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Economic Impacts of Agriculture and Forestry in Tennessee, 2000

by

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Executive Summary

In 2000, the agro-forestry industrial complex contributed $60.6 billion to the Tennessee economy, accounting for 18.3 percent of the economic activity conducted within the state, and employed 292,000 individuals, or 17.1 percent of the total number of workers. The agro-forestry industrial complex included the primary industries typically associated with agriculture and forest operations such as the growing of crops, the breeding and feeding of livestock, and the management and logging of trees. Also included in the industrial complex were the input supply industries and the value-added sub-sectors, which included food and kindred products manufacturing, apparel and textiles, and forestry products manufacturing.

Agriculture, a subset of the agro-forestry industrial complex in Tennessee, included farming and related industries, as well as value-added food and fiber production, processing and manufacturing. Agriculture accounted for 11.7 percent of the state's economy and generated $38.8 billion in output. Agriculture employed about 214,000 Tennesseans, with 126,000 (both full- and part-time) in agricultural production. In addition,

- Agriculture input supplying industries – agricultural machinery and chemical products – generated nearly $2.6 billion in farm cash receipts annually.

- Tennessee farmers earned more than 62.4 percent of their cash receipts from cattle and calves, cotton, broilers, tobacco, and dairy sales.

- The manufacturing of processed foods added value in excess of $5.3 billion to the state's economy.

- Tennessee merchandise exports from agriculture and forestry production and manufacturing, plus fishing, hunting, and trapping, contributed more close to $2.0 billion, or 17.0 percent, of the states total export base of $11.6 billion.

- Major markets for Tennessee's exports included Canada, Mexico, United Kingdom, and Japan.

This analysis was conducted using the Tennessee Agri-Industry model (TNAIM) and the Impact Analysis for Planning (IMPLAN) model and databases. TNAIM, an input-output model for five trading regions within the state, traces transactions conducted within the economy and attempts to quantify the economic interdependencies within each region's economy for a given point in time. Through these interdependencies, one can evaluate the indirect and induced impacts that economic activity in one region might have on the entire state economy.

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Economic Impacts of Agriculture and Forestry in Tennessee

Introduction

This study updated the previously written report entitled, "*Economic Impacts of Agriculture and Forestry in Tennessee, 1997,"* (English *et al*, 2001) in which the economic importance and impacts of agricultural and forestry industrial complexes on Tennessee's economy were examined using 1997 data. For this study, data for 2000 were used in an input-output model to determine direct impacts on related input industries, and impacts through resulting expenditures by households and institutions at both the state and five-region level. The impacts were provided for four major indicators: total industry output, employment, wages, and value-added.

For the purpose of this analysis, agriculture[1] and forestry included the production and processing of agricultural and forest products and the input suppliers of these products. The objectives of this analysis were to: 1) provide an overview of Tennessee's agriculture and forestry resource base, 2) compare livestock and crop statistics for 1997 and 2000, and 3) evaluate the economic importance and impacts of the agricultural and forestry industrial complex for the state and for specific consumption regions within the state.

Overview of Agriculture and Forestry in Tennessee

In 2000, approximately 11.7 million acres, or 44.3 percent, of Tennessee's total 26.4 million acres were in farms. From 1996 to 1999, the number of farms in the state remained relatively stable at 91,000; but in 2000, the number of farms decreased to 90,000. The average sized farm was 130 acres compared to 432 acres for the United States. Topography, beginning from the eastern part of the state to the west, is mountainous to fairly level. The average farm

[1] In this report, forestry and the production of forest products were incorporated in agriculture and agribusiness, respectively.

size was smaller in the eastern and middle parts of the state and larger in the western part. Approximately 75.5 percent of the total number of farms had sales in the $1,000-$9,999 range, 20 percent in the $10,000-$99,999 range, and 4.4 percent had sales of $100,000 or more (Tennessee Agricultural Statistics Service, 2001).

Tennessee was ranked in the upper half of the nation in all of the major crops except for rice and peanuts (Table 1). More than 40 percent of the state's crop acreage was in hay (all types). Tennessee's top crop counties included Robertson County for alfalfa hay and all tobacco, Greene County for all other hay, Obion County for corn and soybeans, Haywood County for cotton, and Gibson County for wheat.

Table 1. Crops Harvested, Acreage, and State Ranking, 2000

Crops	Acreage	State Ranking
	(thousands of acres)	
Hay (all types)	2,035	--
Soybeans	1,150	17
Corn for Grain	580	18
Cotton, Lint	565	9
Winter Wheat	380	20
Corn for Silage	65	--
Tobacco (all types)	46	3
Grain Sorghum	22	12
Vegetables*	14	--

*Snap beans, squash, and tomatoes
Source: Tennessee Agricultural Statistics Service, 2002

Cattle and calves, poultry and poultry products, dairy products, and hogs and pigs were the predominant livestock products in the state. According to the Tennessee Agricultural Statistics Service for 2000, cash receipts from farm marketing for these livestock products totaled close to $930 million. Of that total, cattle and calves contributed 44.7 percent, poultry and poultry products 27.8 percent, dairy products 20.8 percent, and hogs and pigs 6.6 percent. Tennessee ranked 14th in the United States for number of cattle and calves, 9th for beef cows, 23rd for milk cows, and 24th for hogs and pigs. Tennessee's top livestock counties included Greene

County for all cattle and milk cows, Maury County for beef cows, and Weakley County for all hogs.

Tennessee's more significant agricultural commodities in terms of value, along with their corresponding U.S. market share, are shown in Table 2. In descending order they were cattle, hay and pasture, poultry and eggs, greenhouse and nursery products, tobacco, cotton, dairy farm products, feed grains (barley, corn, oats, and sorghum for grain), and oil bearing crops (primarily soybeans). Tobacco and cotton had the largest U.S. market share at 8.64 percent and 4.31 percent, respectively.

Table 2. State Value of Agricultural Commodities and U.S. Market Share, 2000

Commodity	Value	U.S. Market Share
	(million $)	(percent)
Cattle	390	0.96
Hay & Pasture	300	1.78
Poultry & Eggs	260	1.19
Greenhouse & Nursery Products	217	1.46
Tobacco	200	8.64
Cotton	196	4.31
Dairy Farm Products	193	0.94
Feed Grains	168	0.73
Oil Bearing Crops	126	0.91

Source: Minnesota IMPLAN Group, Inc.

Tennessee's raw agricultural commodity exports in 2000 totaled $461.7 million. The value of the more predominant commodities exported included unmanufactured tobacco at $87.7 million, cotton and cottonseed products at $63.2 million, soybeans and soybean products at $57.1 million, feed grain and products at $36.4 million, poultry and poultry products at $30.3 million, wheat and wheat products at $18.4 million, feeds and fodders at $13.4 million, and dairy products at $8.6 million. Exports for the category "Other" totaled $111.5 million. This category included confectionery, nursery and greenhouse, essential oils, beverages, excluding juice and other miscellaneous animal and vegetable products (Tennessee Agricultural Statistics Service, 2002).

In 2000, Tennessee's forest products (paper products, wood products, plus furniture and related products) exports outside the United States, including forestry and logging, totaled $613.6 million. Paper products had the highest export value at $463.6 million followed by wood products ($71.4 million), furniture and related products ($69.8 million), and forestry and logging ($8.6 million) (U.S. Department of Commerce, 2003).

Tennessee is one of the top hardwood lumber producing states in the United States. In 2000, approximately 934.2 million board feet of hardwood products (lumber, crossties, handle blanks, etc.) were manufactured. Likewise, for softwood lumber, approximately 194.4 million board feet was produced. The majority of the forest cover, 78 percent, was hardwood. White oak, red oak, hickory, yellow poplar, and maple were some of the more predominant hardwood species. For softwoods, loblolly pine, virginia pine, redcedar, and shortleaf pine were major species. The top five counties with the largest timber volume were Cumberland (587.8 cu. ft.), Wayne (573.9 cu. ft.), Morgan (544.5 cu. ft.), Monroe (528.3 cu. ft.), and Hickman (527.1 cu. ft.). For lumber production, the top five leading counties were Hardeman (75.2 million board feet (mbf)), Macon (45.0 mbf), McNairy (39.9 mbf), Johnson (37.2 mbf), and Henry (36.2 mbf) (Tennessee Division of Forestry, 2003; Tennessee Agricultural Statistics Service, 2001; Tennessee Agricultural Statistics Service, 2002).

Manufacturing industries for the state included food manufacturing, beverage and tobacco products, textile mills, textile product mills, apparel manufacturing, leather and allied products, wood product manufacturing, paper manufacturing, and furniture and related products. In 2000, close to $28 billion dollars of goods were shipped and over 142 thousand Tennesseans were employed with a payroll close to $4 billion (Table 3). Food manufacturing shipped the largest value, close to $11 billion, followed by paper manufacturing at $4.7 billion, and beverage and tobacco products at close to $3.0 billion. As a group, textile mills, including textile product

mills and apparel, shipped $4.1 billion. For the forest products group, including wood product manufacturing, paper manufacturing, and furniture and related products, close to $10.0 billion of goods were shipped. Tennessee's market share of the United States for value of shipments for food manufacturing were 2.5 percent, beverage and tobacco products at 2.6 percent, textile mills at 3.3 percent, textile product mills at 2.3 percent, apparel manufacturing at 2.7 percent, leather and allied products at 2.3 percent, wood product manufacturing at 2.7 percent, paper manufacturing at 2.8 percent, and furniture and related products at 3.5 percent.

Table 3. Manufacturing Statistics for Tennessee, 2000

Manufacturing Industry	Employees (number)	Payroll (million $)	Establishments (number)	Value of Shipments (million $)
Food Manufacturing	37,661	1,173	351	10,748
Beverage & Tobacco Products	3,490	124	64	2,930
Textile Mills	9,816	275	92	1,691
Textile Product Mills	4,980	129	137	765
Apparel Manufacturing	21,023	379	280	1,645
Leather & Allied Products	2,123	48	41	225
Wood Product Manufacturing	19,026	478	608	2,544
Paper Manufacturing	18,160	692	172	4,703
Furniture & Related Products	25,756	627	473	2,660
Total	142,035	3,925	2,218	27,911

Source: U.S. Census Bureau, Manufacturing, Mining, and Construction Statistics, Annual Survey of Manufacturers, 2000 Geographic Area Statistics; U.S Census Bureau, State and County *Quickfacts*, Tennessee *QuickLinks*, County Business Patterns Economic Profile, 2000.

In terms of employment, the forest products group (wood product manufacturing, paper manufacturing, and furniture and related products) employed the largest share at close to 63,000, followed by food manufacturing at close to 38,000 and textile mills and related products, including apparel, at close to 36,000. Although the latter group employed a large number of individuals, recent trends of decreasing employment have occurred. For the industries listed in Table 3, the maps in Figures 1 through 9 show the predominant areas where these manufacturing and processing establishments were located throughout the state.

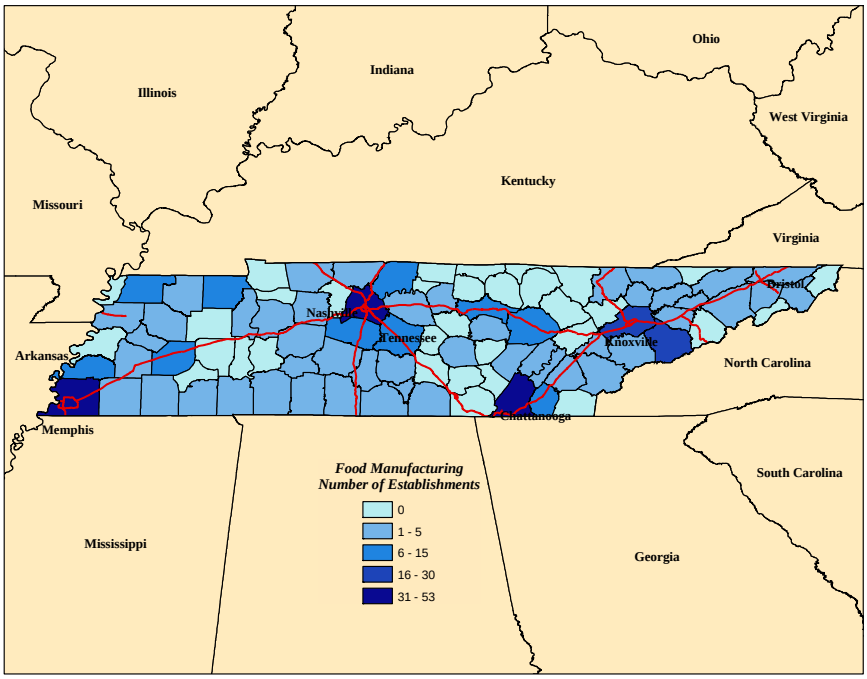

Figure 1. Number of Food Manufacturing Establishments in Tennessee, 2000.

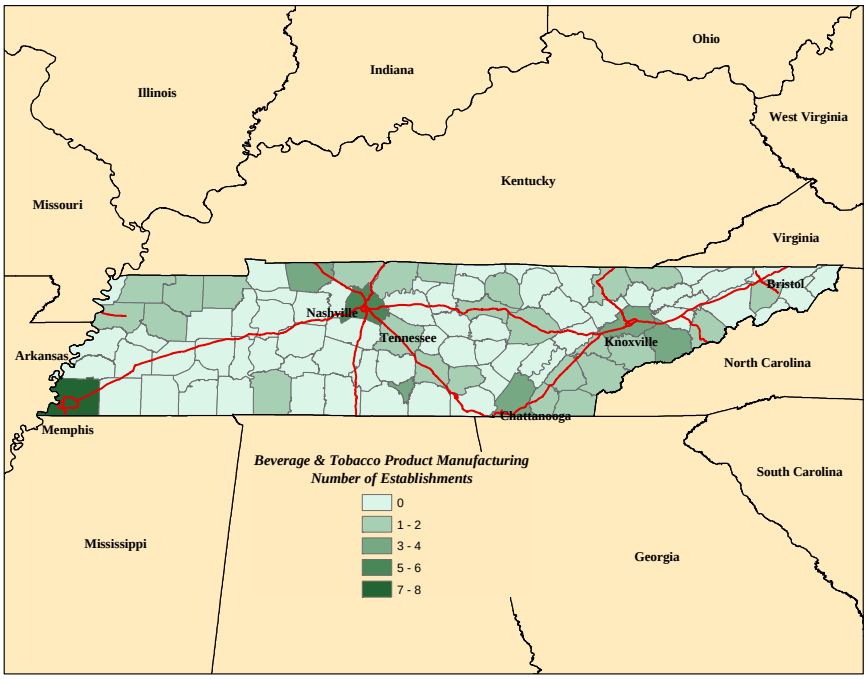

Figure 2. Number of Beverage and Tobacco Products Establishments in Tennessee, 2000.

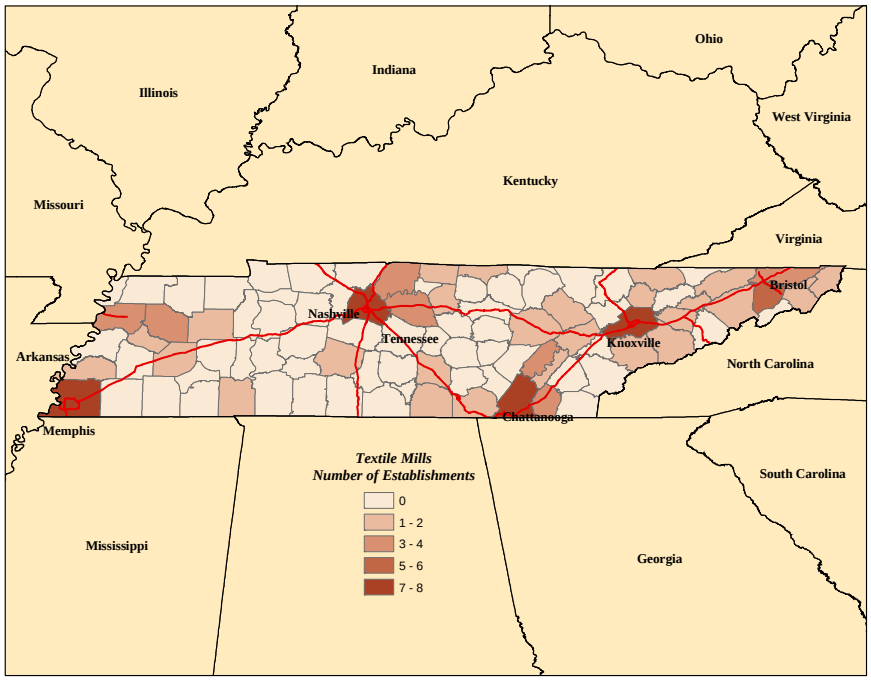

Figure 3. Number of Textile Mills Establishments in Tennessee, 2000.

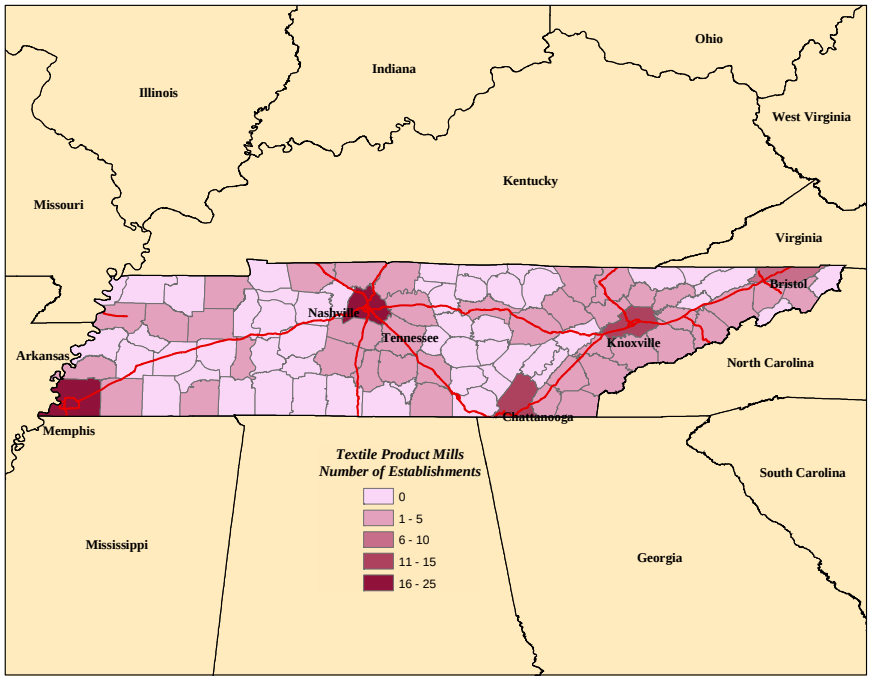

Figure 4. Number of Textile Product Mills Establishments in Tennessee, 2000.

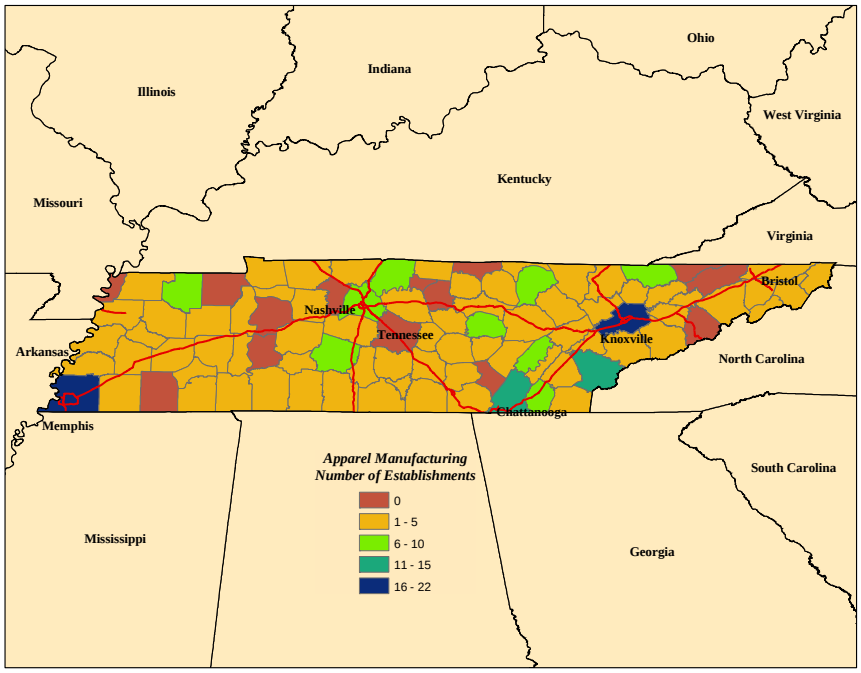

Figure 5. Number of Apparel Manufacturing Establishments in Tennessee, 2000.

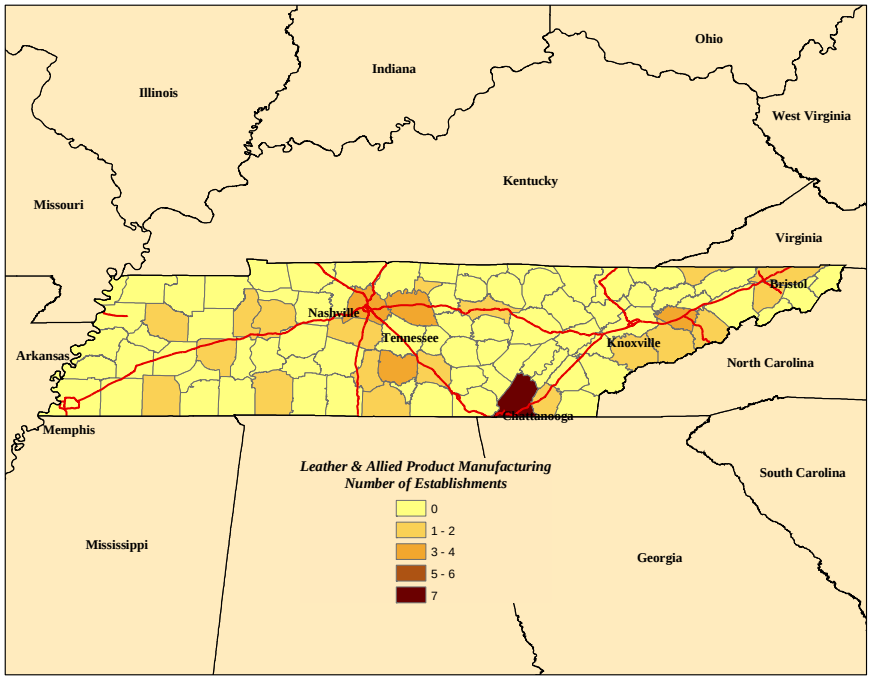

Figure 6. Number of Leather & Allied Products Establishments in Tennessee, 2000.

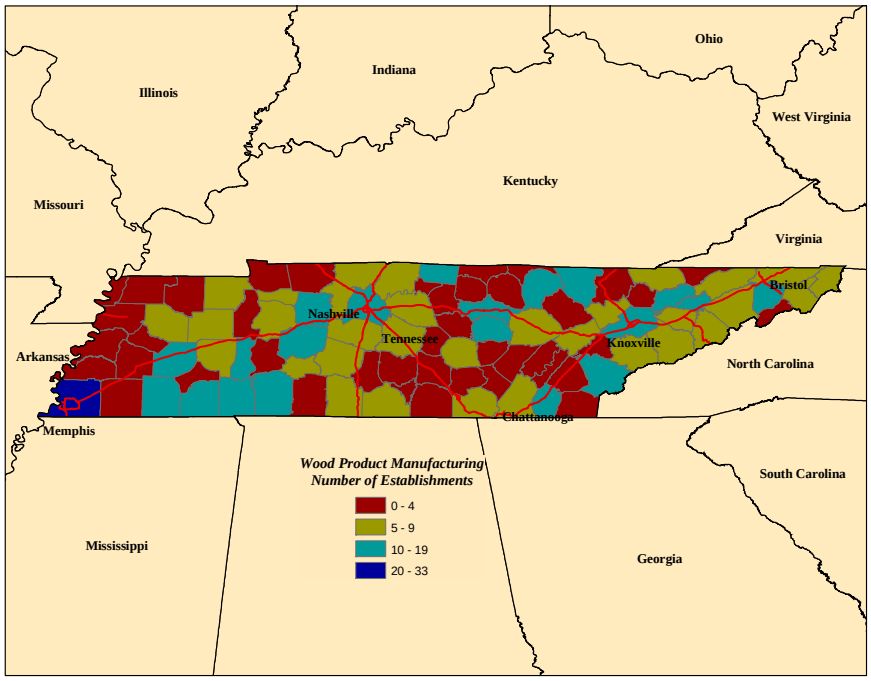

Figure 7. Number of Wood Product Manufacturing Establishments in Tennessee, 2000.

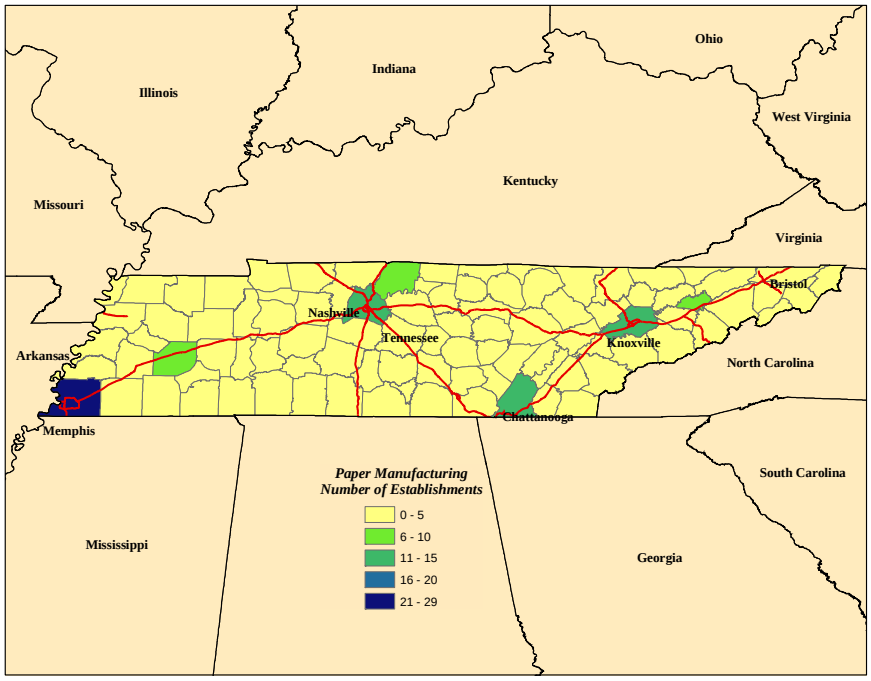

Figure 8. Number of Paper Manufacturing Establishments in Tennessee, 2000.

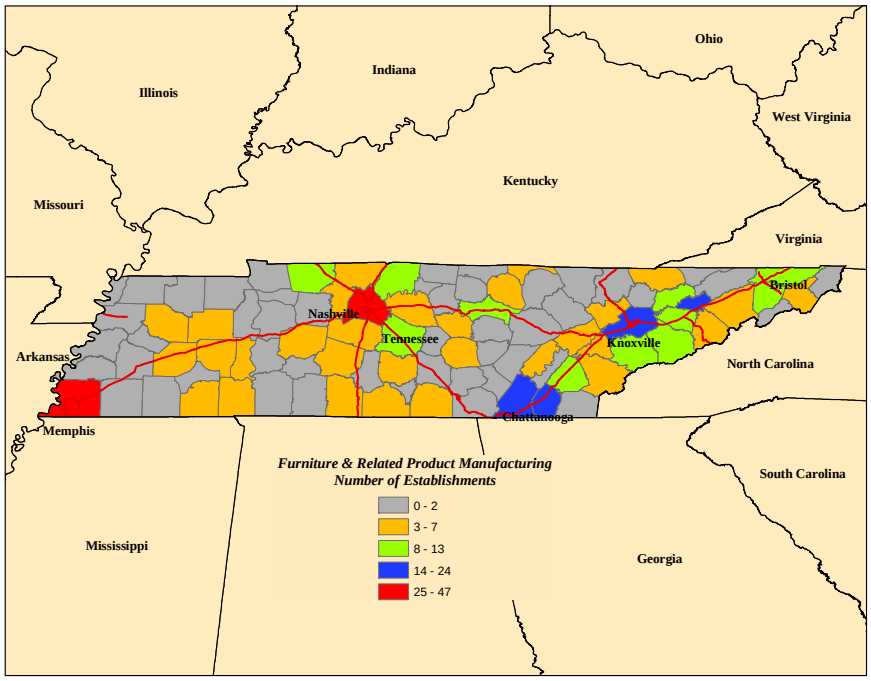

Figure 9. Number of Furniture & Related Products Establishments in Tennessee, 2000.

State Level Changes in Livestock and Crops: 1997 to 2000

The agriculture and forestry sectors included in this analysis have changed since 1997. In 1997, the Total Industry Output of the primary and secondary industries within the Agricultural and Forest Products Industrial Complexes was estimated at $31.3 billion ($32.2 billion in 2000 dollars). This increased to $32.7 billion in 2000. Much of the change occurred in the Forest Products Industrial Complex ($1.6 billion increase) with the Agricultural Industrial Complex reporting a $300 million decrease.

Comparing 1997 and 2000 agricultural data for the state revealed a decline in livestock numbers for cattle, milk cows, and hogs. Poultry, broilers, and egg production numbers increased, however. Livestock prices increased for most of the livestock products except for broilers and hogs. For crops, most of the traditional row crops grown in the state had reduced planted acreage except for cotton and grain sorghum. Crop prices were lower for most major crops grown in the state.

Precipitation for the state for the timeframe reviewed can be characterized as extreme. Above average rainfall for both years 1997 and 1998 was followed by drought conditions for years 1999 and 2000 (National Climatic Data Center, 2001).

Livestock Changes in Inventory and Prices

The number of poultry, broilers, and eggs produced increased from 1997 levels (Table 4). Hogs had the largest decrease (32.3 percent) in numbers followed by the number of milk cows and cattle. Milk production declined 12.7 percent over the timeframe. Livestock prices were higher for all livestock commodities except for broilers and hogs. The greatest price increases were for eggs (33.3 percent) followed by poultry (25.0 percent), milk cows (22.8 percent), and cattle (17.7 percent).

Table 4. Comparison of Tennessee Livestock Numbers and Prices, 1997 and 2000.[*]

Commodity	Inventory		Change	Price		Change	Units
	1997	2000		1997	2000		
	(1,000 head)		%	(dollars/unit)		%	
Cattle	2,350	2,150	-8.5	$55.40	$65.20	17.7	100 pounds
Poultry	2,036	2,210	8.5	$4.80	$6.00	25.0	head
Broilers	138,600	151,300	9.2	$0.38	$0.33	-13.2	pound
Eggs	255,000	278,000	9.0	$0.93	$1.24	33.3	dozen
Milk Cows	115	96	-16.5	$1,050	$1,290	22.8	head
Hogs	340	230	-32.3	$49.60	$41.00	-17.3	100 pounds

Source: Tennessee Agricultural Statistics Service, 2002
[*]Data in nominal values.

Crop Changes in Acres Planted and Prices

With the exception of cotton and grain sorghum, acres planted to traditional row crop production declined from 1997 to 2000 (Table 5). Cotton and grain sorghum acres planted increased 16.3 and 25.0 percent, respectively. Tobacco had the largest decline in acreage production – 22.6 percent. Production of hay and pasture increased close to 17 percent. Vegetables produced, both tomatoes and snap beans, had an increase in planted acres. On the other hand, fruit production declined. Practically all the crop commodities experienced lower prices for the timeframe examined except for tobacco, tomatoes, peaches, and apples. The largest price decline was for cotton followed by soybeans, grain sorghum, wheat, and corn.

Table 5. Comparison of Tennessee Crop Acreages and Prices, 1997 and 2000.*

Commodity	Harvested Acres		Change	Price		Change	Units
	1997	2000		1997	2000		
	1,000 acres		%	$/unit		%	
Hay & Pasture	1,740	2,035	16.9	$56.00	$51.00	-8.9	ton
Corn	700	650	-7.1	$2.65	$1.96	-26.0	bushel
Soybeans	1,240	1,180	-4.8	$6.89	$4.69	-31.9	bushel
Cotton	490	570	16.3	$0.65	$0.45	-38.4	pound
Tobacco	59.5	46	-22.6	$1.95	$2.01	3.1	pound
Grain Sorghum	20	25	25.0	$2.57	$1.81	-29.6	bushel
Wheat	550	550	0.0	$3.30	$2.35	-28.8	bushel
Tomatoes	3.8	4.2	10.5	$27.00	$31.00	14.8	cwt
Snap Beans	10	10.5	5.0	$26.50	$26.00	-1.8	cwt
Apples	1.4	1.1	-21.4	$0.238	$0.244	2.5	pound
Peaches	0.9	0.6	-33.3	$0.38	$0.545	43.4	pound

Source: Tennessee Agricultural Statistics Service, 2002.
*Data in Nominal Values.

Although floriculture growers and areas under cover for floriculture crop production declined from 1997 and 2000, the wholesale value of production increased from $45.7 million to $52.4 million, an increase of 14.7 percent (Table 6). Bedding and garden plants contributed the greatest amount of the total wholesale value followed by potted flowering plants, foliage for indoor or patio use, and, finally, cut flowers. Open ground square footage increased from 111 thousand square feet to 227 thousand square feet between 1997 and 2000.

Table 6. Comparison of Tennessee Floriculture Statistics, 1997 and 2000.

Floriculture	1997	2000	Percent
Growers	214	200	-6.5
Total Covered Area (1,000 sq. ft.)	7,148	6,876	-3.8
Wholesale Value of Production ($ million)	$45.7	$52.4	14.7

Source: Tennessee Agricultural Statistics Service, 2002.

Changes in yields, along with the changes in acres planted, impacted production and, hence, crop receipts. Corn, grain sorghum, and wheat had an increase in yields between 1997 and 2000, while cotton and soybean yields decreased.

One cause for the change in yields was the weather. Precipitation values from 1997 to 2000 are shown in Figure 10. The values shown were departure from normal precipitation. For example, for climate division 4 in 1997, rainfall was 7.53 inches above normal precipitation

values. Likewise, for that same climate division for 2000, rainfall was 8.18 inches below normal. Rainfall for years 1997 and 1998 was above normal for all the climate divisions in the state. On the other hand, rainfall was below normal for both 1999 and 2000. Rainfall extremities were greater in the western part of the state compared to the middle and eastern parts.

Changes in acres, yields, and prices impacted the Total Industry Output contributed to the state's economy from crops. Of the five major crops only grain sorghum had an increase in gross receipts when comparing 2000 with 1997.

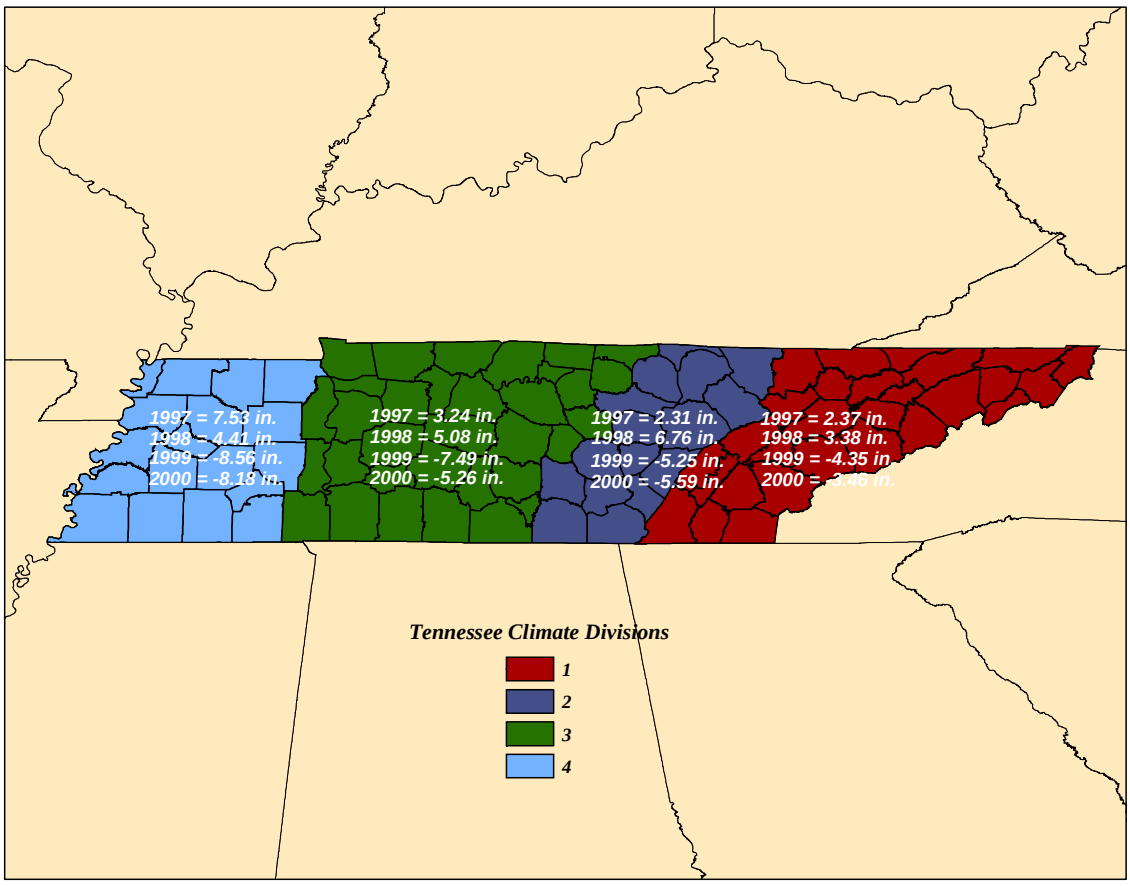

Figure 10. Departure from Normal Precipitation for Tennessee's Climate Divisions.

Data and Methods Used

The Tennessee Agri-Industry Model (TN-AIM) was used to model industry and institutional interrelationships in each of five regions within Tennessee and was based on the Impact Analysis for Planning (IMPLAN) model and databases (Olson and Lindall, 1999). The five regions were based on those used by the Bureau of Economic Analysis to represent areas of economic consumption (consumption regions), as displayed in Figure 11 (for county listings, see Appendix A). Regional values were then aggregated to the state level.

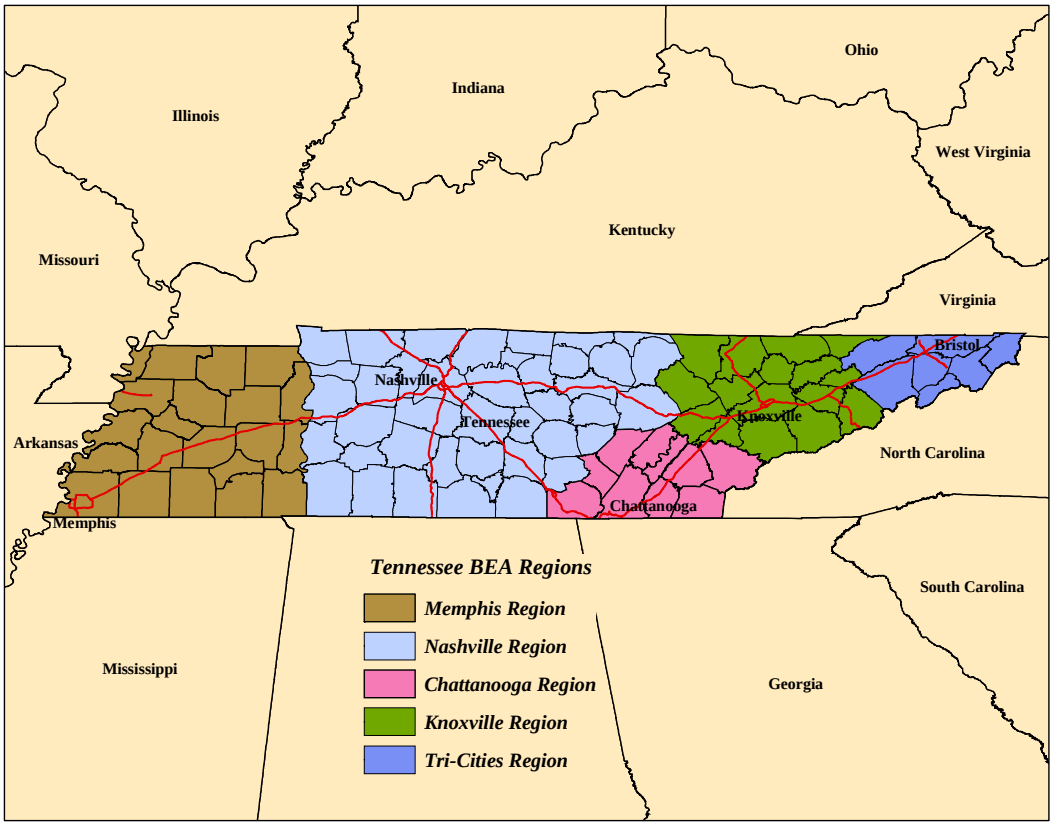

Figure 11. Tennessee Agri-Industry Model Analysis Regions

IMPLAN employs a regional social accounting system and can be used to generate a set of balanced economic/social accounts and multipliers. The social accounting system is an

extension of input-output analysis[2]. Input-output analysis can provide important and timely information on the interrelationships in a regional economy and the impacts of changes on that economy. Input-output analysis has been expanded beyond market-based transaction accounting to include non-market financial flows by using a social accounting matrix or SAM framework (Pyatt and Round, 1985). The model describes the transfer of money between industries and institutions and contains both market-based transactions and non-market financial flows, such as inter-institutional transfers (see Figure 12). The 'Make' and 'Use' components of the SAM include the commodities made and used by industries. Factors represent the value-added by industries, including wages and compensation to workers, interest, profits, and indirect business taxes. Capital includes expenditures made by industries and institutions to obtain equipment and construction. The SAM takes into account corporate profits as 'Enterprises'. The SAM also accounts for non-industrial financial flows, including factor exports and imports, institution exports, factor distribution, and inter-institutional transfers. Factor exports (imports) are payments, such as employee compensation or stock dividend received (paid) from outside the region. Institutional exports would include situations such as a person from inside the region working outside the region. Factor distributions are payments from the factor sectors to institutions, such as households or governments. Inter-institutional transfers include payments between institutions, such as federal government grants to state governments, welfare, social security payments, and taxes paid to governments.

The model uses regional purchase coefficients generated by econometric equations that predict local purchases based on a region's characteristics. Output from the model includes descriptive measures of the economy including total industry output, employment, and value-

[2] Input-output (I-O) analysis, also know as inter-industry analysis, is the name given to an analytical work conducted by Wassily Leontief (1936) in the late 1930's. The fundamental purpose of the I-O framework is to analyze the interdependence of industries in an economy through market-based transactions.

	Industry	Commodity	Factors	Institutions	Enterprises	Capital	Trade	Total
Industry		Make					Exports	Total Industry Output
Commodity	Use			Consumption		Consumption		Total Commodity Output
Factors	Value Added						Exports	Total Factor Income
Institutions		Sales	Transfers	Transfers	Transfers		Exports	Total Institutional Income
Enterprises								Total Enterprise Income
Capital						Transfers	Exports	Total Capital Income
Trade	Imports		Factor Trade	Imports		Transfers	Exports	Total Trade Income
Total	Total Industry Outlay	Total Commodity Outlay	Total Factor Outlay	Total Institutional Outlay	Total Enterprise Outlay	Total Capital Outlay	Total Regional Exports	

Figure 12. Social Accounting Matrix Framework

Source: Olson and Lindall, 1999.

added for over 500 industries in the Tennessee economy. Total industry output is defined as the value of production by industry per year. Employment represents total wage and salary employees, as well as self-employed jobs in a region, for both full-time and part-time workers. Total value added is defined as all income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses. The model also can be used for predictive purposes, by providing estimates of multipliers.

Multipliers measure the response of the economy to a change in demand or production. Multiplier analysis generally focuses on the impacts of exogenous changes on: a) output of the sectors in the economy, b) income earned by households because of new outputs, and c) employment (in physical terms) that is expected to be generated because of the new outputs. The notion of multipliers rests upon the difference between the initial impact of an exogenous change (final demand) and the total impacts of a change. Direct impacts measure the response for a given industry given a change in final demand for that same industry. Indirect impacts represent the response by all local industries from a change in final demand for a specific industry. Induced impacts represent the response by all local industries caused by increased (decreased) expenditures of new household income and inter-institutional transfers generated (lost) from the direct and indirect impacts of the change in final demand for a specific industry. This study uses Type I and Type SAM (Social Accounting Matrix) multipliers. Type I multipliers are calculated by dividing direct plus indirect impacts by the direct impacts, where the Type SAM multipliers = (direct + indirect + induced impacts)/direct impacts. The Type SAM multipliers take into account the expenditures resulting from increased incomes of households as well as inter-institutional transfers resulting from the economic activity. Therefore, Type SAM multipliers assume that as final demand changes, incomes increase along with inter-institutional transfers.

As these people and institutions increase expenditures this leads to increased demands from local industries.

Results

Economic Impacts at the Sate & In-State Region Levels

Direct economic activity for total industry output (TIO), employment, wages and salaries, and total value-added (TVA) for agriculture and forestry for the state and by analysis regions within the state are presented in Table 7. In 2000, agriculture and forestry related industries contributed a total of $32.7 billion in direct economic activity to the state of Tennessee or close to 10 percent of the state's economy. Employment in agriculture and forestry related industries was close to 292 thousand persons or 8.3 percent of the workforce. Total value added was over $10 billion with nearly $6 billion in wages and salaries. Much of the industry output generated from agriculture and forestry was through secondary or manufactured products. For agriculture, approximately 41.4 percent of the workforce was employed in secondary industries and 58.6 percent in primary industries. For forestry, however, 70.3 percent of the forestry workforce was employed in secondary industries and 29.6 percent in primary.

The largest value of output from primary agriculture, 44.1 percent, originated in the Nashville Region, followed by the Memphis Region at 28.9 percent. For secondary agriculture, however, the largest value of output was from the Memphis Region (32.3 percent) followed by the Nashville Region (28.4 percent). For both primary and secondary forestry, the Memphis Region had the largest value of total industry output followed by the Nashville Region. This was the same finding for secondary agriculture except both the Nashville and Knoxville Regions had roughly the same percentage value of output at 25 percent. The Knoxville Region contributed roughly the same value of output (12 to 13 percent) for both primary and secondary agriculture. This also held true for the Chattanooga Region for both primary and secondary forestry (16 to 17

percent). The Tri-Cities Region's contribution ranged from 5 to 7 percent of the state's industry output from both primary and secondary agriculture and forestry.

Table 7. Direct Economic Activity in Agriculture and Forestry

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
All Sectors (Including Non-Agricultural and Non-Forestry):								
State[c]	330,218		3,519,471		101,489		175,945	
Chattanooga	38,827	11.8	375,841	10.7	10,693	10.5	19,165	10.9
Knoxville	51,375	15.6	594,773	16.9	16,115	15.9	27,726	15.8
Memphis	92,021	27.9	958,797	27.2	29,568	29.1	50,986	29.0
Nashville	127,412	38.6	1,334,581	37.9	38,402	37.8	67,385	38.3
Tri-Cities	20,583	6.2	255,479	7.3	6,711	6.6	10,683	6.1
Agriculture & Forestry:								
State[c]	32,763		291,820		5,937		10,193	
Chattanooga	5,993	18.3	42,571	14.6	1,200	20.2	1,938	19.0
Knoxville	4,883	14.9	52,309	17.9	1,005	16.9	1,596	15.7
Memphis	10,926	33.3	67,780	23.2	1,821	30.7	3,444	33.8
Nashville	9,035	27.6	105,169	36.0	1,577	26.6	2,634	25.8
Tri-Cities	1,926	5.9	23,991	8.2	334	5.6	581	5.7
Primary & Secondary Agriculture								
State[c]	20,799		214,426		3,367		6,051	
Chattanooga	3,986	19.2	29,899	13.9	775	23.0	1,291	21.3
Knoxville	2,632	12.7	32,601	15.2	460	13.7	782	12.9
Memphis	6,617	31.8	47,145	22.0	943	28.0	1,897	31.4
Nashville	6,379	30.7	85,760	40.0	998	29.6	1,736	28.7
Tri-Cities	1,186	5.7	19,022	8.9	191	5.7	344	5.7
Primary Agriculture								
State[c]	3,012		125,757		315		857	
Chattanooga	253	8.4	8,419	6.7	19	6.2	53	6.2
Knoxville	353	11.7	19,828	15.8	50	15.8	131	15.3
Memphis	870	28.9	25,398	20.2	85	27.2	245	28.6
Nashville	1,328	44.1	58,327	46.4	137	43.5	365	42.7
TriCities	209	6.9	13,784	11.0	23	7.3	62	7.3
Secondary Agriculture								
State[c]	17,787		88,670		3,052		5,194	
Chattanooga	3,733	21.0	21,479	24.2	755	24.7	1,238	23.8
Knoxville	2,279	12.8	12,774	14.4	410	13.4	651	12.5
Memphis	5,747	32.3	21,747	24.5	858	28.1	1,653	31.8
Nashville	5,051	28.4	27,432	30.9	861	28.2	1,371	26.4
TriCities	977	5.5	5,238	5.9	168	5.5	282	5.4
Primary & Secondary Forestry								
State[c]	11,964		77,394		2,571		4,142	
Chattanooga	2,008	16.8	12,672	16.4	426	16.6	647	15.6
Knoxville	2,251	18.8	19,707	25.5	545	21.2	814	19.7
Memphis	4,309	36.0	20,635	26.7	877	34.1	1,547	37.3
Nashville	2,656	22.2	19,410	25.1	579	22.5	898	21.7

Table 7. Direct Economic Activity in Agriculture and Forestry (Cont.)

Sector	TIO[a] (Million $)	%	Employment (Number)	%	Wages (Million $)	%	TVA[b] (Million $)	%
Tri-Cities	740	6.2	4,969	6.4	143	5.6	237	5.7
Primary Forestry								
State[c]	4,118		22,941		832		1,498	
Chattanooga	643	15.6	2,484	10.8	114	13.7	215	14.4
Knoxville	307	7.5	3,294	14.4	71	8.5	128	8.6
Memphis	2,175	52.8	8,918	38.9	448	53.8	793	53.0
Nashville	714	17.3	6,467	28.2	142	17.1	256	17.1
TriCities	278	6.8	1,777	7.7	57	6.9	105	7.0
Secondary Forestry								
State[c]	7,846		54,453		1,739		2,645	
Chattanooga	1,365	17.4	10,188	18.7	311	17.9	432	16.3
Knoxville	1,944	24.8	16,413	30.1	475	27.3	686	25.9
Memphis	2,134	27.2	11,717	21.5	430	24.7	753	28.5
Nashville	1,941	24.7	12,943	23.8	437	25.1	641	24.3
TriCities	462	5.9	3,192	5.9	86	5.0	132	5.0

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.
[c] State totals may not add due to rounding.

Primary Agricultural Products:

The largest output value for the state from farm production was from cattle, which compromised nearly 17 percent of the value (Table 8). Hay and pasture, poultry and eggs, greenhouse and nursery products, tobacco, cotton, dairy products, feed grains, and oil bearing crops, primarily soybeans, followed cattle. Primary agricultural products also included agricultural, forestry, and fishery services, as well as landscape and horticultural services. In terms of wages, greenhouse and nursery products had the largest value followed by cattle. The largest total value added contributors included hay and pasture followed by cattle and greenhouse and nursery products.

Table 8. State Level: Direct Economic Activity in Farm Production

Rank	Sector	TIO[a]	Employment	Wages	TVA[b]
		(million $)	(number)	(million $)	(million $)
	All Farm Production:	2,320	103,905	140	429
1	Cattle	390	17,753	24	60
2	Hay & Pasture	300	37,635	9	64
3	Poultry & Eggs	260	2,655	10	24
4	Greenhouse & Nursery Products	217	6,509	27	59
5	Tobacco	200	11,710	19	37
6	Cotton	196	2,423	8	32
7	Dairy Farm Products	193	3,153	14	36
8	Feed Grains	168	5,134	4	36
9	Oil Bearing Crops	126	4,725	5	30
10	Vegetables	83	1,727	9	19
11	Hogs, Pigs & Swine	61	1,735	3	6
12	Miscellaneous Livestock	58	5,532	6	11
13	Food Grains	50	2,165	1	9
14	Fruits	10	418	2	3
15	Miscellaneous Crops	4	313	0[c]	1
16	Tree Nuts	2	46	0[c]	0[c]
17	Grass Seeds	1	218	0[c]	0[c]
18	Commercial Fishing	1	55	0[c]	1

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.
[c] Values of 0 are nonzero values that are less than 1.

The direct economic activity from farm production of the top ten sectors for each region within the state is summarized in Table 9. Poultry and eggs, dairy products, cattle, and hay and pasture were primary contributors to total industry output from farm production in the Chattanooga Region. In the Knoxville Region, cattle, hay and pasture, tobacco, and greenhouse and nursery products were important sectors. For the Memphis Region, cotton, feed grains, and oil bearing crops had the largest total industry output, while in the Nashville Region the greatest total industry output values were from cattle, hay and pasture, poultry and eggs, greenhouse and nursery products, and tobacco. Tobacco, cattle, and hay and pasture were important contributors to total industry output for the Tri-Cities Region. For all regions, the hay and pasture sector employed the largest number of workers.

Table 9. Region Level: Direct Economic Activity in Farm Production (Top Ten Sectors)

Rank	Sector	TIO[a] (million $)	Employment (number)	Wages (million $)	TVA[b] (million $)
	Chattanooga:				
1	Poultry and Eggs	72	699	2	5
2	Dairy Farm Products	39	544	2	5
3	Cattle	33	1,239	1	3
4	Hay and Pasture	30	3,102	1	4
5	Vegetables	12	246	1	3
6	Greenhouse and Nursery Products	6	187	1	2
7	Tobacco	5	218	0[c]	1
8	Feed Grains	3	120	0[c]	1
9	Miscellaneous Livestock	3	283	0[c]	0[c]
10	Oil Bearing Crops	2	93	0[c]	1
	Knoxville:				
1	Cattle	52	3,064	4	10
2	Hay and Pasture	41	6,546	1	11
3	Tobacco	38	2,711	4	8
4	Greenhouse and Nursery Products	33	1,348	6	13
5	Dairy Farm Products	26	563	2	6
6	Poultry and Eggs	22	339	2	4
7	Vegetables	10	320	2	4
8	Miscellaneous Livestock	6	811	1	1
9	Feed Grains	3	138	0[c]	1
10	Hogs, Pigs and Swine	3	121	0[c]	0[c]
	Memphis:				
1	Cotton	193	2,357	8	30
2	Feed Grains	108	2,905	2	19
3	Oil Bearing Crops	101	3,526	3	21
4	Cattle	56	1,984	3	6
5	Hay and Pasture	37	3,763	1	6
6	Hogs, Pigs and Swine	36	865	2	3
7	Food Grains	35	1,336	1	5
8	Greenhouse and Nursery Products	23	633	3	6
9	Vegetables	16	260	1	3
10	Poultry and Eggs	11	86	0[c]	1
	Nashville:				
1	Cattle	213	9,392	14	34
2	Hay and Pasture	160	19,286	5	35
3	Poultry and Eggs	145	1,356	5	12
4	Greenhouse and Nursery Products	139	3,657	13	30
5	Tobacco	108	5,516	10	19
6	Dairy Farm Products	93	1,418	7	17
7	Feed Grains	51	1,874	1	14
8	Vegetables	39	709	3	7
9	Miscellaneous Livestock	34	3,075	4	6
10	Oil Bearing Crops	22	1,051	1	8

Table 9. Region Level: Direct Economic Activity in Farm Production (Top Ten Sectors) (Cont.)

Rank	Sector	TIO[a] (million $)	Employment (number)	Wages (million $)	TVA[b] (million $)
	Tri-Cities:				
1	Tobacco	46	3,179	5	9
2	Cattle	36	2,074	2	7
3	Hay and Pasture	31	4,939	1	9
4	Dairy Farm Products	25	507	2	6
5	Greenhouse and Nursery Products	16	684	4	8
6	Poultry and Eggs	11	174	1	2
7	Vegetables	7	192	1	3
8	Miscellaneous Livestock	5	661	1	1
9	Hogs, Pigs and Swine	2	89	0[c]	0[c]
10	Feed Grains	2	96	0[c]	1

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.
[c] Values of 0 are nonzero values that are less than 1.

Secondary Agricultural Products:

Among secondary agricultural products, food and kindred products contributed the largest total industry output followed by apparel, textiles, agricultural machinery, tobacco products, leather goods, and agricultural chemicals (Table 10). Over 61 percent of the value of total industry output from processed agricultural products came from food processing. In addition, food processing employed the largest number of workers, had the largest amount of wages, and contributed the largest amount in total value added. A more detailed presentation of the total industry output from processing by sub-sector is shown in Appendixes B and C.

Primary Forest Products:

The largest output value for primary forest products was from pulp, paper and paperboard mills followed by sawmills, planning and flooring mills; logging; and forest and forestry products (Table 11). The Memphis Region had the largest output value for pulp, paper and paperboard mills at 68.8 percent of the state's value. For employment, sawmills, planing and flooring mills had the largest number of individuals with the Nashville Region employing the

Table 10. Direct Economic Activity in Secondary Agricultural Products

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Food & Kindred Products:								
State[c]	10,795		39,836		1,605		3,106	
Chattanooga	2,437	22.6	10,759	27.0	436	27.2	806	26.0
Knoxville	1,361	12.6	5,273	13.2	195	12.2	353	11.4
Memphis	3,936	36.5	11,613	29.2	549	34.2	1,162	37.4
Nashville	2,637	24.4	11,127	27.9	375	23.4	665	21.4
Tri-Cities	424	3.9	1,065	2.7	49	3.1	119	3.8
Apparel:								
State[c]	2,660		23,144		583		747	
Chattanooga	377	14.2	3,368	14.6	86	14.7	110	14.7
Knoxville	645	24.2	5,069	21.9	149	25.6	203	27.2
Memphis	474	17.8	4,347	18.8	93	15.9	117	15.6
Nashville	1,038	39.0	9,203	39.8	225	38.6	281	37.6
Tri-Cities	125	4.7	1,156	5.0	31	5.2	37	5.0
Textiles:								
State[c]	2,227		15,794		510		722	
Chattanooga	824	37.0	6,641	42.0	210	41.1	287	39.7
Knoxville	240	10.8	2,177	13.8	58	11.5	79	10.9
Memphis	288	12.9	1,760	11.1	58	11.3	77	10.6
Nashville	527	23.6	2,710	17.2	109	21.4	175	24.3
Tri-Cities	348	15.6	2,507	15.9	75	14.7	105	14.5
Agricultural Machinery:								
State[c]	1,185		4,800		152		278	
Chattanooga	76	6.4	431	9.0	15	10.2	22	7.9
Knoxville	2	0.2	17	0.4	0[d]	0.2	0[d]	0.1
Memphis	727	61.4	2,859	59.6	89	58.3	166	59.9
Nashville	321	27.1	1,263	26.3	41	27.0	77	27.5
Tri-Cities	58	4.9	230	4.8	7	4.4	13	4.5
Tobacco Products:								
State[c]	419		1,170		80		117	
Chattanooga	0	0.0	0	0.0	0	0.0	0	0.0
Knoxville	0	0.0	0	0.0	0	0.0	0	0.0
Memphis	132	31.5	350	29.9	30	36.9	43	36.8
Nashville	284	67.7	813	69.5	50	62.8	73	63.0
Tri-Cities	3	0.7	7	0.6	0[d]	0.2	0[d]	0.2
Agricultural Chemicals:								
State[c]	235		859		48		108	
Chattanooga	4	1.8	15	1.7	1	2.1	3	2.3
Knoxville	5	2.1	17	2.0	1	2.1	2	2.3
Memphis	179	76.4	685	79.7	38	78.3	84	77.7
Nashville	45	19.4	140	16.3	8	17.2	19	17.2
Tri-Cities	1	0.3	3	0.3	0[d]	0.4	0[d]	0.4
Leather Goods:								
State[c]	267		3,066		73		116	
Chattanooga	14	5.3	266	8.7	7	9.9	11	9.3

Table 10. Direct Economic Activity in Secondary Agricultural Products (Cont.)

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Knoxville	26	9.9	221	7.2	6	8.7	13	11.3
Memphis	10	3.6	133	4.3	2	3.2	4	3.3
Nashville	198	74.4	2,177	71.0	52	70.4	81	69.6
Tri-Cities	18	6.8	269	8.8	6	7.9	8	6.5

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.
[c] State totals may not add due to rounding.
[d] Values of 0 are nonzero values that are less than 1.

largest number. In addition, the Nashville Region had the largest output values for sawmills, planning and flooring mills; logging; and forest and forestry products. For IMPLAN analysis, forest products was defined as the production from the forest including stumpage, pulpwood, fuel wood, Christmas trees, and fence posts. Forestry products, on the other hand, were establishments that manage and operate timber tracts, tree farms, and forest nurseries as well as conduct reforestation activities.

Table 11. Direct Economic Activity in Primary Forest Products

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Pulp, Paper & Paperboard Mills:								
State[c]	2,620		7,555		526		919	
Chattanooga	568	21.7	1,501	19.9	103	19.5	184	20.0
Knoxville	29	1.1	108	1.4	4	0.8	7	0.8
Memphis	1,802	68.8	5,244	69.4	373	70.9	650	70.7
Nashville	51	2.0	162	2.1	11	2.1	18	2.0
Tri-Cities	169	6.5	540	7.1	35	6.7	60	6.5
Sawmills, Planing & Flooring Mills:								
State[c]	1,180		9,928		268		427	
Chattanooga	37	3.2	385	3.9	7	2.7	12	2.8
Knoxville	225	19.1	2,234	22.5	60	22.2	93	21.7
Memphis	295	25.0	2,466	24.8	65	24.4	104	24.4
Nashville	539	45.7	4,153	41.8	116	43.4	187	43.7
Tri-Cities	84	7.1	689	6.9	20	7.3	31	7.3
Forest & Forestry Products:								
State[c]	153		4,193		9		87	
Chattanooga	19	12.4	469	11.2	1	11.8	12	13.7
Knoxville	25	16.6	751	17.9	2	17.3	17	19.4
Memphis	39	25.3	894	21.3	3	27.6	23	26.9

Table 11. Direct Economic Activity in Primary Forest Products (Cont.)

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Nashville	55	36.0	1,620	38.6	3	33.6	24	28.1
Tri-Cities	15	9.8	459	10.9	1	9.8	10	11.8
Logging:								
State[c]	165		1,265		28		64	
Chattanooga	18	11.0	128	10.2	3	11.8	8	11.9
Knoxville	28	16.8	201	15.9	5	18.5	11	17.8
Memphis	40	24.3	315	24.9	7	23.3	15	23.8
Nashville	69	41.7	531	42.0	12	41.3	27	41.4
Tri-Cities	10	6.1	90	7.1	1	5.2	3	5.2

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.
[c] State totals may not add due to rounding.

Secondary Forest Products:

The largest output value for secondary forest products were paper and allied products followed by furniture, other wood products, mobile homes and wood buildings, and millwork, veneer, plywood and structural wood (Table 12). The furniture industry for this analysis was comprised of household, office, and public building furniture. The other wood products category was comprised of wood containers, wood partitions and fixtures, and miscellaneous wood products. The Memphis Region had the largest value for output, employment, wages, and value added for paper and allied products. The Chattanooga Region had the largest output value for furniture but followed the Knoxville Region in number of employees. The Knoxville Region had the largest values for output, employment, wages, and value added for the other wood products and mobile homes and wood buildings categories, with the latter category being an important industry for the state. For the millwork, veneer, plywood, and structural wood category, the Memphis Region had the largest output value followed by the Nashville, Knoxville, Chattanooga, and Tri-Cities Regions.

Table 12. Direct Economic Activity in Secondary Forest Products

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Paper & Allied Products:								
State[c]	3,223		13,917		589		982	
Chattanooga	377	11.7	1,750	12.6	67	11.3	98	10.0
Knoxville	282	8.8	1,266	9.1	57	9.7	85	8.7
Memphis	1,425	44.2	5,253	37.7	254	43.1	491	50.1
Nashville	871	27.0	4,251	30.5	168	28.6	239	24.3
Tri-Cities	267	8.3	1,396	10.0	43	7.3	68	7.0
Furniture:								
State[c]	2,377		21,308		622		832	
Chattanooga	878	37.0	7,418	34.8	223	35.8	299	35.9
Knoxville	715	30.1	8,072	37.9	207	33.3	265	31.9
Memphis	212	8.9	1,593	7.5	51	8.1	69	8.3
Nashville	479	20.1	3,253	15.3	119	19.1	167	20.1
Tri-Cities	94	3.9	971	4.6	23	3.8	32	3.9
Other Wood Products:								
State[c]	981		7,507		193		312	
Chattanooga	67	6.8	594	7.9	12	6.1	20	6.4
Knoxville	415	42.3	2,404	32.0	69	35.9	115	36.9
Memphis	205	20.9	2,019	26.9	49	25.6	77	24.6
Nashville	222	22.7	1,944	25.9	50	26.0	80	25.6
Tri-Cities	72	7.3	547	7.3	12	6.4	20	6.5
Mobile Homes & Wood Buildings:								
State[c]	678		5,632		172		279	
Chattanooga	5	0.7	39	0.7	1	0.6	1	0.5
Knoxville	382	56.3	3,124	55.5	98	56.9	157	56.2
Memphis	91	13.5	804	14.3	21	12.4	36	13.1
Nashville	198	29.3	1,650	29.3	52	29.9	83	30.0
Tri-Cities	2	0.3	16	0.3	0[d]	0.2	1	0.2
Millwork, Veneer, Plywood, & Structural Wood:								
State[c]	587		6,089		163		240	
Chattanooga	37	6.3	387	6.4	9	5.6	14	5.9
Knoxville	150	25.6	1,547	25.4	43	26.7	63	26.4
Memphis	201	34.2	2,048	33.6	54	33.5	80	33.2
Nashville	171	29.2	1,845	30.3	48	29.8	72	30.0
Tri-Cities	27	4.7	262	4.3	7	4.3	11	4.5

[a] Total Industry Output – annual value of production by industry.

[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.

[c] State totals may not add due to rounding.

[d] Values of 0 are nonzero values that are less than 1.

Estimated Total Economic Impacts of Agriculture and Forestry:

The estimated total economic impacts of agriculture and forestry included not only the direct impacts from the industry, but also the impacts the industry had on input supplying industries (indirect impacts) and on expenditures by households and other institutions (induced impacts). The total economic impacts from agriculture and forestry included direct, indirect, and induced impacts. The total industry output, employment, wages, and value added resulting from agriculture and forestry including each of these impacts are shown in Table 13. Agriculture and forestry contributed an estimated value of over $60.6 billion to Tennessee's economy annually. An estimated 64.1 percent of the total impacts came from primary and secondary agriculture, while forest products contributed about 35.9 percent. Employment from both agriculture and forestry totaled over 601 thousand workers. Of that value, 69.3 percent was contributed by impacts from primary and secondary agriculture, with 30.7 percent being contributed from primary and secondary forest products. Intrastate trade represented values purchased or imported from outside the regions. A more detailed total impact presentation of output, employment, wages, and value added by sub-sector is shown in Appendix C.

Primary Agriculture Products Total Impacts:

Figures 13 through 17 show the estimated direct, indirect, and induced impacts for the cattle, hay and pasture, poultry and eggs, greenhouse and nursery crops, tobacco, cotton, dairy products, feed grains, and oil bearing crops agricultural sectors. The top ten indirect and induced sectors based on output value are also listed. Using cattle as an example, indirect impacts (input supplying industries) explained 32.1 percent ($254.6 million) of the total impact on output. The sectors most impacted in descending order included cattle; wholesale trade; hay and pasture; real estate; motor freight transport and warehousing; feed grains; maintenance and repair other facilities; agricultural, forestry, fishery services; banking; and railroads and related services.

Table 13. Estimated Total Economic Impacts from Agriculture and Forestry

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Agriculture & Forestry:								
State	60,605		601,552		14,465		25,359	
Chattanooga	9,890	16.3	86,932	14.5	2,366	16.4	4,025	15.9
Knoxville	8,087	13.3	91,575	15.2	2,015	13.9	3,429	13.5
Memphis	19,942	32.9	162,611	27.0	4,593	31.8	8,363	33.0
Nashville	16,012	26.4	186,205	31.0	3,716	25.7	6,471	25.5
Tri-Cities	3,093	5.1	39,795	6.6	700	4.8	1,214	4.8
Intrastate Trade	3,580	5.9	34,433	5.7	1,076	7.4	1,856	7.3
Primary & Secondary Agriculture								
State	38,855		417,255		8,841		15,762	
Chattanooga	6,642	17.1	59,999	14.4	1,562	17.7	2,696	17.1
Knoxville	4,709	12.1	57,926	13.9	1,101	12.5	1,932	12.3
Memphis	12,181	31.3	105,537	25.3	2,640	29.9	4,902	31.1
Nashville	11,318	29.1	144,500	34.6	2,493	28.2	4,421	28.0
Tri-Cities	1,926	5.0	29,394	7.0	424	4.8	739	4.7
Intrastate Trade	2,079	5.4	19,899	4.8	621	7.0	1,071	6.8
Primary Agriculture								
State	5,775		169,543		1,106		2,381	
Chattanooga	403	7.0	11,030	6.5	60	5.4	133	5.6
Knoxville	639	11.1	24,981	14.7	135	12.2	295	12.4
Memphis	1,671	28.9	35,882	21.2	320	28.9	699	29.3
Nashville	2,478	42.9	77,594	45.8	465	42.1	998	41.9
Tri-Cities	341	5.9	16,772	9.9	60	5.5	135	5.7
Intrastate Trade	242	4.2	3,283	1.9	65	5.9	121	5.1
Secondary Agriculture								
State	33,080		247,712		7,735		13,381	
Chattanooga	6,238	18.9	48,969	19.8	1,502	19.4	2,563	19.2
Knoxville	4,069	12.3	32,945	13.3	966	12.5	1,638	12.2
Memphis	10,510	31.8	69,655	28.1	2,320	30.0	4,203	31.4
Nashville	8,841	26.7	66,906	27.0	2,027	26.2	3,423	25.6
Tri-Cities	1,585	4.8	12,622	5.1	364	4.7	604	4.5
Intrastate Trade	1,837	5.6	16,615	6.7	556	7.2	950	7.1
Primary & Secondary Forestry								
State	21,750		184,297		5,624		9,597	
Chattanooga	3,249	14.9	26,933	14.6	804	14.3	1,329	13.8
Knoxville	3,378	15.5	33,649	18.3	914	16.3	1,497	15.6
Memphis	7,761	35.7	57,074	31.0	1,953	34.7	3,461	36.1
Nashville	4,694	21.6	41,705	22.6	1,223	21.8	2,050	21.4
Tri-Cities	1,167	5.4	10,401	5.6	276	4.9	475	4.9
Intrastate Trade	1,501	6.9	14,534	7.9	455	8.1	784	8.2
Primary Forestry								
State	7,874		63,346		1,980		3,557	
Chattanooga	1,075	13.6	7,230	11.4	242	12.2	446	12.5
Knoxville	94	1.2	1,483	2.3	20	1.0	51	1.4
Memphis	4,055	51.5	28,622	45.2	1,026	51.8	1,826	51.3

Table 13. Estimated Total Economic Impacts from Agriculture and Forestry (Cont.)

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Nashville	1,322	16.8	13,131	20.7	329	16.6	594	16.7
Tri-Cities	453	5.8	3,995	6.3	110	5.6	201	5.7
Intrastate Trade	876	11.1	8,884	14.0	253	12.8	438	12.3
Secondary Forestry								
State	13,875		120,951		3,644		6,040	
Chattanooga	2,174	15.7	19,703	16.3	562	15.4	883	14.6
Knoxville	3,284	23.7	32,166	26.6	894	24.5	1,445	23.9
Memphis	3,706	26.7	28,452	23.5	927	25.4	1,635	27.1
Nashville	3,372	24.3	28,573	23.6	894	24.5	1,456	24.1
Tri-Cities	714	5.1	6,406	5.3	165	4.5	274	4.5
Intrastate Trade	626	4.5	5,650	4.7	202	5.5	346	5.7

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.

Likewise, induced impacts (expenditures by households and other institutions) explained 18.9 percent ($150 million) of the total impact on output. Again in descending order the sectors most impacted included owner-occupied dwellings; wholesale trade; real estate; doctors and dentists; eating and drinking; state and local government, non-education; hospitals; banking; state and local government, education; and new residential structures.

Secondary Agriculture Products Total Impacts:

Table 14 shows the estimated total economic impacts from secondary agricultural products. For all categories (output, employment, wages, and value added), food and kindred products contributed the greatest total economic impact values. The Memphis Region, followed by the Nashville Region, had the largest values for each of the categories analyzed for this sector. The Nashville Region also had the largest values for apparel, tobacco products, and leather goods for all categories analyzed. The Chattanooga Region had the largest values for the categories analyzed for textiles. For both the agricultural machinery and agricultural chemicals sectors, the Memphis Region had the largest output values.

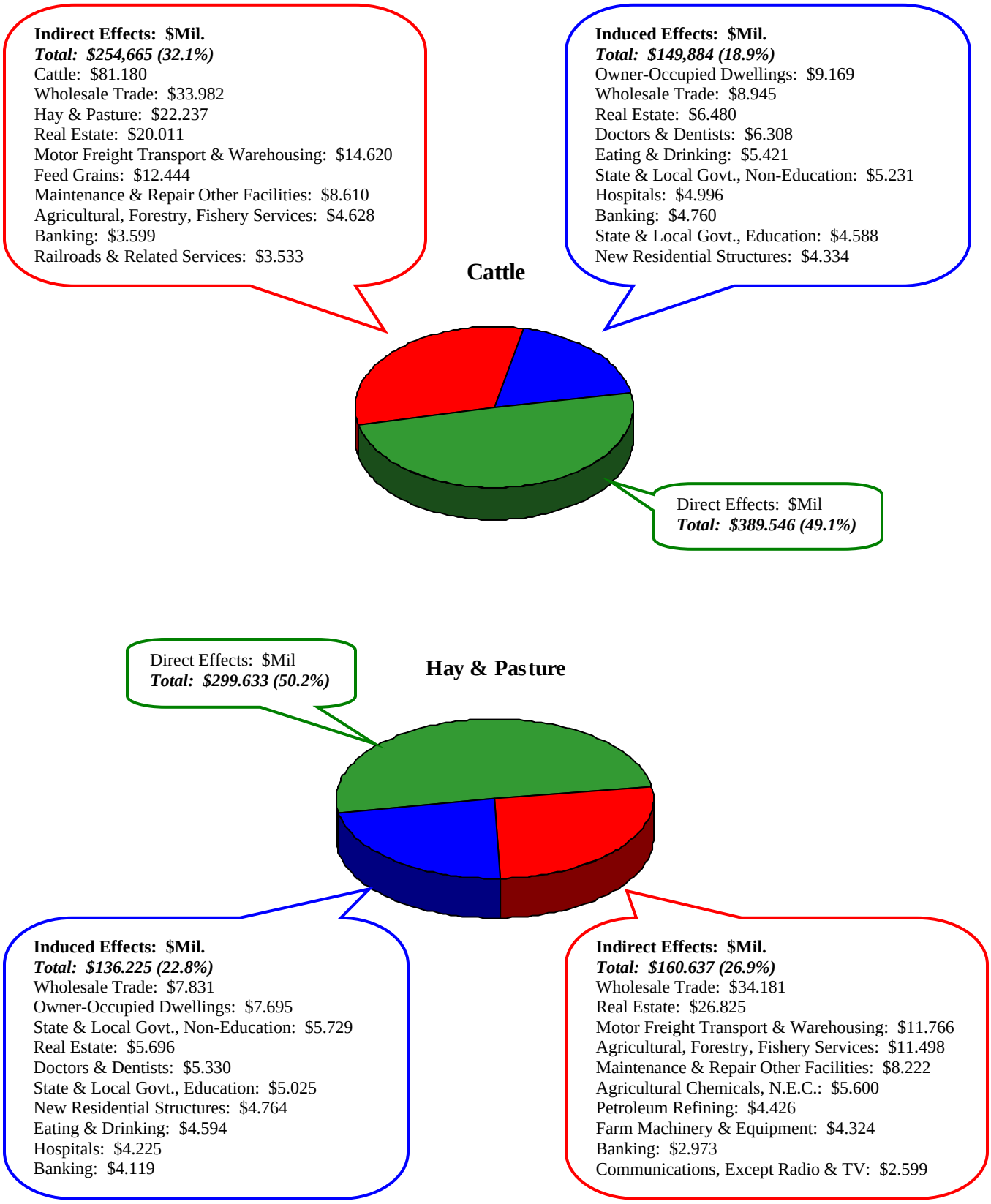

Figure 13. Estimated Direct, Indirect, and Induced Impacts for Cattle and Hay & Pasture.

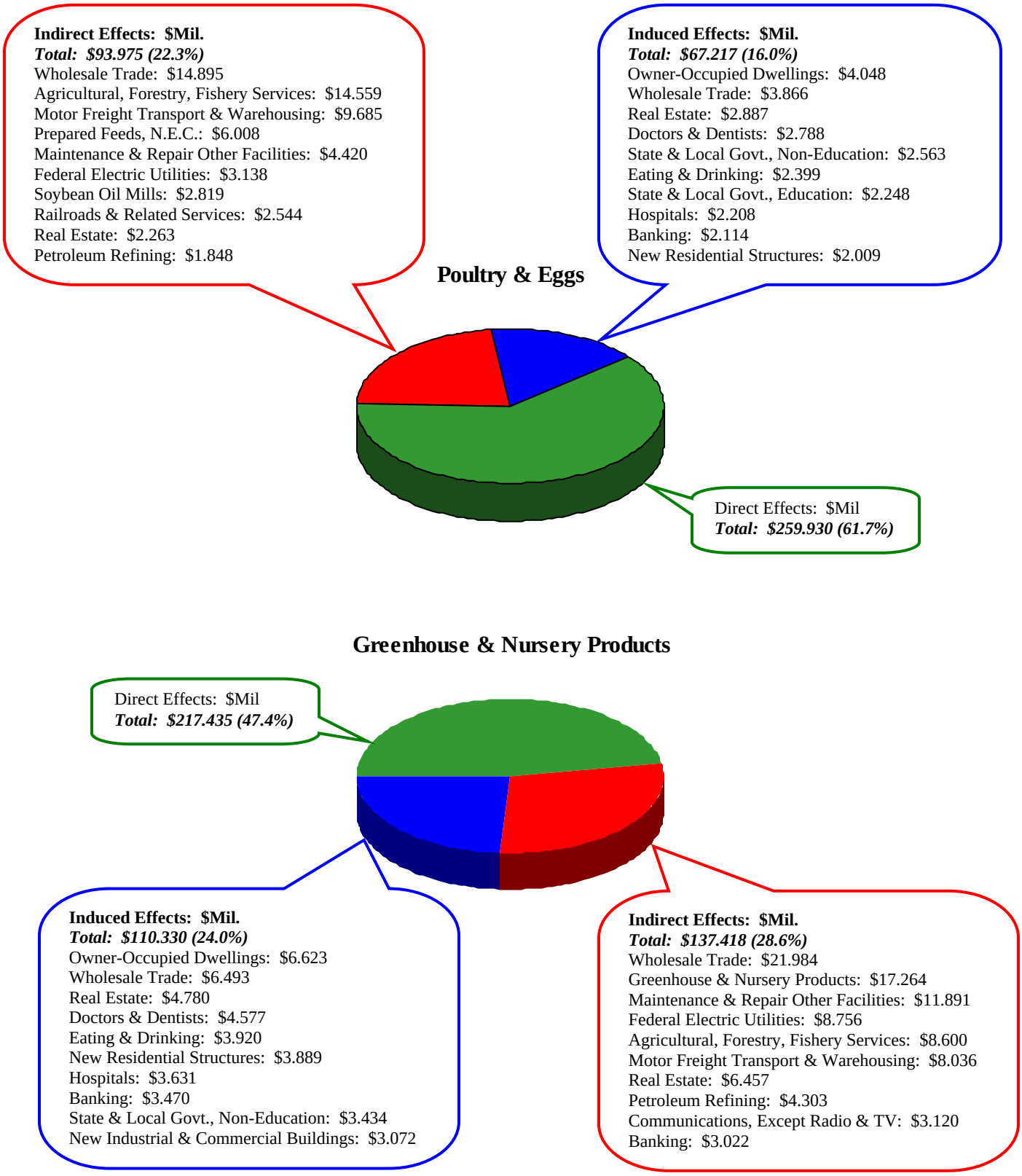

Figure 14. Estimated Direct, Indirect, and Induced Impacts for Poultry & Eggs and Greenhouse & Nursery Products.

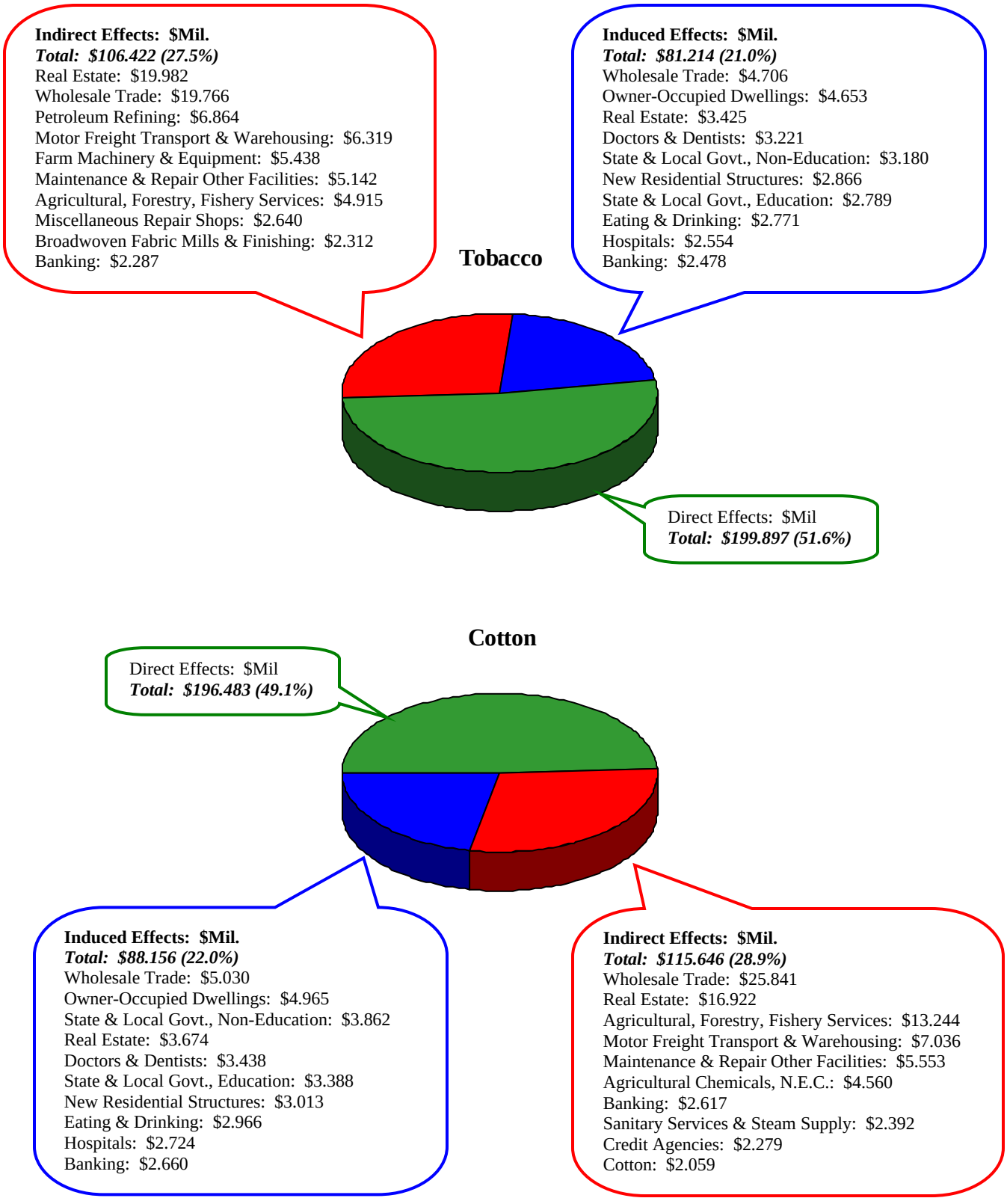

Figure 15. Estimated Direct, Indirect, and Induced Impacts for Tobacco and Cotton.

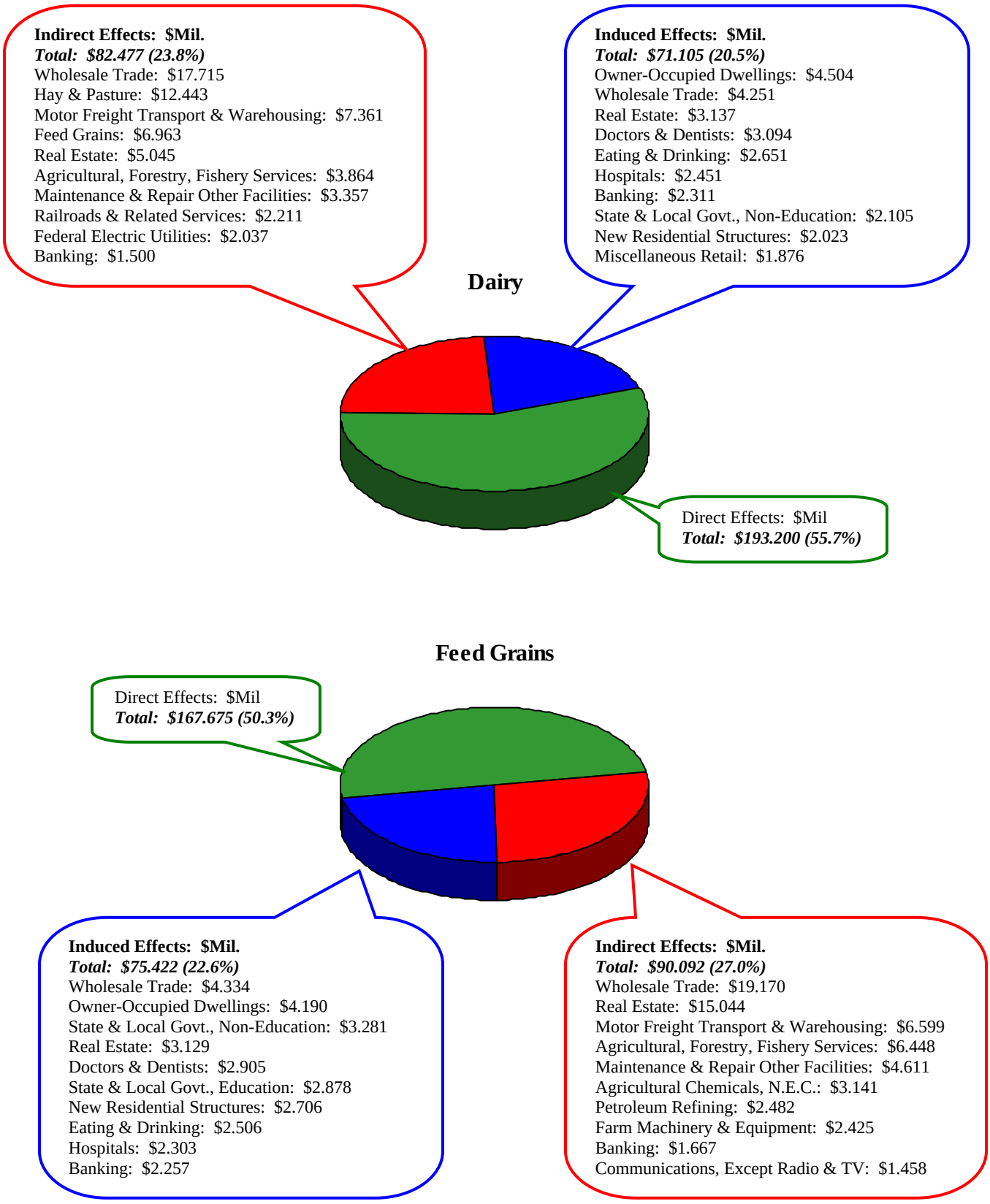

Figure 16. Estimated Direct, Indirect, and Induced Impacts for Dairy and Feed Grains.

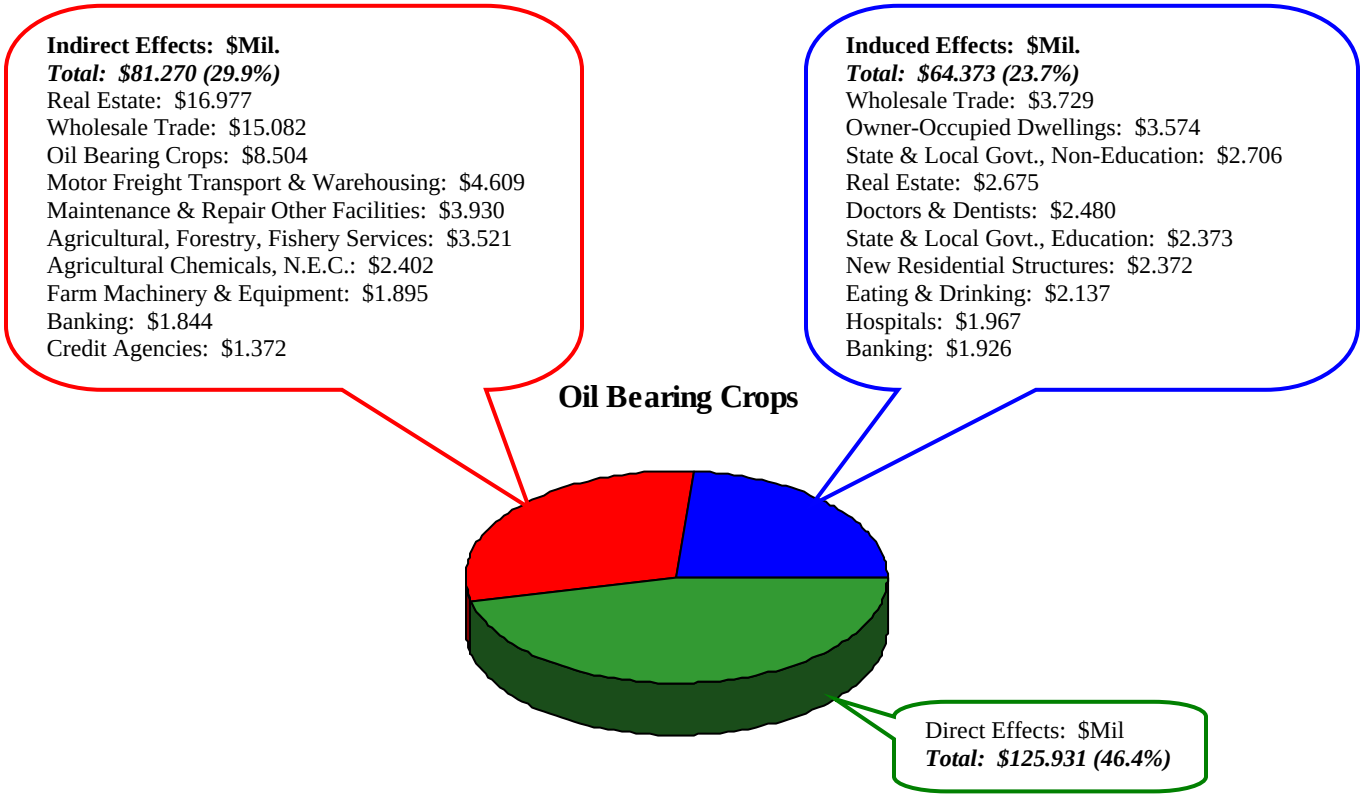

Figure 17. Estimated Direct, Indirect, and Induced Impacts for Oil Bearing Crops.

Table 14. Estimated Total Economic Impacts from Secondary Agricultural Products

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Food & Kindred Products:								
State	19,205		128,132		4,215		7,687	
Chattanooga	3,907	20.3	27,171	21.2	874	20.7	1,585	20.6
Knoxville	2,380	12.4	16,713	13.0	517	12.3	920	12.0
Memphis	7,069	36.8	43,571	34.0	1,533	36.4	2,881	37.5
Nashville	4,407	22.9	29,648	23.1	927	22.0	1,630	21.2
Tri-Cities	642	3.3	3,545	2.8	111	2.6	232	3.0
Intrastate Trade	801	4.2	7,483	5.8	253	6.0	439	5.7
Apparel:								
State	5,326		51,340		1,381		2,151	
Chattanooga	639	12.0	6,381	12.4	163	11.8	249	11.6
Knoxville	1,194	22.4	11,303	22.0	316	22.9	502	23.4
Memphis	909	17.1	8,865	17.3	222	16.1	346	16.1
Nashville	1,912	35.9	18,628	36.3	494	35.8	761	35.4
Tri-Cities	217	4.1	2,287	4.5	57	4.1	84	3.9
Intrastate Trade	455	8.5	3,876	7.6	129	9.3	209	9.7

Table 14. Estimated Total Economic Impacts from Secondary Agricultural Products (Cont.)

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Textiles:								
State	4,547		39,428		1,228		1,953	
Chattanooga	1,527	33.6	13,962	35.4	420	34.2	658	33.7
Knoxville	438	9.6	4,393	11.1	118	9.6	186	9.5
Memphis	530	11.6	4,155	10.5	128	10.4	199	10.2
Nashville	947	20.8	7,015	17.8	238	19.3	404	20.7
Tri-Cities	603	13.3	5,772	14.6	170	13.9	245	12.5
Intrastate Trade	502	11.0	4,131	10.5	153	12.5	262	13.4
Agricultural Machinery:								
State	2,184		14,561		444		783	
Chattanooga	135	6.2	1,035	7.1	32	7.3	51	6.5
Knoxville	4	0.2	36	0.2	1	0.2	1	0.2
Memphis	1,382	63.3	8,840	60.7	277	62.4	489	62.4
Nashville	530	24.3	3,441	23.6	107	24.1	192	24.5
Tri-Cities	89	4.1	590	4.0	16	3.6	29	3.6
Intrastate Trade	44	2.0	620	4.3	11	2.5	21	2.7
Tobacco Products:								
State	909		5,976		222		359	
Chattanooga	0	0.0	0	0.0	0	0.0	0	0.0
Knoxville	0	0.0	0	0.0	0	0.0	0	0.0
Memphis	276	30.4	1,778	29.8	72	32.4	116	32.2
Nashville	610	67.1	3,903	65.3	145	65.2	234	65.1
Tri-Cities	6	0.7	35	0.6	1	0.4	1	0.4
Intrastate Trade	17	1.8	259	4.3	4	2.0	8	2.3
Leather Goods:								
State	469		5,236		135		227	
Chattanooga	23	4.9	371	7.1	10	7.3	16	6.9
Knoxville	45	9.6	439	8.4	12	9.1	24	10.5
Memphis	16	3.4	203	3.9	4	3.2	7	3.3
Nashville	353	75.4	3,752	71.7	98	72.3	163	71.9
Tri-Cities	27	5.8	385	7.4	8	6.3	13	5.5
Intrastate Trade	5	1.0	86	1.6	2	1.8	4	1.9
Agricultural Chemicals:								
State	441		3,040		111		221	
Chattanooga	7	1.7	49	1.6	2	1.7	4	1.9
Knoxville	9	2.0	61	2.0	2	2.0	5	2.1
Memphis	328	74.4	2,243	73.8	84	75.3	166	75.1
Nashville	82	18.6	520	17.1	20	17.7	39	17.6
Tri-Cities	1	0.3	8	0.3	0	0.3	1	0.3
Intrastate Trade	14	3.1	159	5.2	3	3.1	7	3.0

[a] Total Industry Output – annual value of production by industry.

[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.

Primary Forest Products Total Impacts:

Pulp, paper and paperboard mills contributed the largest values for all the categories analyzed compared to the other three primary forest products sectors combined (Table 15). The Memphis Region dominated all value categories for this sector, with the Chattanooga Region having the largest values next followed by the Tri-Cities Region. The Nashville Region had the largest output values for sawmills, planing, and flooring mills, forest and forestry products, and logging.

Table 15. Estimated Total Economic Impacts from Primary Forest Products

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Pulp, Paper & Paperboard Mills:								
State	5,049		33,035		1,264		2,241	
Chattanooga	954	18.9	5,677	17.2	216	17.1	389	17.3
Knoxville	54	1.1	379	1.1	12	0.9	21	0.9
Memphis	3,367	66.7	21,489	65.0	853	67.5	1,508	67.3
Nashville	98	1.9	646	2.0	25	2.0	44	2.0
Tri-Cities	276	5.5	1,856	5.6	68	5.4	119	5.3
Intrastate Trade	300	5.9	2,988	9.0	90	7.1	161	7.2
Sawmills, Planing & Flooring Mills:								
State	2,261		21,794		601		1,025	
Chattanooga	60	2.7	658	3.0	14	2.4	25	2.4
Knoxville	413	18.3	4,483	20.6	119	19.7	200	19.5
Memphis	552	24.4	5,229	24.0	145	24.1	247	24.1
Nashville	1,005	44.5	9,181	42.1	261	43.3	445	43.5
Tri-Cities	139	6.1	1,377	6.3	36	6.0	61	5.9
Intrastate Trade	91	4.0	866	4.0	27	4.5	46	4.5
Logging:								
State	270		2,513		61		123	
Chattanooga	27	10.0	239	9.5	6	9.9	13	10.2
Knoxville	46	16.9	425	16.9	11	17.7	21	17.5
Memphis	64	23.5	586	23.3	14	22.9	28	23.1
Nashville	114	42.0	1,051	41.8	26	41.8	51	41.8
Tri-Cities	14	5.3	146	5.8	3	4.4	6	4.5
Intrastate Trade	6	2.3	66	2.6	2	3.4	4	2.9
Forest & Forestry Products:								
State	294		6,004		53		168	
Chattanooga	33	11.1	656	10.9	5	10.1	20	11.8
Knoxville	46	15.6	1,040	17.3	8	15.6	29	17.3
Memphis	73	24.8	1,318	22.0	13	25.1	43	25.7
Nashville	104	35.4	2,254	37.5	18	34.1	53	31.5
Tri-Cities	24	8.3	616	10.3	4	7.5	16	9.4

Table 15. Estimated Total Economic Impacts from Primary Forest Products (Cont.)

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Intrastate Trade	14	4.7	120	2.0	4	7.7	7	4.3

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.

Secondary Forest Products Total Impacts:

Secondary forest products estimated total impacts are shown in Table 16. Paper and allied products and furniture were the largest contributors for all categories. Although paper and allied products had the largest value for output, wages, and value added, the furniture sector had the largest number of employed individuals. The Memphis and Nashville Regions had the largest output value for the paper and allied products sector. For furniture, the Chattanooga and Knoxville Regions were the leaders. The Knoxville Region had the largest output values for other wood products and mobile homes and wood buildings sectors. For the millwork, veneer, plywood, and structural wood sector, the Memphis Region followed by the Nashville and Knoxville Regions were the largest contributors for all the categories analyzed.

Table 16. Estimated Total Economic Impacts from Secondary Forest Products

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Paper & Allied Products:								
State	5,539		38,954		1,317		2,275	
Chattanooga	566	10.2	3,945	10.1	125	9.5	203	8.9
Knoxville	469	8.5	3,448	8.9	116	8.8	192	8.5
Memphis	2,439	44.0	15,853	40.7	572	43.4	1,053	46.3
Nashville	1,471	26.5	10,651	27.3	358	27.2	576	25.3
Tri-Cities	402	7.3	3,099	8.0	86	6.5	144	6.3
Intrastate Trade	192	3.5	1,958	5.0	61	4.6	107	4.7
Furniture:								
State	4,368		43,657		1,258		1,963	
Chattanooga	1,429	32.7	13,914	31.9	393	31.3	605	30.8
Knoxville	1,268	29.0	14,716	33.7	384	30.5	585	29.8
Memphis	376	8.6	3,414	7.8	104	8.3	163	8.3
Nashville	849	19.4	7,360	16.9	238	18.9	380	19.3
Tri-Cities	153	3.5	1,734	4.0	42	3.3	65	3.3
Intrastate Trade	294	6.7	2,519	5.8	97	7.7	165	8.4

Table 16. Estimated Total Economic Impacts from Secondary Forest Products (Cont.)

Sector	TIO[a]		Employment		Wages		TVA[b]	
	(Million $)	%	(Number)	%	(Million $)	%	(Million $)	%
Other Wood Products:								
State	1,646		14,641		394		674	
Chattanooga	111	6.7	1,099	7.5	25	6.4	44	6.6
Knoxville	614	37.3	4,492	30.7	124	31.5	215	31.9
Memphis	360	21.9	3,699	25.3	98	24.9	164	24.4
Nashville	388	23.6	3,767	25.7	103	26.1	174	25.8
Tri-Cities	112	6.8	1,072	7.3	25	6.3	43	6.4
Intrastate Trade	60	3.7	512	3.5	19	4.8	34	5.0
Mobile Homes & Wood Buildings:								
State	1,226		11,834		347		590	
Chattanooga	7	0.6	73	0.6	2	0.5	3	0.5
Knoxville	665	54.2	6,537	55.2	189	54.4	320	54.2
Memphis	161	13.1	1,564	13.2	44	12.6	76	12.9
Nashville	353	28.7	3,357	28.4	101	29.0	171	29.0
Tri-Cities	3	0.2	28	0.2	1	0.2	1	0.2
Intrastate Trade	38	3.1	274	2.3	12	3.4	19	3.2
Millwork, Veneer, Plywood, & Structural Wood:								
State	1,095		11,865		327		538	
Chattanooga	61	5.6	673	5.7	17	5.1	28	5.2
Knoxville	267	24.4	2,972	25.1	82	24.9	133	24.8
Memphis	370	33.8	3,922	33.1	110	33.5	179	33.3
Nashville	313	28.6	3,437	29.0	94	28.9	155	28.9
Tri-Cities	43	4.0	473	4.0	12	3.7	20	3.7
Intrastate Trade	40	3.7	388	3.3	13	3.9	22	4.1

[a] Total Industry Output – annual value of production by industry.
[b] Total Value Added – income to workers paid by employers; self-employed income; interests, rents, royalties, dividends, and profit payments; and excise and sales taxes paid by individuals to businesses.

The output and employment multipliers for 2000 for primary agricultural and forestry activities ranged from 1.61 to 2.10 for total industrial output and 1.05 to 2.43 for employment (Table 17). For instance, if sawmills and planing mills increased total industry output by $1 million, the state's economy would increase by an estimated $.77 million overall and for each job created in this same industry an estimated 1.43 additional jobs would be added. Soybean farmers that produce $1 million of total industry output generated an additional $.59 million indirectly through the purchase of inputs and $1.07 million in total economic activity within the state.

Table 17. Primary Agriculture and Forestry Output and Employment Multipliers

IMPLAN Sector	TIO[a] Indirect	TIO[a] Indirect & Induced	Employment Indirect	Employment Indirect & Induced
Dairy Farm Products	1.42	1.78	1.79	2.06
Poultry & Eggs	1.35	1.61	1.60	1.91
Ranch Fed Cattle	1.60	1.97	1.42	1.52
Range Fed Cattle	1.47	1.79	1.32	1.40
Cattle Feedlots	1.39	1.72	1.78	2.09
Sheep, Lambs, & Goats	1.39	1.73	1.06	1.08
Hogs, Pigs, & Swine	1.55	1.86	1.54	1.68
Other Meat Animal Products	1.45	1.75	1.23	1.30
Miscellaneous Livestock	1.44	1.79	1.13	1.17
Cotton	1.53	1.96	1.64	2.08
Food Grains	1.55	1.97	1.12	1.25
Feed Grains	1.47	1.89	1.21	1.39
Hay & Pasture	1.47	1.90	1.05	1.09
Grass Seeds	1.57	1.99	1.02	1.05
Tobacco	1.46	1.85	1.09	1.17
Fruits	1.50	2.00	1.17	1.33
Vegetables	1.54	2.01	1.43	1.72
Miscellaneous Crops	1.39	1.79	1.13	1.20
Oil Bearing Crops	1.59	2.07	1.22	1.39
Greenhouse & Nursery Products	1.58	2.08	1.29	1.49
Commercial Fishing	1.05	2.06	1.01	1.14
Agricultural, Forestry, Fishery Services	1.25	1.92	1.08	1.27
Landscape & Horticultural Services	1.34	2.01	1.19	1.48
Logging Camps & Logging Contractors	1.22	1.63	1.32	1.99
Sawmills & Planing Mills, General	1.37	1.77	1.58	2.43
Hardwood Dimension & Flooring Mills	1.46	2.10	1.35	2.05
Special Products Sawmills, NEC	1.21	1.80	1.11	1.53

[a] Total Industry Output – annual value of production by industry.

Summary and Conclusion

Input-output modeling was useful for evaluating and analyzing information on the interrelationships in a regional economy and impacts of changes on that economy. The model is a useful planning tool for policy-makers in evaluating potential impacts of their decisions concerning agriculture and forestry industries for the state. For this analysis, a baseline for 2000 was developed along with Tennessee Agricultural Statistics Service information. The state was divided into five trade regions. Look for these five regions in future analyses as individual

sectors are examined and the impacts of additions to the state's agro-forestry industrial complex are evaluated.

Agriculture and forestry were very important to the Tennessee's economy holding an 18.3 percent share in the state's economy. An increase in economic impact has occurred between 1997 and 2000 despite a reduction in traditional agricultural production and prices. This decrease if offset by increases in the forestry and primary and secondary forest products sectors.

Comparing agricultural data for 1997 and 2000 revealed that most of Tennessee's traditional row crops acreage declined along with their corresponding crop prices for the major crops grown. Livestock numbers declined for some of the traditional livestock commodities (cattle, dairy, and hogs) during that timeframe while poultry products increased. Livestock prices increased for most of the livestock products except for broilers and hogs. Precipitation for the state for the timeframe reviewed can be characterized as extreme. Above average rainfall for both years 1997 and 1998 was followed by drought conditions for years 1999 and 2000.

The agro-forestry industrial complex included the primary industries typically associated with agriculture and forest operations such as the growing of crops, the breeding and feeding of livestock, and the management and logging of trees. Also included in the industrial complex were the input supplying industries and value-added subsectors, which included food and kindred products manufacturing, apparel and textiles, and forestry products manufacturing. In 2000, the agro-forestry industrial complex contributed $60.6 billion to the Tennessee economy and employed 220,000 individuals. Compared to 1997's value of $58.2 billion (value in 2000 dollars), this was an increase of 4.1 percent.

Agriculture, a subset of the agro-forestry industrial complex in Tennessee, included farming and related industries, as well as value-added food and fiber production, processing and

manufacturing. Agriculture accounted for 11.7 percent of the state's economy and generated $38.8 billion in output. Compared to 1997's value of $39.5 billion (value in 2000 dollars), this was a decrease of 1.7 percent. About 214,000 Tennesseans, with 126,000 in the production sector, were employed in agriculture.

Forestry included the management and logging of trees, sawmills (primary forestry products), including pulp and paper mills, plus forestry products manufacturing (secondary forestry products). Forestry accounted for 6.6 percent of the state's economy, employed about 184,000 Tennesseans, and generated $21.7 billion in output. Compared to 1997's value of $19.8 billion (value in 2000 dollars), this was an increase of 9.6 percent.

From a regional perspective, the importance of the agro-forestry industrial complex was more important to the Chattanooga and Memphis regions relative to other regions in the state followed by the Knoxville, Tri-Cities, and Nashville regions (Table 18). Although the Memphis Region contributed the largest amount of economic activity, close to $20 billion, this value represented only 22 percent of the total for the region.

Table 18. Regional Importance of Agriculture to that Region's Economy, 2000

Location	Total Economic Activity	Estimated Agro-Forestry Industrial Complex Contributions to the State's Economy	Proportion
	(million $)	(million $)	(ratio)
State	330,218	60,605	0.18
Chattanooga	38,827	9,890	0.25
Knoxville	51,375	8,087	0.16
Memphis	92,091	19,942	0.22
Nashville	127,412	16,012	0.13
Tri-Cities	20,583	3,093	0.15

Source: Minnesota IMPLAN Group, Inc.

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Appendix A: County Region Identification Table

Table A.1. County Assignment to TNAIM's Modeling Regions.

Memphis	Nashville		Chattanooga	Knoxville	Tri-Cities
Benton	Bedford	Macon	Bledsoe	Anderson	Carter
Carroll	Cannon	Marshall	Bradley	Blount	Greene
Chester	Cheatham	Maury	Hamilton	Campbell	Hawkins
Crockett	Clay	Montgomery	McMinn	Claiborne	Johnson
Decatur	Coffee	Moore	Marion	Cocke	Sullivan
Dyer	Cumberland	Overton	Meigs	Grainger	Unicoi
Fayette	Davidson	Perry	Monroe	Hamblen	Washington
Gibson	DeKalb	Pickett	Polk	Hancock	
Hardeman	Dickson	Putnam	Rhea	Jefferson	
Hardin	Fentress	Robertson	Sequatchie	Knox	
Haywood	Franklin	Rutherford		Loudon	
Henderson	Giles	Smith		Morgan	
Henry	Grundy	Stewart		Roane	
Lake	Hickman	Sumner		Scott	
Lauderdale	Houston	Trousdale		Sevier	
McNairy	Humphreys	Vanburen		Union	
Madison	Jackson	Warren			
Obion	Lawrence	Wayne			
Shelby	Lewis	White			
Tipton	Lincoln	Williamson			
Weakley		Wilson			