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Feasibility of wood industries in Model Valley

Thomas H. Lederer

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To the Graduate Council:

I am submitting herewith a thesis written by Thomas H. Lederer entitled "Feasibility of wood industries in Model Valley." I have examined the final electronic copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

M. B. Badenhop, Major Professor

We have read this thesis and recommend its acceptance:

D. W. Brown, B. R. McManus

Accepted for the Council:

Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

(Original signatures are on file with official student records.)

176

May 25, 1972

To the Graduate Council:

I am submitting herewith a thesis written by Thomas H. Lederer entitled "Feasibility of Wood Industries in Model Valley." I recommend that it be accepted for nine quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

W. B. Badenhop

Major Professor

We have read this thesis and recommend its acceptance:

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Accepted for the Council:

Hilton A. Smith


Vice Chancellor for
Graduate Studies and Research

FEASIBILITY OF WOOD INDUSTRIES
IN MODEL VALLEY

A Thesis
Presented to
the Graduate Council of
The University of Tennessee

In Partial Fulfillment
of the Requirements for the Degree
Master of Science

by
Thomas H. Lederer
August 1972



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ABSTRACT

Important areas of distress in the American economy have been identified, and the people living in these areas and their problems are major concerns of national, state, and local governments. One such area is Appalachia and within Appalachia there are many valleys that have all the characteristics associated with distressed areas. Model Valley, where this study was made, is one of these areas. This study is concerned with one aspect of alleviating such distress, namely, the creation of job opportunities through the development of an integrated wood industry to use the limited resources of the area.

One hope is that the development of an integrated wood industry in Model Valley would offer a partial solution to the problem of economic decline in the area. The objective of this study, therefore, is to determine whether it would be feasible to locate an integrated wood industry in the area.

The study was divided into the following sections: a review of the existing wood industries in the area; a compilation of forest inventory data; a selection of the wood industries that the available wood resource base can support; the further selection of the wood industries that appear to be feasible for development and an economic analysis of each of these industries. Finally, a set of recommendations was made stating the requirements necessary for the successful establishment and maintenance of the selected wood industries.

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CHAPTER I

INTRODUCTION

Conventional criteria for the location of economic activity, i.e., market analysis and degree of infrastructure development, have often led to and reinforced the dualistic aspects of the American economy--the paradox of areas of distress within an economy of plenty. Important areas of distress in the American economy have been identified, and the people living in these areas and their problems are major concerns of national, state, and local governments.¹ One such area is Appalachia and within Appalachia there are many valleys that have all the characteristics associated with distressed areas. Model Valley, where this study was made, is one of these areas. This study is concerned with one aspect of alleviating such distress, namely, the creation of job opportunities through the development of an integrated wood industry to use the limited resources in the area.

I. THE LOCATION OF ECONOMIC ACTIVITY

Where and how to grow are the real issues to be resolved in the intricate problem of rural area development. The location of economic activity is the most important consideration for those who plan for the

¹Areas of distress with concentration of rural poor are located in Appalachia; the East North Central states of Ohio, Indiana, Illinois, Michigan and Wisconsin; the Ozarks; selected areas in New England; and other limited areas, including Indian reservations.

development of physical and human resources. An ideal strategy for development proposing to resolve these issues of where and how to grow might consist of the planned location of development nuclei within a system of functional economic areas.² This strategic concept provides a framework for economic planning and decision-making.³

A real challenge also lies in narrowing the gap between specific problems and general solutions in development situations. A serious shortcoming is often the absence of an adequate local planning body to identify needs and to effectively coordinate and allocate resources to meet these needs.⁴ The adoption of the functional economic area concept would help provide a mechanism for the coordination of programs as well

²Karl A. Fox and T. Krishna Kumar, "Delineating Functional Economic Areas," Research and Education for Regional and Area Development, Center for Agricultural and Economic Development, Iowa State University, Ames, 1966, pp. 13-55. The term "functional economic area" and the elaboration of the theory behind this concept is primarily the work of Karl A. Fox.

³Ibid., pp. 13-55; Also, John S. Hoyt, Jr., Regional Development Systems in Minnesota, Minnesota State Planning Agency, St. Paul, January, 1969; U. S. Department of Agriculture, "Strategies, Models, and Economic Theories of Development in Rural Regions," Agricultural Economic Report No. 127, Economic Research Service, Washington, D. C. 1968.

The first step toward encouraging this pattern of location will be the delineation and recognition of functional economic areas that are large enough to be economically and administratively efficient, yet small enough to have an effective human concern. Recognition and acceptance of these functional economic areas often means casting off biases that have tended to preserve the arbitrarily defined town, city, and county divisions.

⁴Harold R. Capener, Comprehensive Regional Development, Cornell Community and Resource Development Service, Bulletin No. 2, New York College of Agriculture, Cornell University, Ithaca, 1967, p. 18.

as provide an opportunity for the development of intergovernmental cooperative relationships at the local level.⁵

A key step in this location process is the identification of development nuclei within the functional economic areas.⁶

A growth point (development nucleus) is the nucleus of sustained growth from which the impulses of development are transmitted to other regions, especially the immediate surrounding area. The process of development is not unidirectional in its nature. The impulses transmitted by one nucleus to the other get feedback, in some form, to be supported further by the growing points. The development paths are, in fact, intertwined in a web of interdependence. A certain degree of interdependence may exist in the earlier periods of growth, but this sphere of interdependence begins to be reinforced more with feedback to and from the various centers integrated for purposes of development. A growth point has to be, essentially, the nucleus of social and economic development.⁷

The criteria for the selection of these development nuclei vary with the differing characteristics of each functional economic area.⁸

An economic base study that considers the human and physical resources is necessary to provide a reasonable assessment of the locational advantages and disadvantages of proposed activities within a functional economic area. Consideration should be given to past employment; income and production levels of the area; marketing

⁵ John S. Hoyt, op. cit., p. 15.

⁶ The use of the term "development nucleus" rather than "growth point" is preferred. This is a reflection of the increasing awareness that the full implications of "growth" are not all positive. "Development" is a broader term, and implies social progress.

⁷ Muza A. A. Bez, "Regional Growth Points in Economic Development," West Virginia Center for Appalachian Studies and Development, "Economic Development Series 8", West Virginia University, Morgantown, 1965, p. 16.

⁸ Ibid., pp. 16-22.

patterns and transportation grids; prospects for future growth; present economic activities; the size, mix, and skill level of the labor force; the availability of private and public investment capital; and the felt needs of the inhabitants of the area.

However, a majority of the time, the location of development nuclei is predetermined by decisions already made, i.e., an industrial plant of large size, a rail center, a government installation, or a special natural resource within an area. These special advantages need to be reinforced with appropriate economic activities. Areas without these obvious advantages, such as Model Valley, must explore new fields of production and investment, keeping in mind that employment of the local labor force is a key objective of development efforts.

II. THE ADJUSTMENT PROCESS

The central problem is how to help people adjust to economic adversity with the primary responsibility for the adjustment process resting upon the adult individual acting alone or in voluntary groups. Since an economy is so interdependent that no person can be truly self-sufficient, a secondary responsibility rests upon society acting through government and business organizations.⁹ Ultimately of course, the achievement of greater employment depends upon the decisions and initiatives of individual businesses and the response of individual workers to

⁹Committee for Economic Development, Distressed Areas in A Growing Economy, A Statement on National Policy by the Research and Policy Committee for Economic Development (Library of Congress Catalogue Card No. 61-14416), June, 1961, p. 35.

these opportunities. But community action, channeled through private and government organizations, can do much to help reinforce, accelerate, and enhance these individual efforts. Thus, the adjustment process of the distressed area is comprised of alternatives: the individual response, the community response, or varying combinations of both.

One individual response is migration. When there is a decline in employment opportunities in an area, the worker seeks employment in places where opportunities are greater. Mobility is easiest for workers who have acquired some experience, who are under 45, and who do not have strong involvements in their local communities. Workers in the age group, 25 to 35 years, have the greatest mobility.¹⁰

For many reasons, however, some workers do not migrate to a new location. Lack of knowledge of opportunities elsewhere, lack of training for a different occupation, familiarity with the home community, deep emotional ties with family and friends, investment in a house, and exhaustion of personal savings are factors that discourage migration.¹¹ Under these circumstances, the community adjustment alternative offers the best solution to those who remain in the area.

The community solution consists of local development efforts. Community organizations, in addition to unemployed workers, have a strong interest in maintaining high employment and providing for economic development. In Model Valley, local citizens have attempted to more fully utilize the resources of their valley by forming the Model Valley

¹⁰Ibid., p. 31.

¹¹Ibid.

Development Corporation with the primary purpose of attracting new industry and assisting existing local industries in their development effort. The main thrust is to provide employment for workers who wish to remain within the area.

III. THE PURPOSE AND ORGANIZATION OF THE STUDY

One hope of the Model Valley Development Corporation is that the development of an integrated wood industry would offer a partial solution to the problem of economic decline in the area. The objective of this study, therefore, is to determine whether it would be feasible to locate an integrated wood industry in Model Valley.

The concept of what an integrated wood industry is and what it should accomplish is the common denominator found in the analysis and final recommendations of this study.

An integrated wood industry, by definition, is simply one that contains a variety of processing lines so interrelated as to be able to extract a maximum of useful products from the incoming raw material at minimum cost. It is usually geared to a specific forest area and, in theory, is designed to operate in harmony with the best forest management practices for the area. It would process the species and sizes available and in quantities properly balanced with regard to regeneration and growth. At the highest level of development it would also process trees removed for stand improvement purposes.

Such intensive utilization of the forest resource encourages and makes possible the application of continuous effort to the growing of trees for the best interest of the industry. Thus, the cycle of mutual benefit continues indefinitely, while at the same time men are gainfully employed and markets are supplied with useful products. Society is at peace with nature.¹²

¹²George G. Marra, "The Economic Power of an Integrated Wood Products Industry for Ferry County, Washington," Institute of Technology Bulletin 283, Washington State University, January, 1964, p. 10.

This workable and concise interpretation should be the principal guideline that governs the decisions necessary to initiate and sustain this development project in Model Valley.

With this concept in mind, the opportunities for developing an integrated wood industry in Model Valley were analyzed. The study was divided into the following sections: a review of the existing wood industries in the area; a compilation of forest inventory data; a selection of the wood industries that the available wood resource base can support; the further selection of the wood industries that appear to be feasible for development, and an economic analysis of each of these industries; and a set of recommendations.

The existing wood industries in Model Valley were analyzed to determine what role they could possibly play in the location of new wood industries in the area. Any potential overlap in land and capital utilization between the existing and potential wood industries was looked for and considered. Thought was given to the technical aspects involved in integrating the newly selected industries with the existing ones.

A forest inventory summary was compiled to determine the extent of the wood resource base. Questions of how much and what quality wood resource would be available to the industry were investigated. This forest resource data were compiled without adjustment for ownership patterns or physical accessibility, but technical personnel familiar with the area were consulted when the final decisions were made concerning the actual availability of specific wood types over time.

Initial selection of the wood industries to be considered was accomplished by determining from the forest inventory summary which wood products could be manufactured using the local forest resource. This list was further narrowed down by applying the constraints appropriate to the situation in Model Valley. A realistic appraisal of the local human resource was made which included the number of potential workers, their skill levels, and the opportunities for training. Industries that were not commensurate with the entrepreneurial, management, and technical abilities found in the area were eliminated from further consideration.

Each of the final selections was considered to be a wood product industry which the human and physical resource base of Model Valley is capable of initiating and sustaining. Further analysis of the economic characteristics of these final selections was made to determine the economic feasibility of each, and also to decide whether these proposed wood industries are capable of making a desirable contribution to the economy of the distressed area. The economic characteristics analyzed were as follows: the amount of private and government capital necessary for each industry; the physical capital necessary for the functioning of each industry, including buildings and equipment; a market survey to determine the market potential of the proposed wood products; an investigation of the transportation alternatives that are available in the supply and demand matrix; and a cost and return analysis to determine the industry's profit potential and repayment capacity.

Finally, a set of recommendations was made stating the requirements necessary for the successful establishment and maintenance of the wood industries found to be feasible. These recommendations provide a guideline to those responsible for the development of these industries. Possible slippages were pointed out with the idea that if these slippages are anticipated, they can be avoided. The last recommendation suggests that a realistic appraisal of the integrated wood industry should be made at regular intervals.

CHAPTER II

THE SITUATION IN MODEL VALLEY

I. SOCIOECONOMIC CHARACTERISTICS

Model Valley¹ is a typical example of a depressed Appalachian community suffering from the symptoms associated with the decline of the coal industry in the area. The Valley is a rugged 303 square mile stretch of Appalachia with the southern half located in Claiborne and Campbell counties of Tennessee and the northern half located in Bell and Whitley counties of Kentucky. It is bounded by the Pine Mountain range to the north and the Cumberland Mountain range to the south (see Figure 1).

Model Valley is extremely isolated because of the mountainous terrain. The resulting network of roads makes it difficult for people to reach their respective county seats. The roads in the Valley are narrow and winding and generally in poor repair. Heavy traffic resulting from the remaining coal trucks operating in the area makes it difficult to keep local roads in good condition. Interstate Highway 75 passes to the west of Model Valley and can be reached in approximately 30 minutes driving time from Clairfield. The Southern Railway and the Louisville and Nashville Railroad have tracks in the Valley that are presently used very little because of the depressed coal industry.

¹Model Valley is the name given to the area by a local postmistress.

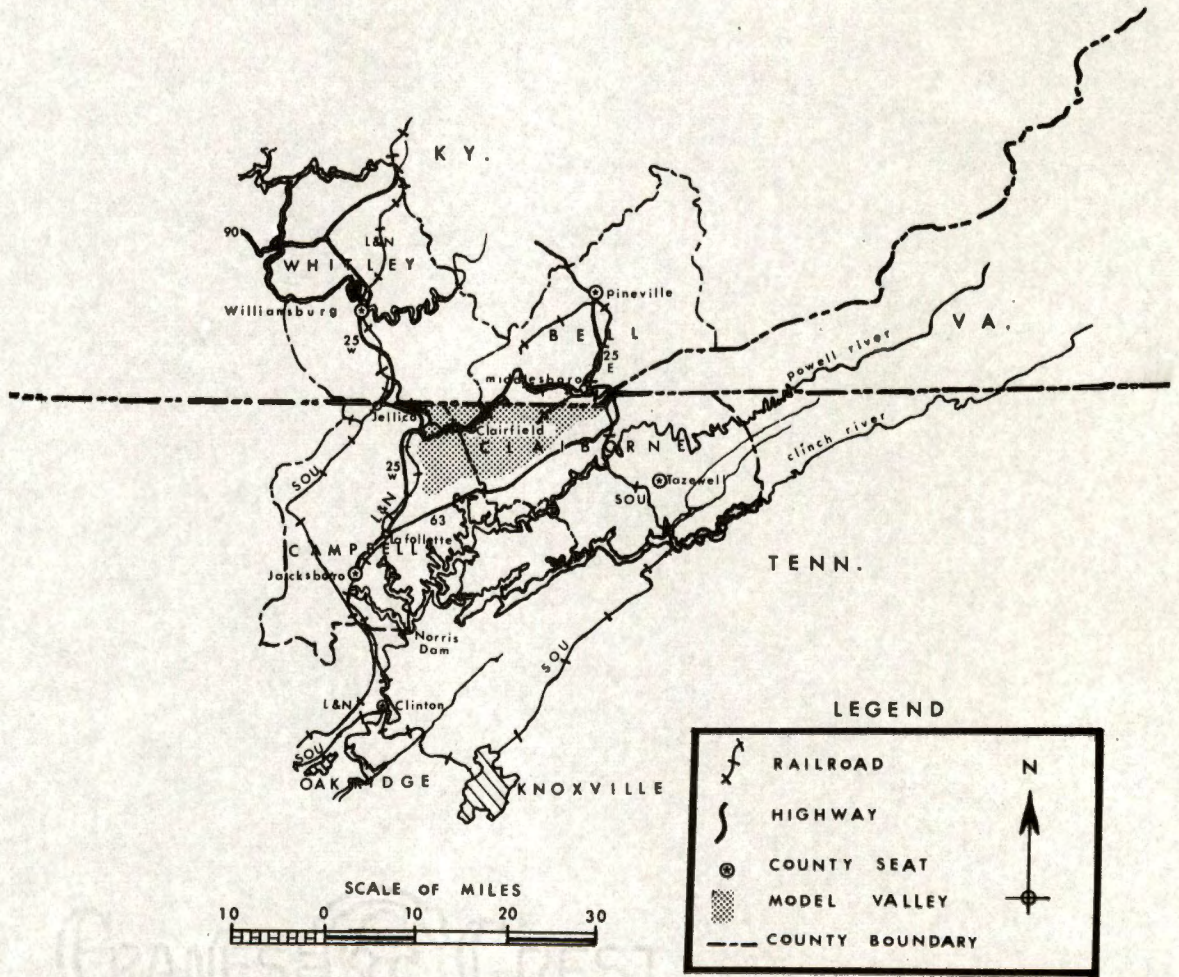


Figure 1. Location of Model Valley in Tennessee Appalachia.

Housing is generally below the standard considered to be acceptable. Only 26 percent of owner-occupied housing is valued at more than \$5,000.² Health facilities and other social services are deficient and inadequate. The educational level of the population is low because school facilities are limited and because many persons leave school at an early age.³ The principal skills the men in the area have acquired are those associated with coal mining. However, an estimated 40 men have skills in logging and wood related jobs.

Model Valley was once heavily populated with near full employment in deep coal mining. Presently, the Valley supports a smaller population than it did ten years ago.⁴ Outmigration and a 20 percent unemployment rate among the remaining working force are indicative of a declining economy.⁵ In the last few years, the leaders and people of Model Valley have been making a determined effort to reverse this trend by implementing action programs designed to increase the economic viability of the area.

²The 1970 Census of Housing shows that out of 573 owner-occupied housing units in Model Valley, 425 or 74 percent are valued at less than \$5,000; 121, or 21 percent, are valued between \$5,000 and \$9,000; 22, or 4 percent, are valued between \$10,000 and \$14,999; and only 5 units, or 1 percent are valued above this level. For the purpose of enumerating census data, Model Valley is considered the Clairfield Division of Claiborne County and the Habersham Division of Campbell County as defined by the 1970 Census. All population and employment data are confined to these two divisions.

³An estimated 80 percent of the students beginning first grade do not complete high school.

⁴The population in this area was 6,208 in 1960 and 4,613 in 1970, indicating a 26 percent decrease during the last ten years.

⁵The working force is defined as all persons between the ages of 18 and 64 and was 2,360 in 1970. Unemployment rate data are from the Tennessee Department of Employment Security, Research and Statistics Section, Tennessee Annual Average Work Force Estimates by Area, 1964-1968.

II. EXISTING WOOD INDUSTRIES

One way to ameliorate the high unemployment problem is to locate industries in Model Valley that will provide sustained employment for the local working force. The recent location of a new pallet manufacturing plant in Clairfield, Claiborne County, is a step toward accomplishing this end.

The Clairfield Pallet Company began operation in July, 1971, and is in the process of training its employees and in smoothing out production line operations. The Clairfield Pallet Company was organized and is controlled by the Model Valley Development Corporation (MVDC). The MVDC owns 51 percent of the stock of the company. It is a nonprofit organization made of 25 local people who are interested in improving the economic welfare of the Valley. The plant site is leased to the Clairfield Pallet Company by the Clairfield Development Company (CDC) on a lease-purchase agreement. The CDC is another nonprofit development corporation in Clairfield and is made up of 30 local residents who have purchased 35 acres of land and have sold five of these acres to the Clairfield Pallet Company. The Small Business Administration (SBA) community development program (502) permitted the CDC to participate with a local bank and the SBA to finance the fixed assets of the Clairfield Pallet Company. The SBA 502 loan was made to the CDC, and in turn, loaned to the Clairfield Pallet Company. The Tennessee Valley Authority provided technical assistance for setting up the plant and for a special training program to train the plant manager. The Industrial Pallet Company of Cleveland, Ohio, is responsible for marketing the pallets at a

5 percent commission rate. The Cleveland firm agreed to make immediate payment (market price less 5 percent commission) for the pallets manufactured. Thus, the market is assured and the management does not have to wait until the actual purchaser of the pallets makes payment. This allows the Clairfield plant to function with less operating capital than would be normally required.

A small sawmill is located on the plant site and it sells its output to the pallet operation. When the pallet operation reaches a high level of production, additional sawmill facilities will have to be developed or contracted with to provide sufficient output of raw material to keep the plant supplied.

III. FOREST INVENTORY SUMMARY

An analysis of the wood resource base in the four-county area; Campbell and Claiborne counties, Tennessee, and Bell and Whitley counties, Kentucky, was made.⁶ Wood raw materials from these four counties, with Clairfield acting as the "hub of activity," are within trucking distance of the proposed site for the wood industries that might be developed. Forest resource data was taken from the Tennessee Valley Authority's Forest Inventory Statistics bulletins for Campbell and Claiborne counties. For Bell and Whitley counties the forest inventory data

⁶ Spencer D. Boardman, Graduate Teaching Assistant, Department of Forestry, University of Tennessee, was responsible for the compilation of the forest resource data used in the study.

was drawn from the State-U.S. Forest Service inventory publication, The Southern Cumberland Unit, Kentucky, 1968.⁷

The inventory for the four-county area shows approximately 823,000 acres of commercial forest land of which 432,600 acres are classified as sawtimber stands. Of the sawtimber acres, 87 percent is hardwoods and the remaining 13 percent a mixture of pine hardwood and pine stands (Tables I and II). The total growing stock for the area is greater than eight million standard cords with an average of 10.5 cords per acre (Table III). The sawtimber volume for the four-county area is greater than two billion board feet, with an average of 2,700 board feet per acre (Table IV). A table of sawtimber volumes by species shows that red oaks comprise 23 percent of the sawtimber species; white oaks, 22 percent; hickory, 13 percent; yellow poplar, 9 percent; and yellow pines, 12 percent (Table V). From these data on the wood resource base in the four-county area, the possible wood industries that this base would support were determined.⁸

The forest resource data was compiled with no adjustments made for ownership patterns or physical accessibility. Discussions with technical personnel familiar with the area suggest that sufficient wood resources would be available through time to support adequately the

⁷Kentucky Forests, Southern Cumberland Unit, U. S. Department of Agriculture, Forest Service, Resource Bulletin CS-3, Washington, D. C., November, 1965.

⁸A complete list of commercial forest industries is provided in Appendix A. A complete list of wood products considered as development possibilities is provided in Appendix B.

TABLE I

COMMERCIAL FOREST ACREAGE OF SAWTIMBER
BY COUNTY AND WOOD TYPE GROUP IN
WHICH MODEL VALLEY IS LOCATED

County	Mixed Pine			All Types
	Pine	Hardwood	Hardwood	
-----Sawtimber Acres-----				
Campbell (Tennessee)	10,800	6,800	109,200	126,800
Claiborne (Tennessee)	3,300	2,200	83,500	89,000
Bell (Kentucky)	3,300	6,000	86,500	95,800
Whitley (Kentucky)	<u>6,500</u>	<u>16,800</u>	<u>97,700</u>	<u>121,000</u>
4 County Totals	23,900	31,800	376,900	432,600
Acres in Sawtimber (percent)	5.5	7.4	87.1	100

Source: Forest Inventory Statistics for Campbell County, Tennessee, TVA Forestry Bulletin No. 133, September 1967, p. 5; Forest Inventory Statistics for Claiborne County, Tennessee, TVA Forestry Bulletin No. 79, February 1960, p. 2; and Kentucky Forests, Southern Cumberland Unit, U. S. Forest Service Resource Bulletin CS-3, U.S.D.A., Washington, D. C., November 1965, pp. 20, 32.

TABLE II
 AREA OF COMMERCIAL FOREST LAND BY COUNTIES IN
 WHICH MODEL VALLEY IS LOCATED

County	Acres	County Inventory Date
Campbell (Tennessee)	225,300	1967
Claiborne (Tennessee)	170,900	1958
Bell (Kentucky)	198,900	1963
Whitley (Kentucky)	<u>228,200</u>	1963
4 County Total	823,300	

Source: Forest Inventory Statistics for Campbell County, Tennessee. TVA Forestry Bulletin No. 133, September, 1967, p. 5; Forest Inventory Statistics for Claiborne County, Tennessee, TVA Forestry Bulletin No. 79, February, 1960, p. 2; and Kentucky Forests Southern Cumberland Unit, U. S. Forest Service Resource Bulletin CS-3, U.S.D.A., Washington, D. C., November, 1965, p. 19.

TABLE III
 VOLUME OF GROWING STOCK BY TYPE IN COUNTIES
 IN WHICH MODEL VALLEY IS LOCATED

County	Growing Stock (Standard Cord)			Cords/ Acre
	Softwood	Hardwood	All Types	
Campbell (Tennessee)	486,400	2,281,800	2,768,200	12.3
Claiborne (Tennessee)	137,333	1,388,571	1,525,904	8.9
Bell (Kentucky)	154,133	1,796,285	1,950,418	9.8
Whitley (Kentucky)	<u>389,733</u>	<u>2,027,000</u>	<u>2,416,733</u>	<u>10.6</u>
4 County Total	1,167,599	7,493,656	8,661,225	10.5
Growing Stock (percent)	13	87	100	--

Source: Forest Inventory Statistics for Campbell County, Tennessee, TVA Forestry Bulletin No. 133, September 1967, p. 11; Forest Inventory Statistics for Claiborne County, Tennessee, TVA Forestry Bulletin No. 79, February, 1960, p. 9; and Kentucky Forests, Southern Cumberland Unit, U. S. Forest Service Resource Bulletin CS-3, U.S.D.A., Washington, D. C., November, 1965, pp. 32, 26.

TABLE IV
 VOLUME OF SAWTIMBER BY TYPES IN COUNTIES
 IN WHICH MODEL VALLEY IS LOCATED

County	Sawtimber Board Feet (thousands)			Board Feet/ Acre
	Softwood	Hardwood	All Types	
Campbell (Tennessee)	123,700	691,600	815,300	3,619
Claiborne (Tennessee)	41,200	358,300	399,500	2,338
Bell (Kentucky)	37,910	420,930	458,840	2,307
Whitley (Kentucky)	<u>86,020</u>	<u>463,650</u>	<u>549,670</u>	<u>2,409</u>
4 County Total	288,830	1,934,480	2,223,310	2,700 ^a
Sawtimber (percent)	13	87	100	--

^aWeighted average based on total acres in all types of sawtimber.

Source: Forest Inventory Statistics for Campbell County, Tennessee, TVA Forestry Bulletin No. 133, September, 1967, p. 8; Forest Inventory Statistics for Claiborne County, Tennessee, TVA Forestry Bulletin No. 79, February, 1960, p. 6; and Kentucky Forests, Southern Cumberland Unit, U. S. Forest Service Resource Bulletin CS-3, U.S.D.A., Washington, D. C., November, 1965, pp. 26, 32.

TABLE V
SAWTIMBER INVENTORY BY SPECIES COMMERCIAL FORESTS
IN COUNTIES IN WHICH MODEL VALLEY IS LOCATED^a

Species	Board Feet (thousands)	Percent
Shortleaf Pine	174,290	7.8
Other Yellow Pines	93,370	4.2
Other Softwoods (Cedar, Hemlock, etc.)	<u>21,170</u>	<u>1.0</u>
All Softwoods	288,830	13.0
Black, Northern, and Southern Red Oaks	232,440	10.5
Other Red Oaks (Scarlet)	287,490	12.9
White Oaks	266,610	10.2
Other White Oaks (Chesnut)	269,660	12.1
Gum (Sweet and Black)	80,190	3.6
Yellow Poplar	209,320	9.4
Beech	143,690	6.5
Hickory	293,010	13.2
Ash	19,700	.9
Maple (Hard and Red)	57,540	2.6
Black Walnut	14,380	.6
Others (Locust, Cott, Bass, etc.)	<u>100,450</u>	<u>4.5</u>
All Hardwoods	1,934,480	87.00
All Species	2,223,310	100.0

^aCounties included are: Campbell and Claiborne in Tennessee and Bell and Whitley in Kentucky.

Source: Forest Inventory Statistics for Campbell County, Tennessee, TVA Forestry Bulletin No. 133, September, 1967, p. 8; Forest Inventory Statistics for Claiborne County, Tennessee, TVA Forestry Bulletin No. 79, February, 1960, p. 6; and Kentucky Forests, Southern Cumberland Unit, U. S. Forest Service Resources Bulletin CS-3, U.S.D.A., Washington, D. C., November, 1965, pp. 26, 32.

industries considered. However, caution must be taken to insure that the supply of raw materials is adequate to meet the continuing demands of the new industries as they are added to the Clairfield operation.

CRANES  CREST

CHAPTER III

WOOD INDUSTRIES THE RESOURCE BASE CAN SUPPORT

The available wood resource base consists primarily of low-grade hardwoods.¹ Therefore, only those industries that require low-grade hardwood or small quantities of imported high quality wood are feasible. Capital intensive industries and those that require a high level of technical competence, such as fabricating modular housing units, manufacturing plywood, and processing particle board were eliminated as possible industries at this time.² These industries may be considered in the future when the levels of skill and management have greatly improved, when investment capital becomes sufficient, and when transportation facilities improve.

The wood industries selected for consideration are: (1) hand free oak shake shingles, (2) oak split rail and post production, (3) educational wooden toys, (4) specialty wood products for industrial use, and (5) cross-ties. Each of these industries is labor intensive and requires little capital investment. Each of the products manufactured by these industries

¹Forest Inventory Statistics for Campbell County, Tennessee, TVA Forestry Bulletin No. 133, September, 1967, pp. 9, 11. Forest Inventory Statistics for Claiborne County, Tennessee, TVA Forestry Bulletin No. 79, February, 1960, pp. 7, 9. The quality of the wood resource in the Kentucky counties is similar to the quality of the wood resource in the Tennessee counties.

²Paul E. Craft, "Construction-grade Plywood from Grade 3 Appalachian Oak," U. S. Department of Agriculture, Forest Service, Research Paper NE-163.

has a potentially viable market. Each of the products requires for manufacturing the skills available in Model Valley. Each of these industries has potential for growth in size of operation and diversification. Separate, or in combination, industries producing the products suggested offer a solid base on which to build wood industries in the future that require more technical know-how and capital.

I. HAND FROE OAK SHAKE SHINGLES

The wood split shake shingle is being used considerably in today's architectural design of private homes and commercial buildings. The shingles, which provide a rustic effect, are used for interior decoration as well as for exterior use. Principal uses are as roofing material, siding, and uses in combination with other materials; such as stone, log, and board and batten wall structural material. A review of building material literature indicates an increased emphasis on the use of shake shingles for decorative as well as structural purposes.

The manufacturing of split shake shingles is primarily on the West Coast. This is because the raw material (western red cedar) has the qualities required for a good shingle and because it is readily available in that area. The hand froe oak shake shingle which can be manufactured in Model Valley is a product that can substitute satisfactorily for the machine split western cedar shake shingle. Its aesthetic qualities are excellent; it can be treated easily and effectively with a fire retardant; and it is rot resistant. The demand for shake shingles appears adequate to support a small manufacturing industry in the Clairfield area.

Plant Location and Production

In the four-county area (Campbell and Claiborne, Tennessee; and Bell and Whitley, Kentucky) embracing the Clairfield area, approximately 87 percent of the sawtimber inventory consists of hardwood species. An adequate supply of the first clear four foot to six foot log of the preferred oak species could be available for making oak shingles. Table VI shows the species which are preferred for splitting shake shingles.

The manufacturing unit for making the shake shingles could be a separate plant or it could be integrated with the present pallet company. The proposed plant could employ from 10 to 13 men. Each employee could produce between 800 and 1,000 hand froe oak shake shingles per eight hour day. The necessary manpower with the technical skills needed is available in the area. A plant foreman with the necessary skills would supervise the work of splitting the shakes and stacking them for drying. His overall job would be to keep the operation running efficiently. If a local person is not available with the qualifications necessary for a foreman, one could be easily trained. The present manager of the pallet plant could provide the management and technical skills required.

A small post beam building could be constructed at a relatively low cost (preferably close to the pallet plant) to house the manufacturing unit. A cost breakdown to establish this industry is given in Table VII.

The shingle varies in width depending on the size of the log from which it is split. The average shingle is 6 inches by 24 inches by 1/2 inch thick. The splitting is done radially (perpendicular to the

TABLE VI

SPECIES OF HARDWOODS PREFERRED FOR MANUFACTURING HAND FROE
SHAKE SHINGLES IN ORDER OF THEIR PREFERENCE
CLAIRFIELD AREA, TENNESSEE

Common Name	Scientific Name
American Chestnut	Castanea Dentata
Scarlet Oak	Quercus Coccinea
Other Red Oak	Quercus Spp.
White Oak	Quercus Alba
Chestnut Oak	Quercus Montana
Other White Oaks	Quercus Spp.

TABLE VII

ESTIMATED COSTS OF LAND, BUILDINGS, AND EQUIPMENT REQUIRED
FOR MANUFACTURING HAND FROE OAK SHAKE SHINGLES
CLAIRFIELD AREA, TENNESSEE, 1971

Item	Cost (Dollars)
Pole building with dirt floor, 40' x 60'	\$ 4,000
Land, including leveling	5,000
Cut-off chain saw (electric)	600
Hand tools	200
Heating and lighting	800
Total Cost	\$10,600

growth rings) which allows for minimum shrinkage and edge cupping. The oak shakes may or may not be dried before installation. The wooden shingle is easier split and nailed when the moisture content is high. However, the shrinkage is greater if installed when green and left to dry on the roof. The normal procedure in producing shake shingles is to split the wood when green and stack to air dry. After seasoned, the shingle is ready for nailing to the structure. An alternative procedure would be to lease a dry kiln located in an adjoining county to dry the finished split shakes. If this were done, the time required to produce a dry shingle would be reduced considerably.

The oak shake shingle in its natural state is relatively resistant to decay and should last from 30 to 40 years depending on the climatic region in which the shingles are used. It is feasible, however, to chemically treat the oak shingles to increase their service-life.³ The red oak species, because of its anatomical properties, treats somewhat better than does the white oak species. However, both species can be chemically treated with satisfactory results. The recommended treatment is a hot-and-cold bath using a coaltar creosote or pentachlorophenol in fuel oil as a preservative.⁴ A stain or pigment could also be integrated into this process if a particular color of shingle is desired.

³F. L. Browne, "The Preservative Treatment and Staining of Shingles," Forest Products Laboratory Bulletin 761, U. S. Department of Agriculture, Forest Service, Revised, October, 1960, p. 5.

⁴Ibid., pp. 6-7.

Two advantages of this treatment are that it is the most effective nonpressure process when long service is required and that it takes less time than other effective nonpressure treatments.⁵

Treatment of the oak shake shingle with a fire retardant was found to be nonfeasible. Expensive pressure treating equipment would be necessary to impregnate the retardant which would increase cost of production approximately \$70 or more per thousand board feet. The treatment would be of little value because the fire retardants leach out of the shingle within a few years. The Federal Housing Administration (FHA) has no provision in its building standards for requirement of fire retardants on any type of wooden roofing material. This, however, may not be true for specific cities which have local building codes that specify regulations on types of roofing material.

Home owners' insurance premiums of most insurance companies are in general no higher for homes with wooden roofs than they are for homes with asphalt shingled roofs. The adverse differential premium rates against the use of wood shingles and shakes on homes have been removed in 32 states and reduced in the other 18 states.⁶

⁵J. Oscar Blew, Jr. and Francis J. Champion, "Preservative Treatment of Fence Posts and Farm Timbers," Farmers Bulletin No. 2049, U. S. Department of Agriculture, Revised, April 1956, pp. 9-14.

⁶C. A. Holmes, "Evaluation of Fire-Retardant Treatments for Wooden Shingles," Forest Service Research Paper FPL 158, U. S. Department of Agriculture, Forest Service, 1971, pp. 1-2.

Promotion and Marketing

Since this type wood product is a luxury item, it is necessary to seek viable markets. A promotional effort would have to be made to convince prospective users that the hand froe oak shake shingle has many of the superior qualities found in the conventional western red cedar shingle. A small brochure promoting the advantages of oak shake shingles is essential. The brochure should include pictures of men splitting the shingles and thus show they are handmade locally in East Tennessee. The pamphlet should also include pictures of places where these type shingles have been installed as a part or as a complete interior or exterior design. Possibly the company's plant or office roof could be constructed of the first shingles made and thus demonstrate the use of the finished product. It is important to impress upon the buyer that these shingles when installed present a pleasing color and texture which after a few years turns to a natural silver-grey. Pictures of houses (Norris, Tennessee, or elsewhere) where oak shakes have been in use 30-35 years would be a good selling point. The wooden shingles are more expensive initially than asphalt shingles; however, they last from two to three times longer. The average life guarantee for a 235 pound asphalt shingle is generally between 10 and 15 years and for a 300 pound asphalt shingle, 25 years.

Presently, actual cost figures are not available for making the hand froe oak shake shingles. Only a few such shingles have been made locally and these have been sold on an individual negotiated basis and not through a formal market. It is estimated, however, that the cost of

making an oak shingle is between 11 and 12 cents. Raw material accounts for more than one-half and labor slightly more than one-fourth of the total cost. These two items are the major cost items and must be watched closely by management. If the shakes can be sold at a price that covers production and marketing costs, or at a figure above 13 cents per shake, the industry should have an excellent chance for success. It is recognized that the major concern in establishing such an industry is to employ persons living in the area rather than to make substantial profits from the operation of the industry.

Personal contact with 16 local (Knoxville) lumber and building supply companies indicated that six of these firms carried in stock some form of a cedar shingle roofing material; that three firms could supply such material upon request through a local wholesaler; and that seven firms did not stock this type item. A further check of these firms indicated that the cost figures for the western shake shingles vary considerably--that the cheapest shingle sold for 13 cents per shake and the most expensive one for 22 cents per shake (Table VIII). This would indicate that the oak shingle should be in a relatively good competitive position in the market for wooden style shakes.

Data from the U. S. Department of Agriculture show the shingle and shake siding used per unit in new FHA homes constructed in the South Atlantic and Lake States regions of the United States for 1959 and 1962 (Table IX). These data provide a good indicator as to where the potential market would be for hand split oak shake shingles. Since transportation costs are an important cost item in marketing shingle shakes, a

TABLE VIII

RETAIL PRICE FOR WESTERN RED CEDAR SHINGLES AND COST ESTIMATES
 PROVIDED BY LOCAL FIRMS FOR CEDAR SHINGLES NEEDED TO
 COVER A 1,200 SQUARE FOOT ROOF, 1971

Suppliers Stocking Shake Shingles	Price Per Square ^a	Price Per Bundle ^b	Price Per Shake ^c	Cost To Cover 1,200 Square Foot
1	\$29	\$5.80	\$.13	\$348
4	35	6.95	.15	420
1	51	10.20	.22	612

^aOne square of shingles covers 100 square feet.

^bApproximately 45 to 55 shakes per bundle (5 bundles per square).

^cApproximately 225 shakes per square.

TABLE IX
SHINGLE AND SHAKE SIDING USED PER UNIT IN NEW FHA-INSPECTED SINGLE-FAMILY
DETACHED HOUSES BY EXTERIOR WALL CONSTRUCTION AND REGION
1959 AND 1962

Exterior Wall Construction	All Regions		North Atlantic		South Atlantic		Florida		Lake States		Central States		South Central		Northwest		Southwest	
	1959	1962	1959	1962	1959	1962	1959	1962	1959	1962	1959	1962	1959	1962	1959	1962	1959	1962
All houses	0.9	0.6	2.4	1.9	0.2	0.2	a	a	0.3	0.4	1.4	0.7	0.9	0.2	0.8	0.4	0.4	0.2
All wood-frame houses	1.1	.7	2.5	2.0	.2	.2	a	0.2	.3	.4	1.5	.7	1.0	.2	1.0	.8	.4	.3
Lumber siding	a	a	a	a	a	a	a	a	a	a	.1	.1	a	a	a	a	a	a
Plywood siding	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a
Fiberboard siding	a	.1	a	a	a	a	a	a	a	a	a	a	a	a	a	a	a	.1
Shingle or shake siding	10.6	10.9	10.4	10.6	9.9	12.6	b	b	13.1	14.1	10.9	11.0	9.9	11.5	10.1	10.0	12.6	12.9
Nonwood siding	.1	.1	.3	.3	a	a	a	a	a	a	a	a	a	a	a	a	a	.1
Mixed siding	.5	.7	2.4	2.5	a	a	a	a	a	a	.8	.9	a	.4	a	a	.5	.5
All masonry houses	a	.1	.5	.7	a	.1	a	a	a	a	a	a	a	a	a	a	a	a

^aLess than 0.05 square.

^bInsufficient number of houses for meaningful estimate.

NOTE: Shingles and shakes used in attached and detached garages and in carports not included.

Source: Robert B. Phelps, "Wood Products Used in Single-Family Houses Inspected by the Federal Housing Administration, 1959 and 1962," U. S. Department of Agriculture, Forest Service, Statistical Bulletin 366, p. 32.

company manufacturing such shingles located in East Tennessee could provide cheaper transportation to these regional markets than their main competitors.

II. OAK SPLIT RAIL AND POST PRODUCTION

An alternative manufacturing industry to consider is the establishment of a small firm to produce and install split rail and/or post rail custom fencing. Like the oak shake shingles, this type fencing is generally considered a luxury item appealing primarily to upper and middle income individuals.

Wood fencing has become a multipurpose product. Fences in the past were constructed for utility purposes, or more specifically, to hold someone or something inside or outside a land area. Presently, people generally construct wooden fences for privacy, protection, and decoration. Styles and types vary to please individual tastes. The common types are: shadowboard, basketweave, stockage, picket, and split rail. Variations of the above types are also available.

Major commercial woods used for wooden fences presently on the market are northern white cedar, California redwood, and western red cedar. These species are chosen because of their light weight, workability, and rot resistance. Most of the material is cut from the West Coast and shipped to eastern and midwestern markets to be fabricated and sold. In the eastern part of the United States, the above species do not grow. However, wood species are grown from which excellent wood fences can be made.

In East Tennessee there is one species, the eastern red cedar, with similar wood characteristics to those grown on the West Coast. The eastern red cedar is generally used locally for farm fence posts because of its resistance to decay. The other species that are grown locally which are also preferred by farmers for fencing material are the black locust, osage orange, and the catalpa species.

Even though the eastern red cedar, black locust, osage orange, and catalpa grow in East Tennessee, these particular species comprise only 6 percent of the sawtimber inventory in the area where the proposed plant would be located. Sufficient raw material of these species would be difficult to obtain in large enough volumes to split for rails. There are, however, sufficient quantities of the oak species available (46 percent of the hardwood) from which good fencing materials can be manufactured.

Plant Location and Production

Locating the fencing manufacturing plant near the present pallet plant has many advantages. Utilities, including power, water telephone, sewage, and roads could be integrated. Thus, the fixed costs of installing the utilities and the variable costs associated with plant operations would be less than if the plants were not integrated. Concentrating the raw material in one place would allow logs and bolts to be selected according to size and quality and channeled into the highest product use. In terms of the industry, it is feasible to transport needed raw material from an approximate 50 mile trucking distance to the plant location.

The fencing plant would employ approximately five men full time. Three men would fabricate the fencing material while the other two could select and prepare timber to keep the plant inventory at a safe margin.

The manufacturing unit could be housed in a pole building. Land, building, and equipment costs necessary to start this industry are estimated in Table X.

With the hydraulic railsplitter the low quality oak hardwood logs may be split with ease. Rails are quartered and may be further split depending upon the size of the log. Posts can be round or split, but round is preferred because penetration on the preservative would be more uniform and the amount of preservative used more easily controlled. After the logs are split into rails, the bark is removed by hand and then cut into proper length. If necessary, the split rails may be trimmed longitudinally on the butt end of the piece to square up the rail. Next, the posts are taken to the drill press where holes are bored for the fitting of the rails. After completion of this task, the rails and posts are stacked for drying. The air dried posts, with about a 20 percent moisture content, are then chained into bundles. The bundles are then lifted by an electric hoist and moved to the treatment tank where the posts are lowered into a preservative material. They are soaked until a given retention of the chemical in the posts is obtained through a diffusion process. There are two solutions which have been found most satisfactory for this cold soak process: (1) 5 percent pentachlorophenol, made by diluting one part of the concentrated

TABLE X

ESTIMATED COSTS OF LAND, BUILDING, AND EQUIPMENT, 1971

Item	Cost (Dollars)
Pole Building with Dirt Floor, 30' x 50'	\$3,000
Land and Leveling	5,000
Installation and Wiring	1,500
Hydraulic Railsplitter (Bles Model 1200 or equivalent)	5,181
Small Band Saw (wood shop size)	600
Chain Saw	230
Chemical Dip Tanks (2) 700 gallons	600
Chemical Solution--600 gallons	250
Commercial Drill Press	300
Electric Hoist (1/2 ton)	515
Trolley and 30 foot Monorail	<u>100</u>
Total Cost	\$17,276

pentachlorophenol with ten parts of diesel oil, and (2) 5 percent copper naphthenate in diesel oil.⁷

The rails are cut to a ten foot length and tapered on each end. The treating of the rails is optional because the rails will not be in direct contact with the ground. It is suggested, however, to dip treat the tapered ends of the rail which are more susceptible to decay because moisture will remain in the joint longer than that portion of the rail which would be in contact with the sun and air. When treated, the oak posts and rails can be professionally installed giving satisfactory service. Service tests have shown treated oak posts will be serviceable for more than 15 years.

Only one or two types of fencing material should be produced in order to be efficient in production and to keep costs at a minimum. It would not be advisable to compete with the range in types and styles offered by the highly mechanized and well established manufacturing companies in the west. There still remains, however, an excellent opportunity locally to manufacture good quality rustic fencing material.

Promotion and Marketing

Although West Coast fencing material is established firmly in local markets, its cost is relatively high. Of the eight fence companies selling fencing materials in the Knoxville area, only four stocked some form of wooden fencing. Four companies sold only chain

⁷J. S. Kring, "Servicability of Farm-Treated Fence Posts," University of Tennessee Agricultural Experiment Station Bulletin 358, Knoxville, Tennessee, January 1963, p. 13.

link wire fencing material. Much of the wooden fence material sold was made from West Coast timber and was for the most part purchased through a wholesaler located in Cleveland, Ohio.

Local fence dealers give consumers the option to buy fencing materials to be installed by themselves or they quote a price which includes the cost of material and labor installation. Table XI shows estimated cost figures for basic materials on a per-foot basis and the materials and installation charges for a ten foot section which includes two posts and rails. The cost of materials and the cost of installation varied considerably from company to company. The cost of transporting materials to the site, digging holes for the posts, evaluating the type of terrain that the fence would encompass, and the fencing design are responsible for the difference in installation cost estimates. Each of the four fence companies quoted material prices which were relatively close to one another; however, when installation factors were considered, the cost was more variable. The market is competitive. When the cost of materials and installation varies widely, there is greater opportunity for a new company to enter the market.

Using sales techniques similar to those used by the Knoxville area fence companies, the proposed industry could offer prospective buyers similar services; that is, the option to buy fencing materials and let the customer install them, or allow the customer to buy both the fencing material and installation service.

During the early stages of development of the proposed fencing industry, it would not be feasible to consider the installation service

TABLE XI

ESTIMATED MATERIAL AND INSTALLATION COSTS FOR RAIL
FENCES IN THE KNOXVILLE AREA, 1971

Fence Company	Material Cost per 10 Foot Section ^a		Material and Installation Cost per Foot ^b	
	2 Rail Fence	3 Rail Fence	2 Rail Fence	3 Rail Fence
-----Dollars-----				
A	11.38	15.05	1.25	1.65
B	15.00	19.50	1.50	1.80
C	12.50	16.00	1.70	1.90
D	16.50	19.50	1.53	1.75

^aCorner post and end gate post costs are not included in these estimates.

^bCost will vary with type of terrain on which the fence is constructed, soil strata, and type of fencing design.

as part of the operation. This is because of the problems associated with becoming established in the market such as high transportation costs and lack of merchandising skill. Since the major marketing territory would be the Knoxville and Oak Ridge areas, fencing should be sold to wholesalers and retailers.

Brochures showing the possibilities for using oak split rail fences should be made available to local retailers and building supply outlets. The brochure should have pictures of the production of the split rail fence from log to finished product and a short written statement about the quality, rustic beauty, durability, strength, and utility of such fences. The East Tennessee area offers a good prospective market for such a product.

III. EDUCATIONAL WOODEN TOYS

The producers of wooden educational toys are more concentrated throughout the Great Lakes, Middle Atlantic, and New England areas than in any other region of the United States.⁸ The Chicago and New York City areas are the principal centers of production and marketing. There are only ten manufacturers located in the Southeast which includes the four located in Tennessee.⁹

⁸"Educational Wooden Toys, Market Analysis," TVA Division of Forestry Development, Norris, Tennessee, 1968, p. 2.

⁹"Educational Wooden Toys, Production Opportunities in the Tennessee Valley," TVA Division of Forestry Development, Norris, Tennessee, 1969, Figure 1.

In 1968, \$77.7 million were spent on educational wooden toys in the Southeast.¹⁰ This figure is expected to increase considerably because the number of children in the toy-using age groups is expected to exceed 18.6 million by 1975 in the Southeast.¹¹ Educators in all parts of the United States are realizing the importance of educational toys and the excellence of those made of wood. The added boost from such federal programs as Day Care and Head Start make the market prospects even brighter. Because of access to the rapidly growing toy market in the Southeast and a large supply of suitable lumber within trucking distance, the Clairfield area would be a good location for a manufacturer of educational wooden toys.

The simple, practical design of most wooden toys protects them against obsolescence; and for this reason, the typical line of educational wooden toys is limited in variety and has remained basically unchanged for years. This gives the manufacturer the added advantage of low inventory and reduced promotion cost which is important when considering the possibilities for locating such an industry in the Clairfield area.¹²

The Product

The buyers of wooden educational toys are interested in strong and safe toys that will be appealing to the children and long lasting under hard playing conditions. The toys must be well made of the

¹⁰Ibid., Table 3.

¹¹Ibid., Table 1.

¹²Ibid., p. 1.

finest materials. All surfaces and edges of the toys must be sanded smoothly. Finishes should be nontoxic and the wood nonsplintering. Above all, the toys must be sturdy.

Hard maple, beech, and sycamore are clean, high quality hardwoods suitable for the manufacture of the wooden toys. Of these species, only beech is found in sufficient quantity in the area to be used to make the wooden toys.

Presently, kiln dried high quality hardwood lumber required to make these toys is not available in the area. Because a dry kiln could not be located economically in the Clairfield area at this time, kiln dried lumber would have to be purchased from outside sources. Hard maple is a more desirable species for the manufacture of wooden toys than the locally available beech. Therefore, as long as kiln dried lumber must be imported, hard maple should probably be specified.¹³ As wooden toys use relatively small amounts of lumber, transportation cost per unit of production should not be a limiting factor.

Half of the wooden toys made for younger children are purchased by kindergartens and nursery schools.¹⁴ Buyers for the kindergartens and nurseries want quality material and workmanship and are willing to pay the price for good quality items. Wooden transportation toys, large hallow blocks, wooden kitchen equipment, ladder and gym sets,

¹³Hard maple costs about \$200 per thousand board feet for No. 1 common lumber.

¹⁴"Educational Wooden Toys, Production Opportunities in the Tennessee Valley," TVA Division of Forestry Development, Norris, Tennessee, 1969, p. 2.

rocking boats, and small blocks are the toys most demanded by buyers and most popular with the children. Buyers have indicated a year-round buying pattern with no discernible preference. This reduces the large seasonal fluctuations in demand which are characteristic of most toy markets. Buyers prefer buying locally and they want to examine samples of the product they are interested in purchasing. The main suppliers of wooden toys to institutions are local school supply firms.

It would be desirable to survey the directors of day care centers and kindergartens in eastern Tennessee and eastern Kentucky. This would help determine the line of toys to be manufactured and the marketing technique that offer the greatest opportunities to develop a strong, viable market. Questions should be concerned with the type of toy preferred, and the interest the buyers might have in obtaining the educational wooden toys from the Clairfield industry.

Set-up and Operation

The following steps are offered as a guideline for establishing a wooden toy industry:¹⁵

1. Investigate toy catalogues and pick out those toys which could be made with a limited number of wood working machines. Two or three different toys is the maximum number recommended at the beginning of the project.
2. Make one model of each toy that has been selected for manufacture keeping in mind that the toys must not be exact copies of toys made by other firms.

¹⁵For further information on establishing a toy manufacturing plant, it is suggested that the Tennessee Valley Authority Forestry Division be contacted for technical assistance.

3. A competent salesman should contact school supply houses in the market area. This is the most significant step since these firms are the major dealers handling these products. The salesman should use models for illustration and determine the interest of the supply house representatives in making purchases of the toys that could be made. If possible, the salesman should obtain specific orders for toys that might be ordered during the next year. Once it is assured that the line of toys is marketable, manufacturing could begin. A fairly complete list of school supply houses can be obtained from Dun and Bradstreet Company for a small fee, P. O. Box 3040, Knoxville, Tennessee, 37919. Under the law, government programs such as Head Start, are required to purchase their needs from a business that is backed by a loan or support from the federal government. This is a definite advantage that the manufacturer should exploit.

4. Investigate supply sources of good inexpensive machinery that must be purchased before manufacturing could begin. Good used equipment could possibly satisfy the needs. Southern Lumberman magazine and The Tennessee Forestry Association Marketing Bulletin are excellent sources of information on the location and availability of used equipment. The minimum amount of processing equipment with estimated new and used costs are as follows:

	<u>Estimated New Price</u>	<u>Estimated Used Price</u>
Cut-off Saw	\$ 2,000	\$ 500
Double Surface Planer	10,000	2,000
Surface Sander	10,000	2,000
Rip-Saw	3,500	500
Soft Drum Sander	500	250
Hand Tools	<u>500</u>	<u>---</u>
Total	<u>\$26,500</u>	<u>\$5,250</u>

Optional equipment might include a small wood turning lathe and accessories and a revolving drum for waxing wood surfaces and/or dyeing wood various colors. Working capital estimates for the first six month's operation employing five men and a foreman would approximate \$17,000. To start, the industry might be housed in an existing building available for rent in the community.

5. It would be highly desirable to have a small pamphlet made up illustrating the toys and their price. Prices should be in line with those of other educational toy makers. To assure the school supply houses a fair profit and a good bargaining margin, the manufacturer should provide a 45-50 percent discount on retail list prices. A typical retail

price list for selected toy items might show the following values:

Sawhorse	\$11
Tow Truck	15
Ride-on Bus	19
Child-size Stove	30
Child-size Sink	32

It should be remembered that the advantages of working through school supply distributors far outweigh the disadvantages of lower profit margins, especially for a firm trying to break into the market.

IV. SPECIALTY WOOD PRODUCTS

A specialty wood products industry could be established in the Clairfield area as part of an integrated wood industry. The proposed industry could design and fabricate, on order, most types of wood components needed to complete or pack the product of a manufacturer. Many manufacturers, particularly in Appalachia and surrounding areas, should find it more economical to purchase the needed components from a small industry that specializes in supplying these needs than to make these items in their production plant or to purchase the same item from a distant supplier. Manufacturers making nonwood products frequently will not have the necessary facilities to make the wooden components economically for their products. These components could be manufactured by the type of industry proposed. There are many possibilities of items that might be manufactured; for example, a drawer pull in the kitchen of a mobile home, dowels for dimension stock, a shim for transporting pipe, rough packing boxes and crates, or a precision wooden box to house a delicate instrument. A list of 24 such items is included in Appendix C.

Capital requirements for the specialty wood products industry would be relatively small. The necessary manpower and skill is available in the area. Many of the same wood working machines utilized in making educational wooden toys could be used to produce many of the specialty products. During slack periods of production in making educational toys, personnel and machines could be used for the manufacture of the specialty products, and vice versa. As production in both of these areas expands, shop facilities and number of employees could be increased as needed. The type of lumber specified for a given product, as stated in a contract and not locally available, could be ordered with consideration given to the concurrent needs of both the specialty products and educational toy industries. The possibility of more efficient use of pallet and crosstie waste materials could be realized through the development of the specialty products firm. As with the other wood industries suggested for the Clairfield community, sound management and a sustained marketing program are essential.

Present wood supply and waste from the pallet operation coupled with current market conditions indicate that among the first items that might be considered for manufacture as a specialty products item are wooden dowels. This type of operation would utilize the short clear pieces of cants and trim available by taking this low value waste and producing a high value product.

A doweling operation could be established within the present pallet plant building and it would require only two additional employees to operate the needed machinery. A new machine capable of producing

one fourth inch to two inch dowels can be purchased for about \$7,500 plus \$200 for knives and \$500 for a knife grinder. Thus, with little additional capital and a small increase in the work force, the manufacturing of dowels is a developmental possibility that would fit well into an integrated wood industry. Such an industry would also help eliminate a waste problem and at the same time provide an opportunity to add profit to the present wood industry.

Locating the Market for Specialty Products

A market survey should be conducted to obtain information concerning the type and number of wood specialty products local manufacturers are interested in obtaining. A list of industries that might be contacted in the East Tennessee area has been compiled to save time for those making the initial market survey (Appendix D). The names, addresses, product lines, and approximate number of employees of potential customers were taken from the Directory of Tennessee Industries, 1969. The telephone numbers of these industries were taken from local telephone directories. The industries chosen were those which are good prospects for using the products which could be manufactured by the wood specialty products company. Only those cities with a population greater than 1,000 in Anderson, Campbell, Claiborne, and Knox counties were listed as probable markets. Knoxville was the largest city listed and Jellico the smallest. It should be noted that this list is not complete and that no consideration was given to how large the marketing radius for these specialty items might be. It may be feasible to deal with industries as far away as Chattanooga and Nashville. This list is a good

starting point and the results from this preliminary survey will help determine the size and distance of future markets. A firm located in Middle Tennessee and similar in concept to this proposed specialty products industry has used this marketing approach with considerable success.

Another marketing approach would entail making contact with wholesale distributors of wood products for industrial use. One such company located in Ohio expressed a genuine interest in a wide range of hardwood products.¹⁶ A telephone call to a company such as this could be a starting point for developing a market for many of the wood products that might be manufactured.

V. CROSSTIES

One of the alternatives that was thought to be a development possibility for the integrated wood industry is the manufacturing of crossties. An analysis of the crosstie industry showed that it was not feasible for the Clairfield integrated wood industry at this time. Crosstie manufacturing is not feasible because it competes too heavily with pallet production for the limited output of the present sawmill. It is an industry, however, that should be considered when the output of the sawmill operation is large enough to warrant it, and when the

¹⁶Liberty Industrial Sales Company, 1796 Pleasant Valley Road, Girard, Ohio, 44420, Charles E. Trebilcock, Manager, Telephone: 216-539-6343. This company is interested in purchasing hardwood blocking material, pallets, boxes, crates, reels, timbers, and ties.

other industries are operating satisfactorily. An analysis of the crosstie industry submitted as information for future consideration follows.

With annual crosstie replacements under American railroad trackage approaching 75 per mile, average purchases of crossties in the United States alone should amount to at least \$20 million annually for the next ten years.¹⁷ This strong market demand coupled with the results of research done by the U. S. Department of Agriculture, Forest Service, on low-grade hardwood log utilization¹⁸ indicates that with a well trained sawyer, crosstie production as a by-product of a sawmill operation offers a manufacturing opportunity that might be integrated into a wood products industry in the Clairfield community.

The research referred to shows that: (1) If sawed timbers are cut from hearts of physically suitable hardwood logs, the combined profit from lumber and timber will be greater than if these same logs were sawed entirely into grade lumber. This result prevails when large timbers are sawed from high, medium, and low grade logs (Table XII); (2) More than 90 percent of the lumber contained in a four by six inch timber would grade two common or poorer. Over half the volume would be three common regardless of log grade. Even the larger seven by nine

¹⁷"Cross Ties," June, 1971, The Railway Tie Association, St. Louis, p. 22.

¹⁸Lawrence D. Garrett, "Economic Implications of Manufacturing Sawed Ties and Timbers," Research Paper NE-148, U. S. Department of Agriculture, Forest Service, 1969.

TABLE XII

NET HOURLY INCOME FROM BOTH LUMBER AND TIMBERS SAWED
FROM DIFFERENT SPECIES AND LOG GRADES

Species	Log Grade	Lumber Only	Lumbers Plus Timbers Measuring		
			4 x 6 Inches	6 x 8 Inches	7 x 9 Inches
Red Oak	1	\$25.37	\$31.14	\$32.20	\$34.57
	2	9.30	13.64	17.70	23.17
	3	2.40	6.65	13.60	22.45
White Oak	1	13.98	19.55	25.33	29.02
	2	.63	5.58	12.46	19.95
	3	-2.40	.97	11.23	23.89
Hickory	1	12.45	20.89	23.16	27.98
	2	1.94	9.20	15.93	21.50
	3	-6.40	-.68	8.86	21.39

Source: Lawrence D. Garrett, "Economic Implications of Manufacturing Sawed Tree and and Tree and Timbers, Research Paper NE-148, U. S. D. A., Forest Service, 1969, p. 21.

inch timbers would contain 55 to 84 percent of two common and poorer grades. Lumber grades are directly linked to dollar yields. A grade one log sawed into lumber, plus a seven by nine inch timber will yield greater net hourly income than a grade one log sawed only into lumber. In the case of a grade three log the net value per hour increased even more dramatically (Table XIII). The greater income in both cases is due to less kerf loss and a decrease in sawing time.

In summary, the combined production of lumber and timbers from suitable factory grade logs will normally increase log overrun, hourly volume output, and net hourly income. Reduced sawing time per unit of output is the critical factor in affecting the dollar gains achieved from sawed timber manufacture. The sawmill operator should saw timbers from those species and log grades that normally would give him the lowest hourly return if sawed exclusively into lumber.

Marketing Crossties

The Southern Wood Piedmont Company¹⁹ expressed a definite interest in the purchase of Clairfield area produced crossties. The company offers the following production and delivery guidelines:

All crossties should be free from any defects that may impair their strength and durability as crossties such as decay, splits, shakes, large or numerous holes, stump shot ends, and grain with slant greater than one in fifteen. All bark and spurs must be removed. Ties cannot be shorter than eight feet and six inches or longer than nine feet.

¹⁹Southern Wood Piedmont Company, P. O. Box 1368, Chattanooga, Tennessee, 37401, Lewis Hawkins, Procurement Manager--Crossties, Telephone: 615-583-4551.

TABLE XIII

COMPARISON OF COST AND VALUE CHANGES WHEN BOTH LUMBER
AND LUMBER PLUS 7-BY-9 INCH TIMBERS ARE SAWED
FROM GRADE 1 LOGS AND GRADE 3 LOGS

Item	Grade 1 Logs		Grade 3 Logs	
	All lumber	Lumber and 7-by-9-inch timbers	All lumber	Lumber and 7-by-9-inch timbers
Product volume (board feet):				
Volume in salable lumber	1,595	935	1,552	650
Lumber volume in timbers	--	660	--	902
Overrun from timbers	--	216	--	297
Volume in salable timber	--	876	--	1,199
	<u>1,595</u>	<u>1,811</u>	<u>1,552</u>	<u>1,849</u>
Total product value:				
Value salable lumber	303.81	202.91	128.75	61.34
Value lumber in timber	--	100.90	--	67.41
Value salable timbers	--	65.76	--	90.05
Value salable lumber and timbers	--	268.67	--	151.39
Value corrected for degrade loss	279.51	263.30	118.47	148.36
Production time (hours):				
All lumber	2.45	--	2.59	--
Lumber in timber	--	.38	--	.63
Adjusted time--lumber and timber	--	2.07	--	1.96
Product value per hour	114.08	127.19	45.60	75.81
Costs per hour:				
Log costs	48.42	55.66	18.20	20.62
Production costs	<u>33.80</u>	<u>33.80</u>	<u>33.80</u>	<u>33.80</u>
Total	82.22	89.46	52.00	54.42
Net value per hour to mill owner (before taxes)	31.86	37.73	-6.40	21.39

Source: Lawrence D. Garrett, "Economic Implications of Manufacturing Sawed Tree and Timbers," Research Paper NE-148, U.S.D.A., Forest Service, 1969, p. 20.

The ties cannot be scant or more than one inch oversize measured at the smaller end. All ties shall be graded from the top side which is the side with the narrow face. All ties must be cut from fresh cut logs and delivered in green condition. Ties made of water oak, willow oak, ash, poplar, and willow will not be accepted.

For crossties delivered to the Chattanooga plant, prices as of January, 1971, were as follows:

Grade #5--7 x 9 cut full and square edge	\$3.60
Grade #4--7 x 8 cut full and square edge, or 7 x 9 with 1 inch wane or bark	3.60
Grade #3--6 x 8 cut full and square edge, or 7 x 8 with 1 inch wane or bark, or 7 x 9 with 2 inch wane or bark	2.30

The above quoted prices are for oak and mixed hardwood, including hickory. This company prefers the ties to be loaded on cars of the Southern Railway if they cannot be delivered direct to the Chattanooga plant. Quoted prices would be lowered if this practice were adopted by the cost of shipment from Clairfield to Chattanooga.



CHAPTER IV

RECOMMENDATIONS

Model Valley has virtually no economic advantages. Its forest resource, while a valuable asset, is duplicated many times in other counties of Appalachia and in the nation as a whole. Therefore, this resource is only an asset and not particularly a prime competitive advantage. Consequently, in order to reverse the trend of economic decline, Model Valley must create economic advantages where none seem now to exist.

The creation of economic advantages is no easy task. A possibility outlined in this report is the establishment of an integrated wood industry of moderate size with built-in elements for survival and longevity.

Four requirements must be met for the successful establishment and maintenance of an integrated wood industry:

1. A viable wood industry requires that an intensive degree of utilization be practiced on the harvested timber and that diversified products displace lumber as the major product. Outlets for low-grade lumber must be found, preferably in the form of remanufactured products. These problems of wood utilization in Model Valley are difficult to solve and involve many considerations other than technical. Investment capital is very limited in the area and in order to attract it from the outside, competitive advantages must be clearly demonstrated.

2. Qualified management personnel are essential for the successful operation of an integrated wood industry. Lack of managerial skill in many cases is the limiting factor for the development of small enterprises. Local people should be used in management and administration whenever possible. (This can be accomplished through special training programs.) Specialized personnel, not available locally, must be attracted to the area by salary levels competitive with jobs at other locations.

3. The ability to market the products manufactured is the key to success. Therefore, an aggressive marketing program is an essential first step in establishing a new industry. The markets have to be developed and maintained. Potential customers have to be contacted and informed of product lines and prices. Continuous effort must be made to build a good reputation with customers. The products must be manufactured according to the customer's specifications with service being a prime consideration.

4. Good forest resource management is necessary to maintain a wood resource base of sufficient quantity and quality to support an integrated wood industry. The basic aim of a resource management program is to keep the forest lands productive. Individual forest landowners in Model Valley should be encouraged to practice good forest management and to seek information on the best methods of accomplishing this goal from the county agent, local service forester, and elsewhere.

With these requirements in mind, the following recommendations are made:

1. The concept of what an integrated wood industry will accomplish should be kept in mind at all times and particularly when each new wood industry is added.

2. The sawmill operation that is located in the proximity of the present pallet plant should be expanded as soon as possible so that it will be capable of meeting the increased demands of the integrated wood industry. Initially, sawmill production should be increased to 25 percent over the needs of the pallet plant.

3. Each of the four wood industries that are recommended for Model Valley should be initiated singly or in combination during the next ten years. These industries are: (a) hand froe oak shake shingles; (b) oak split rail and post rail production; (c) educational wooden toys; and (d) specialty wood products.

4. Since investment capital is scarce in the area, every possible avenue of capital sources; both government and private, should be explored and actively sought. Local investment in the integrated wood industry should be encouraged by making shares of stock available to the public at values in the range from \$10 to \$25 per share.

5. Local workers capable of assuming management positions should be encouraged to enroll in special training programs to learn essential management and technical skills. If possible, financial assistance should be arranged for such training. Many facilities are available for this type of training. Programs are offered at Haywood Technical School, Clyde, N. C.; Martin Technical Institute, Williamston, N. C.; Forestry and Wood Technology School, University of Kentucky,

Quicksand, Ky.; and Savannah Area Vocational and Technical School, Savannah, Ga.

6. The hand froe shake shingle industry should be initiated first and should utilize the higher quality straight grain butt section of the log presently being sawed into pallet lumber.

7. The manufacturing of wooden fence rails and fence posts should be initiated as soon as possible using the low-grade oak logs. The fence rails and fence posts should be produced by hand until the purchase of a hydraulic rail splitter becomes economically feasible.

8. Provision should be made for setting up a wood working shop capable of producing educational wooden toys and specialty products as soon as the technical skills are developed and adequate financing is provided.

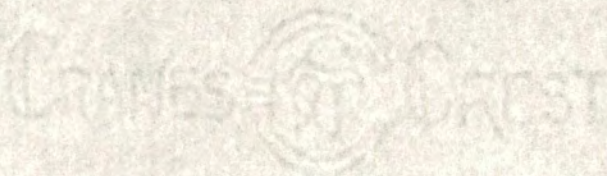
9. The products recommended for manufacture should be grouped initially as follows: (a) shake shingles, split rail fencing, and pallets; (b) educational toys and specialty products. These product lines fit together naturally in a manufacturing operation and are compatible with the available wood supply.

10. A broad market program should be implemented for each product manufactured and should include promotional pamphlets where appropriate. A sales representative should be employed on a commission or salary basis to develop the market for all of the product lines manufactured and to represent the industry in the market. The sales representative should make contact with brokers, wholesalers, commission agents, and retailers who deal with the products manufactured by the industry.

A final recommendation, i.e., that a complete evaluation of the integrated wood products industry be made ten years from the date of its initiation. Future plans for the industry should be projected at that time.



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APPENDICES

GRANES  CREST

APPENDIX A

COMMERCIAL FOREST INDUSTRIES

Sawmills and planing mills, general
Hardwood dimension and flooring mills (dimension includes wood blanks for furniture parts, handles, shuttles, picker sticks, bobbins, spools and carvings)
Special product sawmills, (excelsior, wood shingles, cooperage stock)
Millwork plants
Veneer and plywood plants
Prefabricated wooden buildings and structural members
Hailed and lock-corner wooden boxes and shook
Wirebound boxes and crates
Veneer and plywood containers, except boxes and crates
Cooperage (includes tobacco hogsheds)
Wood preserving
Wood products, (includes handles, turnings, pallets, particle board, and other)
Wood household furniture, except upholstered
Wood household furniture, upholstered
Household furniture, (rattan, reed, willow, fiber and etc.)
Wood office furniture
Wood partitions, shelving lockers, and office and store fixtures
Furniture and fixtures
Pulp mills
Paper mills, except building paper mills*
Paperboard mills*
Building paper and building board mills*
Gun and wood chemicals

The following industries may be considered as forest industries if their major products are made principally from wood:

Mobile homes
Boot and shoe cut stock and findings (wood)
Boat building and repairing (wood)
Musical instruments and parts (wood)
Games and toys, except dolls and children's vehicles (wood)
Sporting and athletic goods (wood)
Lead pencils, crayons, and artists' materials (wood)
Brooms and brushes (wood)
Matches (wood)
Morticians' goods (wood)

*Pulp mills combined with paper mills and not separately reported are also included in this industry.

APPENDIX B

PRODUCTS THAT CAN BE MADE FROM THE WOOD RESOURCE OF TENNESSEE

Baseball bats	Cabinets (continued)	Crates (con-
Basket	kitchen	tinued)
market	phonograph: see furni-	commercial
novelty	ture phonograph cabinets	shipping
Battons, tobacco sticks	radio: see furniture	corrugated
Bee hives	radio cabinets	shipping
Beverage cases	T.V.: see furnitue	Dimension
Blanks, broom and mop	T.V. cabinets	furniture
ladder rung	Cartons	special
pickerstick	milk	Displays
pipe	Caskets	Doors
pitman rod	parts	Door bumper
shunt pole	shipping boxes	Double trees
ski	Cedar sheets	Dowels
Bleacher seating	sheet panels	Drapery
Blocking	closet linings	fixtures
Boat	oils	Drapery poles
motor	Chair rounds	Drawing boards
outboard	Charcoal	Excelesior
Bobbin blocks	Charcoal briquets	Faucets, wooden
Bowling alleys	Chicket coops	wooden barrel
Boxboard	crates	Fence posts
Boxes	Chips	Fertilizer carts
ammunition	Cigar box lumber	Flake board
burial: see burial boxes	Coat hanger sticks	Floorings,
corrugated	Concentration yards	hardwood
fruit, wirebound	chemical wood	pine
paper-folding	cross arm	Floral sticks
poultry, wirebound	logs	Frames, bed
shipping casket: see	lumber	door
casket shipping boxes	mine proper	mattress
shook	poles	pictures
vegetable, wirebound	posts	sign
Brooms	pulpwood	window
Brooms and mops	ties	Furniture,
Buckets, cedar	Cooperage, slack	bedroom
Building board	slack assembly	billiard table
Burial boxes	tight	bookcase
Buckings, wooden for	Core stock	carvings
rolled paper	Counters	chairs
Cabinets	Counter tops	church
display	Crates	church, pews
gun: may be called	chicken: see chicken	church, chancel
gunracks	crates	compact home

Furniture (continued)

custom
 disks
 dining room
 doll
 frames
 juvenile
 kitchen
 lawn
 living room
 office
 outdoor
 parts
 phonograph
 cabinets
 porch
 radio cabinets
 repair
 school
 sewing machine
 cabinets
 tables
 T.V. cabinets
 upholstered
 Golf shafts
 Fun stocks
 Handle blanks, broom
 and mop
 striking tool
 Handle dowels, garden
 tools
 shovel
 logging tools
 striking tools
 Handles, striking
 tool unfinished
 Heading, slack
 tight
 tobacco hogshead
 House trim
 Ice boxes
 Ice cream spoons
 Inculator pins
 Ironing boards
 Kraft board liner
 Ladder rungs
 Logging tools
 Loom parts, wooden

Lumber, cigar box:
 see cigar box
 lumber
 dimension: see
 dimension
 dimension: furniture:
 see dimension
 furniture
 dimension special:
 see dimension
 special
 dressed
 flooring hardwood:
 see flooring hard-
 wood
 flooring pine: see
 flooring pine
 rough
 treated
 Mantels
 Milkbottle cases
 Millwork
 Mine, timbers,
 wedges
 Miscellaneous wood
 products
 Moldings
 Musical instruments
 and parts
 Novelties
 Paint paddles
 Pallets, shipping
 Paneling
 Paper
 bags
 board
 products
 Particle board
 Patterns, castings
 Pencils, cased wood
 Pencil slots
 Pickers sticks, loom
 Play pens
 Platforms, garage
 repairman
 Platform--shipping
 Plywood
 Prefabricated buildings

Pulp
 Reels, wood
 Restaurant fixtures
 Rolls, cloth
 (used to take
 cloth from the
 loom; white
 pine can be
 used)
 Room dividers
 Screens
 Seats, public
 conveyance
 Shoe heels
 Shoe lasts
 Shuttle blocks
 Signs, wooden
 Single trees
 Skewers
 Squares
 Stage
 equipment
 Stair material
 Stair treads
 Stoves, slack
 tight
 tobacco
 Store fixtures
 Surfboards
 Surveyors stakes
 Sweeping compound
 Tamping sticks
 Tanning extract
 Ties
 Timbers
 Tobacco
 hogsheads
 Toilet seats
 Towel rods
 Toys
 dolls, wooden
 guns
 Truckbeds
 bodies
 bows
 Turnings: see
 wood turnings
 Veneer

Veneer, package
Venetian blinds
Wagon, farm
 wheel
Walking sticks
Warehouse trucks
Water heater, tops
Water skis
Wheelbarrows
Wheel rims
Wheel spokes
Windows
Window frames: see
 frames, window
Wood bendings
Wood bristles for
 street brooms



APPENDIX C

A LIST OF WOODEN COMPONENTS FOR LOCAL INDUSTRY

Wooden spools for thread or cloth

Wooden floats or reels to wind up netting

Wooden instrument panels

Wooden boxes to house delicate instruments

Wooden frames and components for displays for advertising

Wooden parts for signs

Wooden crates for plastic signs or other items

Small wooden supports integrated with metal and aluminum

Tent pegs and ridge poles

Structural ribbing for fiberglass boats

Wooden cabinet components and structural materials for mobile homes
and travel trailers

Custom wooden cabinets

Rough dimension stock for furniture

Wooden frames for box springs and bed slats

Shipping frames for cut stone

Various types of shipping shims and crating components

Wooden pipe yolks for transporting pipe on truck or by rail

Wooden components for caskets and vaults

Wooden stage scenery

Window and door components

Wooden shipping bases for stoves, refrigerators, and other appliances

Apple and other fruit boxes and crates

Chicken crates

Dowels for dimension stock



APPENDIX D

POTENTIAL CONSUMERS OF PRODUCTS THAT COULD BE MANUFACTURED
BY A CLAIRFIELD SPECIALTY WOOD PRODUCTS INDUSTRY

A list of potential consumers of products that might be manufactured by a Clairfield specialty wood products industry is provided below. The size of these industries in terms of the number of persons employed is also given. An explanation of employment indicators is as follows:

1. Less than 25 employees during normal operation
2. 25-49 employees during normal operation
3. 40-99 employees during normal operation
4. 100-499 employees during normal operation
5. 400-999 employees during normal operation

This list was compiled from the Directory of Tennessee Industries for 1969. Copies of the directory are available from the Executive Office, State of Tennessee, Nashville.

ANDERSON COUNTY

Clinton

Clinton Bedding Company (1)
Route 6, South Clinton 37716
(Mattresses and box springs)
457-0537

Modine Manufacturing Company (4)
Modine Road 37716
Main Office: Racine Wisconsin
(Automobile air conditioning condensers and assemblies)
457-3100

Lake City

Continental Textile Corporation (2)
Industrial Park 37769
(Lace)
426-2832

Davis Mills, Inc. (3)
Church Street 37769
Main Office: Linen Thread Company
Blue Mountain, Alabama
(Synthetic industrial and marine netting)
426-2186

Lake City Laces, Inc. (2)
Industrial Park 37769
(Laces)
426-2812

Oak Ridge

Atomic City Tool and Gage Company, Inc. (1)
253 Midway Lane 37830
(all types of gauges)
483-6323

Fairport Instruments, Inc. (1)
270 Midway Lane, P. O. Box A 37828
(Nuclear instruments)
483-0214

The Nucleas (1)
9217 Oak Ridge Highway,
P. O. Box R 37830
(Nuclear instruments and accessories)
483-0008

ORTEC, Inc. (4)
100 Midland Road
P. O. Box C 37830
Main Office: EG&G, Inc.
Bedford, Massachusetts
(Nuclear instruments and
associated electronics for nuclear research)
482-4411

Pitts Signs and Displays (1)
134 East Division Road 37830
(Electric signs)
483-1451

Tennecomp, Inc. (1)
 P. O. Box J 37830
 Main Office: Tennelee Instrument Company
 Oak Ridge, Tennessee
 (Nuclear electronic instruments)
 482-3491

CAMPBELL COUNTY

Jellico

Imperial Bronze Sales Company, Inc. (2)
 101 Ash Street 37762
 (Bronze castings)
 424-8401

Imperial Cantrell Mfg. Co., Inc. (2)
 101 Ash Street 37762
 (Bronze castings)
 424-8401 or 424-7310

LaFollette

Alco Buildings and Mfg. Co. (1)
 P. O. Box 1197, East Central 37766
 (Awnings and carpets)
 562-8446

American Tent and Canvas, Inc. (4)
 125 First Street, P. O. Box 1140 37766
 (Tents and tarpaulins)
 562-8453

International Textile Products
 110 North Indiana Avenue 37766
 (Canvas tentage and related)
 562-8457

Norris Craft Boat Company (1)
 P. O. Box 209 37766
 (Fiberglass boats and church baptistries)
 562-7629

Royalty Homes, Inc. (3)
 P. O. Box 1408 37766
 Main Office: American Tent & Canvas Company
 LaFollette, Tennessee
 (Mobile Homes)
 562-8471

New Tazewell

Giles Industries, Inc. (2)
Main Office: Middlesboro, Kentucky
(House trailers)
626-3552

Norris Homes, Inc. (4)
P. O. Box 28 37825
(Travel trailers and truck campers)
626-4253

Smokey Trailers, Inc. (1)
P. O. Box 252 37825
Main Office: Norris Homes
New Tazewell, Tennessee
(Travel Trailers)
626-4253

Volunteer Cabinets, Inc. (3)
P. O. Box 28 37825
(Wood Cabinets)
626-4522

Tazewell

Brooks Furniture Mfg., Inc. (3)
U. S. Highway 25-E, P. O. Box 199 37870
(Wood bedroom suites)
626-3471

England Upholstery Mfg. Company, Inc. (4)
P. O. Box F 37879
(Upholstered furniutre)
626-4238

KNOX COUNTY

Knoxville

AMOCO Marble Division (1)
Route 3, Belt Road 37920
(Cut stone and stone products)
477-2493

Acme Mattress Company (1)
5003 Clinton Highway 37912
(Mattresses and bedsprings)
687-1427

C. B. Atkins Company (d)
Harvey Street, P. O. Box 1431 37901
(Wood dining room and bedroom furniture)
522-8105

Bell Engineering Company (2)
2020 Chapman Highway 37920
(Instruments and controls)
573-5071

Benco Plastics, Inc. (4)
3008 Industrial Parkway, West 37921
(Plastic signs)
524-0744

Brothers Bedding Company, Inc. (1)
5037 Broadway, N. E. 37918
(Upholstered furniture)
689-2373

Camel Manufacturing Company (d)
329 South Central Street 37902
(Tents, tarpaulins, and canvas)
523-5126

Ceilheat, Inc. (2)
P. O. Box 10066 37919
(Electric heating equipment)
966-5811

Cherokee Porcelain Enamel Corporation
5300 Homberg Drive 37919
(Porcelain enameled products)
588-3553

City Lumber Company (2)
2714 Central Avenue, N. E. 37917
(Millwork)
522-1121

Cor-Met-Company, Inc. (1)
2357 Neyland Drive 37919
(Corrugated steel pipe)
524-2385

Extron Corporation (3)
P. O. Box 10625 37919
(Plastic extrusions)
966-5822

GRAVES & CO. CREST
Foam-Lite Plastics, Inc. (2)
Alcoa Highway, P. O. Box 5 37901
(Foam molded plastic articles)
577-2653

Fountain City Lumber & Builders Supply (1)
4829 Broadway 37918
(Wood Cabinets)
689-3308

Graves and White Marble Company (1)
Tazewell Pike 37918
(Marble window sills)
687-5910

Huttig Sash and Door Company (2)
1116 North Sixth Avenue 37901
Main Office: St. Louis, Missouri
(Window and door units)
522-6125

Imperial Black Marble Company (1)
801 Bluff Drive 37919
(Black marble)
588-1538

Knoxville Casket Company, Inc. (1)
4833 North Broadway 37918
(Metal and wood caskets)
688-2731

Knoxville Scenic Studios, Inc. (2)
P. O. Box 1029 37901
(Stage curtains, scenery and hardware)
577-5551

Knoxville Showcase Mfg. Company (a)
217 Dameron Avenue 37917
(Showcases and store fixtures)
522-4842

Marshall Spring and Bedding Company (2)
1318 Proctor Street 37921
(Upholstered furniture and bedding)
523-2241

Newman and Sons Furniture Shop (1)
Wayne Road 37914
(Wood Cabinets)
546-2475

Plasti-Line, Inc. (5)
P. O. Box 5066, Knoxville 37918
Main Office: Texal Drug and Chemical Company
Los Angeles, California
(Plexiglas and metal outdoor signs)
947-1511

Reedcraft, Inc. (1)
401 East Jackson Avenue
P. O. Box 10121 37919
(Advertising displays)
524-5531

Southern Granite and Marble Works (1)
4100 Island Home Pike 37920
(Cut finish stone)
573-1551

Special Instruments Laboratory, Inc. (2)
312 West Vine Avenue 37902
(Electronic textile-testing equipment and portable
public address systems)
525-9538

Tennessee Mattress Company, Inc. (1)
509 Radford Place 37917
(Mattress and box springs)
524-5521

Tennessee Metal Culvert Company (1)
2343 Neyland Drive 37917
Main Office: Nashville, Tennessee
(Corrugated steel pipe)
525-9305

Todd Lumber Company (1)
2510 Mitchell Street 37917
(Special woodwork)
525-9396

Watson Furniture Shop (1)
2716 Bond Street 37914
(Wood furniture)
522-8015

Wilkerson Funeral Supplies (1)
2657 Middlebrook Pike 37921
(Caskets and burial vaults)
523-4153

VITA

Thomas H. Lederer was born in Elmira, New York, on January 10, 1945. He was graduated from Horseheads High School in 1963. He received a Bachelor of Science in Agriculture degree from West Virginia University in June, 1968. After serving two years in the Peace Corps in India, he entered Graduate School at the University of Tennessee in January, 1971. He was an NDEA Fellow during the 1971-72 academic year. A Master of Science degree was received in August, 1972.

He is the son of Dr. and Mrs. Otto Lederer of Big Flats, New York.

The author has accepted a doctoral assistantship in the Department of Agricultural Economics at The Pennsylvania State University, in University Park, Pennsylvania.