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Agribusiness in the Tennessee economy

William Donald Pitt

To the Graduate Council:

I am submitting herewith a thesis written by William Donald Pitt entitled "Agribusiness in the Tennessee economy." 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.

Benny Ray McManus, Major Professor

We have read this thesis and recommend its acceptance:

Brady J. Deaton, Thomas H. Klindt

Accepted for the Council:
Carolyn R. Hodges

Vice Provost and Dean of the Graduate School

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

To the Graduate Council:

I am submitting herewith a thesis written by William Donald Pitt, Jr., entitled "Agribusiness in the Tennessee Economy." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

B. R. McManus

Benny Ray McManus, Major Professor

We have read this thesis
and recommend its acceptance:

Thomas H. Klindt

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Vice Chancellor
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AGRIBUSINESS IN THE TENNESSEE ECONOMY

A Thesis

Presented for the

Master of Science

Degree

The University of Tennessee, Knoxville

William Donald Pitt, Jr.

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ABSTRACT

The study was concerned with the magnitude and importance of agribusiness firms in the Tennessee economy. The principal objectives were to determine the degree of economic activity and employment of agribusiness located throughout Tennessee and to estimate the impact of agribusiness in the Tennessee economy.

The agricultural subsector was set apart from the Tennessee economy and was viewed as an open model economy. The subsector was delineated as to agricultural inputs firms, agricultural output firms, and agricultural production.

The method used in the analysis employed multipliers taken from previous[1] studies which when multiplied by data obtained by a statewide survey of agribusinesses gave direct, indirect, and total impacts of agribusinesses. Two Leontief type multipliers were used. Modified employment impact and modified unit output multipliers showed the degree of economic impact of agribusinesses on employment, payrolls, gross sales, and capital investment. Adapted employment impact and adapted unit output multipliers were used to show the impact of a 10 percent increase in agribusiness.

Agribusiness impacts were examined on statewide and regional bases. For regional analyses the State was divided into East, Middle, and West Tennessee.

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[1]Charles MacArthur Wilson, "An Interindustry Analysis of Tennessee with Emphasis on Agriculture" (Ph.D. dissertation, University of Tennessee, Knoxville 1968). Tong Hun Lee, John R. Moore, and David P. Lewis, A Report on Tennessee Interindustry Study (Knoxville: University of Tennesee, 1967).

The 1,214 agribusiness firms surveyed employed 26,526 persons and paid $214.3 million in wages and salaries. Gross sales amounted to $1.9 billion and capital investment was $583.5 million. Most agribusiness, 63.3 percent, dealt with farmers in the county in which the businesses were located, 24.3 percent in adjacent counties, 5.2 percent in the rest of the State, 6.8 percent in other states, and 0.4 percent internationally.

When indirect impacts were added to direct impacts agribusiness increased to $2.3 billion of gross sales, $690.4 million of capital investment, 30,960 jobs, and $250.9 million of payrolls. Assuming a 10 percent increase in agribusiness, gross sales rose to $2.6 billion, capital investment to $787.2 million, jobs increased to 34,397 and payrolls equaled $278.8 million.

The general conclusion of the study was that agribusiness is a major subsector of the Tennessee economy. Measurement of the agribusiness subsector without the inclusion of indirect effects would underestimate the impact of agribusiness on the Tennessee economy.

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CHAPTER I

INTRODUCTION

Through the years the structure of the agricultural sector of the economy has evolved from primative agriculture to a more highly developed independent system. In colonial times the economy was primarily agricultural based with most families largely self sufficient. Most of the agricultural production was for farm and home use while a small portion was traded for items coming from the nonfarm sector or imported. These economic relationships existed primarily because of the limited capabilities within the system for a high level of interdependence.

In 1776 at the time of the Declaration of Independence, Adam Smith, a famous English economist, set forth his ideas about how the people of a nation could increase the total output of goods and services. He recognized that the extent of the market for any good or service would be limited by transportation and communication capabilities.[1] He further revealed that production could be increased through specialization and division of labor because of natural dexterity and diverse attributes of each person.[2] However, specialization could increase only as transportation and communication systems improved which would expand the marketable area for any good or service.

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[1]Adam Smith, The Wealth of Nations, ed. Edwin Cannon (New York: Random House, Inc., 1937) p. 17-19.

[2]Ibid., p. 7-10.

As the economy developed and expanded, specialization became more common. Along with specialization, expanded markets, and increased trade, a sector developed in the economy known as agribusiness which serves agricultural production. Agribusinesses have enabled the agricultural production sector to become more productive and thus by 1976 one farmer was producing food and fiber for 56 persons.[3]

The changes responsible for increased agricultural productivity, the substitution of capital for labor, placed the farmer in a situation that required larger farms, larger investments, and better management in order to remain competitive. As a result many individuals went into other occupations including agribusiness. To keep abreast with new machinery and techniques the farmers who remained became more interdependent with agribusiness firms.

Agricultural business firms perform many of the functions previously accomplished by the agricultural production sector. Farmers once did the major portion of their business directly with the consumer. In 1974 Tennessee farmers sold almost all of their output to agribusiness firms which assembled, processed, and distributed farm products. In essence much of what was once the responsibility of farmers has been transferred to agribusiness firms. Measurement of the agricultural sector by observation of the production sector alone would be an underestimate of the importance of agriculture within the Tennessee economy.

In order to determine the impact and importance of agriculture in Tennessee, the succeeding objectives were pursued:

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[3] Fact Book of U.S. Agriculture, Department of Agriculture, Miscellaneous Publication No. 1063 (Washington, D.C.: Government Printing Office, 1967), p. 16

1. Determine the present degree of economic activity and employment of agribusinesses located throughout Tennessee.
2. Estimate the impact of agribusinesses in the Tennessee economy.

A. CONCEPTUAL MODEL

The workings of today's economic system is illustrated in the model labled Figure I-1. Households supply resources and services in return for incomes in the form of wages, rents, interest, and profits. At the same time households spend these incomes for goods and services produced by businesses. The flows continue between the households and businesses because of specialization and the need for exchange. When all the households and businesses are included in the circuitous flow, the economic model is normally considered closed.

Depicted also in the model is the agricultural subsector of the total economy. The agricultural subsector was set apart from the total economic model and was viewed as an open model economy since economic activity occurred outside the agricultural subsector.

An open model of the economy, in contrast to a closed model of the economy, infers that at least one sector is exogenous. Unlike a closed model, which includes the assumption that all sectors are dependent upon one another, the open model implies sectoral relationships between all sectors; yet, one or more sectors are not functionally dependent upon the others.[4] In most models of this kind final demand

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[4]Tong Hun Lee, John R. Moore, and David P. Louis, A Report on the Tennessee Interindustry Study (Knoxville: University of Tennessee, 1967), p. 3.

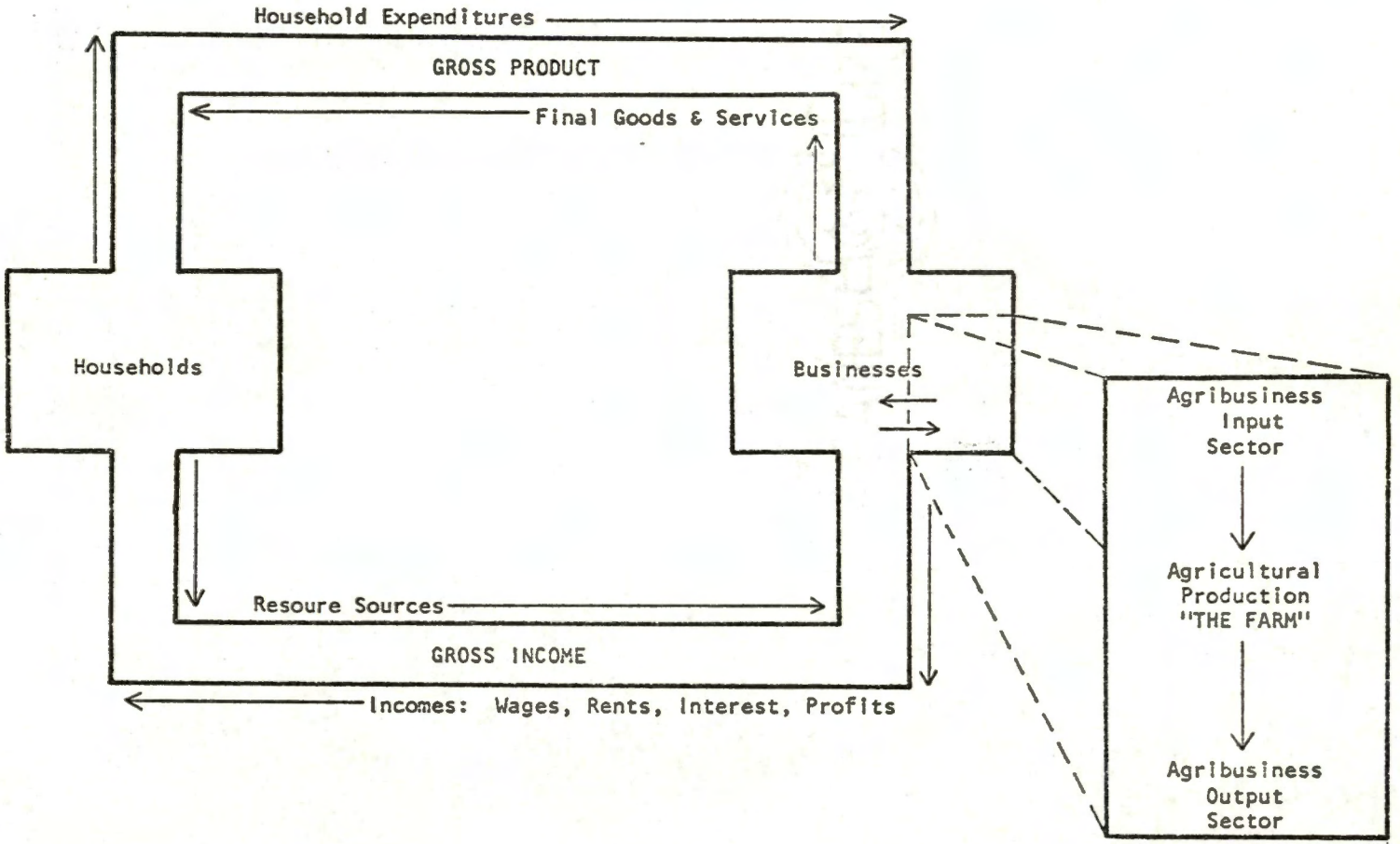

Figure I-1. A General Economic Model Including a Depiction of the Agricultural Sector.

sectors such as households, government expenditures, and exports assumed to be determined by factors other than those within the interindustry system. Once final demand is determined, the open model, with input-output analysis, will show the economic impact ov various levels of demand upon intermediate sectors; therefore, the total impact of changes in final demand can be determined.[5]

Basically, input-output analysis is an accounting system which facilitates measurement of the flows of goods and services to and from all sectors of the economy. It shows outputs as well as the inputs used by each sector. In input-output analysis a sector appears once as a user of inputs and again as a producer of outputs. Final demand sectors, because they do not produce goods or services, appear only once.[6]

Input-output analysis is useful in the development of several research instruments. Flow tables for instance show interindustry exchanges of goods and services. Technical coefficients show output requirements from one sector per unit of output of other sectors. Interdependence coefficients show the relationship of one sector to final demand and to other producing sectors of the economy. Multipliers measure direct and indirect effects of final demand for the products of one industry upon the overall economy.

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[5] Ibid.

[6] An Input-Output Study of the Economy of Northeast Texas, Department of Agricultural Economics and Rural Sociology Report No. 72-4 (College Station: Texas A & M University, 1972), p. 11.

Figure I-1 illustrates the interaction of the agribusiness input sector, the agricultural production sector, and the agribusiness output sector with each other and with the general economic system. The economic interactions give rise to the "multiplier effect." To illustrate, when the manager of an agribusiness firm expects an increase in demand for agribusiness products, he steps up production by using more inputs some of which are bought from the farm while others are purchased from the other business sectors. These sectors, to fill the increased orders, increase demand for their production inputs.

For example, an increase in final demand for lumber products will cause lumber dealers to require more logs. Thus more machinery will be required to saw and handle the logs. The increased demand for machinery creates a need for more inputs from machinery manufacturers which in turn gives rise to similar but diminishing increases further down the chain until the original increase in demand has been diffused. Since multipliers measure not only the direct effects of an increase in final demand but indirect effects as well, they can be used to determine the economic impacts of agribusinesses on the Tennessee economy.

B. PROCEDURE

Data

Primary data were obtained by personal interviews conducted by the Rural Development Committees in 91 of the 95 Tennessee counties. Each manager of an agribusiness firm in the State was asked to answer

a structured questionnaire concerning number of employees, payrolls, trade area, volume of business, capital investment, and plans for expansion. Volume of business for firms selling to farmers and purchasing from farmers was expressed in terms of gross sales.

In order to have been classified an agribusiness firm, a concern, for the purpose of this study, must have met certain rules of eligibility. They were as follows:

1. The firm supplied retail or wholesale supplies, equipment, or services directly to the farmer for use in direct production of agricultural products. At least 75 percent of its business must have been done with farmers.
2. The firm was engaged in handling, retailing, wholesaling, or processing plant or animal products which came directly from the farm.

Basically the firm must have been directly connected to the farm base either by selling to or buying from the farmer. Agricultural finance and transportation companies were not included in the study.

The survey originally divided agribusiness into nine categories on the basis of the principal products or service provided, but one group, textile mills, fiber manufacturers, and fabricators was omitted because completed schedules were few in number. Another category, agricultural chemical companies, was combined with agricultural supply firms. The seven groups used in the analysis are as follows:

1. Field crop handlers, manufacturers and wholesalers - This grouping, which was an agribusiness output sector, included

cotton ginners, grain elevators, tobacco buyers, and others who bought field crops from the agricultural production sector.

2. Farm machinery and equipment dealers, sales and service - Companies in this category supplied mechanical inputs to farm production. They bought used machinery from agricultural sector production; but the majority of their purchases were from farm machinery manufacturers. Firms in this category made the great majority of their total sales to farmers.
3. Agricultural supply retail sales and service firms - This agribusiness input category included firms which supplied agricultural inputs such as seeds, fertilizer, pesticides, lime, custom labor, and other necessary farm production items.
4. Lumber and wood products - This grouping included loggers, paper mills, sawmills, and wood using companies which bought stumpage.
5. Food processors and assemblers - Firms which bought raw material from the primary agricultural sector and processed the products into partial processed or usable food stuffs were included in this sector. Examples are meat packers, custom slaughters, canneries, and poultry product firms.
6. Livestock markets - This category primarily included stockyards which conducted auction sales where farmers either bought or sold livestock.

7. Nursery wholesalers and landscaping services - This sector included firms which sold nursery products to retailers and/or dealt in landscaping and design.

Multipliers

Multipliers used in the analysis were obtained from two earlier studies. In 1967 in separate input-output projects Wilson[7] and Lee[8] developed multipliers for the Tennessee economy. Wilson primarily dealt with output multipliers and Lee was concerned with employment multipliers. The multipliers they estimated were adapted for this study and were multiplied by figures from each agribusiness sector to determine the direct, indirect, and total impact of agribusiness on employment, payrolls, gross sales and capital investment.

The following assumptions were made concerning relationships outside the multiplier analysis:

1. Agribusiness imports in Tennessee were equal to agribusiness exports.
2. Business conducted by agribusiness firms with non-farm customers was equal to the business conducted with farmers by non-agribusiness firms.
3. The agribusiness sector in this study were similar to those used to develop the multipliers by Wilson and Lee.

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[7]Charles MacArthur Wilson, "An Interindustry Analysis of Tennessee With Emphasis on Agriculture" (Ph.D. dissertation, University of Tennessee, Knoxville, 1968), pp. 44 and 77-79.

[8]Lee, Moore, and Lewis, pp. 57-59 and 71.

C. REVIEW OF LITERATURE

Interest in interindustry analysis dates back to the eighteenth century when the Physiocrates began studying the economic interaction between the various sectors of the economy.[9] Interindustry analysis was continued by Leon Walras who developed a theoretical model concerning economic interdependence. Walrus was limited in his endeavor due to the lack of computational capabilities to handle necessary calculations. In the early 1940's Wassily Leontief employed modern mathematical procedures to interindustry analysis and developed a means of applying interindustry or input-output analysis to economic research.[10]

A study was completed in 1968 at the University of Nebraska concerning the economic impact of irrigation on the Nebraska economy.[11] The researchers studied two methods of determining impacts before deciding upon input-output analysis. The first method which was considered was area comparisons in which a central area could be compared with a subject area to determine the effects of increased investments. Due to the large area to be studied, such a method was impractical. Another alternative was economic base analysis. This method uses base firms, companies which export goods to other regions, and service firms, companies which supply goods within the region, to arrive at a

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[9] William Miernyk, The Elements of Input-Output Analysis (New York: Random House, Inc., 1965), p. 4.

[10] Wassily Leontief, The Structure of the American Economy, 1919-1939 (New York: Oxford University Press, 1951).

[11] The Economic Impact of Irrigated Agriculture On The Economy of

ratio. Using employment data, for instance, a ratio of 2 to 1 would mean that for every worker employed with a basic firm there would be two employed with nonbasic companies. For every employee added in a base industry, a total of three would be added to the economy. Economic base analysis, because the method normally develops only one multiplier for all basic industries, would require excessive sector aggregation.[12]

Texas A & M conducted a similar project in 1975 entitled, Impact of Reduction in Peanut Acreage, Texas West Cross Timbers Region.[13] The project was similar to the Nebraska study except the ability of multipliers to show reductions in an economic system due to decreased investments was recognized.

In 1967 and again in 1972 the Tennessee Valey Authority and Auburn University joined to study the importance of agribusiness in the Tennessee Valley counties of Alabama. The project used the approach in data collection adapted for this study but dealt only with the direct impacts of agribusiness.

For the purposes of this study, input-output analysis was determined to be the best method to determine the impact and magnitude of agribusiness in the Tennessee economy. Existing multipliers were available which could be modified and data collection was feasible with the aid of county Rural Development Committees.

Nebraska, Nebraska Economic and Business Report No. 4 (Lincoln: University of Nebraska, 1968).

[12] Ibid., pp. 13-14.

[13] Impact of Reduction in Peanut Acreage, Texas West Cross Timbers Region, Department of Agricultural Economics and Rural Sociology Bulletin No. 75-4 (College Station: Texas A & M University, 1975).

CHAPTER II

CHARACTERISTICS OF TENNESSEE AND TENNESSEE AGRIBUSINESS

A. FACTORS AFFECTING TENNESSEE AGRIBUSINESS

Several factors were responsible for the evolution of the various kinds and sizes of agribusiness in Tennessee. Probably the most important components were the nature of the agricultural production sector and Tennessee economic activity. Both of the components were influenced by the geographic characteristics of the State.

Geographic Characteristics of Tennessee

Tennessee ranks thirty-fifth in size among the other states of the United States with an area of 42,022 square miles. It forms a narrow parallelogram approximately 400 miles from east to west and 110 miles from north to south.[14]

The topography (Figure II-1) slopes from a maximum altitude of 6,642 feet at Clingman's Dome in the eastern portion of Tennessee to 200 feet at the Mississippi River which forms the western boundary of the state.[15] The shape, position, and contour of Tennessee makes climatic variations due more to changes in altitude than to differences in latitude.

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[14]Stanley Johnson, ed. The Tennessee Handbook (Knoxville: University of Tennessee, 1938), p. A-1.

[15]Ibid., p. A-4.

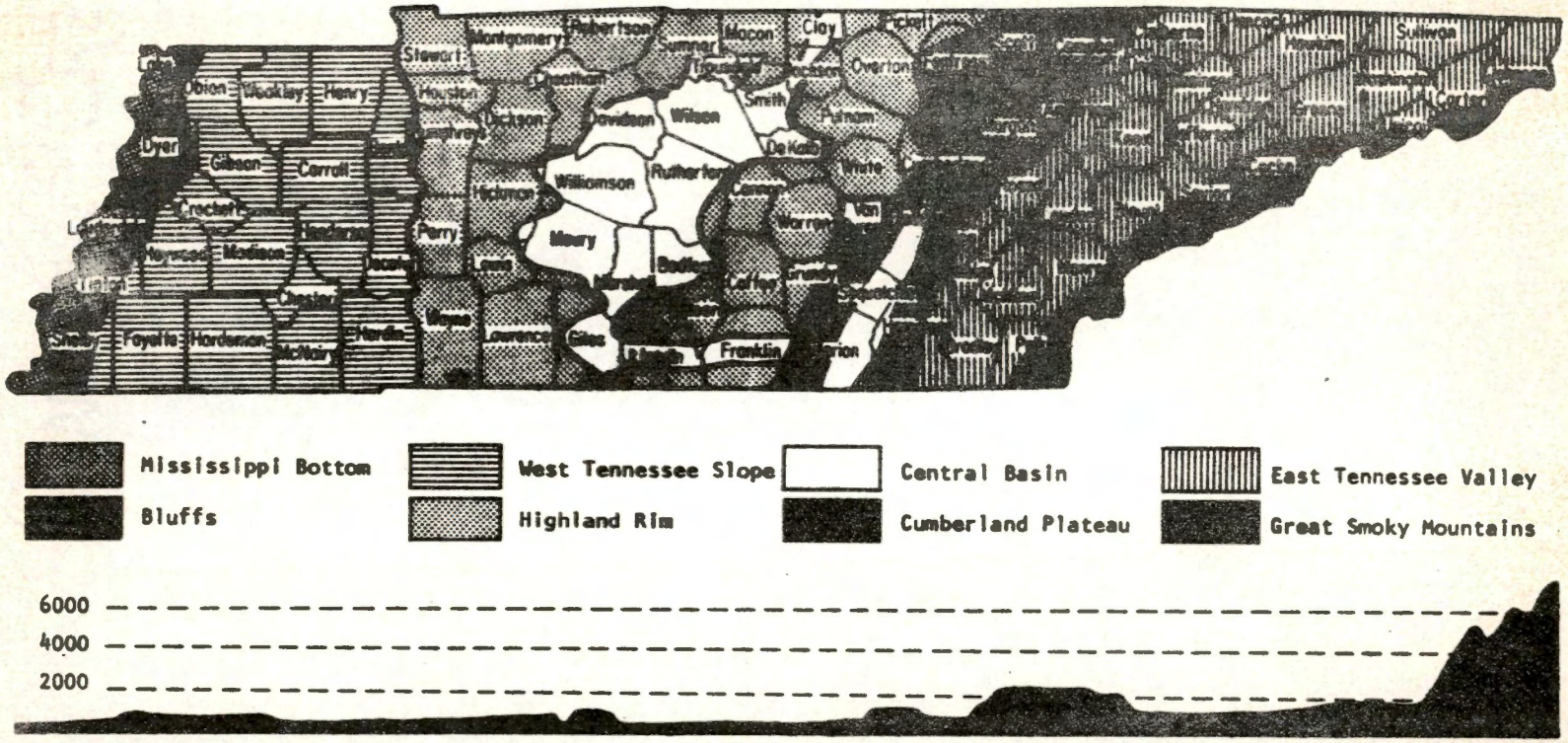

Figure II-1. The Eight Soil Areas of Tennessee with Cross Section Showing Elevations.

Source: Stanley Johnson, ed., The Tennessee Handbook (Knoxville: University of Tennessee, 1938), p. A-2.

There are eight soil groups[16] across the State (Figure II-1) each of which has varying comparative advantages for the agricultural commodities produced in each general soil group area. The different comparative advantages influence both the types of commodities grown and the economic activity of an area. The commodities grown and economic activity affect both the types and number of agribusiness firms needed to service agricultural producers in a trade area.

Because of the variations in soil groups, climate, and because of the availability of regional multipliers, the State was divided into the three grand divisions of East, Middle, and West Tennessee, Figure II-2. The division made it possible to compare the various types of agribusiness activities for the three areas.

East Tennessee Soil Groups. There are four basic soil groups in East Tennessee. Each group offers comparative advantages for certain commodities.

1. The Great Smoky Mountains is a mountainous region with high rocky bluffs and small areas of rich valley land. The area is predominately forested; however, some livestock and tobacco is produced.
2. East Tennessee Valley is characterized by low ridges with poor upland soil and rich fertile valleys. The area is noted for burley tobacco production with some corn, truck crops, and livestock.

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[16] Ibid., pp. A-1 - A-4.

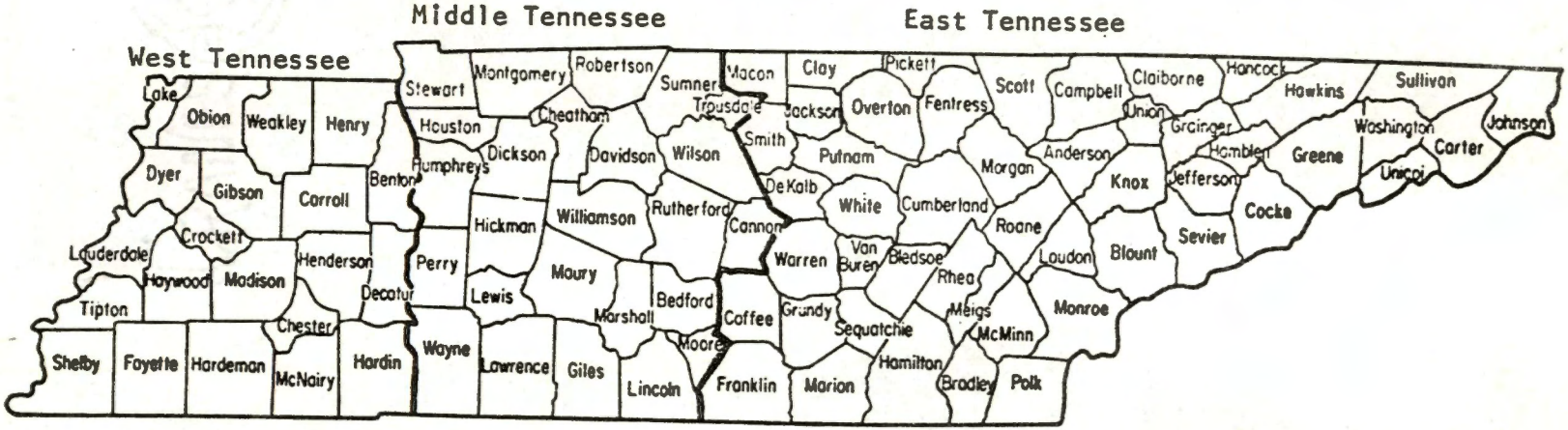

Figure II-2. Geographical Sectoring of the State by East, Middle, and West Tennessee.

3. Cumberland Plateau forms a ridge overlooking the East Tennessee Valley at elevations of up to 2,000 feet. The area is mostly forest land due to poor sandstone soils.
4. Highland Rim accounts for a small portion of East Tennessee land area. This soil group consists of two types of soils. One relatively fertile type where tobacco, wheat, corn, and soybeans are produced; another less fertile type which is more suited to livestock and lumber production.

Middle Tennessee soil groups. There are two major soil groups in Middle Tennessee.

1. Highland Rim, mainly a middle Tennessee soil group, is the most predominant group in the area. The soil maintains the same characteristics discussed in the East Tennessee section.
2. The Central Basin soil group is an eliptical basin of rich limestone land. It forms a relatively level tract for the production of tobacco, corn, soybeans, and wheat. Blue grass grows well and the area is famous for production of the Tennessee Walking Horse.

West Tennessee soil groups. West Tennessee has three basic soil groups; each of which contains some of the most productive soils occurring in large tracts.

1. The West Tennessee slope rises to an elevation of 800 feet. The soils are deep, fertile, and noted for cotton, corn, soybean, and truck crop production.

2. The Bluffs overlook the Mississippi River Bottoms. The area is relatively narrow but excellent for cotton, soybeans, corn, timber, and livestock production.
3. The Mississippi River Bottoms contain some of the richest soils in the State. The soils are deep and rich in humus and organic matter. The area is noted for large farms where cotton, corn, wheat, and soybeans are grown.

Tennessee Agricultural Production

In 1974 there were 125,000 farms in Tennessee with 15.4 million acres of land used for farming. The average size farm was 123 acres with an estimated value of $449 per acre. The total value of Tennessee farmland amounted to $6.6 billion.[17] In 1974 total cash receipts from farm marketing amounted to $1,004.6 million with $545.4 million from crop production and $459.2 million from livestock and poultry enterprises.[18] The above figures did not include timber sales because that information for 1974 was not available; however, in 1971 the expenditure for wood by wood-using firms amounted to $170.1 million.[19]

The average annual farm employment in 1974 averaged from four quarters of statistics, was 134,000 persons. Of the total, 109,000

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[17] Tennessee Agricultural Statistics, Tennessee Crop Reporting Service Bulletin T-12 (Nashville: Tennessee Department of Agriculture, 1975), p. 16.

[18] Ibid., p. 9.

[19] "TVA Wood-Using Industry Survey," Division of Forestry, Fish and Wildlife (unpublished) (Norris, 1971).

were farm operators or unpaid family members. The remaining 25,000 included all persons working for cash wages.[20]

Tennessee Economy

The Tennessee economy is strongly dominated by the manufacturing and trade sectors as classified by the University of Tennessee Center of Business and Economic Research.[21] The farm sector accounted for only 3 percent of the economy according to that classification; however, much of the business directly or indirectly supporting the farm sector was widely and importantly dispersed throughout many of the sectors classified "other than agricultural."

The most recent data available concerning Tennessee Gross State Product was for 1973. That year, the total value of all final goods and services produced in Tennessee amounted to $21.1 billion.[22] The production process provided jobs for 1.8 million persons who were paid $11.6 billion in wages and salaries.[23]

Figure II-3 shows the contributions to Gross State Produce in percentages and dollars made by each of the various economic sectors. Since the Gross State Product does not show both direct and indirect

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[20] Tennessee Agricultural Statistics, p. 13.

[21] Telephone interview with John Kort, Center of Business and Economic Research, College of Business Administration, University of Tennessee (Knoxville, 1976).

[22] Ibid.

[23] Hui S. Chang and Richard D. Gustaly, "The Tennessee Economic Outlook: An Overview," Survey of Business (Knoxville: University of Tennessee, November/December 1975), p. 6.

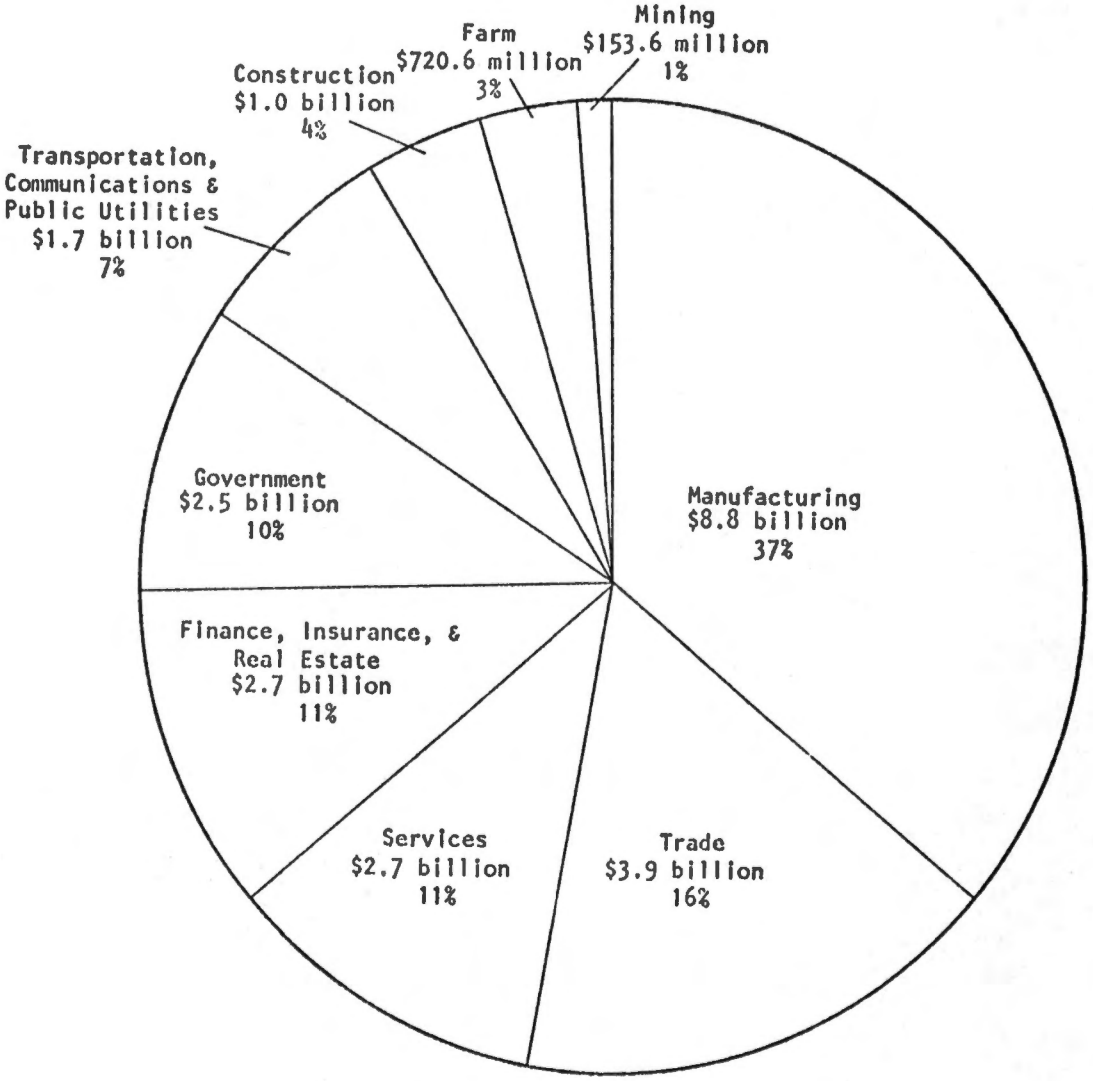

Figure II-3. Dollar and Percentage Amounts of Various Economic Sectors for Tennessee Gross State Product, 1973.

Source: Telephone Interview with John Kort, Center of Business Research, College of Business Administration, The University of Tennessee (Knoxville, 1976).

impacts of the various sectors, the true magnitude of each category was not established. Some of the sectors probably contributed larger magnitudes than were the actual figures while other sectors contributed less.

Manufacturing, because of its relative size, added the largest amount of final goods and services to the Tennessee economy by producing $8.8 billion of output. Trade was second producing $3.9 billion of products; services sector was third with $2.7 billion of goods and services. Mining was least among the sectors with $153.6 million of output and the agricultural production sector was next to last with $720.6 million. Because of its many facets, agribusiness firms made contributions to Gross State Product in many of the other sectors, which were not differentiated as an agribusiness industry.

B. THE TENNESSEE AGRIBUSINESS SURVEY

Agribusiness firms in Tennessee were surveyed to ascertain the importance of the agribusiness industry. The agribusiness survey included 1,214 companies which in 1974 either bought commodities from the farm or sold 75 percent or more of total sales to the agricultural production sector. Since all the 1,214 firms did not respond to every question, it was necessary to adjust the responses to improve the estimates.[24] After adjustments were completed the agribusiness

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[24]Data was adjusted under the assumption that the firms not responding to a given question were on the average similar to the firms which did respond. Estimates of actual figures were determined by dividing the total number of firms by the number of reporting firms and multiplying the quotient by the total answers of the respondents.

industry, in 1974, employed an estimated 26,626 persons, paid $214.3 million in wages and salaries, produced $1.9 billion of goods and services, and had a capital investment of $583.5 million. Figure II-4 and Tables II-1 and II-2 show statewide responses and estimated figures by nature of business for employment, payrolls, gross sales, and capital investment. (For discussion comparing survey and census data see Appendix A.)

Agricultural Input Firms

The two agricultural input categories employed 5,703 workers and paid them $48.9 million in wages and salaries. The firm sold $589.8 million of goods and services and had $169.8 million in capital assets.

Farm Machinery and Equipment Dealers. The 225 farm machinery and equipment dealers were fifth in employment and output with 2,047 employees and $204.8 million of gross sales. In 1974 median gross sales equaled $615,000 worth of farm machinery and medial capital investment was $95,000. The total capital investment of the sector was $53.8 million and $7.4 million more was forecast to be invested during the next five years.

Fifty-nine percent of gross sales was made in the county where the company was based (Table II-3). Only 29.5 percent was in adjacent counties, 5.0 percent in other counties, and 6.5 percent in other states.

Agricultural Supply. In terms of sales, the agricultural supply sales and services group was ranked second with $385.1 million. The

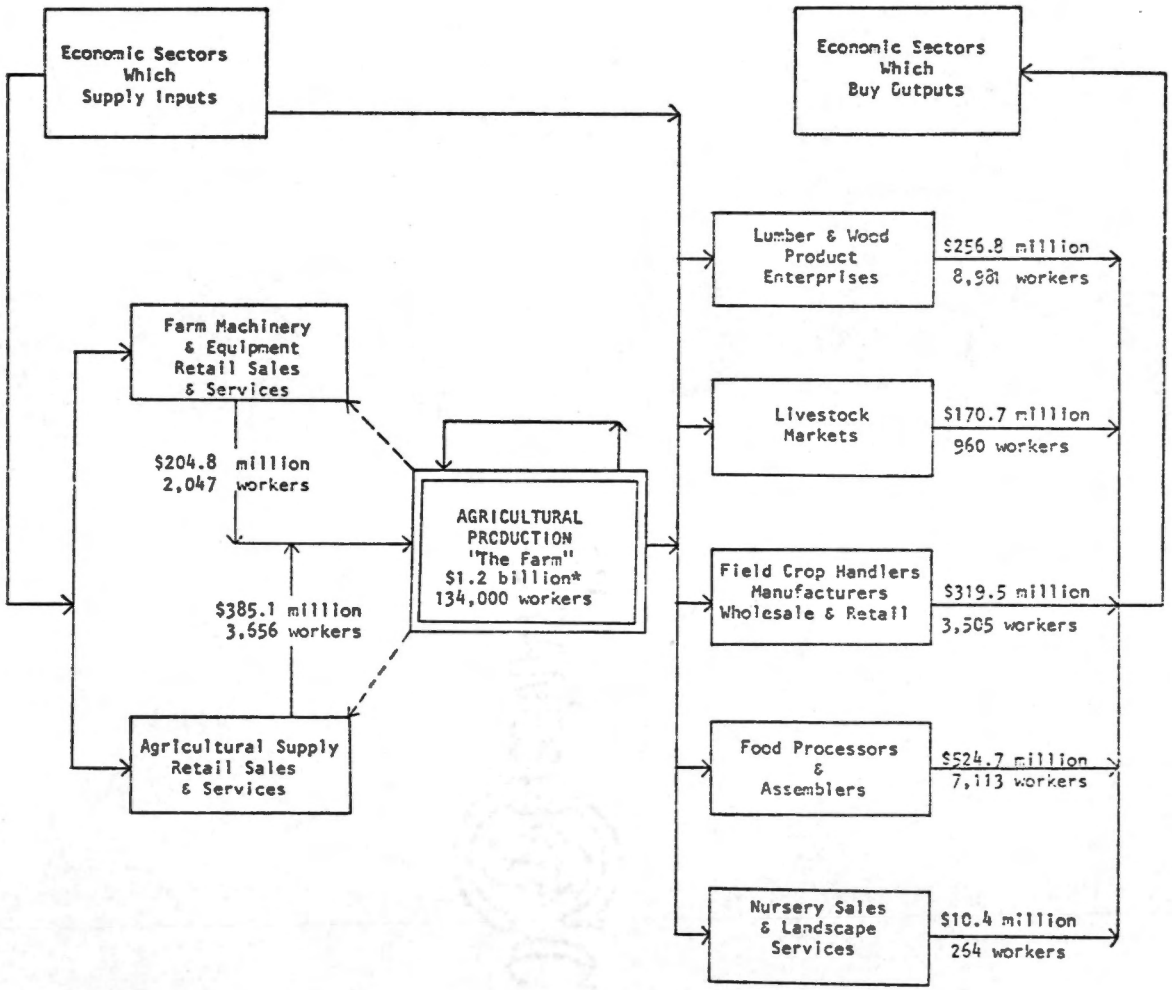

Figure II-4. Relationship of the Agricultural Inputs and Agricultural Outputs Subsectors with Dollars of Gross Sales and Number of Workers, 1974.

*Assumes $170.1 million timber sales.

TABLE II-1

ESTIMATED AGRIBUSINESS EMPLOYMENT AND PAYROLL WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS IN TENNESSEE, 1974

Nature of Business	Employment					Payroll			
	Firm	Respondents	Employees of Respondents	Estimated Employment[a]	Rank	Respondents	Payroll of Respondents	Estimated Payroll[a]	Rank
	-number-					-number-	-thousand dollars-		
Agribusiness Input Firms									
Farm machinery and equipment dealers sales and service	225	223	2,027	2,047	5	186	11,681	14,118	4
Agricultural supply retail sales and services	419	411	3,586	3,656	3	209	17,662	34,795	3
Subtotal	644	---	-----	5,703		---	------	48,913	
Agribusiness Output Firms									
Lumber and wood products	206	b	b	8,981[c]	1	b	b	87,177[c]	1
Food processors and assemblers	95	89	6,708	7,113	2	73	49,663	62,386	2
Livestock markets	53	53	960	960	6	38	1,370	1,914	6
Nursery and landscape services	22	22	265	264	7	16	1,135	1,463	7
Field crop handlers, manufacturers and wholesalers	194	189	3,396	3,505	4	158	9,881	12,401	5
Subtotal	570	---	-----	20,823		---	-----	165,341	
Total	1,214	---	-----	26,526		---	-----	214,254	

[a]Estimated state-wide data were obtained by adding estimated area data.

[b]Omitted to avoid disclosure of individual firm data.

[c]Employment and payroll of atypical firms were excluded during the adjustment procedure. After adjustments were completed, atypical firm data were added to the estimates.

TABLE II-2

ESTIMATED AGRIBUSINESS GROSS SALES AND CAPITAL INVESTMENT WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS IN TENNESSEE, 1974

Nature of Business	Firms	Gross Sales: Respondents	Gross Sales: Sales of Respondents	Gross Sales: Estimated Sales[a]	Gross Sales: Rank	Capital Investment: Respondents	Capital Investment: Capital Investments of Respondents	Capital Investment: Estimated Capital Investment[a]	Capital Investment: Rank
	----number----		-thousand dollars-			-number-	--thousand dollars-		
Agribusiness Input Firms									
Farm machinery and equipment dealers sales and service	225	183	162,198	204,765	5	182	44,598	53,757	5
Agricultural supply retail sales and services	419	332	303,969	385,061	2	339	92,571	116,044	2
Subtotal	644	---	-------	589,826		---	------	169,801	
Agribusiness Output Firms									
Lumber and wood products	206	b	b	256,766[c]	4	b	b	257,539[c]	1
Food processors and assemblers	95	67	343,770	524,682	1	65	60,049	76,794	3
Livestock markets	53	41	133,713	170,713	6	36	5,672	7,987	6
Nursery and landscape services	22	15	6,828	10,370	7	16	2,668	3,593	7
Field crop handlers, manufacturers and wholesalers	194	138	282,727	319,468	3	152	56,586	67,806	4
Subtotal	570	---	-------	1,281,999		---	------	413,719	
Total	1,214	---	-------	1,871,825		---	------	583,520	

[a]Estimated state-wide data were obtained by adding estimated area data.

[b]Omitted to avoid disclosure of individual firm data.

[c]Gross sales and capital investment of atypical firms were excluded during the adjustment procedure. After adjustments were completed, atypical firm data were added to the estimates.

TABLE II-3

TRADE AREA OF AGRIBUSINESS FIRMS BY NATURE OF BUSINESS IN TENNESSEE, 1974

Nature of Business	Volume of Business					
	County	Adjacent Counties	Rest of the State	Rest of the Nation	International	Total
	percent					
Agribusiness Input Firms						
Farm machinery and equipment dealers sales and service	58.9	29.5	5.0	6.5	0.1	100
Agricultural supply retail sales and services	75.8	18.4	2.1	3.2	0.5	100
Agribusiness Output Firms						
Lumber and wood products	52.3	30.6	9.0	7.3	0.8	100
Food processors and assemblers	45.0	21.8	14.3	18.9	0.0	100
Livestock markets	46.7	40.5	6.0	6.8	0.0	100
Nursery and landscape services	32.8	13.5	7.3	46.4	0.0	100
Field crop handlers, manufacturers, and wholesalers	69.9	22.2	3.6	4.0	0.3	100
All agribusinesses	63.3	24.3	5.2	6.8	0.4	100

419 companies in this category made it the sector with the largest number of firms. Median agricultural service and supply gross sales equaled $720,000 of products. Agricultural supply firms were ranked third in terms of employment with 3,656 employees who were paid $34.8 million in 1974. The agricultural supply firms had an estimated total capital investment of $116.0 million. Most firms sold supplies to farmers located in the county. Only 18.4 percent of the firm's sales were from adjacent counties and less than 6.0 percent of the business was conducted in other areas.

Agricultural Output Firms

The five agricultural output categories employed 20,823 workers and had payrolls of $165.3 million. Agricultural output firms sold $1.3 billion of goods and services and had $413.7 million of capital assets.

Lumber and Wood Products Enterprises. Ranked fourth in volume of business were the 206 firms classified in the category of lumber and wood products companies. The firms reported adjusted sales of $256.8 million. Median sales by wood products firms was $400,000 of finished products.

Lumber and wood products firms were ranked first in number of employees with 8,981 full-time and part-time workers including persons in logger crews delivering logs to the various firms. The payroll was also ranked first for an estimated total of $87.2 million. Wood using firms accounted for $257.5 million of total assets. Almost 83 percent of the stumpage was purchased within the immediate county and/or

adjacent counties with the remainder, 17.1 percent, coming from the other areas.

Food Processors and Assemblers. Companies grouped under the category of food processors and assemblers were ranked first in terms of gross volume of sales with $524.7 million. There were 95 firms listed and the median firm had a total volume of business of $1.8 million gross sales. Food processors and assemblers group was second in terms of number of employees with 7,113 full-time and part-time workers. The category was second in terms of payroll with $62.4 million of annual wages and salaries. The firms had a total of $76.8 million of capital invested and 65 were expected to invested $8.6 million more during the next five years. Food processors transacted 45.0 percent of their farm business within the county. Twenty-two percent of farm trade was conducted in adjacent counties, 14.3 percent in the remaining part of the State and the remainder, 18.9 percent, came from other states.

Livestock Markets. Livestock markets accounted for $170.7 million of gross agribusiness sales. Almost all livestock markets were auctions which traded with farmers in the county or in adjacent counties. Only 12.8 percent of the total business was done in other areas. The median sales amounted to $3.5 million and median capital investment was $117,500. The estimated capital assets of livestock markets amounted to $7.9 million, and according to survey results, was expected to increase to $.5 million within the next five years. Livestock markets employed a

total of 960 workers in 1974. The majority of the employees were part-time with only 203 full-time workers.

Nursery Sales and Landscape Services. Nursery sales and landscape services included firms which bought products from shippers (agriculture producers) and sold either wholesale to retail nurseries or to the general public. There were 22 firms which were surveyed. These companies sold $10.4 million of products and had $3.6 million in capital assets. The firms employed 264 persons and paid $1.5 million in salaries and wages.

The trade area was interesting in that 46.4 percent of the business conducted with the farmer came from out-of-state. The remaining farm business was done within the county and/or adjacent counties. There was no reported sales made by firms in the nursery and landscape services category to international concersn.

Field Crop Handlers, Manufacturers, and Wholesalers. One hundred ninety-four[25] field crop handlers were ranked third among the agribusiness groups in Tennessee with gross sales of $319.5 million. These firms had an estimated capital investment of $67.8 million. Fifty-four firms estimated a need for $16.2 million added investment within the next five years for increased employment and services.

In 1974 field crop handlers employed 3,505 full-time and part-time employees and paid $12.4 million in salaries and wages. Seventy percent of the farm business was conducted in the county in which the

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[25]Cook industries, with its home office in Memphis, was excluded from the survey because of the small amount of business conducted in Tennessee relative to its total output.

company was located with 22.2 percent in adjacent counties, 3.6 percent in the rest of the State, 4.0 percent national and 0.3 percent international.

C. THE TENNESSEE AGRIBUSINESS SURVEY BY REGION

Each soil area had commodities in which the agricultural production sector specialized. Since the types of agribusiness firms had varying impacts upon the economy, Tennessee was divided into the three grand divisions of East Tennessee, Middle Tennessee, and West Tennessee (Figure II-2, page 15).

East Tennessee

Forty-seven percent of agribusiness gross sales was conducted in East Tennessee. Wood users and food processors accounted for 64 percent of the agribusiness activity. The 373 agribusiness firms in East Tennessee employed 13,607 persons (Table II-4), paid $149.1 million in wages and salaries (Table II-5), sold $874.0 million of goods and services (Table II-6), and had capital investments of $336.9 million (Table II-7). The area, though second in number of firms, was ranked first in total agribusiness activities. In terms of gross sales East Tennessee agricultural output firms were most prevalent with 83 percent or $718.8 million of agribusiness gross sales as compared to $155.2 million made by agribusiness input firms. Agribusiness output firms had $280.9 million of capital investment, 11,822 workers and paid $125.0 million in wages and salaries. Agribusiness input firms contributed $55.2 million to capital investment, 1,785, workers, and $24.1 million in payrolls. Gross sales in relation

TABLE II-4

ESTIMATED AGRIBUSINESS EMPLOYMENT WITH RANK OF IMPORTANCE BY AREA AND NATURE OF BUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee					Middle Tennessee					West Tennessee				
	Firms	Respondents	Employees of Respondents	Estimated Employment	Rank	Firms	Respondents	Employees of Respondents	Estimated Employment	Rank	Firms	Respondents	Employees of Respondents	Estimated Employment	Rank
	number					number					number				
Agribusiness Input Firms															
Farm machinery and equipment dealers sales and services	69	69	518	518	5	62	61	591	601	5	94	93	918	928	4
Agricultural supply retail sales and services	137	134	1,239	1,267	3	106	104	894	911	4	176	173	1,453	1,479	3
Subtotal	206	---	-----	1,785		168	---	-----	1,512		270	---	-----	2,407	
Agribusiness Output Firms															
Lumber and wood products	81	a	a	5,455[b]	1	62	61	1,225	1,245	2	63	57	2,064	2,281	1
Food processors and assemblers	39	37	4,849	5,111	2	39	38	1,356	1,391	1	17	14	503	611	5
Livestock markets	13	13	397	397	6	13	13	176	176	6	27	27	387	387	6
Nursery and landscape services	8	8	115	115	7	8	8	84	84	7	6	6	65	65	7
Field crop handlers, manufacturers, and wholesalers	26	25	715	744	4	38	37	997	1,024	3	130	126	1,684	1,737	2
Subtotal	167	---	-----	11,822		160	---	-----	3,291		243	---	-----	5,081	
Total	373	---	-----	13,607		328	---	-----	5,433		513	---	-----	7,488	

[a]Omitted to avoid disclosure of individual firm data.

[b]Employment of atypical firms were excluded during the adjustment procedure. After adjustments were completed atypical firm data was added to the estimates.

TABLE II-5

ESTIMATED AGRIBUSINESS PAYROLL WITH RANK OF IMPORTANCE BY AREA AND NATURE OF BUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee					Middle Tennessee					West Tennessee				
	Firms	Respondents	Payroll of Respondents	Estimated Payroll	Rank	Firms	Respondents	Payroll of Respondents	Estimated Payroll	Rank	Firms	Respondents	Payroll of Respondents	Estimated Payroll	Rank
	----number-----		-thousand dollars-			----number-----		-thousand dollars-			----number-----		-thousand dollars-		
Agribusiness Input Firms															
Farm machinery and equipment dealers sales and services	69	53	2,873	3,740	5	62	58	3,587	3,834	4	94	75	5,221	6,544	3
Agricultural supply retail sales and services	137	103	15,338	20,401	3	106	90	5,126	6,037	3	176	145	6,885	8,357	2
Subtotal	206	---	------	24,141		168	---	-----	9,871		270	---	-----	14,901	
Agribusiness Output Firms															
Lumber and wood products	81	a	a	70,773[b]	1	62	57	6,028	6,557	2	63	47	7,346	9,847	1
Food processors and assemblers	39	31	38,850	48,876	2	39	33	9,778	11,556	1	17	9	1,035	1,955	5
Livestock markets	13	9	328	474	7	13	10	333	433	6	27	19	709	1,007	6
Nursery and landscape services	8	8	745	745	6	8	5	155	248	7	6	3	235	470	7
Field crop handlers, manufacturers, and wholesalers	26	18	2,860	4,131	4	38	35	2,424	2,632	5	130	106	4,597	5,638	4
Subtotal	167	---	------	124,999		160	---	-----	21,426		243	---	-----	18,917	
Total	373	---	------	149,140		328	---	-----	31,297		513	---	-----	33,818	

[a] Omitted to avoid disclosure of individual firm data.

[b] Payroll of atypical firms were excluded during the adjustment procedure. After adjustments were completed, atypical firm data were added to the estimates.

TABLE II-6

ESTIMATED AGRIBUSINESS GROSS SALES WITH RANK OF IMPORTANCE BY AREA AND NATURE OF BUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee					Middle Tennessee					West Tennessee				
	Firms	Respondents	Sales of Respondents	Estimated Sales	Rank	Firms	Respondents	Sales of Respondents	Estimated Sales	Rank	Firms	Respondents	Sales of Respondents	Estimated Sales	Rank
	-----number---		-thousand dollars-			----number-----		-thousand dollars-			----number-----		-thousand dollars-		
Agribusiness Input Firms															
Farm machinery and equipment dealers sales and service	69	55	29,673	37,226	5	62	59	41,744	43,867	5	94	69	90,781	123,672	3
Agricultural supply retail sales and services	137	110	94,728	117,979	4	106	92	80,320	92,543	2	176	130	128,921	174,539	1
Subtotal	206	---	------	155,205		168	---	------	136,410		270	---	-------	298,211	
Agribusiness Output Firms															
Lumber and wood products	81	a	a	162,995[b]	2	62	53	31,179	36,474	6	63	44	40,017	57,297	5
Food processors and assemblers	39	24	246,309	400,252	1	39	31	86,002	108,196	1	17	12	11,459	16,234	6
Livestock markets	13	9	22,861	33,021	6	13	13	47,108	47,108	4	27	19	63,744	90,584	4
Nursery and landscape services	8	8	3,958	3,958	7	8	5	1,570	2,512	7	6	2	1,300	3,900	7
Field crop handlers, manufacturers, and wholesalers	26	20	91,230	118,599	3	38	35	61,008	66,737	3	130	126	130,487	134,632	2
Subtotal	167	---	------	718,825		160	---	------	261,027		243	---	-------	302,647	
Total	373	---	------	874,030		328	---	------	397,437		513	---	-------	600,858	

[a] Omitted to avoid disclosure of individual firm data.

[b] Gross sales of atypical firms were excluded during the adjustment procedure. After adjustments were completed, atypical firm data were added to the estimates.

TABLE II-7

ESTIMATED AGRIBUSINESS CAPITAL INVESTMENT WITH RANK OF IMPORTANCE BY AREA AND NATURE OF BUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee					Middle Tennessee					West Tennessee				
	Firms	Respondents	Capital Investment of Respondents	Estimated Capital Investment	Rank	Firms	Respondents	Capital Investment of Respondents	Estimated Capital Investment	Rank	Firms	Respondents	Capital Investment of Respondents	Estimated Capital Investment	Rank
	----number-----		-thousand dollars-			----number-----		-thousand dollars-			----number-----		-thousand dollars-		
Agribusiness Input Firms															
Farm machinery and equipment dealers sales and service	69	53	9,503	12,372	4	62	58	14,106	15,079	4	94	75	20,989	26,306	4
Agricultural supply retail sales and services	137	103	32,200	42,829	3	106	90	23,542	28,512	1	176	145	36,829	44,703	1
Subtotal	206	---	-------	55,201		168	---	-------	43,591		270	---	-------	71,009	
Agribusiness Output Firms															
Lumber and wood products	81	a	a	216,229[b]	1	62	57	13,470	14,652	5	63	47	19,888	26,658	3
Food processors and assemblers	39	31	40,605	51,085	2	39	33	15,584	18,417	3	17	9	3,860	7,291	5
Livestock markets	13	9	3,070	4,434	6	13	10	1,200	1,560	6	27	19	1,402	1,992	6
Nursery and landscape services	8	8	1,443	1,443	7	8	5	750	1,200	7	6	3	475	950	7
Field crop handlers, manufacturers, and wholesalers	26	18	5,311	7,671	5	38	35	21,975	23,858	2	130	105	29,300	36,276	2
Subtotal	167	---	------	280,862		160	---	-------	59,687		243	---	-------	73,167	
Total	373	---	------	336,862		328	---	-------	103,278		513	---	-------	144,176	

[a]Omitted to avoid disclosure of individual firm data.

[b]Capital investment of atypical firms were excluded during the adjustment procedure. After adjustments were completed, atypical firm data were added to the estimates.

to farmland[26] was largest with $156 of agribusiness products (bought and sold) per acre of farmland (Table II-8). The area was second when compared on the basis of gross agribusiness per farmer of $14,520.[27]

Middle Tennessee

Middle Tennessee had the least agribusiness activity of the three. Middle Tennessee agribusiness employed 5,433 persons and paid $31.3 million in wages and salaries. The volume of gross sales was $397.4 million with $103.3 million of capital investment. In Middle Tennessee 65 percent of agribusiness gross sales or $261.0 million of products were sold by agribusiness output firms. Capital investment totaled $59.7 million, and 3,291 workers were paid $21,4 million in wages and salaries. Agribusiness input firms sold $136.4 million of products, owned $43.6 million in capital assets, employed 1,512 workers and paid $9.9 million in wages. On a per acre or per farmer basis Middle Tennessee was ranked third in both with $12,141 of gross sales of agribusiness per farmer and $84 of gross agribusiness sales per acre of farmland.

West Tennessee

West Tennessee had the largest number of agribusiness firms. The 513 companies handled 32 percent of State agribusiness sales with

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[26] County and City Data Book, 1972, U.S. Department of Commerce, Bureau of Census (Washington, D.C.: Government Printing Office, 1973), pp. 436 and 448.

[27] Ibid.

TABLE II-8

VOLUME OF AGRIBUSINESS GROSS SALES IN RELATION TO NUMBER OF FARMERS AND NUMBER OF ACRES OF FARMLAND BY AREA AND NATURE OF BUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE

Nature of Business	Agribusiness Gross Sales					
	East Tennessee		Middle Tennessee		West Tennessee	
	Per Farmer[a]	Per Acre of Farmland[a]	Per Farmer[a]	Per Acre of Farmland[a]	Per Farmer[a]	Per Acre of Farmland[a]
	dollars					
Agribusiness Input Firms						
Farm machinery and equipment dealers, sales and service	618.42	6.66	1,340.10	9.31	4,342.87	25.98
Agricultural supply retail sales and services	1,959.95	21.12	2,827.12	19.64	6,129.12	36.67
Subtotal	2,578.37	27.78	4,167.22	28.95	10,471.99	62.65
Agribusiness Output Firms						
Lumber and wood products	2,707.78	29.18	1,114.25	7.74	2,012.04	12.04
Food processors and assemblers	6,649.26	71.65	3,305.31	22.97	570.08	3.41
Livestock markets	578.57	5.91	1,439.12	10.00	3,180.95	19.03
Nursery and landscape services	65.75	.71	76.74	.53	136.95	.82
Field crop handlers, manufacturers, and wholesalers	1,970.24	21.23	2,038.77	14.16	4,727.75	28.28
Subtotal	11,941.60	128.68	7,974.19	55.40	10,627.77	63.58
Total	14,519.97	156.46	12,141.41	84.35	21,099.76	126.23

[a]Agribusiness survey data were divided by the number of farmers and the number of acres of farmland which were taken from County and City Data Book, 1972, U. S. Department of Commerce, Bureau of Census (Washington, D. C.: Government Printing Office, 1973), pp. 436 and 448.

a total volume of $600.9 million. Capital investment was $144.2 million. Agribusiness employed 7,488 persons and had payrolls of $33.8 million.

In West Tennessee agribusiness input firms and agribusiness output firms were almost equally matched in terms of gross sales. Agribusiness input firms sold $298.2 million in goods and services while agribusiness output firms sold $302.6 million. Capital investment was larger among agribusiness output firms which owned $73.2 million in capital assets as compared to $71.0 million held by input firms. West Tennessee agribusiness output firms employed 5,081 workers and paid $18.9 million in wages and salaries. Agribusiness input firms employed 2,407 workers and paid $14.9 million in wages and salaries.

With a total of $21,099 per farmer, West Tennessee had the largest gross agribusiness sales on a per farmer basis. The area was second on a per acre basis with $126 per acre of farmland.

Distribution of Agribusiness Firms

Most of the various types of agribusiness firms were distributed proportionately across the State. For instance farm machinery firms accounted for about the same proportion of agribusiness firms in East Tennessee as in Middle and West Tennessee. In East Tennessee 18.4 percent of all agribusiness firms were farm machinery dealers, 18.9 percent were farm machinery dealers in Middle Tennessee, and 18.3 percent were farm machinery dealers in West Tennessee. There were, however, a few sectors which seemed to congregate in certain regions. Field

crop handlers for instance made up 25 percent of all firms in West Tennessee but only 11.5 percent and 6.9 percent in Middle and East Tennessee. Lumber and wood products firms were more numerous in East Tennessee where 21.7 percent of all agribusiness firms were in the category compared to 18.9 percent in Middle Tennessee and 12.2 percent in West Tennessee.

Middle Tennessee had the largest proportion of food processors and assemblers with 11.8 percent compared to 10.4 percent in East Tennessee and 3.3 percent in West Tennessee.

Agribusiness Trade Area

East Tennessee agribusiness firms conducted business in a wider area than did firms in Middle and West Tennessee. Agribusiness in the area handled more out-of-state and international trade than either Middle or West Tennessee (Table II-9). The remaining agribusiness trade area data was comparable in all areas.

TABLE II-9

TRADE AREA OF AGRIBUSINESS FIRMS BY NATURE OF BUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	Volume of Business																	
	East Tennessee						Middle Tennessee						West Tennessee					
	County	Adjacent Counties	Rest of the State	Rest of the Nation	International	Total	County	Adjacent Counties	Rest of the State	Rest of the Nation	International	Total	County	Adjacent Counties	Rest of the State	Rest of the Nation	International	Total
	percent																	
Agribusiness Input Firms																		
Farm machinery and equipment dealers sales and service	53.7	35.6	6.4	4.2	0.1	100	63.7	24.6	4.2	7.5	0.0	100	58.2	30.6	4.6	7.6	0.0	100
Agricultural supply retail sales and services	74.5	20.1	1.7	2.2	1.5	100	76.4	18.0	1.6	4.0	0.0	100	76.4	16.9	3.5	3.2	0.0	100
Agribusiness Output Firms																		
Lumber and wood products	42.0	30.6	12.0	14.0	1.4	100	63.9	26.0	6.5	2.7	0.9	100	55.8	33.5	7.6	3.1	0.0	100
Food processors and assemblers	39.3	20.6	13.6	25.5	0.0	100	64.5	20.6	6.5	7.4	0.0	100	42.1	23.5	17.6	16.8	0.0	100
Livestock markets	46.8	43.2	6.8	3.2	0.0	100	49.7	34.5	5.8	10.0	0.0	100	40.1	52.0	5.4	2.5	0.0	100
Nursery and landscape services	17.8	17.5	14.6	51.1	0.0	100	75.5	2.6	0.0	21.9	0.0	100	13.3	18.1	5.1	63.5	0.0	100
Field crop handlers, manufacturers, and wholesalers	52.6	28.4	8.3	9.4	1.3	100	80.0	16.7	1.5	1.8	0.0	100	48.5	35.2	7.9	8.0	0.5	100

CHAPTER III

MULTIPLIERS

A. ORIGIN OF MULTIPLIERS

The agribusiness survey showed the direct impact and importance of agribusiness in the Tennessee economy. There were, however, secondary effects which if ignored would result in an underestimate of the magnitude of the agribusiness industry. To determine the indirect affects of agribusiness, multipliers were adapted from input-output analysis completed by Wilson[28] in 1968 and Lee[29] in 1967. Wilson's project was concerned with the derivation of multipliers which showed direct and indirect changes in dollars of output brought about by a one unit change in final demand for the products of a particular sector. Lee's study determined multipliers which showed direct and indirect changes in number of employees caused by a one unit change in final demand for the products of a sector. Wilson's multipliers were referred to as unit output multipliers; Lee's were called employment impact multipliers.

B. TYPE OF MULTIPLIERS

Adapted Employment and Adapted Output Multipliers

Wilson and Lee computed the various multipliers according to specific categories or sectors. Unless altered the multipliers were

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[28] Wilson, pp. 44 and 77-79.

[29] Lee, Moore, and Lewis, pp. 57-59 and 71.

valid only if the firms in another study were identically categorized as set forth by Wilson or Lee. Because the objectives of the agribusiness project and the studies by Wilson and Lee were slightly different, the various agribusiness categories were sectored in a manner similar to Wilson or Lee.

Basically, there were two types of sectorial variations.

1. The agribusiness study placed two or more Wilson and/or Lee sectorial groups in one agribusiness sector. Such a variation meant that two or more multipliers would be combined in order to better represent economic impacts of agribusiness firms.
2. The agribusiness study contained sectors which were only small portions of Wilson and/or Lee sectors. Wilson or Lee multipliers showed economic activity for firms not found in the agribusiness sectoral group.

To make the Wilson and Lee multipliers compatable with the agribusiness data, the following adaptations were made.

First, multipliers were developed by weighting the existing multipliers by sectorial gross domestic outputs or employment totals taken from appropriate flow tables[30] in either Wilson's[31] of Lee's[32] analysis.

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[30]Flow tables show the movement of goods and services from one sector to all other economic sectors within the economy. The total sales made by a sector is the sector's gross domestic output. The flow table also shows the total number of employees due to the sector's existence. For further explanation see Wilson, "An Interindustry Analysis . . . ," pp. 5-8.

[31]Wilson, pp. 120-122 and pp. 130-133.

[32]Lee, Moore, and Lewis, pp. 129-133 and pp. 146-175.

For example, it was necessary to combine the employment impact multipliers for wholesale and retail trade and the multiplier for food and tobacco products in order to determine the appropriate employment impact multiplier for food processors and assemblers. Wholesale and retail trade had an employment impact multiplier[33] of 1.1203858 and a total of 208,200 workers.[34] Food and tobacco products had a multiplier of 2.9065024 and a total of 34,100 employees. An adapted multiplier of 1.3717542 was obtained, by multiplying each multiplier times the number of employees in a sector, adding the products, and dividing the total by the number of employees in both sectors.

Similarly, other multipliers were developed. The second variation necessitated the assumption that firms in the subject sector, in terms of direct and indirect impacts, were typical of all the companies in the larger sectorial grouping. For example, Lee included agricultural supply firms in the wholesale and retail sales grouping. To expect reliable results from the application of the wholesale multiplier for agricultural supply firms, it was assumed that a one unit increase in the employment of agricultural supply companies was as likely to increase employment by the magnitude of the wholesale multiplier as were any of the other companies classified under wholesale and retail trade.

The adapted Wilson unit output multipliers and adapted Lee employment impact multipliers were designed to determine the direct and

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[33] Ibid., p. 71

[34] Ibid., pp. 129-133.

indirect impact on the economy of a unit increase in final demand for the goods of the sectors under study.

Table III-1 shows statewide adapted Wilson unit output multipliers and statewide adapted Lee employment impact multipliers used in the study.

Table III-2 shows regional adapted multipliers which were adjusted from Wilson's and Lee's multipliers.

Modified Employment and Modified Output Multipliers

Since adapted multipliers included the increase in employment and output of a sector caused by an increase in the same sector, they could not be applied when agribusiness magnitudes for the 1974 economy were desired. For part of the project the adapted Wilson unit output multipliers and the adapted Lee employment impact multipliers were modified to avoid overestimation of the magnitude of agribusiness. The modified multipliers could then be multiplied by agribusiness output and agribusiness employment to show direct and indirect output and employment associated with agribusiness.

The new multipliers, hereafter referred to as modified unit output multipliers and modified employment impact multipliers, were computed from Wilson and Lee interdependence coefficients.[35] The sectorial multiplier was divided by that sector interdependence coefficient.

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[35]Interdependence coefficients measure direct and indirect relationships between the various sectors. In essence the coefficients are portions of the multipliers. When all the interdependence coefficients for a particular sector are totaled, the sum is the sector multiplier. See Wilson, "An Interindustry Analysis . . .," pp. 9-12.

TABLE III-1

ADAPTED[a] AND MODIFIED[b] EMPLOYMENT IMPACT MULTIPLIERS AND UNIT OUTPUT MULTIPLIERS BY NATURE OF BUSINESS, TENNESSEE

Nature of Business	Adapted Employment[c] Impact Multipliers	Adapted Unit[d] Output Multipliers	Modified Employment[c] Impact Multipliers	Modified Unit[d] Output Multipliers
Agricultural Supply Firms				
Farm machinery and equipment dealers sales and service	1.1203858	1.0924480	1.1093704	1.0816437
Agricultural supply retail sales and services	1.1203858	1.1817180	1.1093704	1.1442627
Agricultural Output Firms				
Lumber and wood products	1.0940963	1.1776463	1.0823748	1.1628898
Food processors and assemblers	1.3717542	1.5450987	1.3589735	1.4864152
Livestock markets	1.1203858	1.0924480	1.1093704	1.0816437
Nursery and landscape services	1.1203858	1.0924480	1.1093704	1.0816437
Field crop handlers, manufacturers and wholesalers	1.1203858	1.0929387	1.1093704	1.0815257

[a]For adaptation procedure page 40.

[b]For modification procedure see page 42.

[c]From Tong Hun Lee, John R. Moore, and David P. Lewis, A Report on the Tennessee Interindustry Survey (Knoxville: University of Tennessee, Knoxville, 1967), pp. 57-59 and 71.

[d]From Charles MacArther Wilson, "An Interindustry Analysis of Tennessee with Emphasis on Agriculture" (Ph.D. dissertation, University of Tennessee, Knoxville, 1967), pp. 44 and 77-79.

TABLE III-2

ADAPTED AND MODIFIED EMPLOYMENT IMPACT MULTIPLIERS AND UNIT OUTPUT MULTIPLIERS BY NATURE OF BUSINESS, EAST, MIDDLE, AND WEST TENNESSEE

Nature of Business	Adapted Employment Impact Multipliers			Adapted Unit Output Multipliers			Modified Employment Impact Multipliers			Modified Unit Output Multipliers		
	East	Middle	West	East	Middle	West	East	Middle	West	East	Middle	West
Agribusiness Input Firms												
Farm machinery and equipment dealers sales and services	1.16479	1.19943	1.07056	1.11245	1.13090	1.05310	1.15545	1.17392	1.06431	1.10448	1.10684	1.04715
Agricultural supply retail sales and services	1.16479	1.19943	1.07056	1.17070	1.17109	1.09400	1.15545	1.17392	1.06431	1.19787	1.12663	1.08187
Agribusiness Output Firms												
Lumber and wood products	1.26667	1.08902	1.04416	1.21580	1.07026	1.04633	1.26073	1.08291	1.02541	1.40498	1.06522	1.02516
Food processors and assemblers	1.37601	1.53647	1.34229	1.37370[a]	1.51260[a]	1.12633[a]	1.35327	1.37696	1.33692	1.37370[b]	1.51261[b]	1.12633[b]
Livestock markets	1.16479	1.19943	1.07056	1.11245	1.13090	1.05311	1.15545	1.17392	1.06431	1.10448	1.10684	1.04715
Nursery and landscape services	1.16479	1.19943	1.07056	1.11245	1.13090	1.05311	1.15545	1.17392	1.06431	1.10448	1.10684	1.04715
Field crop handlers, manufacturers, and wholesalers	1.16479	1.19943	1.07056	1.18795[a]	1.25098[a]	1.07465[a]	1.15545	1.17392	1.06431	1.18228[b]	1.23448[b]	1.07045[b]

[a]These multipliers were adapted either totally or in part from multipliers for a condensed agricultural processing sector. The adapted multipliers may, therefore, cause a slight miscalulation of agribusiness impact. All other multipliers were adapted from more specific regional multipliers.

[b]Because no interdependence coefficients were available for the agricultural processing sector which made up all or part of the multiplier, only a portion of the multiplier was modified.

The calculation removed the impact of the deliveries the sector made to itself.[36] For example, livestock markets had a statewide Wilson unit multiplier of 1.0924480.[37] The interdependence coefficient associated with purchases of firms of that sector from firms of the same sector was 1.00998880.[38] Division resulted in a modified unit output multiplier of 1.0816436.

Table III-1 shows statewide modified multipliers. Table III-2 shows regional modified multipliers. Because interdependence coefficients were not available, the agriculture processing multiplier was not modified; therefore, the magnitudes of agribusinesses by region were overestimated.

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[36] The Star Valley Economy, Research Journal 85 (Laramie: University of Wyoming, 1974), p. 21.

[37] Wilson, p. 44.

[38] Ibid., p. 128.

CHAPTER IV

IMPACT AND IMPORTANCE OF AGRIBUSINESS IN THE TENNESSEE ECONOMY

A. DIRECT, INDIRECT, AND TOTAL IMPACT OF AGRIBUSINESS IN THE TENNESSEE ECONOMY

To determine the degree of economic activity in 1974, the survey data concerning employment, payroll, gross sales, and capital investment of each agribusiness sector were multiplied by the modified multipliers for each respective sector. Agribusinesses were segregated into two categories one consisting of agribusiness input firms (firms which supply inputs to farmers) and another containing figures for agribusiness output firms (firms which buy farm commodities). The figures for agribusiness input firms were subtotaled, and the figures for agribusiness output firms were subtotaled. These subtotals represent agribusiness impacts upon the Tennessee economy made by either agribusiness input firms or agribusiness output firms. When the subtotals were added, the results showed the total[39] impact of agribusiness upon the Tennessee economy.

Tennessee Agribusiness Employment and Payroll

The total number of workers in Tennessee associated with agribusiness either directly or indirectly was 30,960 persons (Table IV-1).

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[39]Total agribusiness impacts found in this manner were overestimated because the multiplier effect double counts some of the interactions and linkages between agribusiness input firms and agribusiness output firms.

TABLE IV-1

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS EMPLOYMENT AND PAYROLL WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS IN TENNESSEE, 1974

Nature of Business	Employment				Payroll[a]			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	number				thousand dollars			
Agribusiness Input Firms								
Farm machinery and equipment dealers sales and services	2,047	224	2,271	5	14,118	1,544	15,662	4
Agricultural supply retail sales and services	3,656	400	4,056	3	34,795	3,806	38,601	3
Subtotal	5,703	624	6,327		48,913	5,350	54,263	
Agribusiness Output Firms								
Lumber and wood products	8,981	740	9,721	1	87,177	7,181	94,358	1
Food processors and assemblers	7,113	2,553	9,666	2	62,386	22,395	84,781	2
Livestock markets	960	105	1,065	6	1,914	209	2,123	6
Nursery and landscape services	264	29	293	7	1,463	160	1,623	7
Field crop handlers, manufacturers, and wholesalers	3,505	383	3,888	4	12,401	1,356	13,757	5
Subtotal	20,823	3,810	24,633		165,341	31,301	196,642	
Total[b]	26,526	4,434	30,960		214,254	36,651	250,905	

[a] Direct, indirect, and total payroll was computed with employment multipliers.

[b] When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

In other words 30,960 employees worked either for an agribusiness firm or for one of the firms in the sequence of companies which supply goods or services directly or indirectly to agribusiness firms. Employment in agribusiness firms totaled 26,526 persons with 4,434 persons holding jobs in non-agribusiness economic sectors. Agribusiness input and related firms employed a total of 6,327 workers while agribusiness output and related firm supplied 24,633 jobs.

Assuming that wages in agribusiness industries were comparable to wages in indirectly related industries, the total payroll associated with agribusiness and related industries was $250.9 million (Table IV-1).[40] Of the total, $36.7 million was paid by indirectly related industries while $214.3 million was paid directly through agribusiness payrolls. Agribusiness output and related firms paid $196.6 million while agribusiness input and related firms paid $54.3 million in wages and salaries.

Most agribusiness workers were employed by wood products and food processing sectors. These sectors accounted for 62.6 percent of direct and indirect agribusiness and related employment. Wood product companies contributed the highest number of jobs to the Tennessee economy with 8,981 persons employed directly, and 740 persons in associated firms for a total employment of 9,721 persons. Lumber and wood product firms had $94.4 million in wages and salaries. Lumber and

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[40] Direct, indirect, and total payroll was computed with employment multipliers under the assumption that an increase in jobs will have a corresponding increase in payrolls.

wood product payrolls amounted to $87.2 million while associated companies added $7.2 million.

Food processors and assemblers employed 7,113 workers directly and because of the large multiplier, accounted for 2,553 associated jobs for a total of 9,666 jobs. The sector accounted for a total of $84.8 million in wages and salaries.

The next largest sector, agricultural supply, accounted for 13.1 percent of agribusiness employment for a total of 4,056 agribusiness and associated jobs. The payroll totaled $38.6 million with $34.8 million direct and $3.8 million indirect salaries and wages.

Field crop handlers accounted for 3,888 Tennessee jobs and $13.8 million in wages and salaries to be ranked fourth in employment and fifth in payroll. The employment associated with field crop handlers but not employed directly by agribusiness was 383 persons.

Fifth in direct and associated agribusiness employment was farm machinery and equipment dealers. The sector contributed 7 percent to agribusiness employment with 2,047 persons employed for farm machinery companies and 224 indirectly associated with the sector for a total of 2,271 wage earners.

Employees for farm machinery dealers received somewhat higher wages per worker than did those working for field crop handlers. Farm machinery dealers paid $14.1 million in direct payrolls and had associated payrolls of $1.5 million for a total of $15.7 million.

Livestock markets and nursery wholesalers and landscape services together contributed the remaining 4 percent to total agribusiness and associated employment. Livestock markets added 1,065 jobs and paid $2.1 million in wages and salaries.

Salaries were higher per worker in the nursery sector than in livestock markets because the category had a larger percentage full-time employees. The sector had 293 workers and paid $1.6 million in wages.

Tennessee Agribusiness Gross Sales and Capital Investment

Direct and indirect gross sales associated with Tennessee agribusiness amounted to $2.2 billion (Table IV-2). The indirect sales associated with agribusiness accounted for 23.6 percent of the total or $410.2 million. The total capital investment[41] was $690.4 million assuming indirectly related firms had capital investment which were similar to capital investment of agribusiness firms. Eighteen percent, or $106.9 million, was invested in firms which were indirectly related to agribusiness companies while the remainder $583.5 million were capital assets held directly by agribusiness companies (Table IV-2). Agribusiness input and related firms sold a total of $662.1 million of goods and services and had $190.9 million invested in capital assets. Agribusiness output and related firms sold $1.6 billion and had capital assets of $499.5 million.

Food processors and assemblers, though second in number of employees, accounted for 39 percent of agribusiness sales with total direct and indirect sales of $779.9 million. This sector ranked second in assets with $76.7 million in direct agribusiness assets and

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[41]Direct, indirect, and total capital investment was computed with gross sales multipliers under the assumption that an increase in gross sales will cause corresponding increases in capital investment.

TABLE IV-2

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS GROSS SALES AND CAPITAL INVESTMENT WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS IN TENNESSEE, 1974

Nature of Business	Gross Sales				Capital Investment[a]			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	------thousand dollars------				------thousand dollars-------			
Agribusiness Input Firms								
Farm machinery and equipment dealers sales and services	204,765	16,718	221,483	5	53,757	4,389	58,146	5
Agricultural supply retail sales and services	385,061	55,588	440,649	2	116,044	16,752	132,796	2
Subtotal	589,826	72,306	662,132		169,801	21,141	190,942	
Agribusiness Output Firms								
Lumber and wood products	256,766	41,825	298,591	4	257,539	41,950	299,489	1
Food processors and assemblers	524,682	255,213	779,895	1	76,794	37,354	114,148	3
Livestock markets	170,713	13,938	184,651	6	7,987	652	8,639	6
Nursery and landscape services	10,370	847	11,217	7	3,593	293	3,886	7
Field crop handlers, manufacturers, and wholesalers	319,468	26,045	345,513	3	67,806	5,528	73,334	4
Subtotal	1,281,999	337,868	1,619,867		413,719	85,777	499,496	
Total[b]	1,871,825	410,174	2,281,999		583,520	106,918	690,438	

[a]Direct, indirect, and total capital investment was computed with gross sales (output) multipliers.

[b]When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

$37.4 million in capital assets held by associated industries.

Agricultural supply and indirect related firms sold $440.6 million of goods and services. The sector accounted for 18 percent of agribusiness output with direct sales of $385.1 million and $55.6 million indirect sales. Firms in this sector had $116.0 million in capital assets. Indirectly related firms added $16.8 million for a total of $132.8 million of capital invested.

Field crop handlers and indirectly related companies were third in sales with a total of $345.5 million. This category had $73.3 million of total capital assets.

Lumber companies and wood using firms, though first in number of employees, was fourth in gross sales. This sector sold $256.8 million directly from agribusiness and $41.8 million indirectly for a total of $298.6 million. This category had the largest capital investment with a total of $299.5 million.

Ranked fifth, farm machinery dealers accounted, either directly or indirectly, for $221.5 million of merchandise and services. The firms and associated companies had direct and indirect capital assets of $58.1 million.

Livestock market and nursery wholesalers were again ranked sixth and seventh respectively with livestock and related output of $184.7 million of sales, and nursery and related firms totaling $11.2 million of gross sales. These sectors had capital assets of $8.6 million for livestock markets and $3.9 million for nursery and landscape services.

Regional Agribusiness Employment and Payroll

Because of the different multipliers and different direct impacts of agribusiness in the three areas of the State, the total impact of the various types of agribusinesses also differed. For example, agribusiness and related firms had the greatest impact in East Tennessee.

In East Tennessee direct and indirect employment totaled 17,309 jobs as compared to 8,048 in West Tennessee and 6,548 in Middle Tennessee (Table IV-3). Agribusiness firms in East Tennessee had the largest percentage of indirect employment associated with it. For instance, 23 percent of total agribusiness employment in East Tennessee was with firms which catered indirectly to agribusiness firms. Middle Tennessee had indirect impacts of 19 percent while West Tennessee had only 6 percent.

Payroll was greatest in East Tennessee where $189.4 million were paid in salaries and wages (Table IV-4). Middle Tennessee agribusiness and related firms paid $38.5 million and West Tennessee firms had a $36.1 million agribusiness and related payroll for the year.

Regional Agribusiness Gross Sales and Capital Investment

East Tennessee agribusiness output and capital investment were largest among the three regions in gross sales and capital investment. Agribusiness direct and indirect output in East Tennessee was 50 percent of the statewide total for a sales volume of $1.1 billion (Table IV-5). Twenty-three percent or $268.3 million of sales could be attributed to indirectly related firms while $874.0 million were sales made by agribusiness firms.

TABLE IV-3

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS EMPLOYMENT WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee				Middle Tennessee				West Tennessee			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	number				number				number			
Agribusiness Input Firms												
Farm machinery and equipment dealers sales and services	518	81	599	5	601	105	706	5	928	60	988	4
Agricultural supply retail sales and services	1,267	197	1,464	3	911	158	1,069	4	1,479	95	1,574	3
Subtotal	1,785	278	2,063		1,512	263	1,775		2,407	155	2,562	
Agribusiness Output Firms												
Lumber and wood products	5,455	1,422	6,877	2	1,245	103	1,348	2	2,281	58	2,339	1
Food processors and assemblers	5,111	1,806	6,917	1	1,392	525	1,917	1	611	206	817	5
Livestock markets	397	62	459	6	176	31	207	6	387	25	412	6
Nursery and landscape services	115	18	133	7	84	15	99	7	65	4	69	7
Field crop handlers, manufacturers, and wholesalers	744	116	860	4	1,024	178	1,202	3	1,737	112	1,849	2
Subtotal	11,822	3,424	15,246		3,921	852	4,773		5,081	405	5,486	
Total[a]	13,607	3,702	17,309		5,433	1,115	6,548		7,488	560	8,048	

[a]When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

TABLE IV-4

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS PAYROLL[a] WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee				Middle Tennessee				West Tennessee			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	thousand dollars				thousand dollars				thousand dollars			
Agribusiness Input Firms												
Farm machinery and equipment dealers sales and services	3,740	581	4,321	5	3,894	667	4,501	4	6,544	421	6,965	3
Agricultural supply retail sales and services	20,401	3,171	23,572	3	6,037	1,050	7,087	3	8,357	537	8,894	2
Subtotal	24,141	3,752	27,893		9,871	1,717	11,588		14,901	958	15,859	
Agribusiness Output Firms												
Lumber and wood products	70,773	18,453	89,226	1	6,557	544	7,101	2	9,847	250	10,097	1
Food processors and assemblers	48,876	17,266	66,142	2	11,556	4,356	15,912	1	1,955	659	2,614	5
Livestock markets	474	74	548	7	433	75	508	6	1,007	65	1,072	6
Nursery and landscape services	745	116	861	6	248	43	291	7	470	30	500	7
Field crop handlers, manufacturers, and wholesalers	4,131	642	4,773	4	2,632	458	3,090	5	5,638	363	6,001	4
Subtotal	124,999	36,551	161,550		21,426	5,476	26,902		18,917	1,367	20,284	
Total[b]	149,140	40,303	189,443		31,297	7,193	38,490		33,818	2,325	36,143	

[a]Direct, indirect, and total payroll was computed with employment multipliers.

[b]When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

TABLE IV-5

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS GROSS SALES WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee				Middle Tennessee				West Tennessee			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	-----thousand dollars-----				-----thousand dollars-----				-----thousand dollars-----			
Agribusiness Input Firms												
Farm machinery and equipment dealers sales and services	37,226	3,889	41,115	5	43,867	4,687	48,554	5	123,672	5,831	129,503	3
Agricultural supply retail sales and services	117,979	23,345	141,324	3	92,543	11,719	104,262	2	174,539	14,290	188,829	1
Subtotal	155,205	27,234	182,439		136,410	16,406	152,816		298,211	20,121	318,332	
Agribusiness Output Firms												
Lumber and wood products	162,995	66,010	229,005	2	36,474	2,379	38,853	6	57,297	1,442	58,739	5
Food processors and assemblers	400,252	149,574	549,826	1	108,196	55,462	163,658	1	16,234	2,051	18,285	6
Livestock markets	33,021	3,450	36,471	6	47,108	5,033	52,141	4	90,584	4,271	94,855	4
Nursery and landscape services	3,958	414	4,372	7	2,512	268	2,780	7	3,900	184	4,084	7
Field crop handlers, manufacturers, and wholesalers	118,599	21,618	140,217	4	66,737	15,649	82,386	3	134,632	9,485	144,117	
Subtotal	718,825	241,066	959,891		261,027	78,792	339,818		302,647	17,433	320,080	
Total[a]	874,030	268,300	1142,330		397,437	95,198	492,634		600,858	37,554	638,412	

[a]When agribusiness input firms and agribusiness output firms were totaled an unascertained amount of double counting was present due to linkages and interactions among the various sectors.

West and Middle Tennessee were second and third in gross sales with $492.6 million of agribusiness and indirect sales in Middle Tennessee and $638.4 million in West Tennessee. The percent of total sales per region attributable to indirectly related firms, was similar to the percent of indirect employment per region with 19 percent of total sales, $95.2 million in Middle Tennessee and 6 percent or $37.6 million in West Tennessee.

East Tennessee agribusiness and related firms accounted for 62 percent of the agribusiness and indirectly related capital assets for a total capital investment of $454.5 million (Table IV-6). Of the total, $336.1 million was held by agribusiness firms while $118.4 million was held by related companies. As with sales, indirect capital investments were greatest in East Tennessee. Twenty-six percent of the total capital investment was held by related companies.

West Tennessee was second in capital investment with total capital assets of $153.4 million; $9.2 million of which was attributed to indirectly related forms. Indirect capital assets contributed 6 percent to total capital investment.

Middle Tennessee agribusiness firms had the least money invested in capital assets. Total capital investment was $124.8 million with $103.3 million held by agribusiness firms and $21.5 million held by indirectly related forms. Total assets controlled by related companies was 19 percent.

B. ECONOMIC IMPACT OF A 10 PERCENT INCREASE IN AGRIBUSINESSES

Impact on Economic Activity of a 10 Percent Increase of Agribusiness

Over the recent past the Tennessee economy and most of the various sectors have undergone considerable expansion. Assuming the

TABLE IV-6

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS CAPITAL INVESTMENT[a] WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee				Middle Tennessee				West Tennessee			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	-----thousand dollars------				-----thousand dollars-----				-----thousand dollars-----			
Agribusiness Input Firms												
Farm machinery and equipment dealers sales and services	12,372	1,293	13,665	4	15,079	1,611	16,690	4	26,306	1,240	27,546	3
Agricultural supply retail sales and services	42,829	8,475	51,304	3	28,512	3,610	32,122	1	44,703	3,660	48,363	1
Subtotal	55,201	9,768	64,969		43,591	5,221	48,816		71,009	4,900	75,909	
Agribusiness Output Firms												
Lumber and wood products	216,229	87,568	303,797	1	14,652	956	15,608	5	26,658	671	27,329	4
Food processors and assemblers	51,085	19,090	70,175	2	18,417	9,441	27,858	3	7,291	921	8,212	5
Livestock markets	4,434	463	4,897	6	1,560	167	1,727	6	1,992	94	2,086	6
Nursery and landscape services	1,443	151	1,594	7	1,200	128	1,328	7	950	45	995	7
Field crop handlers, manufacturers, and wholesalers	7,671	1,398	9,069	5	23,858	5,594	29,452	2	36,276	2,556	38,832	2
Subtotal	280,862	108,670	389,532		59,687	16,286	75,969		73,167	4,287	77,454	
Total[b]	336,063	118,438	454,501		103,278	21,507	124,785		144,176	9,187	153,363	

[a]Direct, indirect, and total capital investment was computed with gross sales (output) multipliers.

[b]When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

increases will continue, it is possible to estimate the total change in Tennessee caused by a given percentage change in Tennessee agribusiness. In this study a 10 percent increase in agribusiness was assumed.

In 1974 agribusiness and related companies provided jobs for 30,960 Tennesseans and paid $250.9 million in wages and salaries. After a 10 percent increase in final demand for the products of agribusiness firms, an increase of 3,437 positions for a total of 34,397 jobs with a $278.8 million payroll would be expected (Table B-1 in Appendix B). Volume of gross sales was expected to increase $133.9 million for a total of $2.6 billion of gross sales with total assets of $787.2 million (Table B-2 in Appendix B). All sectors showed different increases depending upon the multipliers; however, each sector retained its overall rank.

Impact on Economic Activity of a 10 Percent Increase in Agribusiness, by Region

Regional changes like statewide changes were basically consistent except for variations caused by the multipliers. East Tennessee had an increase in employment to 19,235 jobs as compared to a total of 7,533 in Middle Tennessee and 8,936 in West Tennessee (Table B-3 in Appendix B). Payroll increases were consistent with employment increases for totals of $210.4 million in East Tennessee, $44.8 million in Middle Tennessee and $40.1 million in West Tennessee (Table B-4 in Appendix B). Output amounted to $1.2 billion in East Tennessee, $550.3 million in Middle Tennessee and $708.0 million in West Tennessee

(Table B-5 in Appendix B). Capital assets ranged from $139.6 million in Middle Tennessee to $453.9 million in East Tennessee (Table B-6 in Appendix B).

Only a few sectors changed rank. In West Tennessee wood users and farm machinery dealers changed places in capital assets, and in Middle Tennessee Agricultural supply and wood users switched places in total payrolls.

CHAPTER V

SUMMARY AND LIMITATIONS

A. SUMMARY

The objectives of the study were to determine the economic activity and employment of Tennessee agribusinesses, and to estimate the total impact and importance of agribusiness firms in the Tennessee economy. The procedure to accomplish the first objective consisted of a survey of agribusiness firms in Tennessee. Missing data was assumed equal to the average and estimated with the aid of a weighted average. The second objective was achieved with the aid of multipliers which were formulated from previous research conducted in separate studies by Wilson and Lee and adapted to the purposes of this project. Two types of multipliers were used. The first type included modified employment and output multipliers which when multiplied by the survey findings gave the direct, indirect, and total impact and importance of agribusiness on the 1974 Tennessee economy. The second type included the adapted employment and output multiplier which showed the direct, indirect, and total impact and importance of agribusiness assuming a 10 percent increase in the sector.

The agribusiness survey showed estimated direct agribusiness gross sales from 1,214 firms equal to $1.9 billion. The companies employed 26,526 workers and paid $214.3 million in wages and salaries. Capital investment amounted $583.5 million. The five agricultural output categories contributed most to the figures with 20,823 workers,

payrolls of $165.3 million, $1.3 billion of gross sales, and $413.7 million of capital investment. Agricultural input firms contributed 5,703 workers, $48.9 million in wages and salaries, $589.8 million in gross sales and $169.8 million of capital investments. Food processors and assemblers was the largest agribusiness sector in the State in terms of gross sales with $524.7 million. Lumber and wood product enterprises ranked first in employment with 8,891 workers.

East Tennessee, with $874 million of gross agribusiness sales and 13,607 employees, had the largest portion of Tennessee agribusiness. West Tennessee, with the most agribusiness firms, was second with $600.9 million of sales and 7,488 workers and, Middle Tennessee was third with $397.4 million of output and 5,433 employees.

West Tennessee, on a per farmer basis, was first in gross sales with $21,099 per farmer. East and Middle Tennessee followed with $14,519 per farmer and $12,141 per farmer. When gross sales were compared to the number of acres of farmland, East Tennessee was ranked first with $156 per acre. West Tennessee had $126 per acre and Middle Tennessee had $84 per acre.

Indirect contributions of agribusiness increased Gross State Product by $410.2 million and added 4,434 employees to the Tennessee work force. The total impact of agribusiness on Gross State Product was $2.3 billion with $690.4 million capital investment; the total impact of agribusiness on the work force was 30,960 jobs with a payroll of $250.9 million.

Agribusiness output firms contributed more to Gross State Product than did agribusiness input firms. Agricultural output and

related firms had gross sales of $1.6 billion of goods and services, had $499.5 million invested in capital assets, employed 24,633, and paid $196.6 million in wages and salaries. Agricultural input and related firms sold $662.1 million of goods and services, had $190.0 million of capital investment, employed 6,327 persons, and paid $54.2 million of wages and salaries.

The largest indirect impact on Gross State Product was in East Tennessee where total agribusiness sales were 23.5 percent greater than direct agribusiness sales. Middle Tennessee was second with 19.7 percent of total sales attributable to indirect production and West Tennessee was last with indirect contributions of 6 percent. Indirect employment was comparable to the above gross sales figure with 21.4 percent in East Tennessee, 17 percent in Middle Tennessee, and 7 percent in West Tennessee.

With a 10 percent increase in agribusiness the sector contributed $2.6 billion to Gross State Product and accounted for 34,397 jobs. Payroll of agribusinesses and related firms increased to $278.7 million dollars and capital investment reached $787.2 million.

B. LIMITATIONS

This study had limitations which hindered an accurate completion of the objectives. (1) Data collection was so that some unknown number of firms in four complete counties were not surveyed. (2) An unacertained amount of double counting was present because of the nature of the multipliers. (3) The multipliers, though the best

available, were from 1967 studies and were adjusted. (4) Since households were considered exogenous, the increase in economic activity brought about by increased demands for land, labor, capital, and entrepreneural abilities were omitted.

Measurement of the agribusiness sector of the Tennessee economy without the addition to sales employment caused by the sector would be an underestimate. Furthermore, the total impact of the whole agricultural sector without the inclusion of agribusiness would reduce the importance of Tennessee's basic industry.

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APPENDIXES

APPENDIX A

COMPARISON OF AGRIBUSINESS SURVEY DATA WITH PUBLISHED STATISTICS

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COMPARISON OF AGRIBUSINESS SURVEY DATA WITH PUBLISHED STATISTICS

Agribusiness magnitudes and impacts are subject to limitations; however, a reasonable estimate using published statistics could be made to check agribusiness survey data.

Most agricultural inputs were supplied by farm machinery dealers and agricultural supply firms which according to the agribusiness survey had $589.8 million of gross sales. Farm production expenses, excluding hired labor, in 1974 equaled $661.3 million.[42] There is approximately $71.5 million differences in the two figures.

In 1974 the farmer received 43 cents of the market-basked dollar.[43] Agricultural production which amounted to $1,174.5 million including the $170 million in stumpage would have a retail value (market basket value) of $2,731.4 million. Agribusiness output industries had $1,281.8 million in gross sales.

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[42] Tennessee Agricultural Statistics, p. 11.

[43] Handbook of Agriculture Charts, 1975, Department of Agriculture Handbook No. 491 (Washington, D.C.: Government Printing Office, 1975) p. 29.

APPENDIX B

TABLES SHOWING DIRECT, INDIRECT, AND TOTAL IMPACT OF AGRIBUSINESS ASSUMING A 10 PERCENT INCREASE IN AGRIBUSINESS

TABLE B-1

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS EMPLOYMENT AND PAYROLL WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS ASSUMING A 10 PERCENT INCREASE IN AGRIBUSINESS IN TENNESSEE, 1974

Nature of Business	Employment				Payroll[a]			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	number				thousand dollars			
Agribusiness Input Firms								
Farm machinery and equipment dealers sales and services	2,252	271	2,523	5	15,530	1,870	17,400	4
Agricultural supply retail sales and services	4,022	484	4,506	3	38,275	4,608	42,883	3
Subtotal	6,274	755	7,029		53,805	6,478	60,283	
Agribusiness Output Firms								
Lumber and wood products	9,879	929	10,808	1	95,895	9,023	104,918	1
Food processors and assemblers	7,824	2,908	10,732	2	68,624	25,511	94,135	2
Livestock markets	1,056	127	1,183	6	2,105	253	2,358	6
Nursery and landscape services	290	35	325	7	1,609	194	1,803	7
Field crop handlers, manufacturers, and wholesalers	3,856	464	4,320	4	13,641	1,642	15,283	5
Subtotal	22,905	4,463	27,368		181,874	36,623	218,497	
Total[b]	29,179	5,218	34,397		235,679	43,101	278,780	

[a]Direct, indirect, and total payroll was computed with employment multipliers.

[b]When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

TABLE B-2

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS GROSS SALES AND CAPITAL INVESTMENT WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS ASSUMING A 10 PERCENT INCREASE IN AGRIBUSINESS IN TENNESSEE, 1974

Nature of Business	Gross Sales				Capital Investment[a]			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	-----thousand dollars------				-----thousand dollars-------			
Agribusiness Input Firms								
Farm machinery and equipment dealers sales and services	225,242	20,823	246,065	5	59,133	5,467	64,600	5
Agricultural supply retail sales and services	423,567	76,970	500,537	2	127,648	23,196	150,844	2
Subtotal	648,809	97,793	746,602		186,781	28,663	215,444	
Agribusiness Output Firms								
Lumber and wood products	282,443	50,175	332,618	4	283,293	50,326	333,619	1
Food processors and assemblers	577,150	314,604	891,754	1	84,473	59,098	143,571	3
Livestock markets	187,784	17,360	205,144	6	8,785	812	9,597	6
Nursery and landscape services	11,407	1,055	12,462	7	3,152	291	3,443	7
Field crop handlers, manufacturers, and wholesalers	351,415	32,660	384,075	3	74,587	6,932	81,519	4
Subtotal	1,410,199	415,854	1,826,053		454,290	117,459	571,749	
Total[b]	2,059,008	513,647	2,572,655		641,071	146,122	787,193	

[a]Direct, indirect, and total capital investment was computed with gross sales (output) multipliers.

[b]When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

TABLE B-3

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS EMPLOYMENT WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS ASSUMING A 10 PERCENT INCREASE IN AGRIBUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee				Middle Tennessee				West Tennessee			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	number				number				number			
Agribusiness Input Firms												
Farm machinery and equipment dealers sales and services	570	94	664	5	661	132	793	5	1,021	72	1,093	4
Agricultural supply retail sales and services	1,394	230	1,624	3	1,002	200	1,202	4	1,627	115	1,742	3
Subtotal	1,964	324	2,288		1,663	332	1,995		2,648	187	2,835	
Agribusiness Output Firms												
Lumber and wood products	6,001	1,600	7,601	2	1,370	122	1,492	2	2,509	111	2,620	1
Food processors and assemblers	5,622	2,114	7,736	1	1,531	821	2,352	1	672	230	902	5
Livestock markets	437	72	509	6	194	39	233	6	426	30	456	6
Nursery and landscape services	127	21	148	7	92	18	110	7	72	5	77	7
Field crop handlers, manufacturers, and wholesalers	818	135	953	4	1,126	225	1,351	3	1,911	135	2,046	2
Subtotal	13,005	3,942	16,947		4,313	1,225	5,538		5,590	511	6,101	
Total[a]	14,969	4,266	19,235		5,976	1,557	7,533		8,238	698	8,936	

[a]When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

TABLE B-4

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS PAYROLL[a] WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS ASSUMING A 10 PERCENT INCREASE IN AGRIBUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee				Middle Tennessee				West Tennessee			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	-----thousand dollars------				-----thousand dollars-----				-----thousand dollars-----			
Agribusiness Input Firms												
Farm machinery and equipment dealers sales and services	4,114	678	4,792	5	4,217	841	5,058	4	7,198	508	7,706	3
Agricultural supply retail sales and services	22,441	3,698	26,139	3	6,641	1,324	7,965	2	9,193	649	9,842	2
Subtotal	26,555	4,376	30,931		10,858	2,165	13,023		16,391	1,157	17,548	
Agribusiness Output Firms												
Lumber and wood products	77,850	20,760	98,610	1	7,213	642	7,855	3	10,832	478	11,310	1
Food processors and assemblers	53,764	20,216	73,980	2	12,712	6,820	19,530	1	2,151	736	2,887	5
Livestock markets	521	86	607	7	476	95	571	6	1,118	78	1,186	6
Nursery and landscape services	820	135	955	6	273	54	327	7	517	36	553	7
Field crop handlers, manufacturers, and wholesalers	4,554	749	5,293	4	2,895	577	3,472	5	6,202	438	6,640	4
Subtotal	137,499	41,946	179,445		23,569	8,188	31,757		20,810	1,766	22,576	
Total[b]	164,054	46,322	210,376		34,427	10,353	44,780		37,201	2,923	40,124	

[a]Direct, indirect, and total payroll was computed with employment multipliers.

[b]When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

TABLE B-5

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS GROSS SALES WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS ASSUMING A 10 PERCENT INCREASE IN AGRIBUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee				Middle Tennessee				West Tennessee			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	-----thousand dollars-----				-----thousand dollars-----				-----thousand dollars-----			
Agribusiness Input Firms												
Farm machinery and equipment dealers sales and services	40,949	4,607	45,556	5	48,245	6,316	54,570	5	136,039	7,224	143,263	3
Agricultural supply retail sales and services	129,777	22,153	151,930	4	101,797	17,416	119,213	2	191,993	18,047	210,040	1
Subtotal	170,726	26,760	197,486		150,051	23,732	173,783		328,032	25,271	353,303	
Agribusiness Output Firms												
Lumber and wood products	179,295	38,692	217,987	2	40,121	2,819	42,940	6	63,027	2,920	65,947	5
Food processors and assemblers	440,277	164,532	604.809	1	119,016	61,008	180,024	1	17,857	2,256	20,113	6
Livestock markets	36,323	4,085	40,408	6	51,819	6,783	58,602	4	99,642	5,292	104,934	4
Nursery and landscape services	4,354	490	4,844	7	2,763	362	3,125	7	4,290	228	4,518	7
Field crop handlers, manufacturers, and wholesalers	130,459	24,520	154,979	3	73,411	18,425	91,836	3	148,095	11,055	159,150	2
Subtotal	790,708	232,319	1,023,027		287,130	89,397	376,527		332,911	21,751	354,662	
Total[a]	961,434	259,079	1,220,513		437,181	113,129	550,310		660,943	47,022	707,965	

[a]When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

TABLE B-6

DIRECT, INDIRECT, AND TOTAL AGRIBUSINESS CAPITAL INVESTMENT[a] WITH RANK OF IMPORTANCE BY NATURE OF BUSINESS ASSUMING A 10 PERCENT INCREASE IN AGRIBUSINESS IN EAST, MIDDLE, AND WEST TENNESSEE, 1974

Nature of Business	East Tennessee				Middle Tennessee				West Tennessee			
	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank	Direct	Indirect	Total	Rank
	-----thousand dollars-----				-----thousand dollars-----				-----thousand dollars-----			
Agribusiness Input Firms												
Farm machinery and equipment dealers sales and services	13,609	1,530	15,139	4	16,587	2,171	18,758	4	28,937	1,536	30,473	4
Agricultural supply retail sales and services	47,112	8,042	55,154	3	31,363	5,366	36,729	1	49,173	4,622	53,795	1
Subtotal	60,721	9,572	70,293		47,950	7,537	55,487		78,110	6,158	84,268	
Agribusiness Output Firms												
Lumber and wood products	237,852	51,328	289,180	1	16,117	1,133	17,250	5	29,324	1,359	30,693	3
Food processors and assemblers	56,194	21,000	77,194	2	20,259	10,385	30,644	3	8,020	1,013	9,033	5
Livestock markets	4,877	548	5,425	6	1,716	224	1,940	6	2,191	116	2,307	6
Nursery and landscape services	1,587	178	1,765	7	1,320	173	1,493	7	1,045	55	1,100	7
Field crop handlers, manufacturers, and wholesalers	8,438	1,586	10,024	5	26,244	6,587	32,831	2	39,904	2,979	42,883	2
Subtotal	308,948	74,640	383,588		65,656	18,502	84,158		80,484	5,522	86,006	
Total[b]	369,669	84,212	453,881		113,606	26,039	139,645		158,594	11,680	170,274	

[a]Direct, indirect, and total capital investment was computed with gross sales (output) multipliers.

[b]When agribusiness input firms and agribusiness output firms were totaled an unacertained amount of double counting was present due to linkages and interactions among the various sectors.

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