and to construction firms in the area and beyond. In the area, there are one major pulp and

Table 9

NET ANNUAL GROWTH AND REMOVALS OF GROWING STOCK ON COMMERCIAL FORESTLAND BY SPECIES IN THE 25-COUNTY AREA AND IN THE 100-MILE RADIUS OF ELLIJAY, GEORGIA, 1972
(Thousand Cubic Feet)

Species Group	25-County Area			100-Mile Radius of Ellijay		
	Net Annual Growth	Annual Timber Removals	Excess Growth Over Removals	Net Annual Growth	Annual Timber Removals	Excess Growth Over Removals
Softwood-						
Yellow Pine	117,969	69,214	48,755	313,492	164,549	148,943
White Pine	9,522	1,066	8,456	9,522	1,066	8,456
Other Softwoods	1,715	105	1,610	2,402	160	2,242
Total Softwoods	129,206	70,385	58,821	325,416	165,775	159,641
Hardwood-						
White Oaks	21,134	10,841	10,293	31,913	15,720	16,193
Red Oaks	21,745	16,864	4,881	44,532	23,913	20,619
Ash	893	778	115	2,584	1,859	725
Hickory	6,582	3,071	3,511	10,728	5,552	5,176
Yellow Poplar	14,367	3,239	11,128	32,042	12,757	19,285
Maple	4,862	366	4,496	7,776	2,925	4,851
Sweetgum	3,807	1,937	1,870	20,859	11,865	8,994
Tupelo & Blackgum	581	364	217	1,184	1,527	-343
Other Hardwoods	3,447	764	2,683	7,732	4,023	3,709
Total Hardwoods	77,418	38,224	39,194	159,350	80,141	79,209
All Species	206,624	108,609	98,015	484,766	245,916	238,850

Source: Complied from data supplied by the Management Division, Georgia Forestry Commission, July 1978.

Table 10

NET ANNUAL GROWTH AND REMOVALS OF SAWTIMBER ON COMMERCIAL FORESTLAND BY SPECIES IN THE 25-COUNTY AREA AND IN THE 100-MILE RADIUS OF ELLIJAY, GEORGIA, 1972
(Thousand Board Feet)

Species Group	25-County Area			100-Mile Radius of Ellijay		
	Net Annual Growth	Annual Timber Removals	Excess Growth Over Removals	Net Annual Growth	Annual Timber Removals	Excess Growth Over Removals
Softwood-						
Yellow Pine	334,371	212,942	121,429	952,981	552,489	400,492
White Pine	41,162	6,265	34,897	41,162	6,265	34,897
Other Softwoods	3,412	-	3,412	4,346	-	4,346
Total Softwoods	378,945	219,207	159,738	998,489	558,754	439,735
Hardwood-						
White Oaks	69,249	37,209	32,040	107,816	52,843	54,973
Red Oaks	73,760	54,696	19,064	138,076	76,811	61,256
Ash	3,774	3,519	255	8,572	7,351	1,221
Hickory	20,491	7,183	13,309	31,402	15,563	15,893
Yellow Poplar	42,009	12,695	29,314	106,989	45,551	61,438
Maple	7,922	878	7,044	17,085	8,552	8,533
Sweetgum	8,790	5,324	3,466	44,286	41,594	2,692
Tupelo & Blackgum	1,508	-	1,508	4,445	3,766	679
Other Hardwoods	6,921	2,113	4,808	21,726	12,979	8,747
Total Hardwoods	234,424	123,617	110,807	480,397	265,010	215,387
All Species	613,369	342,824	270,545	1,478,886	823,764	655,122

Source: Complied from data supplied by the Management Division, Georgia Forestry Commission, July 1978.

paper mill and 28 pulpwood yards. Besides sawmills and pulpwood, there are only a few other primary wood-using concerns in the area -- two hardwood veneer plants, one wood treating plant, one wooden pallet plant, and one hardwood flooring mill.

There are 189 primary wood-using concerns in the 100-mile radius. The distribution of these primary wood-using concerns follows the pattern of the 25-county area. Sawmills are the backbone, followed by pulpwood procurement with minor activities in other categories. The number of primary wood-using industry in each category for both areas is presented in Table 11.

Table 11

NUMBER OF PRIMARY WOOD-USING CONCERNS IN THE 25-COUNTY AREA AND IN THE 100-MILE RADIUS OF ELLIJAY, GEORGIA, 1978

Category	25-County Area	100-Mile Radius of Ellijay, Georgia
Sawmills	68	107
Veneer and Plywood	2	5
Treating Plant	1	3
Other Round Timber Processors	2	4
Pulp and Paper	1	1
Pulpwood	28	69
Total	102	189

Source: Compiled from the 1978 Wood-Using Industries in Georgia, Georgia Forestry Commission, 1978.

There are hundreds of secondary wood-using industries, such as cabinets, millworks, furniture makings, picture frames, boxes and crates, art displays, etc., which draw a substantial portion of their wood material supplies from local primary wood-using concerns. These secondary wood-using industries are generally conglomerated around cities and metropolitan areas such as Atlanta, Rome, Gainesville, Dalton, and Toccoa.

Harvesting Practices. Most primary wood-using concerns purchase their timber requirements through contract loggers or through independent loggers,

while a few do their own logging. Since over 70% of commercial forestlands and over 50% of sawtimber volume are in the hands of private ownership in the area, the supplies of timber resources to primary wood-using concerns come largely from the private sector. In general, private timberland ownerships are small and fragmentary without the benefit of sound forestry management practices as you would find anywhere in the East. Yields from private timberlands could be doubled if proper management practices were adopted.

Loggers have generally tried to operate in an area until their cutting rights are exhausted. Stumpage prices, cutting practices, and timing are the subjects of negotiations between loggers and timber owners. In most cases, loggers are not responsible for replanting the cut-over land, and natural reforestation is common.

Logging crews have generally consisted of fewer than 10 workers, with four to five as an average in a gang. North Georgia conditions allow a year-round logging operation with a peak season in summer months. However, stoppages may occur during storms, heavy rain, or brief snow. Logging instruments used are chain saws, farm tractors, skidders, loaders, and tree-length trucks. Some sections are hilly in the area so that transportation costs may be higher compared with the coastal area. However, stumpage prices are generally lower in the area than other regions in the state.

Volume Utilization. Sawmill production and round pulpwood production in the 25-county area are presented in this section in order to give an idea of these two major outlets for timber utilization in the area. The production ranged from 150 million board feet in 1967 to 165 million board feet in 1977, and about 80% of the saw lumber produced was softwood lumber, predominantly southern pines. Hardwoods constituted only about 20% of the lumber produced, although they comprise over half of the sawtimber volume in the area. The lack of market outlets for hardwood species is evident. Lumber production by wood species in 1967, 1971, 1974, and 1977 in the 25-county area is given in Table 12.

Table 12

LUMBER PRODUCTION BY WOOD SPECIES IN THE 25-COUNTY AREA
IN 1967, 1971, 1974, and 1977
(Thousand Board Feet)

Wood Species	1977	1974	1971	1967
Southern Pine	126,565	96,524	85,678	97,117
White Pine	6,552	3,761	5,567	-
Oak	14,973	18,358	23,352	31,299
Gum	3,512	3,531	3,067	5,254
Poplar	6,354	7,162	8,141	9,400
Hickory	3,378	3,767	2,689	1,919
Other Hardwoods	3,365	3,494	6,078	4,520
Total	164,899	136,597	134,572	149,509

Source: Georgia Forestry Commission.

The production of softwood lumber, both southern pine and white pine, has evidently increased through the years, while the production of hardwood lumber in nearly all hardwood species except hickory has declined in the area. Introducing a Com-ply panel plant, which could use both softwoods and hardwoods in its production, is a rational move and compatible with the timber resources in the area.

The number of operating sawmills in the area dropped from 107 in 1967 to 65 in 1977, while the average output per mill increased from 1.4 million board feet to 2.5 million board feet a year in the same period. It reflects also the small-scale operation of sawmills in the area, incompatible with the large sawtimber bases in the area. The number of operating sawmills and the average output per mill in the area are given in Table 13.

Table 13

NUMBER OF OPERATING SAWMILLS AND AVERAGE OUTPUT IN THE 25-COUNTY AREA IN 1967, 1971, 1974, and 1977

Kind	Unit	1977	1974	1971	1967
Operating Sawmills	Number	65	89	99	107
Average Output	MBF	2,537	1,535	1,359	1,397

Source: Georgia Forestry Commission.

The round pulpwood production in the area increased from 261,848 cords in 1962 to 460,882 cords in 1977, a 76% increase in 15 years with an annual rate of 3.8%. In the same period, softwood pulpwood increased from 239,414 cords to 384,270 cords, a 60% increase, while hardwood pulpwood increased from 22,434 cords to 76,552 cords, a 241% increase. Hardwoods constituted 9% of the total round pulpwood production in 1962 and increased to 17% in 1977. Although the hardwoods share in the total pulpwood production has nearly doubled in the 15-year period, it is still below the level of the South and the nation. In 1976, hardwoods constituted 23% of total pulpwood production in the South and close to 25% in the United States. Finding new ways to utilize hardwood in the area demands the attention of both private and public institutions.

Table 14

ROUND PULPWOOD PRODUCTION IN THE 25-COUNTY AREA, 1962 to 1977

Year	All Species		Softwoods		Hardwoods	
	Cords	Percent	Cords	Percent	Cords	Percent
1962	261,848	100	239,414	91	22,434	9
1965	293,806	100	263,667	90	30,139	10
1968	319,244	100	274,879	86	44,365	14
1971	360,686	100	314,504	87	46,182	13
1974	439,553	100	364,841	83	74,712	17
1977	460,882	100	384,270	83	76,552	17

Source: Georgia Forestry Commission.

Chattahoochee National Forest

Acreage. The Chattahoochee National Forest contains 651,524 acres of forestland and lies mostly within the 25-county study area. Of the total acreage, 92% or 599,387 acres are in the Blue Ridge Circle on the east, while only 8% or 52,137 acres are in the Armuchee Circle on the west.

The total forestland in the Chattahoochee National Forest constitutes about 18% of the commercial forestland in the 25-county study area. It plays an important role in timber supplies in the area.

Timber Volume. The timber volume in growing stock and in sawtimber in the National Forest as compared with the 25-county area is given in Table 15. The softwood growing stock in the National Forest constitutes about 17.5% of the 25-county area, while the hardwood growing stock comprises 27.1%. It is obvious that hardwoods are better stocked in the National Forest area. In terms of sawtimber, both softwoods and hardwoods in the National Forest constitute about 19% of the 25-county area. See details in the table.

Table 15

TIMBER VOLUME IN GROWING STOCK AND SAWTIMBER IN THE CHATTAHOOCHEE NATIONAL FOREST AS COMPARED WITH THE 25-COUNTY STUDY AREA

Kind	A Chatt Nat'l Forest	B 25-County Study Area	A / B
	- In Thousand Cubic Feet -		(Percent)
Growing Stock			
Softwoods	309,649	1,766,453	17.5
Hardwoods	549,742	2,030,953	27.1
Total	859,391	3,797,406	22.6
	- In Thousand Board Feet -		
Sawtimber			
Softwoods	870,270	4,593,211	18.9
Hardwoods	998,190	5,168,868	19.3
Total	1,868,460	9,762,079	19.1

Source: The Chattahoochee National Forest and Georgia Forestry Commission.

Timber Sales. Timber sales by the Chattahoochee National Forest are generally conducted through public announcements and bidding procedures. The average sold volume in the last five years was around 40 million board feet a year. However, sales volume in 1977 dropped to only approximately 29 million board feet. The detailed sales volume by sawtimber, pulpwood, and miscellaneous is given in Table 16.

Sawtimber sold by the National Forest constituted about 20% of the lumber produced in the 25-county study area. Pulpwood sold by the National Forest comprised only about 3% to 6% of the pulpwood produced in the 25-county area.

Table 16

TIMBER SOLD BY THE CHATTAHOOCHEE NATIONAL FOREST, 1973 to 1977

Year	Period	Total	Sawtimber	Pulpwood	Miscellaneous
			- Thousand Board Feet -		
1973	7/1/72-6/30/73	33,053.6	20,018.4	12,795.8	239.4
1974	7/1/73-6/30/74	39,763.6	26,232.1	13,067.4	464.1
1975	7/1/74-6/30/75	44,415.2	28,233.6	15,288.0	793.4
1976	7/1/75-6/30/76	43,209.2	32,289.6	10,649.9	269.7
1977	10/1/76-9/30/77	25,863.1	16,494.8	8,802.3	566.0

Source: The Chattahoochee National Forest.

The sales records indicate that the National Forest in the area has supplied an amount of sawtimber to the local sawmills compatible with its timber base, while it falls behind in pulpwood sales. It is believed that the sales policy of the National Forest emphasizes sawtimber rather than pulpwood. Timber removals for thinning purposes are sold for pulpwood, while the majority of trees are allowed to grow to sawtimber size.

SURVEYS OF LOGGERS AND TIMBERLAND OWNERS

In order to understand the supply conditions of timber resources in the study area, two surveys were conducted -- one of loggers and another of timberland owners. An experienced logger could tell a great deal about timber supply conditions in his working area. The attitudes of timberland owners concerning their selling practices and prices received directly affect the future supplies of stumpage. These two surveys are presented separately.

Survey of Loggers

Fifty-five loggers were interviewed based on a predesigned questionnaire. These 55 loggers represented all known loggers in the study area, and they are distributed quite evenly in the study area. Over 90% of them employ fewer than 10 persons in their logging crews, and only three of them have between 11 and 20 employees. The average time in business is 14.4 years, with a range of one to 40 years. They operate within an eight to 120-mile radius of a given location, with an average radius of 42 miles. Some highlights of the survey results are presented here, and more detailed tabulated data, together with the questionnaire, are given in Appendix A.

Although the timber resources in the study area are distributed about evenly between softwoods and hardwoods, the utilization of them is highly tilted to softwoods. Based on 1977 delivered volume of the surveyed loggers, softwood sawtimber was 30,311,000 board feet and softwood pulpwood was 220,500 cords vs. 8,275,000 board feet of hardwood sawtimber and 22,665 cords of hardwood pulpwood.

In the delivered volume, softwood sawtimber averaged 11 inches, d.i.b. (diameter inside bark), while hardwood sawtimber had an average of 12.7 inches, d.i.b. The length of a log delivered was 12 feet for hardwood and 14 feet for softwood.

The loggers were paid about $83/MBF on hardwood sawtimber (Scribner), $125/MBF on hardwood veneer logs (Doyle), $96/MBF on softwood sawtimber (Scribner) and $135/MBF on softwood veneer logs (Doyle) delivered to woodyards or sawmills. These were average prices in May 1978.

The average one-way distance between stumpage sites and sawmills was 31 miles for sawtimber, 23 miles for pulpwood, and 37 miles for veneer logs in the area. It appears that higher valued end products could afford a longer distance of transportation.

Two-thirds of the loggers surveyed considered that the log supplies in the area presented no problem. About the same percentage of loggers surveyed indicated that the area could support a new wood processing complex. About one-third of the loggers surveyed encountered problems in their timber procurements. They considered that the lack of tree replanting programs and unwillingness to sell by timber owners are two major problems in the area.

Survey of Timberland Owners

Based on a prepared questionnaire, about 70 timberland owners in the study area were interviewed as a pilot survey, averaging about three timberland owners per county. Subsequently, the questionnaire was revised for a mail survey.

A list of land owners, covering both timberland and non-timberland owners, was obtained from the Agricultural Stabilization and Conservation Service (ASCS). In the 25-county study area, 27,814 land owners are on the list. For budget and cost effective reasons, a sample of 1,500 land owners was drawn from the list, weighted by the commercial forest acreage vs. the number of land owners in each county (see Appendix B). The revised questionnaires were sent to 1,500 chosen land owners and 1,448 of them were delivered. After a three-month period, 225 responded or about 16% of delivered questionnaires. Among the respondents, 134 of them or 60% own timberland. Data provided by these 134 timberland owners were used as the basis for tabulation. Although the sample size is small, nevertheless it provides a rough guide on the status of timberland owners in the area. It should be noted that the Chattahoochee National Forest and a large pulp and paper corporation which owns extensive timberland in the area are excluded from the tabulation. Some highlights of the tabulation are presented in this section. A more detailed data sheet, together with the questionnaire, is given in Appendix B.

The occupations of respondents are classified as retired persons, farmers, blue collar workers, and white collar workers. Retired persons constitute 31%; farmers, 15%; blue collar workers, 27%; and white collar workers, 27%. About 67% of the respondents live on tract.

The locations of respondents' property are grouped as West, Central, or East in the study area (see details in Appendix B). The respondents are distributed quite proportionally according to the size of each zone: West 37%, Central 27%, and East 36%.

Property size (timberland and non-timberland) of the survey respondents ranges from two acres to 16,000 acres, with an average of 403 acres and a median of 80 acres. In contrast, the size of timberland ranges from one acre to 16,000 acres, with an average of 338 acres and a medium of 48 acres. About 81% of the respondents' properties are in timberland. The average size of timberland, according to type of forest, is: pine timberland, 82 acres; hardwood timberland, 89 acres; and mixed forest, 202 acres. About 60% of the forest is in mixed forest, while pine forest and hardwood forest constitute 20% each.

About 30% of the pine forest reported was created from planted seedlings, and the balance of 70% comes from natural propagation. Only 18% of tabulated timberland was obtained for the purpose of growing timber.

Timberland owners who had sold timber before constitute about 61% of respondents. Pine sawtimber, pine pulpwood, and hardwood sawtimber were the major types of stumpage sold. Independent loggers and company agents were the main buyers.

Roughly a half of the respondents considered that their stumpage prices received were satisfactory. The stumpage prices received in the 1977-1978 season: pine sawtimber, $30 to $65/MBF; pine pulpwood, $4.5 to $7/cord; and hardwood sawtimber, $15 to $65/MBF.

In contrast, stumpage prices expected in the future: pine sawtimber, $40 to $110/MBF; pine pulpwood, $4.5 to $12/cord; and hardwood sawtimber, $30 to $110/MBF. Based on the tabulated results, it appears that larger timberland holdings tend to command higher stumpage prices.

Reasons given for not selling timber before or expecting not to sell in the next five years are (1) timber too small, (2) not fitting ownership plan, (3) stumpage price too low, (4) logging damages property, etc. Logging damage is a significant complaint by timberland owners for their reluctance to sell timber. A program of replanting after logging operations should be adopted by timber buyers or users in order to alleviate the anxiety of damage and should open up more timberland for logging purposes. About 53% of responding timberland owners expect to sell timber in the next five years in the area.

About 85% of responding timberland owners did not spend money for improving their timber holdings. It is interesting to note that the tendency to spend money for timber management increases with the size of timberland property.

The majority of timberland owners perceived that the demand for their timber will increase in the future. In fact, many of them are holding back sales for higher stumpage prices. About 77% of them are not interested in contractual leasing or outside managing of their timberland. There is one exception, however; about 46% of white collar respondents are interested in leasing and contractual management of their timber holdings.

OUTLINE OF A PROTOTYPE COM-PLY PANEL PLANT

Rationale

The steadily increasing population, coupled with the decline of timberland in the United States, has forced timber stumpage costs to rise faster than forest product prices in recent years. Wood material costs is the largest cost outlay of any primary woodworking industry. Efficient use of wood materials is the key to survival and success in the competitive world of woodworking industries.

The big advantage of the COM-PLY method for making panel or lumber is that almost an entire tree can be utilized for high value wood products.[1/] Logs are efficiently utilized by placing veneer cut from the outer diameter of the logs on the surfaces of the COM-PLY panels and building the core of the panels from particleboard made from the lower quality inner portions of the logs and from other logging and mill residues.[2/]

The relative yields among major wood products can be compared. When manufacturing lumber, the yield is about 40% of the log; for plywood, the yield is about 45% of the log; and for COM-PLY the yield is 90% or better.[3/] The cost advantage of COM-PLY over lumber and plywood in log requirement is significant, since COM-PLY products have to compete with lumber or plywood for various end uses in the marketplace.

[1/] Gerald A. Koenigshof, "Economic Feasibility of Making COM-PLY Studs," Southern Lumberman, December 15, 1975.

[2/] R. F. Blomquist, R. H. McAlister, and others, "COM-PLY Studs - A Status Report," Forest Products Journal, Volume 25, No. 9, September 1975.

[3/] Gerald A. Koenigshof, "Economic Feasibility of Producing Composite Panels." A paper presented at the 11th Washington State University Symposium on Particleboard, Pullman, Washington, March 1977.

The high yields of COM-PLY products would extend the national timber supply in the long run. Also, it should add flexibility to plant location decisions because low-grade and small-diameter saw logs of both softwoods and hardwoods can be used. With the supply of large-diameter and high-quality logs declining steadily, the introduction of COM-PLY products at this time has significant value to the nation.

COM-PLY production has the flexibility of changing over to particleboard production when the demand for panels and lumber in the housing market slows down while the markets for particleboard in industrial uses remain strong. The peak demands of the two markets do not overlap.

Panels are chosen as the subject for this study instead of studs because plenty of studs are produced by chip-n-saw operations in the South. Approximately 150 chip-n-saw plants are operating in the South. Over 70% of the output of a chip-n-saw plant is in studs.

COM-PLY joists such as 2 x 8's and 2 x 10's have a very large profit margin. However, detailed input-output relationships and investment requirements are not available at this time.[1/]

Product Description, Plant Size, and Production Procedure

COM-PLY panels are designed as substitutes for plywood panels. They contain a particleboard core, and the outer surfaces consist of veneer sheets. These panels vary in thickness according to whether they are to be used as roof sheathing, flooring, etc. The most common thickness for structural panels is ½ inch. COM-PLY panels of this thickness would have a sheet of 1/10-inch-thick veneer on each face. Such panels would consist of 60% particleboard and 40% veneer.[2/]

The dimension of COM-PLY panels is 4 x 8 feet. On the average, a COM-PLY panel is stronger and stiffer along its long axis and less strong and stiff along its short axis than is a plywood panel of the same thickness. Because the principal direction of stress in a panel is along its length, COM-PLY panels are stronger than plywood for most uses.[3/]

1/Based on correspondence with Mr. Gerald A. Koenigshof, Project Leader, Products Research, Forest Science Laboratory, U. S. Forest Service, Athens, Georgia.

2/Gerald A. Koenigshof, COM-PLY Report 1: The COM-PLY Research Project, USDA Forest Service Research Paper SE-166, July 1977, p. 7.

3/Ibid., p. 14.

Extensive laboratory tests by the American Plywood Association have demonstrated that COM-PLY panels have structural and durability properties equaling or exceeding those of plywood.[1/] Several demonstration houses were built using COM-PLY panels, joists, and studs with excellent results.[2/] One of the houses built is in Marietta, Georgia. The builder was very much impressed by COM-PLY products. Detailed test results on product performance are given in a USDA Forest Service report.[3/]

This study assumes that the manufacturing facility of COM-PLY panels is located in north Georgia, using both southern pines and hardwoods as raw materials. A focal point is needed for the purpose of calculating various costs in the study. For that reason, Ellijay (Gilmer County), Georgia is chosen.

The proposed COM-PLY plant would produce 126,720,000 square feet of panels, ½-inch thickness, a year. It is assumed that the production would be 20% in AB-grade panels and 80% in CD-grade sheathing panels.[4/] The plant would employ 188 direct laborers with an annual payroll of $2,842,500. Additionally, nine persons would be needed for administrative purposes.

A two-stage production system is adopted. Logs are sorted, cut, and separated for the purposes of making particleboard and veneer. Logs unsuitable for veneer are chipped, flaked, and mixed with resin adhesives for mat forming and particleboard pressing. Logs suitable for veneer are steamed and roll peeled by lathe to make face-and-back veneer. Then particleboard panels of 4 x 8 feet are placed between two sheets of veneer. The resin bonding the veneer to the particleboard core is cured in a conventional plywood press at low pressure. After cut to size, sanded, and trade marked, COM-PLY panels are ready for warehousing and shipping. A simplified material flow diagram for the proposed plant is given in Figure 1.

[1/] Ibid., p. 14.

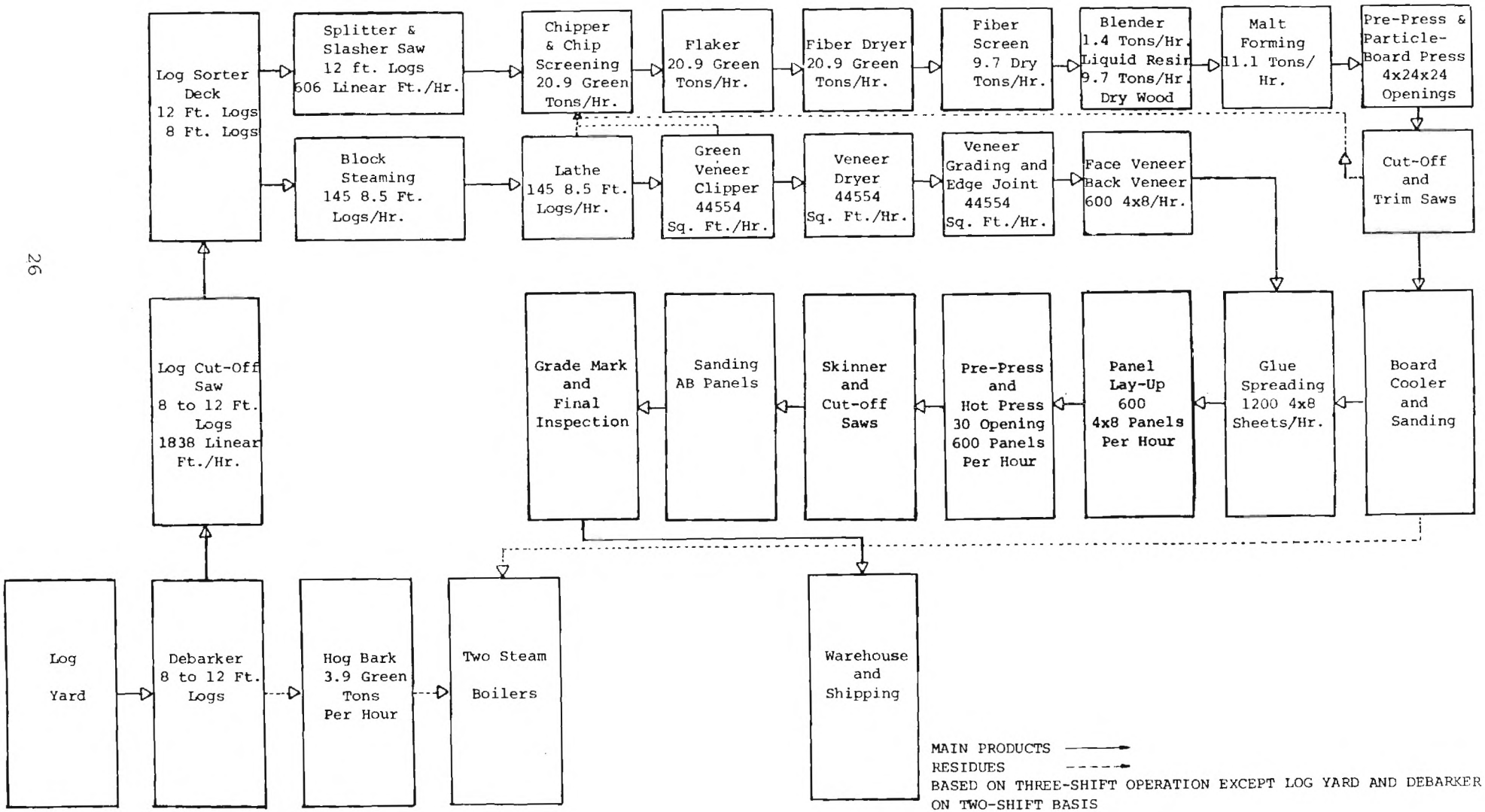
[2/] Gerald A. Koenigshof and Robert H. McAlister, Demonstration Houses Built With COM-PLY Products, USDA Forest Service Research Paper SE-177, December 1977.

[3/] J. M. Carney, Plywood Composite Panels For Floors and Roofs: Summary Report, USDA Forest Service Research Paper SE-163, January 1977.

[4/] Robert H. McAlister and Michael A. Taras, COM-PLY Report 9: Yield of Southern Pine Veneer Suitable For Composite Lumber and Panels, USDA Forest Service Research Paper SE-179, January 1978.

FIGURE 1

SIMPLIFIED MATERIALS FLOW DIAGRAM FOR A MODEL PRODUCTION OF COM-PLY PANELS



Raw Material Requirements

The manufacture of COM-PLY panels requires that trees of only No. 2 quality be used.[1/] Trees with smaller diameters (16 inches d.b.h. and less) that yield a high proportion of grade C and better veneer are suitable. The major advantage of COM-PLY products is that all of the harvested trees can be used in their manufacture. Production of COM-PLY products generates essentially no residues except bark, which is used as boiler fuel.[2/]

The proposed plant would require 956 cubic feet of solid wood per hour or 6,309,000 cubic feet per year. It is assumed that southern pines and hardwoods constitute one half each. Although dense hardwoods such as oaks and hickory are known to make excellent veneer and particleboard, their use should not exceed 15% of the total wood volume in order to avoid excessive weight in panels. No. 2 logs with a diameter range of 8 inches to 16 inches (12 inches is used as an average) would be procured from the open market and shipped to a log yard of a proposed site.

By conversion, annual log procurements would be 21,549,180 board feet of southern pines, International ¼ rule, and 14,217,215 board feet of hardwoods, Doyle rule. These log requirements are within the supply capabilities of the timber resources in north Georgia.

Bark generated at the plant is estimated at 872,200 cubic feet or about 18,720,000 pounds a year. Bark, together with plywood trims and core sander dust generated at the plant, could supply 88% of boiler fuels required by two boilers installed. Details of wood wastes generated and fuel requirements for boilers are given in a later section concerning production costs.

Investment Requirements

Investment requirements for the proposed COM-PLY panel plant involve capital outlays for fixed capital requirements and working capital. These costs estimates were based on a production model prepared by the Forest Science Laboratory, Athens, Georgia, some time ago and were adopted, modified, and updated in 1978 under this study.

[1/] Gerald A. Koenigshof, "Economic Feasibility of Producing Composite Panels." op. cit.

[2/] R. H. McAlister and Michael A. Taras, COM-PLY Report 9: Yield of Southern Pine Veneer Suitable for Composite Lumber and Panels, USDA Forest Service Research Paper SE-179, January 1978.

Fixed Capital. The requirements for fixed capital are grouped into four main areas -- land, buildings, facilities, and machinery. The total cost for fixed investments was estimated at $21,199,000. The detailed breakdowns of these cost outlays are presented separately.

1. Land. An estimated 30 acres of land are necessary for building sites, material storage, access road, and space for future expansion. Land cost in a developed industrial district in Gilmer County, Georgia, was estimated roughly at $9,000 per acre. Development and engineering would be $68,000.

Land, 30 acres at $9,000	$270,000
Land development and engineering	68,000
Total	$338,000

2. Buildings. Plant building would require 17,000 square feet at a cost of $13.64 per square foot. A total of 7,500 square feet would be needed for miscellaneous buildings such as maintenance, boiler house, and guard house at a cost of $13.64 per square foot. Office buildings would need 2,500 square feet at a cost of $15.19 per square foot.

The buildings for processing, maintenance, and boilers include the following features: 20-foot ceiling, sprinkler system, loading dock, heating, and ventilation systems. The office building is constructed of tilt-up concrete, and is centrally air conditioned and fully lighted.

Plant Building (170,000 square feet, @ $13.64)[1/]	$2,319,000
Miscellaneous Buildings (7,500 square feet, @ $13.64)[1/]	102,000
Office (2,500 square feet, @ $15.19)[1/]	38,000
Engineering and contingencies	600,000
Total	$3,059,000

3. Facilities. Capital outlays for facilities include site preparation, roads, parking and paving, outside fire protection and lighting, outside piping, waste disposal, fuel storage, inside electrical and piping, and engineering and contingencies. These costs are given below:

[1/] Building costs are based on the Dodge Building Cost Index for U. S. and Canadian Cities, F. W. Dodge Company, Division of McGraw-Hill, Inc., New York, N.Y., data valid to March 30, 1978.

Site preparation	$55,000
Road, parking, and paving	55,000
Outside fire protection	103,000
Outside lighting	7,000
Outside piping	22,000
Waste disposal	11,000
Fuel storage (gas & diesel tanks & pumps)	15,000
Inside electrical	1,161,000
Inside piping	95,000
Engineering, construction, and contingencies	1,118,000
Total	$2,642,000

4. Machinery. Itemized machinery costs, including the costs of installation and freight in, for the model COM-PLY panel plant (based on 1978 costs) are given below:

Item	Cost
Log storage and handling (unloaders, storage skids, sprinkling facilities)	$ 302,500
Log barking	738,000
Foundations and supports	50,000
Foundations and supports (installation)	260,000
Block handling (two loaders and steam vault)	394,700
Boiler system (two 1123 HP/Hr. boilers, bank storage feeding system, and smoke control)	1,496,000
Log transfer to lathe and foundation (installation)	68,700
Lathe and charger installed	434,500
Trays and tripples installed	125,000
Green clipper installed	160,000
Green veneer sorting installed	152,000
Green veneer system belt	11,800
Green veneer chipper and conveyor installed	118,000
Core chipper installed	84,000
Bark conveyor installed	80,700
Chip handling facility	80,700
Two dryers installed	1,807,000
Two dryer feeders	193,000
Two dryer unloaders	115,200
Moisture meter	11,000
Dry sorting chain	22,000
Dryer emission control	60,500
Hammermill or flaker	111,800

Machinery Requirements and Costs (cont.)

Fiber dryer	783,700
Fiber dryer emission control	34,000
Fiber screen	12,800
Glue mixing, pumping and metering	37,500
Blender installed	75,000
Forming felter and caul line	1,219,000
Curtain coater	120,000
Semi-automatic lay-up system	388,000
Pre-press	91,000
Particleboard press (4' x 24' x 14-openings)	2,319,000
Board cooler	268,000
Hot press (30 opening, low pressure)	308,000
Hot press loading & unloading system	349,000
Saw line	324,000
Veneer edge-gluing equipment	171,000
Veneer plugger	85,000
Packaging and strapping machine	8,000
Hog-fuel system	29,400
Forklifts and carts	150,000
Air compressor installed	82,500
Maintenance equipment and small tools	112,000
Sander	215,000
Sander feeder	34,000
Conveyor to grade-line	7,600
Panel patch line	90,600
Patching equipment (pumps, gun, etc.)	16,300
Spare parts and quality control equipment	116,400
Sweeper and yard truck	42,000
Storage tanks	132,500
Storage bins	100,000
Air conveyors (blowers, cyclones, piping)	208,700
Freight in	365,300
Total	$15,160,000

A summary of fixed capital outlays is presented in Table 17. A total of $21,199,000 is required.

Table 17

ESTIMATED FIXED CAPITAL REQUIREMENTS
FOR A MODEL PRODUCTION OF COM-PLY PANELS, 1978

Item	Cost
Land	$ 338,000
Buildings	3,059,000
Facilities	2,642,000
Machinery	15,160,000
Total	$21,199,000

Working Capital. Estimated working capital for the model production is given in Table 18. Working capital is estimated on the basis of material supplies for two months, accounts receivables for one month, cash reserve for two months of wage and salaries, and a contingency fund. The contingency fund is estimated on the basis of 10% of the total fixed capital outlays. Total working capital is estimated at $6,330,000 for the model production.

Table 18

ESTIMATED WORKING CAPITAL REQUIREMENTS
FOR A MODEL PRODUCTION OF COM-PLY PANELS, 1978

Item	Cost
Material Supplies	$ 1,364,000
Accounts Receivables	2,372,000
Cash Reserve for Paychecks	474,000
Contingency	2,120,000
Total	$6,330,000

Total capital requirements for the model production are estimated at $27,529,000, including fixed capital investments and working capital. These capital requirements are estimated on the basis of 1978 costs.

Production Costs

Production costs consist of variable costs and fixed costs. Variable costs are those which vary with the level of production. The level of production is controlled by machinery processing capacity and time. The production conditions of the model plant are given below:

- Production time
  - 22 operating hours/day
  - 6 days/week
  - 50 weeks/year
  - 300 days/year
  - 6,600 operating hours/year
- Processing capacities
  - 600 panels/hour, 4 x 8 feet, ½-inch thickness
  - 19,200 square feet/hour
  - 126,720,000 square feet, ½-inch thickness Com-ply panels/year

It should be noted that the bulk of cost data and price information used in this study was collected during a five-month period between July and November, 1978. These data constitute the foundation for various cost and return calculations presented in this section.

Variable Costs. Variable costs for the model production are log requirements, chemicals, labor, maintenance and parts, production supplies, electrical power, and thermal energy. Detailed calculations for each cost element are given separately.

1. *Log Requirements.* Wood material requirements would be 956 cubic feet per hour or 6,309,000 cubic feet a year. This is solid wood without bark. Total volume is equally divided between southern pines and hardwoods. Tree-length logs with an average diameter of 12-inch d.b.h. are assumed for the model production. Log conversion to board feet and costs involved in north Georgia are given below:

Log conversion to board feet and costs involved in north Georgia are given below:

- Pine logs

  Conversion factor: Number of cubic feet peeled volume per MBF when scaled by International ¼ rule at 12-inch diameter: 146.4 ft^3.

  6,309,000 ft^3 ÷ 2 ÷ 146.4 ft^3 = 21,549,180 BF, International ¼

- Hardwood logs

  Conversion factor: Number of cubic feet peeled volume per MBF when scaled by Doyle rule at 12-inch diameter: 221.9 ft^3.

  6,309,600 ft^3 ÷ 2 ÷ 221.9 ft^3 = 14,217,215 BF, Doyle

- Total log requirements a year

Southern pines	21,549,180 BF, International ¼, at $122/M	$2,629,000
Hardwoods	14,217,215 BF, Doyle at $95/M	1,350,635
Total		$3,979,635

2. *Chemicals.* Three types of chemicals are required -- particleboard resin, wax, and laminating adhesives. The volumes required, unit costs, and total costs are given in Table 19.

Table 19

CHEMICAL REQUIREMENTS AND COSTS

Item	Quantity Flow Per Hour (Pounds)	Hours Per Year	Annual Volume (Pounds)	Per Pound Cost (Cents)	Annual Cost
Particleboard resin	1,086	6,600	7,167,600	28	$2,006,926
Particleboard wax	189	6,600	1,247,400	7	87,318
Laminating adhesive	1,766	6,600	11,655,600	8.7	1,013,760
Total					$3,108,004

3. *Labor.* A total of 188 direct laborers would be required in a three-shift operation for the model plant. A detailed listing of job titles, number of workers, number of shifts, hours worked, hourly rate, and wages paid per day are given in Table 20. Daily wages would be $7,580, before adding 25% for payroll taxes and fringe benefits of $1,895. The total direct labor costs would be $9,475 per day and $2,842,500 per year.

Basic wages/day	$7,580
Payroll taxes and fringe benefits, 25%	1,895
Labor expenses/day	$9,475
Total labor costs/year, 300 days	$2,842,500

Table 20

LABOR REQUIREMENTS AND WAGES PAID PER DAY FOR MODEL PRODUCTION

Job Title	No. of Workers	No. of Shifts	Hrs. per shift	Hrly. Wage rate	Hrs. worked per day	Wage Per Day
Log scaler	1	2	8	$7.00	16	$112
Log lift drivers	4	2	8	5.00	64	320
Barker operator	1	2	8	5.00	16	80
Conveyor chaser	1	2	8	4.00	16	64
Fireman	1	4	8	5.00	32	160
Cut-off sawyer	1	2	8	5.00	16	80
Helper	1	2	8	4.00	16	64
Log sorter	1	2	8	6.00	16	96
Jitney driver (veneer log)	1	2	8	5.00	16	80
Grinding room man	1	1	8	6.00	8	48
Lathe operator	1	2	8	6.00	16	96
Lathe spotter	1	2	8	5.00	16	80
Clipperman (green)	2	2	8	5.00	32	160
Offbearers (veneer)	6	2	8	4.00	96	384
Jitney driver (veneer)	1	3	8	5.00	24	120
Dryer tender	1	3	8	5.00	24	120
Dryer feeders	4	3	8	5.00	96	480
Dryer offbearer	8	3	8	5.00	192	960
Glue mixer	1	1	8	6.00	8	48
Veneer plugger	2	3	8	5.00	48	240
Jointer & edge glue	2	2	8	5.00	32	160
Lay up	4	3	8	5.00	96	480
Press operator	2	3	8	5.00	48	240
Jitney driver (warehouse)	2	3	8	5.00	48	240
Panel sawyer	1	2	8	5.00	16	80
Trapper operator	1	2	8	4.00	16	64
Car loader	2	2	8	5.00	32	160
Splitter & slasher	1	2	8	5.00	16	80
Chipper operator	1	2	8	5.00	16	80
Cleanup & Screen	1	2	8	4.00	16	64
Hammermill operator	1	3	8	5.00	24	120
Dryer & screen	1	3	8	5.00	24	120
Resin mixer	1	3	8	5.00	24	120
Former operator	1	3	8	6.00	24	144
Trimmer & cooler	1	3	8	5.00	24	120
Millwright	1	3	8	6.00	24	144
Millwright helper	1	3	8	5.00	24	120
Electrician	1	3	8	6.00	24	144
Cleanup	1	3	8	4.00	24	96
Foreman	1	3	8	7.00	24	168
Superintendent	1	1	8	10.00	8	80
Machinist	1	1	8	6.00	8	48
Pipefitter	1	1	8	6.00	8	48
Storeroom man	1	1	8	5.50	8	44
Watchman	1	3	8	4.00	24	96
Shipping clerk	1	1	8	5.00	8	40
Office	1	1	8	5.00	8	40
Sanderman	1	2	8	6.00	16	96
Grader	1	2	8	5.00	16	80
Stitchers	2	2	8	5.00	32	160
Dress operator	1	3	8	5.00	24	120
TOTAL						$ 7,580

4. *Maintenance and Parts.* Replacement of parts, repair and adjustment supplies for machinery, and maintenance supplies such as oil and grease are estimated at 10% of the machinery costs a year.

$15,160,000 x .10 = $1,516,000

5. *Production supplies.* Direct production supplies, such as wires, strappings, wooden pallets, cover paper, labels, ink, and nails, are estimated at $4 per thousand square feet of panels produced or $506,880 a year.

$4 x 126,720 = $506,880

6. *Electrical power.* Electricity required for processing is 2,317.86 KWH per hour or 15,297,901 KWH a year. Based on the fuel adjustment rate of .506¢/KWH, given by the Georgia Power Company in September 1978, annual electricity cost for the production would be $442,109.

15,297,901 KWH ÷ 12 = 1,274,825 KWH/month
1,274,825 KWH x 2.89¢/KWH = $36,842/month
15,297,901 KWH x 2.89¢/KWH = $442,109/year

7. *Thermal energy.* Thermal energy is required for various types of operations in the plant. Two wood boilers with 1,123 HP/hr. each would be installed to generate about 775.11 therms of thermal energy per hour. These boilers are equipped with storage, feeding, and smoke control systems. Bark and processing wood wastes in the plant could provide nearly 90% of the fuel required for the two boilers. Estimates on wood residues generated in the plant, additional wood wastes to be purchased, and cost involved are considered in the calculations below.

Thermal energy required per year:
775.11 therms/hr. x 6,660 hours = 5,115,756 therms

Wood residues generated in the plant:

(1) Barks

Pine solid wood 3,154,800 ft^3/year	
Bark volume 10% or	315,480 ft^3
Hardwoods 3,154,800 ft^3/year	
Bark volume 15% or	436,220 ft^3
Total	788,700 ft^3

Mixed soft and hardwood barks weight at 18 to 26 pounds per cubic foot with an average of 23.74 pounds per cubic foot (dry).
788,700 ft^3 x 23.74 lbs. = 18,720,000 lbs.

(2) Plywood trims: Cut panels from 54' x 102' to 48' x 96' would generate 0.17 ton/M sq. ft., ½-inch thickness
126,720M x 0.17 = 21,542.4 tons or 43,085,000 lbs.

(3) Core sander dust: sander dust is generated at 200 lbs. per thousand square feet from particleboard core.
126,720M x 200 lbs. = 25,344,000 lbs.

Barks	18,720,000 lbs.
Plywood trims	43,085,000 lbs.
Sander dust	25,344,000 lbs.
Total	87,149,000 lbs.

One pound of dry wood would produce 8,600 Btu.
87,149,000 lbs. x 8,600 = 7,494,814 therms.
At 60% boiler efficiency: 4,496,888 therms
Required outside supply: 5,115,756 - 4,496,888 = 618,868 therms

Alternative fuel costs:

(1) Barks: Green bark would generate 3,500 Btu/lb.
or 7,000,000 Btu/ton, at 60% boiler efficiency or 4,200,000 Btu/ton or 42 therms/ton
618,868 therms ÷ 42 = 14,735 tons
14,735 tons x $7/ton = $103,145/year

(2) #2 fuel oil: 128,000 Btu/gal. and based on 84% boiler efficiency or 107,520 Btu/gal. or 1.0752 therms/gal.
618,868 ÷ 1.0752 = 575,584 gallons
575,584 x 45.6¢/gal. = $262,466/year.

(3) Natural gas: 100,000/therm at 80% boiler efficiency
618,868 therms ÷ 0.8 = 773,585 therms
773,585 therms x 23¢/therm = $177,924/year.

It is obvious that purchasing bark or wood waste is the most economical way to provide additional fuel required for the two boilers. The annual cost is estimated at $103,145, based on $7 per green ton of wood residues.

Fixed Costs. Fixed costs are those which remain constant and are not influenced by the level of production under normal operating conditions. These costs are salaries, facilities maintenance, dues, miscellaneous office expenses, contingency expenses, ad valorem taxes, insurance, interest and debt service, and depreciation. These fixed costs are described and estimated as follows:

1. *Salaries.* Approximately nine persons are included as the administrative personnel necessary for the model production. Their positions, number, salaries, total costs, and fringe benefits are given below:

Position	Number	Annual Salary
General Manager	1	$ 32,000
Accountant	1	20,000
Procurement manager	1	30,000
Forester	2 @$16,000	32,000
Receptionist & typists	4 @$ 8,000	32,000
Subtotal	9	$146,000
Fringe benefits at	28%	40,880
Total		$186,880

2. *Facilities Maintenance.* Upkeep expenses for roads, buildings, and other facilities are estimated at 2% of the original costs of the buildings and facilities.

$5,701,000 x 0.02 = $114,000/year.

3. *Dues.* Association dues are estimated at 1% of gross sales a year.

$29,399,040 x 0.01 = $294,000 (approximate)

4. *Miscellaneous office expenses.* Expenses for office supplies, telephone and telegraph, light, heat, water, sewage, etc., are estimated at 6/10 of 1% of annual gross sales.

$29,399,040 x 0.006 = $176,000 (approximate)

5. *Contingency expenses.* Expenses for any unexpected event and work delays are budgeted at 2% of annual gross sales.

$29,399,040 x 0.02 = $588,000 (approximate)

6. *Ad valorem taxes.* Based on the Gilmer County tax base and on the given fixed investments and inventories, total ad valorem taxes are estimated at $202,672 a year. Detailed calculations are given as follows:

Fixed investments	$21,199,000
Inventories	
Raw materials, four weeks	545,000
Finished goods, two weeks	1,131,000
Total tax base	$22,875,000
At 40% valuation	$ 9,150,000
Tax rate $22.15/$1,000	$ 202,672/year

7. *Insurance.* Insurance rates on an industrial plant depend on building materials, fire prevention equipment installed, water availability at the plant, and products and raw materials stored. Insurance costs for the plant are estimated as follows:

Item	Insured Amount	Annual Cost
Inventories		
Raw materials, four weeks	$ 545,000	
Finished goods, two weeks	1,131,000	
Total inventories	$1,676,000	
Insurance rate @45.36¢/$100		$ 7,602
Fixed investment less land	$20,861,000	
Insurance rate @32.4¢/$100		$67,590
Total insurance costs		$75,192

8. *Interest and debt service.* The investment capital required would be supplied from two sources -- equity capital and long-term borrowing. It is assumed that about 23% of the investments would be financed by equity capital and the balance would come from borrowing. Interest and debt retirement have been worked out on a 10-year basis at 12% per annum on borrowed capital.

The annual costs for interest and debt retirement is $3,649,384.

Fixed capital investments	$21,199,000
Working capital	6,330,000
Total capital investments	$27,529,000
Assumed equity capital	- 6,332,000
Borrowed Capital	21,197,000
Monthly payment on interest and debt*	304,115
Annual payment*	3,649,384

*Based on a 10-year plan at 12% per annum.

9. *Depreciation.* Depreciation is a noncash cost. It is important for entrepreneurs to set aside a sufficient fund for the cost of depreciation. For this study, a 10-year straight-line depreciation method is adopted for machinery and equipment. A 20-year straight-line depreciation is selected for buildings and facilities. Total depreciation costs are estimated at $2,086,100 a year.

Item	Annual Rate	Invested Value	Annual Depreciation
Machinery	10%	$15,160,000	$1,516,000
Buildings & facilities	5%	5,701,000	570,100
Total			$2,086,100

A summary of annual production costs is provided in Table 21. The manufacturing costs are the sum of variable costs and fixed costs. Adding interest and debt retirement to the manufacturing cost is equal to out-of-pocket costs. Total production costs are equal to the sum of out-of-pocket costs and depreciation.

Total production costs are estimated at $19,870,501 for producing 126,720,000 square feet of COM-PLY panels, ½-inch thickness, a year. On a per thousand square feet basis, the production cost is estimated at $156.81, of which nearly 63% goes to variable costs and the balance is for fixed costs. The details are presented in Table 21.

Table 21

ESTIMATED ANNUAL PRODUCTION COSTS FOR A MODEL PRODUCTION OF COM-PLY PANELS, 1978
(126,720,000 square feet, CD, ½-inch thickness)

Variable Costs	Total	M SQ.FT.,* ½"
Logs	$ 3,979,635	$ 31.41
Chemicals	3,108,004	24.53
Labor	2,842,500	22.43
Maintenance and supplies	1,516,000	11.96
Production supplies	506,880	4.00
Electrical power	442,109	3.49
Thermal energy	103,145	0.81
Subtotal	$12,498,273	$ 98.63
Fixed Costs		
Salaries	$ 186,880	$ 1.48
Facilities maintenance	114,000	0.90
Dues	294,000	2.32
Miscellaneous office expenses	176,000	1.39
Contingency expenses	588,000	4.64
Ad valorem taxes	202,672	1.60
Insurance	75,192	0.59
Subtotal	$ 1,636,744	$ 12.92
Manufacturing Costs	$14,135,017	$111.55
Interest and debt retirement	3,649,384	28.80
Out-of-Pocket Costs	$17,784,401	$140.35
Depreciation	2,086,100	16.46
Total Production Costs	$19,870,501	$156.81

*Per thousand square feet

Projected Returns

In order to project annual gross sales for the model production, the unit sale price of COM-PLY panels has to be decided. COM-PLY panels are used in place of plywood of the same thickness. Prices of plywood are good references for pricing of COM-PLY panels. Recent prices of CD plywood are given below:

Kind	September 22, 1978	Nine-month Average*
CD 3 ply	$234/M	$209/M
CD 4 ply	$244/M	$222/M

*January through September, 1978.

Source: Random Lengths, bi-monthly publication, 1978.

According to trade sources, COM-PLY panels are equal to or better than plywood panels on the same thickness basis in product performance. They should be priced equal to CD-4 ply plywood panels. Since all cost data used for the investment and production in this study are based on current prices, the unit price for COM-PLY panels adopted for the model production should be current as well. However, the prices of wood products are high currently because of a strong housing market. For conservative reasons, a trend-line price of $200 per thousand square feet, CD 4 ply, ½-inch thickness, is adopted. This price is 22% below the current price (September 22, 1978) and 11% below the nine-month average price. AB grade plywood is sold generally at 1.8 to 2 times the price of CD grade. A price of $360 per thousand square feet is assumed for AB grade panel. Since AB grade would contribute 20% of the total production and CD grade would be 80%, a weighted average price of $232 per thousand square feet is adopted for this proposed production.

The projected returns on the model production are based on the output of a normal year in full production, 126,720,000 square feet, ½-inch COM-PLY panels. According to reliable trade sources, a COM-PLY plant may take two years to build and full production can be reached in six months. Total gross sales for this model production, based on $232/M, f.o.b., would reach $29,399,040 a year.

A statement of estimated costs and profits on the model production is summarized in Table 22. From the gross sales, 5% has been deducted for cash discounts and for advertising and promotional expenses to arrive at net sales.

Table 22

SUMMARY STATEMENT OF ESTIMATED COSTS AND PROFITS
FOR A MODEL PRODUCTION OF COM-PLY PANELS, 1978
(126,720,000 square feet, CD, ½-inch thickness)

	Total	M SQ. FT.*, ½"
Gross Sales	$29,399,040	$232.00
Sales Expenses & Discounts, 5%	1,469,952	11.60
Net Sales	$27,929,088	220.40
Manufacturing Costs		
Variable	$12,498,273	$ 98.63
Fixed	1,636,744	12.92
Operating Profits	$13,794,071	$108.85
Interest and Debt Retirement	3,649,384	28.80
Depreciation	2,086,100	16.46
Net Profit before Taxes	$ 8,058,587	$ 63.59
Federal Taxes, 48%	3,868,122	30.52
State Taxes, 6%	483,515	3.82
Net Profit after Taxes	$ 3,706,950	$ 29.25
Profitability Indicators		
After-Tax Internal Rate of Return**		32.97%
Profit Margin		13.27%
Return on Total Assets		13.47%
Rate of Return on Common Equity		58.54%
Payout Period	4.75 years	

*Per thousand square feet
**After-tax internal rate of return is based on a cash flow without debt service (cash flow = after-tax net profit + interest and debt retirement + depreciation)

These two outlays are considered as sales expenses. Manufacturing costs consisting of variable costs and fixed costs, are deducted from net sales to obtain operating profits. To determine net profit before taxes, interest and debt retirement and depreciation must be deducted from operating profits. Net profit after taxes is determined by deducting 48% of the profit for federal taxes and 6% for state taxes.

The model production yields an after-taxes net profit of $3,706,950 in a normal year, based on 1978 costs. The profitability of the proposed venture can be indicated by several ratios: after-tax internal rate of return, 32.97%; profit margin, 13.27%; return on total assets, 13.47%; and the rate of return on common equity, 58.54%. The payout period would be 4.75 years. These indicators strongly suggest that the proposed production is an excellent opportunity for investment purpose.

Measurement of Risk Elements

There are certain unknown elements in any feasibility study. Changing demands, changing techniques in production, and changing price levels of end products as well as raw material supplies may give an entirely different outlook to a proposed project. Two methods of measuring these risk elements were used in this study: break-even analysis and sensitivity analysis (or risk analysis) of changing price, sales volume, manufacturing costs, and fixed investments. These two methods are presented separately.

Break-Even Analysis. The break-even point is that level of production when the total production costs are exactly covered by the sales revenues generated from the volume produced and sold. Two other break-even points are also calculated to cover manufacturing costs and to cover out-of-pocket costs. Detailed calculations and break-even points for the proposed production are given in Table 23. To break even with the total production costs, the plant would have to produce and sell 60,542,235 square feet annually. To cover out-of-pocket costs, 43,410,758 square feet would have to be produced and sold annually. To cover manufacturing costs, 13,441,274 square feet would need to be produced and sold annually.

These break-even points are presented in graphic form for visual evaluation in Figure 2. All of these break-even points amount to less than 50% of the full operational level of 126,720,000 square feet a year. If sales go beyond

the break-even point for total production costs, profit will occur. On the other hand, if sales lag behind the break-even point for total production costs, losses will take place.

Table 23

BREAK-EVEN POINTS FOR A MODEL PRODUCTION OF COM-PLY PANELS
(Based on 126,720,000 square feet/year output)

Basic Calculation and Break-Even Points	Unit	Projected Volume
F.o.b. Sales/M sq. ft.	Dollar	232.00
Sales Expenses, 5%	"	11.60
Net Sales/M sq. ft.	"	220.40
Variable Costs/M sq. ft.	"	98.63
Profits before Fixed Costs/M sq. ft. (A)	"	121.77
Annual Fixed Costs (B)	"	1,636,744
Interest and Debt Retirement (C)	"	3,649,384
Depreciation (D)	"	2,086,100
Break-Even for Manufacturing Costs: B ÷ A	Sq. Ft.	13,441,274
Break-Even for Out-of-Pocket Costs: (B+C) ÷ A	"	43,441,274
Break-Even for Total Production Costs: (B+C+D) ÷ A	"	60,542,235

Risk Analysis. This technique indicates how variations from the estimates of price, volume, manufacturing costs, and capital requirements made for the model production would affect the enterprise. Alternative possibilities on sales price, sale volume, manufacturing cost, and fixed investments are given in Table 24. If the sale prices are cut by 10%, the returns on investment would decrease by 9.7%. If the sales volume drops by 10%, the returns on investment would drop by 5.1%. If the manufacturing costs rise by 10% the returns would decrease by 6%. If the fixed investments increase by 10%, the returns would fall by 3.6%. Finally, if the fixed investments are 10% less than the basic study amounts, the returns would increase by 4.2%. It is obvious that the sale price of the end product has a greater impact on the returns than any other factor. The impacts of manufacturing costs and sales volume on the returns are significant but less than that of sale prices. The fixed investment changes have the least influence on the returns.

Figure 2

BREAK-EVEN CHART FOR A COM-PLY PANEL PLANT, BASED ON ANNUAL PRODUCTION OF 126,720,000 SQUARE FEET, 1/2-INCH THICKNESS

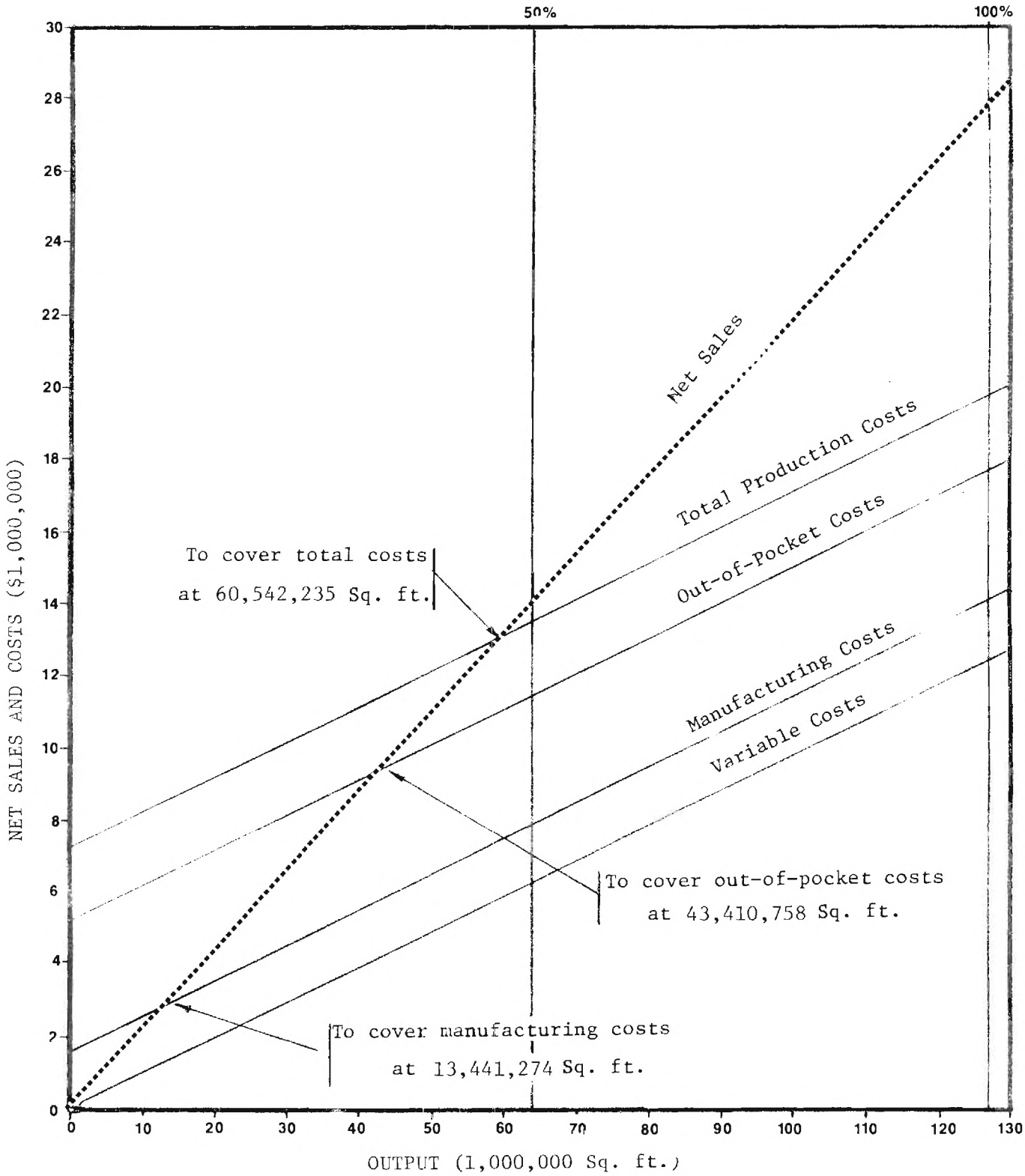


Table 24

SENSITIVITY ANALYSIS: A MODEL PRODUCTION OF COM-PLY PANELS
(Based on full production of 126,720,000 square feet/year)

Item	Basic Study	Sales Price Cut by 10%	Sales Volume Cut by 10%	Manufacturing Cost Increased by 10%	Fixed Investments Increased by 10%	Fixed Investments Decreased by 10%
			- Thousands of dollars -			
Net Sales	27,929	25,136	25,136	27,929	27,929	27,929
Total Manufacturing Costs	14,135	14,135	12,885[2/]	15,548	14,135	14,135
Operating Profit	13,794	11,001	12,251	12,381	13,794	13,794
Fixed Investment	21,199	21,199	21,199	21,199	23,319	19,079
Working Capital	6,330	6,013[1/]	6,013[1/]	6,963[1/]	6,330	6,330
Total Investment	27,529	27,212	27,212	28,162	29,649	25,409
Operating profit as % of total investment	50.1	40.4	45.0	44.0	46.5	54.3
Difference between each alternative and basic study	0	-9.7	-5.1	-6.0	-3.6	+ 4.2

[1/] The working capital requirements vary with the volume of sales income and the level of manufacturing costs.

[2/] A cut of 10% in sales volume with an accompanying cut in the volume of production does not result in a 10% saving in manufacturing costs. The fixed cost items remain.

MARKETS AND MARKETING

National Trends

Since COM-PLY panels are used in the place of plywood for sheathing purposes, the trend of softwood plywood production in the nation will provide a meaningful insight into the potential markets for COM-PLY panels. Softwood plywood produced in the South, which is used predominantly for sheathing purposes, is an excellent inference for COM-PLY panels.

The growth of softwood plywood production in the United States has been impressive in the last three decades, except during a short period, 1974 to 1975, affected by the energy crisis together with an economic recession. Production in the nation increased from 1,200 million square feet in 1945 to 19,376 million square feet in 1977, a growth of 9.1% a year. In contrast, the production in the South increased from 402 million square feet in 1965 to 7,447 million square feet in 1977, a growth of 27.5% a year. The production in the South constituted 3.2% of the national total in 1965 and it increased to 38.4% of the nation in 1977. The growth in the South has been spectacular.

It is interesting to note that between 1975 and 1977, the total number of softwood plywood plants in the United States declined from 191 to 185 while southern plants increased from 57 to 59. This indicates that the increase in the South induced a corresponding reduction in the western region.

The outlook for softwood plywood production has been projected by the American Plywood Association. By 1983, U. S. production is expected to reach 22,000 million square feet a year, or 2,624 million square feet more than the volume produced in 1977. The production in the South is projected to reach 9,000 million square feet a year, or 1,553 million square feet more than the volume produced in 1977, which means that nearly 60% of the projected growth in the nation in the next five years will take place in the South. By 1983, the South is expected to supply about 41% of total softwood plywood and 60% of sheathing-grade plywood in the nation. Detailed statistics concerning the production, number of plants, and projection are given in Table 25.

Table 25

SOFTWOOD PLYWOOD PRODUCTION AND NUMBER OF PLANTS IN THE UNITED STATES AND THE SOUTH, 1945-1977 AND PROJECTION
(production in millions of sq. ft., 3/8-in. rough basis)

	United States		South		
Year	No. of Plants	Production	No. of Plants	Production	% of U. S. Production
1945	31	1,200			
1950	68	2,554			
1955	112	5,075			
1960	152	7,816			
1965	174	12,447	12	402	3.2
1970	179	14,340	40	3,315	23.1
1975	191	16,050	57	5,676	35.4
1976	183	18,440	57	6,814	36.9
1977	185	19,376	59	7,447	38.4
1980*	-	21,150	-	8,400	39.7
1983*	-	22,000	-	9,000	40.9

*Projected

Source: Regional Production and Distribution Patterns of the Softwood Plywood Industry, American Plywood Association, Economic Report E25, July 1978.

The phenomenal growth of softwood plywood production in the South has been caused by two factors: nearness to major markets and the decline of timber base in the western region. Since the majority of the plywood produced in the United States is consumed in the East, the proximity of southern plants to major markets give them distinct advantages in transportation costs, as well as customer service, over those plants in the western regions. Besides the freight advantage enjoyed by southern plants, there is a basic shortage of timber resources in the West. Today the stand of Douglas fir timber is only two-fifths of its original size; in contrast, the stand of southern pine alone has been increasing by 2 billion board feet a year. The increase in southern hardwoods is even larger because of the lack of demand for them. The persistant growth of the timber base in the South can be attributed to several factors. Favorable climatic conditions plus excellent forest management practices adopted by public and private agencies are the major ones. From a regional point of view, the rapid growth of plywood manufacture in the South is a rational move.

Regional Markets

All of the proposed production of COM-PLY panels would be sold in the domestic market. Because of the price structure of the softwood plywood industry, it would be most advantageous to market the production as close to the proposed plant location as possible for the purpose of gaining maximum freight advantages. Recorded shipments to three groups of metropolitan areas which may present the best combination of marketing destinations for the proposed production are given in Tables 26 and 27. Group A, containing six metropolitan areas and representing about 11.5% of the domestic plywood market, 11.8% of interior sheathing shipments, and 22.2% of southern mills' shipments in 1977,[1/] is the first choice of markets for the model production. Group B, containing seven metropolitan areas and representing 8.6% of the U. S. market in 1977, 9.5% of interior sheathing shipments, and 14.9% of southern mills' shipments in 1977, is the second choice. Group C, containing six metropolitan areas and representing 11.1% of the U. S. plywood market in 1977, 11% of interior sheathing shipments, and 15.8% of southerm mills' shipments, is the third choice. The detailed shipments for each metropolitan area are given in the two tables.

In Table 26, the percent change of plywood shipments between 1968 and 1977 is recorded. All southern metropolitan areas registered substantial gains, while northern cities recorded only moderate gains. New York was an exception in that a decline in shipments was recorded.

Interior sheathing constituted 60% to 80% of the total shipments in most of the metropolitan areas given in Table 27. Interior sheathing is the major market outlet for plywood as well as for COM-PLY panels. Southern supplies constituted about 82.4% of the total shipments in Group A, 73.9% in Group B, and 60.9% in Group C (see Table 27). From the past shipment records, it is clear that metropolitan areas in Group A are the first choice, in Group B second choice, and in Group C the third choice of market outlets for the proposed model production.

[1/] According to the American Plywood Association members' shipment records, which represented about 81% of the total softwood plywood produced in the nation in 1977.

Table 26

SHIPMENTS OF SOFTWOOD PLYWOOD
TO SELECTED MAJOR METROPOLITAN AREAS, 1968 and 1977
(in thousands of sq. ft., 3/8-in. basis)

Destination	1968	1977	Percent Change
Group A			
Atlanta, Ga.-Chattanooga, Tenn.	335,022	486,833	+45
Charlotte, N. C.	418,917	666,654	+59
Birmingham, Ala.	95,702	193,947	+103
Knoxville, Tenn.	70,757	126,344	+78
Jacksonville, Fla.	123,836	233,749	+81
Nashville, Tenn.	48,939	106,434	+117
Subtotal	1,093,173	1,803,961	+65
Group B			
Richmond-Norfolk, Va.	182,065	278,338	+53
Tampa-St. Petersburg, Fla.	85,779	159,197	+86
Washington, D.C.-Baltimore, Md.	211,139	318,104	+51
Charleston, W. Va.	18,077	51,123	+183
Cincinnati-Dayton, Ohio	134,776	158,265	+17
Miami, Fla.	150,636	261,156	+73
Mobile, Ala.	40,868	123,553	+202
Subtotal	823,340	1,349,736	+64
Group C			
Columbus, Ohio	65,391	115,493	+77
Memphis, Tenn.	147,915	322,823	+118
New Orleans, La.	133,487	288,019	+116
Indianapolis, Ind.	128,147	149,802	+17
Cleveland, Ohio	161,436	201,463	+25
New York, N.Y.	850,456	657,105	-29
Subtotal	1,486,832	1,734,705	+17
Total of 3 Groups	3,403,345	4,888,402	+44
U. S. Total	10,707,938	15,661,524	+46

Source: Geographical Analysis of Plywood Shipments, 1968 and 1977, American Plywood Association, Tacoma, Washington.

Table 27

SHIPMENTS OF SOFTWOOD PLYWOOD TO SELECTED MAJOR METROPOLITAN AREAS, TOTAL VOLUME, INTERIOR SHEATHING, AND SOUTHERN SUPPLIED, 1977
(in thousands of sq. ft., 3/8-in. basis)

Destination	Total Volume	Interior Sheathing		Southern Supplied	
Group A	(Volume)	(Volume)	(%)	(Volume)	(%)
Atlanta, Ga.-Chattanooga, Tenn.	486,833	319,512	65.6	406,230	83.4
Charlotte, N. C.	666,654	448,185	67.2	559,765	84.0
Birmingham, Ala.	193,947	127,968	66.0	158,824	81.9
Knoxville, Tenn.	126,344	98,472	78.0	106,175	84.0
Jacksonville, Fla.	223,749	142,912	63.9	182,517	81.6
Nashville, Tenn.	106,434	79,702	74.9	72,815	68.4
Subtotal	1,803,961	1,216,751	67.4	1,486,326	82.4
Group B					
Richmond-Norfolk, Va.	278,338	222,219	79.9	228,443	82.1
Tampa-St. Petersburg, Fla.	159,197	106,759	67.1	121,682	76.4
Washington, D.C.-Baltimore, Md.	318,104	240,320	75.5	181,320	57.0
Charleston, W. Va.	51,123	40,545	79.3	44,271	86.6
Cincinnati-Dayton, Ohio	158,265	123,719	78.2	104,413	66.0
Miami, Fla.	261,156	181,624	69.6	212,997	81.6
Mobile, Ala.	123,553	59,837	48.4	103,903	84.1
Subtotal	1,349,736	975,023	72.2	997,029	73.9
Group C					
Columbus, Ohio	115,493	88,508	76.6	65,339	56.6
Memphis, Tenn.	322,823	196,762	60.9	279,395	86.6
New Orleans, La.	288,019	179,550	62.4	236,174	82.0
Indianapolis, Ind.	149,802	114,527	76.5	108,255	72.3
Cleveland, Ohio	201,463	154,347	76.6	135,425	67.2
New York, N.Y.	657,105	395,939	60.2	231,148	35.2
Subtotal	1,734,705	1,129,633	65.1	1,055,736	60.9
Total of 3 Groups	4,888,402	3,321,407	67.9	3,539,091	72.4
U. S. Total	15,661,524	10,301,234	65.8	6,686,126	42.7

Source: Geographical Analysis of Plywood Shipments, 1977, American Plywood Association, Tacoma, Washington.

Price Trends

Monthly averages of reported prices for southern pine plywood, ½-inch thickness, 3-ply and 4-ply sheathings are given in Tables 28 and 29. These two price series are also presented in graphic form in Figure 3. Per thousand square feet is the standard pricing unit used in the trade. All prices reported are f.o.b. mill.

Prices for 3-ply sheathing and 4-ply sheathing are very close. The price difference between the two plywoods is only a few dollars per thousand square feet. It is apparent from the data that plywood prices tend to fluctuate depending upon market demand. However, the long-term price trend is clearly upward.

The current prices for 3-ply and 4-ply sheathings are in the range of $200 to $240 per thousand square feet, ½-inch thickness. A trend-line price of $200 per thousand square feet is adopted for CD-grade COM-PLY panels in this study.

Table 28

MONTHLY AVERAGES OF REPORTED PRICES, SOUTHERN PINE PLYWOOD, ½-INCH THICKNESS, 3-PLY SHEATHING
(in dollars per thousand sq. ft., net f.o.b. mill)

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1968												125
1969	124	127	118	93	87	70	68	76	77	74	74	69
1970	64	64	64	71	72	74	79	85	83	74	71	69
1971	74	86	82	78	77	84	94	97	90	83	87	89
1972	98	100	102	103	109	120	132	132	132	132	132	132
1973	140	146	149	150	139	122	101	102	90	91	132	105
1974	100	110	134	136	123	119	114	107	99	86	95	92
1975	92	91	92	112	120	124	129	129	127	106	116	127
1976	129	138	140	145	140	148	154	160	165	159	166	175
1977	172	178	179	173	173	198	208	232	232	202	193	200
1978	207	207	203	200	209	201	193	235	224			

Source: Random Lengths, Eugene, Oregon, October 1978.

Table 29

MONTHLY AVERAGES OF REPORTED PRICES, SOUTHERN PINE PLYWOOD,
½-INCH THICKNESS, 4-PLY SHEATHING
(in dollars per thousand sq. ft., net f.o.b. mill)

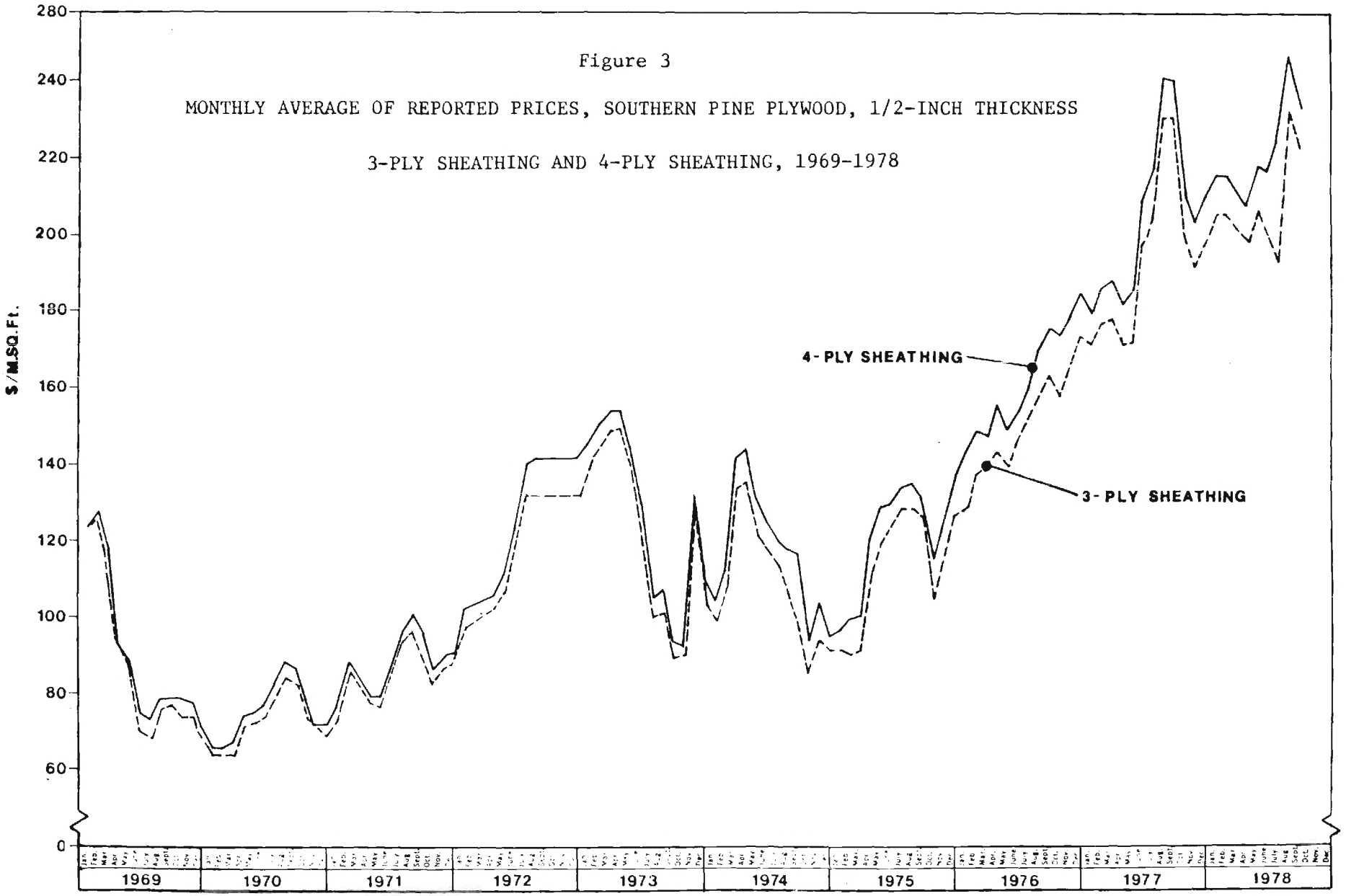
YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1967				68	68	70	75	82	88	73	68	71
1968	71	75	78	78	80	89	95	99	118	120	118	127
1969	124	128	118	93	88	75	73	79	79	79	78	71
1970	66	66	67	74	75	77	83	89	87	78	72	72
1971	77	88	85	80	80	87	96	101	96	87	90	91
1972	102	104	105	106	112	124	141	142	142	142	142	142
1973	146	151	155	155	145	131	106	108	95	93	133	111
1974	105	114	142	145	131	125	120	118	107	93	105	96
1975	97	100	101	122	130	131	135	136	132	117	126	137
1976	144	149	148	156	150	155	161	171	177	175	180	186
1977	180	187	189	183	187	211	219	243	242	212	204	211
1978	217	217	212	209	220	218	227	249	235			

Source: Random Lengths, Eugene, Oregon, October 1978.

Figure 3

MONTHLY AVERAGE OF REPORTED PRICES, SOUTHERN PINE PLYWOOD, 1/2-INCH THICKNESS

3-PLY SHEATHING AND 4-PLY SHEATHING, 1969-1978



BIBLIOGRAPHY

Anderson, Robert C., Long Term Plywood Demand 1977-1986, American Plywood Association, Economic Report E-23, September 1977.

Blomquist, Richard F. and others, Com-Ply Report 2: Performance Standards for Composite Studs Used in Exterior Walls, USDA Forest Service Research Paper SE-155, Athens, Georgia, November 1976.

Carney, J. M., Com-Ply Report 3: Plywood Composite Panels for Floors and Roofs (Summary Report), USDA Forest Service Research Paper SE-163, Athens, Georgia, January 1977.

Chiang, Tze I., A New Look at Manufacturing Southern Pine Plywood in Oglethorpe County, Georgia, Engineering Experiment Station, Georgia Institute of Technology, November 1973.

Dodge Building Cost Index for U. S. and Canadian Cities, F. W. Dodge Company, Division of McGraw-Hill, Inc., New York, NY, March 30, 1978.

Duff, John E., Com-Ply Report 7: Durability and Dimensional Stability of Com-Ply Studs, USDA Forest Service Research Paper SE-172, Athens, Georgia, August 1977.

Forest Resources Information for 100-Mile Radius of Ellijay, Georgia, Georgia Forestry Commission, Macon, Georgia, July 1978.

Forest Resources Information for 25 Counties of North Georgia, Georgia Forestry Commission, Macon, Georgia, July 1978.

Geographical Analysis of Plywood Shipments, 1968 and 1977, American Plywood Association, Tacoma, Washington, December 1968 and December 1977.

Koenigshof, Gerald A., Com-Ply Report 1: The Com-ply Research Project, USDA Forest Service Research Paper SE-166, Athens, Georgia, July 1977.

_____, "Economic Feasibility of Producing Composite Panels." A paper presented at Eleventh Washington State University Symposium on Particleboard, Pullman, Washington, March 1977.

_____, "Economic Feasibility of Making Com-Ply Studs." Southern Lumberman, December 15, 1975.

_____, Economic Feasibility of Manufacturing Com-Ply Panels in the South, USDA Forest Sciences Laboratory, Athens, Georgia (to be published), 1978.

Koenigshof, Gerald A. and Robert H. McAlister, Com-Ply Report 10: Demonstration Houses Built with Com-Ply Products, USDA Forest Service Research Paper SE-177, Athens, Georgia, December 1977.

Koenigshof, Gerald A. and Dick C. Wittenberg, Com-Ply Report 13: Structural Performance and Standards for Com-Ply Partition Studs, USDA Forest Service Research Paper SE-181, Athens, Georgia, May 1978.

McAlister, Robert H., Com-Ply Report 12: Structural Properties of Com-Ply Studs, USDA Forest Service Research Paper SE-180, Athens, Georgia, May 1978.

McAlister, Robert H. and Michael A. Taras, Com-Ply Report 9: Yield of Southern Pine Veneer Suitable for Composite Lumber and Panels, USDA Forest Service Research Paper SE-179 Athens, Georgia, January 1978.

Random Lenghts 1977 Year Book, Random Lengths, Eugene, Oregon, October 1978.

Regional Production and Distribution Patterns of the Softwood Plywood Industry, American Plywood Association, Economic Report E-26, Tacoma, Washington, July 1978.

Springate, Norman C. and Theodore T. Roubicek, Economic Prospect for Southern Manufacture of Composite Structural Sheathing with Flake Core and Veneer Face, Norman Springate & Associates International, Vancouver, British Columbia, A paper presented at the Forest Products Research Society Meeting in New Orleans, Louisiana, April 1978.

Vajda, Peter, General Plant Facility Consideration, Columbia Engineering International Ltd., Vancouver, Canada. A paper presented at a symposium sponsored by the U.S. Forest Service/Forest Products Research Society, Kansas City, MO, June 6-8, 1978.

_____, Exterior Structural Grade Flakeboards from Southern Woods, A Technical and Economic Assessment, Columbia Engineering International Ltd., Vancouver, B.C. A paper presented at the Forest Products Research Society Meeting in New Orleans, Louisiana, April 17-19, 1978.

Vick, Charles B., Com-Ply Report 4: Laminating Com-Ply Studs in a Factory, USDA Forest Service Research Paper SE-167, Athens, Georgia, May 1977.

_____, Com-Ply Report 6: Adhesive for Com-Ply Studs, USDA Forest Service Research Paper SE-171, Athens, Georgia, August 1977.

Walker, Roy M., Com-Ply Report 8: Structural Performance of Nailed Joints with Com-Ply Studs, USDA Forest Service Research Paper SE-175, Athens, Georgia, September 1977.

Wittenberg, Dick C., Com-Ply Report 5: Strength and Stiffness of Composite Studs, USDA Forest Service Research Paper SE-170, Athens, Georgia, July 1977.

_____, Com-Ply Report 11: Comparative Racking Strength of Walls Framed with Com-Ply and Sawn Timber Studs, USDA Forest Service Research Paper SE-178, Athens, Georgia, March 1978.

1978 Woodusing Industries in Georgia, Georgia Forestry Commission, Macon, Georgia, 1978.

Appendix A

SURVEY OF LOGGERS IN THE 25-COUNTY AREA

1. Questionnaire

2. Tabulated Survey Results

QUESTIONNAIRE

Survey of Loggers

Company: _____

Location: _____
City County

Address: _____

Responding Person _____ Position _____

Years in Business: _____

Average Number of Employees: _____

Your Cutting or Logging Area is within _____ miles of _____
City

and it is operating in _____, _____, _____, _____,

_____, _____, and _____ counties.

1977 Delivered Volume:

Kind	Major Species	Volume Delivered	Type of Customer
Softwood			
Hardwood			

1977 Log Data:

Kind	Major Species	Average DIB* (inches)	Average Length of Log (feet)
Softwood			
Hardwood			

* Diameter inside bark at the small end of the log.

Price Paid to Landowner:

Hardwood Stumpage

Sawtimber_____ Pulp_____ Veneer_____ Firewood_____

Scale _____ Scale_____ Scale_____ Scale_____

Softwood Stumpage

Sawtimber_____ Pulp_____ Veneer_____ Firewood_____

Scale_____ Scale_____ Scale_____ Scale_____

Price Received at Millyard or Concentration Yard:

Hardwood Stumpage

Sawtimber_____ Pulp_____ Veneer_____ Firewood_____

Scale _____ Scale_____ Scale_____ Scale_____

Softwood Stumpage

Sawtimber_____ Pulp_____ Veneer_____ Firewood_____

Scale_____ Scale_____ Scale_____ Scale_____

Average Haul Distance by Product:

Pulp_____miles

Sawtimber_____miles

Veneer_____miles

Firewood_____miles

How do you find out about availability of timber for sale?_____

_____

Based on your experience in the area, do you expect any problem in log supply in the future?

_____

_____

_____

_____

_____

Do you think the timber supply condition in your area could support a new primary wood processing complex (either softwood or hardwood or both)?

QUESTIONNAIRE EXPLANATION

1. Company: Show full company name

2. Location: Give actual location of headquarters or office

3. Address: Mailing address

4. Responding Person/Position: Name and title

5. Years in Business: Give number of years

6. Employee: Average number of employees

7. Cutting or Logging Area: Give a radius in miles of your operating base and counties in which you actively operate

8. 1977 Delivered Volume and Log Data:

   a. Give best estimates on softwood and/or hardwood volume delivered to customers in 1977 and type of your buyers.

   b. Give softwood and/or hardwood delivered in terms of log diameter inside bark (DIB) at the small end of the log. If in doubt, measure a representative sample. Record to the nearest inch. Ask about average length of log and record to the nearest foot.

   c. Define price paid either by MBF, cord or weight and by scale, i.e. Doyle, Scribner, or International.

   d. Define price received in same manner as (c).

   e. Haul distance from site of harvest to mill or concentration yard.

   f. Determine how timber for sale is located; for example, word of mouth, company buyer, consulting foresters, etc.

   g. Try to identify any problem concerning timber or log supply in your cutting area (tree conditions, landowner attitude, logging conditions, labor, equipment, etc.).

   H. Determine if they feel there is enough potential hardwood, softwood, or both in the area to justify a new timber processing complex.

Tabulated Survey Results on Loggers

1. Number of loggers interviewed: 55

2. Years in business

   One year to 40-years with an average of 14.4 years.

3. Number of logging crew

Range	Number of Responses	Percent
1-5	41	80
6-10	7	14
11-15	2	4
16-20	1	2
Total	51	100

4. Logging Area

Nearest Town	Number of Loggers In the Area	Radius of Logging Operation
Baldwin	1	40 miles
Ballground	1	30 "
Blairsville	3	45 "
Calhoun	4	35 "
Cartersville	1	25 "
Canton	2	10 "
Carnesville	1	30 "
Clarkesville	5	25 "
Cornelia	2	120 "
Cleveland	4	60 "
Chatsworth	1	no response
Dahlonega	1	50 "
Dawsonville	2	50
Gainesville	6	25 "
Gore	1	40 "
Ellijay	1	8 "
Jasper	1	25 "
Homer	1	60 "
Lavonia	1	20 "
Menlo	1	no response
Murrayville	1	25 "
Morganton	1	60 "
Ringgold	1	no response
Rome	2	100 "
Rabun Gap	1	20 "
Subligna	2	40 "
Suwanee	1	25 "
Sand Mountain	2	50 "
Trenton	1	40 "
Tate	1	100 "
Tiger	1	15 "
Unlisted	1	no response
Total =	55	Average = 41.9 miles

5. 1977 delivered volume

Kind of Wood	Sawtimber (MBF)	Pulpwood (Cords)
Softwood	30,311	220,500
Hardwood	8,275	22,665

6. 1977 log data

Sawtimber	Average DIB* (inches)	Average Length of Log (feet)
Hardwood	12.7	12
Softwood	11.0	14
Pulpwood		
Hardwood	5.3	5.3
Softwood	5.9	5.3

* Diameter inside bark at the small end of the log.

7. Price paid to landowner

Log Type	Scale	Price Range	Average	No. of Responses
Hardwood				
Sawtimber	MBF/Internl.	$25- 35	$28	3
	MBF/Scribner	20-100	36	22
	MBF/Doyle	20- 40	30	4
Pulpwood	Cord	3.8-5	4	7
Firewood	Cord	30	30	1
Veneer	MBF/Doyle	60- 75	67.5	2
Softwood				
Sawtimber	MBF/Internl.	$42.5	$42.5	1
	MBF/Scribner	35-105	45	28
	MBF/Doyle	50	50	2
Pulpwood	Cord	3.8-8	5.8	21
Veneer	MBF/Doyle	65- 70	67.5	2

8. Price received at yard or sawmill

Log Type	Scale	Price Range	Average	No. of Responses
Hardwood				
Sawtimber	MBF/Scribner	$ 50-200	$ 83	23
	MBF/Doyle	75- 90	82.5	2
Pulpwood	Cord	15- 22	20.9	12
Firewood	Cord	35	35	1
Veneer	MBF/Doyle	65-150	125	5
Softwood				
Sawtimber	MBF/Scribner	$ 60-200	$ 96	27
Pulpwood	Cord	19- 30	22.88	14
Veneer	MBF/Doyle	135	135	1

9. Distance hauled (one way)

Type of Log	Distance in Miles					Average Miles
	1-10	11-20	21-30	31-40	41 & Above	
	(No. of responses)					
Sawtimber	0	18	8	6	5	31
Pulpwood	2	12	6	3	1	23
Veneer	0	1	1	0	3	37
Firewood	0	1	0	0	0	12

10. Expect any problem in log supply in the future?

	No. of Responses	Percent
Yes	14	31
No	31	69
Total	45	100

11. Can a large wood processing complex be supported in the area?

	No. of Responses	Percent
Yes	28	62
No	17	38
Total	45	100

Appendix B

SURVEY OF TIMBERLAND OWNERS IN THE 25-COUNTY AREA

1. Number of timberland owners sampled by County

2. Survey cover letter

3. Survey questionnaire

4. Tabulated survey results

Number of Timberland Owners

Sampled by County

District #1 Rome

County	No. Samples
Bartow	91
Catoosa	19
Chattooga	71
Dade	16
Floyd	125
Gordon	70
Walker	95
Total	487

District #2 Canton

County	No. Samples
Whitfield	38
Murray	46
Fannin	86
Gilmer	97
Cherokee	140
Pickens	51
Towns	20
Union	68
	546

District #14 Gainesville

	No. Samples
Banks	38
Hall	96
Davison	17
Forsyth	45
Franklin	77
Stephens	18
Habersham	37
Rabun	56
White	34
Lumpkin	49
	467

District #1	487
District #2	546
District #4	467
	1500 Total

ATTACHMENT B

ENGINEERING EXPERIMENT STATION
GEORGIA INSTITUTE OF TECHNOLOGY • ATLANTA, GEORGIA 30332

June 1, 1978

The Economic Development Division, Technology and Development Laboratory, Georgia Institute of Technology in conjunction with the Georgia Forestry Commission, is conducting a timber supply study in the Appalachian region of Georgia. The main purpose of this study is to investigate the possibility of establishing a new timber processing complex in the area.

We understand that the area's forestry activity has been less than in any other part of the state. The result is a depressed stumpage price at the expense of timber owners in the area. The study is funded by the Appalachian Regional Commission as a part of the economic development efforts in the area. The results of this study may bring new timber users into North Georgia or new customers to you.

Would you please spend a moment of your time in answering the few simple questions posted in the questionnaire? If your land contains no forest, please indicate so and return the blank questionnaire to us. We urge all timber landowners to do their best in answering the questions posted.

All your answers will be kept in strict confidence. Because of the limited time imposed upon the study, I would appreciate your response at your earliest convenience. Please return completed questionnaires in the enclosed stamped, self-addressed envelope.

Sincerely yours,

[redacted]

Tze I. Chiang
Principal Research Scientist

TIC/jcd

cc: Mr. Tom Loggins
Georgia Forestry Commission

Enclosure

TIMBER LANDOWNERS SURVEY

NAME:_____

ADDRESS:_____

1. What is your current occupation?_____

2. Are your presently living on a tract? Yes____ No____

3. Location of Property (County): _____

4. How many total acres on property? _____ acres

5. How many acres of forestland on property? _____ acres

6. About how many acres are in pure pine? _____ acres

7. About how many acres are in pure hardwood trees? _____ acres

8. About how many acres are in mixed pine and hardwood trees? _____ acres

9. If pine is growing on your land, about how many acres of it have been planted? _____ acres

10. About how many acres have you obtained for the purpose of growing timber as a business investment? _____ acres

11. Have you ever sold timber before?

    Yes____(go to #12) No____(go to #13)

12. If yes:

    a. When was the last timber sale made (year)? _____

    b. What products were sold? (please check)

        (1) hardwood firewood ____

        (2) hardwood pulp ____

        (3) hardwood saw timber ____

        (4) hardwood veneer log ____

        (5) pine firewood ____

        (6) pine pulp ____

        (7) pine saw timber ____

        (8) pine veneer log ____

    c. How did you find a buyer (please check one):

        (1) he came to you ____

        (2) through a friend ____

        (3) consulting forester ____

        (4) other (please specify) ____

d. What type of buyer?

(1) independent logger ____

(2) company purchase agent ____

(3) timber broker ____

(4) other (please specify) ____

e. Do you feel the price you received for your timber was satisfactory?

Yes ____ No ____

f. What was the average price you received for your forest products from your last timber sale?

(1) price received per 1,000 board feet of saw timber: $_____

(2) price received per cord of pulpwood: $_____

13. Reasons for not selling timber before (please check):

a. timber too small ____

b. stumpage price too low ____

c. not fitting in future land ownership plan ____

d. other (please specify)

14. Are you willing to sell timber in the next five years?

Yes____ No____

If no, why not?

a. timber too small? ____

b. stumpage price too low ____

c. not fitting in future landownership plan ____

d. other (please specify) ____

15. Have you spent any money to improve your timber during the past?

a. 1-5 years: Yes____ No____

b. 6-10 years: Yes____ No____

c. 11-15 years: Yes____ No____

16. What range of stumpage prices do you expect to receive if you do decide to sell your timber?

a. hardwood sawtimber $_____ per thousand board feet in log scale of

(1) International ___, (2) Scribner ___, or (3) Doyle ____.

b. hardwood pulpwood $_____ per _____ in scale:
(1) cord (128 cu. ft.) ____, or (2) unit (168 cu. ft.) ____

c. hardwood firewood $_____ per _____ scale (standard cord)

d. pine sawtimber $_____ per thousand board feet in log scale of:
(1) International ____, (2) Scribner ____, or (3) Doyle ____

e. pine pulpwood $_____ per _____ scale:
(1) cord (128 cu. ft.) ____, or (2) unit (168 cu. ft.) ____

f. pine firewood $_____ per _____ scale (standard cord)

17. How do you perceive the market demand for your timber? (Please check only one in each time period).

	Low	Medium	High
a. last 5 years	( )	( )	( )
b. current	( )	( )	( )
c. next 5 years	( )	( )	( )

18. Are you interested in a possible contractual agreement with a wood-using company for leasing or managing your timberland?

Yes ____ No ____

Comments: ____ _____

_____

_____

_____

Survey Tabulation of Timberland Owners In The 25-County Area, May to July, 1978

Questionnaires sent	1,500	
Undelivered	52	
Delivered	1,448	
Responses Received	225	
NO Forest	91	
With Forest	134	(Base for tabulation)

1. Occupation of Respondents

Kind	Number	Percent
Retired	38	31
Farmer	19	15
Blue Collar	33	27
White Collar	34	27
Total	124	100

2. Living on tract

Total number of responses: 128

Yes: 85 67%
No: 43 33%

3. Location of Respondents' Property

Location**	Number	Percent
West	49	37
Central	36	27
East	48	36
Total	133*	100

*Excludes a company which owns timberland in all three locations.
**West: Dade, Walker, Catoosa, Chattooga, Floyd, Gordon, and Bartow County
**Central: Whitefield, Murray, Fannin, Gilmer, Pickens, and Cherokee County
**East: Union, Towns, Rabun, Lumpkin, White, Hall, Habersham, Dawson, Forsyth, Banks, Stephens, and Franklin County

4a. Total acres on property

Number of responses: 131*
Range: 2 to 16,000 acres
Average: 403 acres

*Excluding a major company

Area	Range	Average	Median
		- Acres -	
East	2-3,000	241	79
Central	10-16,000	733	80
West	4-4,000	324	83

4b. Property Size of Respondents

Size Class	Number	Percent
Under 100 acres	87	71
101 to 500 acres	27	22
over 500 acres	9	7
Total	123	100

5. Forestland on property

Number of responses: 126*
Forestland as a percent of total property: 81%
Range: 1-16,000 acres
Average: 338 acres
Median: 48 acres

*Excludes a major company

, 7, 8. Kinds of Forestland Owned by Respondents

Kind of Forest	Total Acres	Percent	Average Acres	Range in Acres
Pines	8,872	21	82	0-3,000
Hardwoods	8,178	20	89	0-5,000
Mixed Pine and Hardwoods	24,443	59	202	0-8,000
Total	41,493*	100		

*Excludes a major company

9. Pine planted acres

Number of responses: 117*
Total acreage: 2,618
As a percent of total pine acreage: 29.5%

10. Total acres obtained for the purpose of growing timber

Number of responses: 111
Total acreage for growing timber: 7,523
As a percent of total forestland: 18%

11. Ever Sold Timber Before?

Kind	Number	Percent
Yes	80	61
No	51	39
	131	100

12a. Last timber sale

Number of responses: 80

Time Period	No. of Responses	Percent
1973-78	45	56
1962-72	21	26
Before 1962	14	18

12b. Kind of Timber Sold

Kind	Number of Responses	Percent
Hardwood firewood	7	5
Hardwood pulpwood	10	7
Hardwood sawtimber	28	20
Hardwood veneer log	7	5
Pine firewood	3	2
Pine pulpwood	39	27
Pine sawtimber	46	33
Pine veneer log	2	1
Total	142	100

12c. Ways of Finding a Buyer

Ways	Number of Responses	Percent
He came to me	32	40
Through a friend	21	26
Consulting forester	6	8
Others*	21	26
Total	80	100

*Advertisement in paper, direct contacts with mills, etc.

12d. Type of Buyer

Type	Number of Responses	Percent
Independent logger	42	52
Company purchasing agent	21	26
Timber broker	7	9
Others*	10	13
Total	80	100

*Sawmill, paper mill, friend, etc.

12e. Satisfactory in price received

	Yes	No
Number	42	31
Percentage	58	42

12f. Stumpage prices received in the past related to location

a. Hardwood Sawtimber Prices Received, 1977-1978 & Before, MBF

	1977-78		Before 1977	
Location	Range	Average	Range	Average
East	$40-52.5	$46.25	$27-65	$46.75
Central	15-65	36.67	10-90	38.33
West	30	30.00	21-40	30.25
All	15-65	40.50	10-90	38.45

b. Pine Sawtimber Price Received, 1977-78 & Before, MBF

	1977-78		Before 1977	
Location	Range	Average	Range	Average
East	$40-52.5	$47.5	$25.65	$38.67
Central	30-65	47.5	15-90	41.00
West	30	30	30-62	40.33
All	30-65	47.5	15-90	39.94

c. Pulpwood Price Received, Cord

	1977-78		Before 1977	
Location	Range	Average	Range	Average
East	$5.00-7.00	6.00	$4.50-6.00	$5.60
Central	4.50-7.00	5.48	4.50-6.50	5.33
West	7.00	7.00	5.00-9.00	6.50
All	4.50-7.00	5.82	4.50-9.00	6.03

13. Reasons For Not Selling Timber Before

Reason	Number of Responses	Percent
Timber too small	44	37
Stumpage price too low	28	23
Not fitting ownership plan	32	27
Others*	16	13
Total	120	100

*logging damage, lack of opportunities, no interest, etc.

14a. Are you willing to sell timber in the next five years?

Kind	Number of Responses	Percent
Yes	63	53
No	57	47
Total	120	100

14b. Why not willing to sell in the next five years?

Reason	Number of Responses	Percent
Timber too small	24	37
Stumpage price too low	11	17
Not fitting ownership plan	23	35
Others*	7	11
Total	65	100

*Logging damage, sell with land, not knowing best way of selling, etc.

15. Spent money for improving timber in the past

a. Relate to time period

	Number		Percent	
Past Time Period (Year)	Yes	No	Yes	No
1-5	19	87	18	82
6-10	11	67	14	86
11-15	10	74	12	88
Total	40	228	15	85

b. Relate to the size of timberland

	Number		Percent	
Size of Timberland (Acres)	Yes	No	Yes	No
1-10	1	32	3	97
11-100	21	122	15	85
101-500	9	47	16	84
500 and over	5	13	28	72

16. Stumpage Price Expected to Receive by Timberland Owners

A. Relate to location

a. Hardwood sawtimber price expected to receive per MBF

Location	International		Scribner	
	Range	Average	Range	Average
East	$70-100	85	$50-100	75
Central	35-100	70	25-50	37.78
West	30-40	35	20-40	32.50
All	30-100	68.33	20-100	52.22

b. Hardwood pulpwood price expected to receive per cord

Location	Range	Average
East	$11	$11
Central	2.25-3.00	2.58
West	5	5
All	2.50-11	4.75

c. Pine sawtimber price expected to receive per MBF

Location	International		Scribner	
	Range	Average	Range	Average
East	110	100	60-135	90
Central	75-100	87.5	25-100	50
West	40-50	45	15-100	31.9
All	40-110	82.50	15-135	57.30

d. Pine pulpwood price expected to receive per cord

Location	Range	Average
East	$4.5	4.5
Central	5-10	6.64
West	9-12	10.33
All	4.5-12	8.58

B. Relate to the size of timberland

a. Hardwood sawtimber prices expected per MBF

Size Range in Acres	International		Scribner	
	Range	Average	Range	Average
Under 100	$30-40	35	20-100	55
101-500	50-100	72.5	30-40	36.67
Over 500	100	100	50-75	62.50

b. Hardwood pulpwood price expected per cord

Size Range In Acres	Range	Average
Under 100	$2.25	$2.25
101-500	2.50-500	2.75
Over 500	3-11	7.00

c. Pine sawtimber prices expected per MBF

Size Range	International		Scribner	
In Acres	Range	Average	Range	Average
Under 100	$40-50	45	15-135	57
101-500	75	75	45-100	67.5
over 500	100-110	105	75-100	87.5

d. Pine pulpwood prices expected per cord

Size Range In Acres	Range	Average
Under 100	$4.5-10	$6.6
101-500	5-12	8.4
over 500	10	10

17. Market Demand Perceived For Your Timber

	Low		Medium		High		Total	
Time Period	No.	%	No.	%	No.	%	No.	%
Last 5 years	46	66	21	30	3	4	70	100
Current	26	38	28	41	15	21	69	100
Next 5 years	17	25	21	30	31	45	69	100

18. Interested in Contractual Leasing or Managing Your Timberland

Kind	Number of Responses	Percent
Yes	25	23
No	86	77
Total	111	100

	Number		Percent	
Occupation	Yes	No	Yes	No
Retired	3	27	10	90
Farmer	4	11	27	73
Blue Collar	4	27	13	87
White Collar	12	14	46	54
Total	23	89	21	79