the Economic Impact of Agriculture in Virginia

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Virginia's
Rural Economic Analysis Program

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EXECUTIVE SUMMARY

The Department of Agricultural and Applied Economics at Virginia Tech, in cooperation with the Virginia Department of Agriculture and Consumer Services, analyzed the size and economic contribution of agriculture in Virginia. Agriculture is described and measured as a system including four parts: 1) production of agricultural goods and services, including farm crops, livestock, horticulture and landscaping services, Christmas trees, aquaculture, vineyards, and private woodlots; 2) processing of food, tobacco, wine, and cotton textiles; 3) distribution-related activities such as transportation and wholesale and retail sale of agricultural products; and 4) input sectors, that is, activities that supply goods and services for production, processing, and distribution activities.

The economic contributions of Virginia's agricultural system are summarized as follows:

- **$11-billion contribution (7.6 percent of state total) to Gross State Product (GSP);**
- **250,000 jobs (9 percent of state total), directly related to agricultural production, inputs, processing, or distribution;**
- **An additional $6 billion in GSP (4.0 percent) and 164,000 jobs (5.9 percent) from effects of agriculture-related income on other sectors;**
- **A total of approximately 11.6 percent of GSP, and 14.9 percent of jobs in Virginia, related in some way to the agricultural economic system.**

The major farm commodities produced in Virginia are cattle and calves (in the northern, western, central, and southwestern districts of the state), poultry (in the northern and western districts), milk (in the northern, central, and southwestern districts), tobacco (in the southern and southwestern districts), and soybeans (in the eastern and southeastern districts). The major agricultural manufacturing activities in the state are poultry processing (in the northern district), tobacco processing (in the central district), and meat processing (in the southeastern district).

The agricultural system is very important to Virginia's economy. With approximately one of every seven jobs in Virginia related to agriculture, agricultural activities are major components of the employment base within both rural and urban areas. Agriculture makes significant contributions to Virginia's employment, GSP, and overall economic well-being.

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Mr. Robert T. Bass, State Statistician, Virginia Agricultural Statistics Service;

Dr. Joseph D. Coffey, Vice President of Economics and Planning, Southern States Cooperative, Inc.

J. Carlton Courter, III, former Executive Director, Virginia Agribusiness Council (now Commissioner of the Virginia Department of Agriculture and Consumer Affairs);

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Mr. Herbert H. Hill, Jr., Director, Office of Policy, Planning and Agricultural Development, Virginia Department of Agricultural and Consumer Services;

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Mr. William C. Shelton, Director, Center on Rural Development, Virginia Department of Housing and Community Development.

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INTRODUCTION

In 1994, Virginia contained 43,000 farms and 8.6 million acres of farmland. But farms are only part of a chain of economic activities that stretches from the producer of farm supplies to the processors and distributors that put agricultural products into the hands of consumers. In addition to the state's farms and farmers, the agricultural system includes food, fiber, wine, and tobacco processors that manufacture products for sale across Virginia and around the world; transportation workers, wholesalers, and retailers who distribute both processed and unprocessed products to consumers; and producers and suppliers of "inputs"—goods and services used by an economic sector—to farmers, processors, and distributors. This agricultural system, with its many linkages, touches the lives of every Virginian and contributes to every sector of the state's economy.

The Department of Agricultural and Applied Economics at Virginia Tech, in cooperation with the Virginia Department of Agriculture and Consumer Services, conducted a study in 1993 to determine the size and economic contribution of Virginia's agricultural economic system. This study was guided by an advisory committee that included agricultural industry representatives and experts in analysis of economic impacts. The committee helped define the agricultural system and refine the measurement procedures. State-of-the-art methods were used both to measure the linkages between the system's components and to estimate employment levels. This report describes the study and documents the significant economic impacts of agriculture on Virginia and on particular areas of the state.

THE CHANGING AGRICULTURAL SYSTEM

Since colonial times, when the economy of Virginia was almost entirely agricultural, the proportion of the labor force engaged in farming has been declining as technology has increased the productivity of farm labor. At the same time, the number of jobs in non-farming components of the system has steadily increased as farmers have transferred many of their responsibilities for the production of inputs, processing, and marketing to other sectors of the economy.

Another change that marks the current agricultural system is agriculture's increased diversification and linkages with the nation and world. Today, Virginia's agricultural system produces specialized, high-quality products that are marketed in many parts of the world, while other products are imported and sold through Virginia distribution channels.

It is a mistake to suggest that agriculture is a small sector of the Virginia economy. Virginia's agriculture today includes not only traditional field crops, vegetables, livestock, and seafood, but also encompasses aquaculture, landscape and nursery products, ornamentals, and premium farm wines. Moreover, it has important links to the tourism and forestry industries.

Nationally, farm and farm-related jobs increased by 28 percent between 1975 and 1989 (Majchrowicz and Salsgiver). During these years, the agriculture sector accounted for a declining share of all jobs in the United States– from 19.5 percent in 1975 to 17.3 percent in 1989. In 1989, most farm and farm-related employment was in agricultural wholesale and retail trade. Farm production jobs accounted for 13.7 percent of all farm and farm-related employment. Food-processing industries are growing in larger cities: approximately 4.5 million agriculture-related jobs were added in metropolitan areas from 1975 to 1989. In nonmetropolitan areas,

approximately 600,000 farm and farm-related jobs were added during that period.

The U.S. agricultural sector provided 23.3 million jobs, 17.3 percent of total U.S. employment, in 1989. Thus, more than one in six U.S. jobs were linked to agriculture in that year. Agricultural wholesale and retail accounted for over half of U.S. farm and farm-related employment. More than 80 percent of the wholesale and retail jobs were in metropolitan areas, where large consumer markets exist.

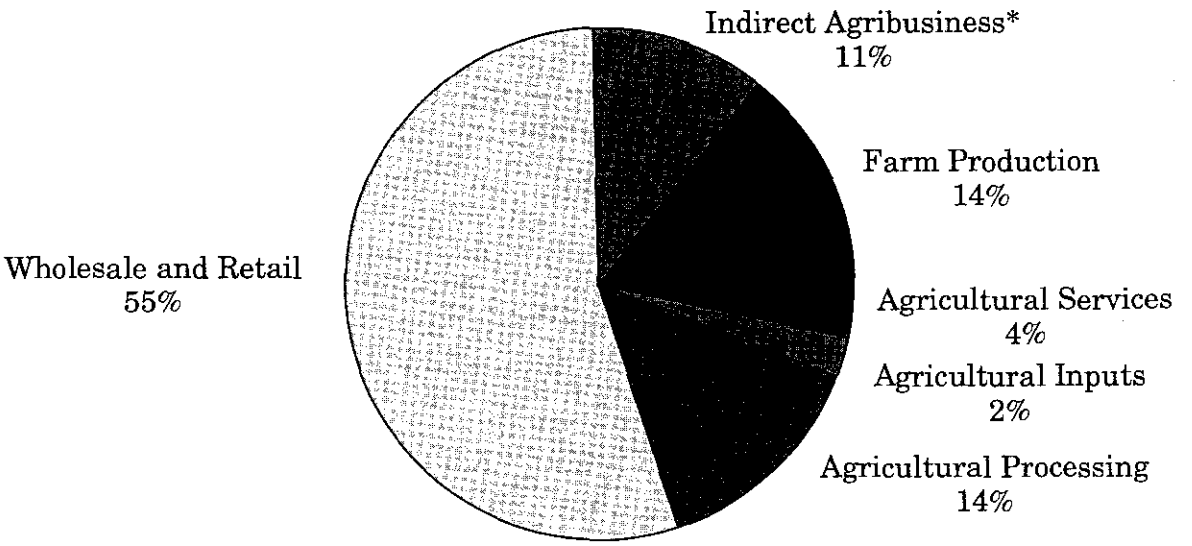

Figure 1. Components of farm and farm-related employment in the United States, 1989.

Source: Majchrowicz and Salsgiver, Changes in Farm and Farm-Related Employment, 1975-89.

MEASURING ECONOMIC CONTRIBUTIONS of AGRICULTURE

The agricultural sector is difficult to measure, especially in terms of employment, because it is so diverse and it includes so many unlike components. This is especially true of the farm production component, which encompasses sole proprietors, family laborers, unpaid labor, dual occupational workers, seasonal labor, contract labor, home consumed products, and government programs that affect income. Because the farm component is linked to the other components both through producers' purchases of inputs and through the sale of products for processing and distribution, double counting can easily occur. This study painstakingly avoided double counting.[1]

The *definition* of an economic sector becomes critical when one attempts to compare one sector's contribution with that of another. The definition of the agricultural sector (also referred to as the agricultural economic system) used in this study is as follows:

- *farm production* includes all farm crops, livestock, horticultural and landscaping services, Christmas trees, aquaculture, vineyards, and private woodlots (but excludes commercial forestry and forest products);
- *processing* of the production includes food and tobacco products, wineries, and

[1]For details, see "Avoiding Double Counting" in Appendix A.

cotton textiles (excluding all non-cotton textiles, all apparel, and all textile-based consumer products);

- *distribution* includes transportation and wholesale and retail sale of farm and processed products (including the basic value of food sold through restaurants *but excluding all restaurant markup and restaurant activity itself*[2]); and
- *input activities*, including all in-state production of goods and services for the farm and for the processing and distribution activities described above.

The definition obviously extends beyond the farm-based definition of agriculture to a "system-wide" definition. A Virginia farm-based definition would include just those products which flow from raw materials produced in the state. The system-wide definition includes all activities that add value to farm products, without regard to where they originate. Therefore, the processing sector includes the value added to processed food, tobacco, and fiber products purchased from out-of-state producers as well as from Virginia producers and the distribution sector includes value added to food products produced out-of-state but distributed to Virginia consumers. In neither case is the value of the out-of-state products themselves included.

In contrast to many measures of the f*ood and fiber* sector, the definition of the *agricultural economic system* used in this study excludes all forestry, forest products, and wood products. This means that most previous measures of Virginia's food and fiber sector are not directly comparable with this study's estimates of the agricultural sector in Virginia. This definition also excludes the impacts of investments in the agricultural system. Furthermore, the definition excludes all wood products, non-cotton textiles, restaurant employees, and employees of distribution sectors not handling agricultural commodities.

In general, any level of sectoral sales or final demand for agricultural goods is expected to have, besides its d*irect* effects, additional *indirect* and *induced* effects on total industrial output, wage income, Gross State Product (GSP), and total employment. The indirect effect is the production by other sectors of goods and services used in the production of food and fiber; the induced effect is the impact of household spending of income earned in direct and indirect production. For example, say a farmer raises cattle. The income generated by the sale of the cattle is a *direct* economic effect. When the farmer purchases fuel to transport the cattle to market, the fuel sale is an *indirect* effect of the cattle production. Finally, if the farmer uses the profit from the cattle sale to purchase a new television, that purchase produces *induced* effects (on the economic activities that supply televisions for purchase).

In this study the IMPLAN (Impact Modeling for PLANing) system was used to generate estimates of inputs, and the induced impacts of Virginia agriculture (farming, processing, and distributing), for the entire state and its several agricultural statistic districts (see Appendix C). IMPLAN is one of the most widely used input-output models in the nation (Lindall and Olson), and is described in Appendix A.

For more information and other definitions of basic economic terms used in this report, please see "Definitions" in Appendix A.

Data Sources

The main data sources were Virg*inia Agricultural Statistics* (published annually by the Virginia Agricultural Statistics Service), employment reports prepared by the Virginia Employment Commission, and databases accessible from within the

[2]The agricultural portion of the restaurant sector was difficult to estimate. Therefore, none of the restaurant sector, neither its sales nor employment, is included in the estimates of the agricultural system. However, its purchases of food from the Virginia processing sector were included as sales of the processing sector, and its purchases from the distribution sector were estimated from the input-output model. Restaurant purchases of out-of-state food were excluded, and none of its other inputs were included.

IMPLAN model. Because official sources of employment information, such as Virginia's Covered Employment series, seriously underestimate employment in farming, farm employment was estimated indirectly from typical employment/output ratios. Inputs were estimated by determining the linkages from each system component to its suppliers. For more details, see "Data Sources" in Appendix A.

THE CONTRIBUTION of VIRGINIA'S AGRICULTURE

Table 1 summarizes the impact of agriculture on Virginia's economy. The main points from our results from the analysis are discussed in more detail in this section.

Table 1. The economic impact of Virginia's agricultural economic system, 1991.

	SALES ($ million)	VALUE-ADDED ($ billion)	EMPLOYMENT (thousand)
Farm Production	2.855	0.695	53.0
Processing	14.340	5.650	51.1
Distribution	2.768	2.361	80.9
Inputs	5.217	2.603	69.2
Total System	25.179	11.309	254.1
Induced Effects	9.386	5.920	163.7
Total Related to Agriculture	34.565	17.229	417.8
% of State Total	—	11.58%	14.93%

- **Over $25 billion in total sales**

Figure 2 shows the estimated value of product flows in Virginia's agricultural system. In 1992 (the most recent year for which data were available), farm-level sales were $2.9 billion dollars. Manufactured food, fiber, and tobacco had sales of $14.3 billion, and the distribution system added another $2.8 billion. Together these three components purchased inputs from in-state suppliers worth $5.2 billion. In total, the system generated $25.2 billion in sales, affecting every sector of the state economy.

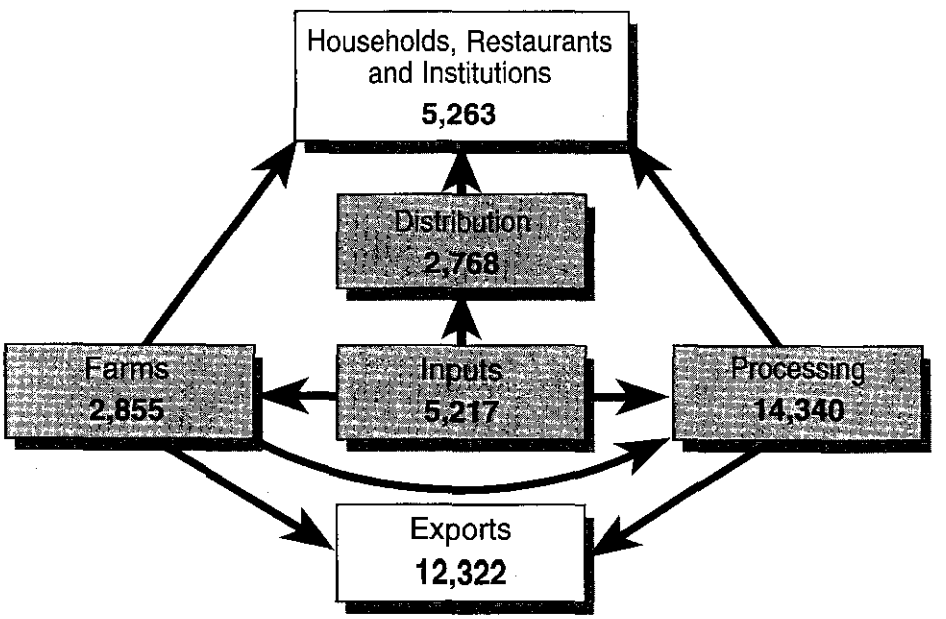

Figure 2: Value of product flows (in million dollars) in Virginia's agricultural system, 1992.

• **$11 billion contribution to Gross State Product (GSP)**

Counting only the value added by in-state activity, called contribution to GSP, agricultural system sales accounted for almost $11.3 billion, or 7.6 percent of the estimated GSP in 1991.

• **One quarter of a million jobs**

The agricultural system also supported approximately 254,000 jobs, about nine percent of the 1991 state total. That included 53,000 on farms, 51,000 in processing, 81,000 in the distribution sector, and 69,000 in input sectors. Most of these jobs were in urban areas of the state. Figure 3 shows the percent of total jobs in Virginia (in 1991) related to agriculture, including those accounted for by the four parts of the agricultural economic system and those supported by the induced effects income earned in the agricultural system.

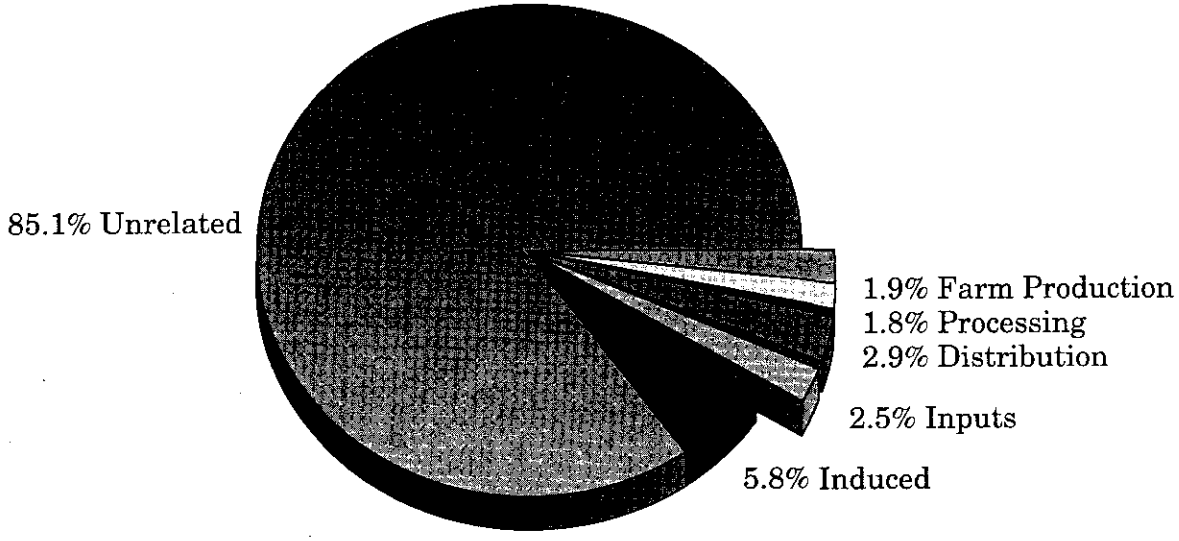

Figure 3: Contribution of Virginia's agriculture to state employment, 1991.

• **An additional $6 billion in GSP (4.0 percent) and an additional 164,000 jobs (5.9 percent) from induced effects.**

Like other industries, the agricultural system has a multiplier effect on other sectors of the economy when the income it generates for employees, proprietors, and owners is spent on goods and services. In 1991, these so-called induced effects added an additional $9.3 billion in sales, $5.9 billion in GSP, and 164,000 jobs (see Table 1 and Figure 3).

•**11.6 percent of GSP and 14.9 percent of jobs in the state are in some way related to the agricultural economic system.**

CONTRIBUTION of VIRGINIA'S AGRICULTURE, by DISTRICT and COMMODITY

As of 1992, the top 10 farm commodities (in cash receipts) in Virginia were (in order from one to ten) cattle and calves, broilers, milk, tobacco, greenhouse and nursery products, peanuts, soybeans, hogs, and eggs (Purcell). Virginia's national rankings in cash receipts in 1992 were fourth in tobacco, fifth in peanuts, sixth in turkeys,

sixth in apples, sixteenth in sweet corn, sixteenth in beef cattle, nineteenth in sheep, nineteenth in milk production, twentieth in hogs, and twentieth in wheat. In 1991, field crops and fruits accounted for 29 percent and meat and animal products accounted for 62 percent of total cash receipts.

Production of most agricultural commodities is concentrated in specific areas of the state. The seven areas shown in Figure 4 represent seven a*gricultural statistic districts*. (Please see Appendix B for a list of the jurisdictions included in each district.) The major food processing industries in Virginia—meat packing, poultry processing, prepared fish, confectionery products, fluid milk products, and canned vegetables—are concentrated in the more-urbanized northern, central, and southeastern districts. Poultry processing is the largest food-manufacturing industry in the northern and eastern districts; meat packing is sizable in the central and southeastern districts; and tobacco processing is located predominately in the central district.

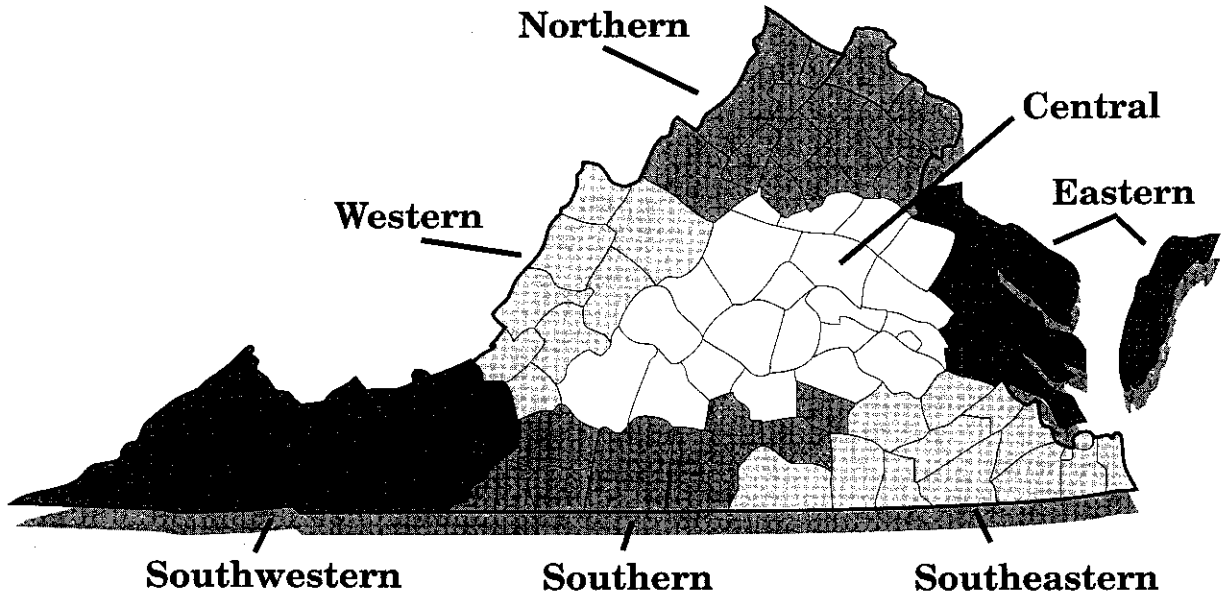

Figure 4: Agricultural statistic districts in Virginia

At the farm-level, grains are generally harvested in the east and southeast; cotton and peanuts are grown in the southeast; flue-cured and fire-cured tobaccos are grown in the south while burley tobacco is grown in the southwest; and milk and livestock production are predominately located in the western half of the state.

Agricultural system employment totals in each agricultural statistic district and in the state as a whole are shown in Table 2. This table shows the number of jobs (in 1991) supported by production of major agricultural commodities (cattle, poultry, hogs and sheep, milk, major crops, tobacco, processed meat, processed milk, processed tobacco, and miscellaneous agricultural manufacturing). For instance, the estimated number of direct jobs supported in Virginia by production of all major crops in 1991 was 3,580. Similarly, the estimated number of direct jobs supported by the processed-meats industry was 16,490. In Table 3, direct employment percentages are presented, for each commodity group, by district. These employment estimates were obtained by grouping commodities presented in Appendix C into major industries (cattle, milk, crops, tobacco, etc), and adding the direct employment numbers within each group.

Table 2. Direct agricultural system employment, by district and commodity group, 1991.

Virginia Agricultural Statistic District								
Farm Production Sector	**Northern**	**Western**	**Central**	**Eastern**	**Southern**	**South-western**	**South-eastern**	**State**
Cattle	2,457	1,278	2,211	147	1,009	2,856	449	10,407
Poultry	2,163	1,876	585	374	119	3	203	5,324
Hogs and Sheep	221	70	113	87	77	112	1,482	2,162
Total Major Livestock	**4,794**	**3,189**	**2,895**	**606**	**1,203**	**2,940**	**2,130**	**17,757**
Milk	980	322	470	42	396	652	102	2,963
Major Crops*	481	154	432	738	213	276	1288	3,580
Tobacco	0	0	258	0	1,765	1,553	650	4,226
Processing Sector	**Northern**	**Western**	**Central**	**Eastern**	**Southern**	**South-western**	**South-eastern**	**State**
Meat	6,786	173	1,430	2,930	148	247	4,776	16,490
Milk	401	148	977	132	0	260	152	2,070
Other Food	3,011	1,295	4,745	4,585	511	832	3,979	18,958
Tobacco	0	0	11,347	174	1,142	0	0	12,663

*The sector includes corn, soybeans, wheat, barley, hay, and peanuts.

Table 3. Percentage of total direct agricultural employment by district and commodity group, 1991.

Virginia Agricultural Statistic District								
Farm Production Sector	**Northern**	**Western**	**Central**	**Eastern**	**Southern**	**South-western**	**South-eastern**	**State**
Cattle	23.6	12.3	21.2	1.4	9.7	27.4	4.3	100
Poultry	40.6	35.2	11.0	7.0	2.2	0.1	3.8	100
Hogs and Sheep	10.2	3.2	5.2	4.0	3.6	5.2	68.5	100
Total Major Livestock	**27.0**	**18.0**	**16.3**	**3.4**	**6.8**	**16.6**	**12.0**	**100**
Milk	33.1	10.9	15.9	1.4	13.4	22.0	3.4	100
Major Crops*	13.4	4.3	12.1	20.6	5.9	7.7	36.0	100
Tobacco	0	0	6.1	0	41.8	36.7	15.4	100
Processing Sector	**Northern**	**Western**	**Central**	**Eastern**	**Southern**	**South-western**	**South-eastern**	**State**
Meat	41.2	1.0	8.7	17.8	0.9	1.5	29.0	100
Milk	19.4	7.1	47.2	6.4	0	12.6	7.3	100
Other Food	15.9	6.82	5.0	24.2	2.7	4.4	21.0	100
Tobacco	0	0	89.6	1.4	9.0	0	0	100

*The sector includes corn, soybeans, wheat, barley, hay, and peanuts.

Before we discuss the commodity- and district-level contributions of Virginia agriculture, three comments are in order on this analysis:

- Data were not available for every commodity in every county or region;
- The district location of input suppliers cannot be determined; and
- Movement of commodities from farms to processors cannot be precisely described.

Commodity Summary

Tobacco, soybeans, and peanuts are the major cash crops in Virginia. Tobacco sales in 1991 were estimated to be $197 million, which stimulated economic activity in the state by as much as $400 million. Farm-input purchases to produce tobacco contributed $137 million to GSP, and created 3,004 indirect jobs. Total soybean sales in 1991 were estimated to be $88.5 million, and the overall economic activity in the state attributable to soybean production amounted to $210 million. Farm purchases of inputs for soybean production contributed $77.9 million to GSP and 1,825 indirect jobs. For peanuts, total sales in 1991 were estimated to be $87 million, resulting in $206.7 million of statewide economic activity. Input purchases to produce peanuts contributed $73 million to GSP and 1788 indirect jobs.

Poultry and egg production accounts for a large share of agricultural output in Virginia. Most chicken and turkey sales are not included in farm sales because poultry farms are largely owned by vertically integrated poultry processing establishments.[3] In 1991, the value of turkeys and chickens combined was about $516 million, and the direct contribution to GSP and employment was $63 million and 5,324 full-time equivalent jobs, respectively. Statewide economic activity resulting from input purchases was approximately $1.05 billion, the contribution to GSP was $655 million, and the number of indirect jobs created was estimated to be 9,452.

Beef cattle, as the second largest meat commodity (in cash receipts) produced in Virginia, made a direct contribution of $155 million to GSP in 1991. The level of direct employment in the beef cattle sector was 10,407, and the sector created approximately 14,150 indirect jobs. Farm input purchases for beef cattle production resulted in an additional $602 million contribution to GSP.

Total fluid milk sales in 1991 were estimated to be $269 million. The sector's direct contributions to GSP and employment were $47 million and 2,963 full-time equivalent jobs, respectively. The level of economic activity in the state attributable to input purchases for dairy farming was estimated to be $595 million, while the impacts on GSP amounted to $247 million.

District Summary

In the northern district, poultry was the number one agricultural activity in 1991 with total sales of approximately $715 million. The direct contribution to GSP was $170 million, and total direct employment was 6,732. The number of indirect jobs created by poultry production was 11,045.

In the eastern district, poultry sales were estimated at $281.6 million, the direct contribution to GSP was $60.5 million, and total employment was 2,733. The number of indirect jobs created was 3,847.

In the central district, meat packing is the largest agricultural system activity. In 1992, meat packing plants employed 239 full-time equivalent workers. Estimated total sales were $87.5 million, and the sector's direct contribution to GSP was $6.5

[3]A vertically integrated poultry establishment is a food-processing firm that owns, or contracts with, poultry farms to ensure a supply of live poultry for its processing plants. The processing firm purchases farm inputs and services and sells processed meat. Because live poultry is an intermediate product of these firms, this poultry is not recorded in any sector's sales.

million. Hence, the impacts in terms of output, GSP, and employment were $257 million, $96.8 million and 3,755 jobs, respectively.

Meanwhile, in the southeastern district in 1992, meat packing employed 2,800 full-time equivalent workers, with total sales of $1.06 billion. The direct contribution to GSP of meat packing in the southeast was $97.9 million. The impacts in terms of sales, GSP, and employment were $1.46 billion, $313.7 million and 10,300 jobs, respectively.

Tobacco is the chief agricultural industry in the central district. Estimated sales of tobacco products in 1991 were about $6.6 billion, while the direct contribution to GSP amounted to $3.7 billion. Tobacco manufacturers employed approximately 11,000 full-time equivalent workers. The impact on the region, therefore, was estimated to be $8.8 billion in terms of total sales, over $4.8 billion in GSP, and 46,315 in total employment. Tobacco stemming and redrying, considered separately, employed 339 full-time equivalent workers in 1991. The industry's estimated total sales in 1991 were $130 million, and the direct contribution to GSP was $18.3 million.

Figures 5 through 14 identify the district shares of total state production and processing employment, showing the relative importance of various agricultural activities to each agricultural statistic district. Poultry, hog and sheep production, tobacco, milk processing, and tobacco processing have the most pronounced distributions among districts.

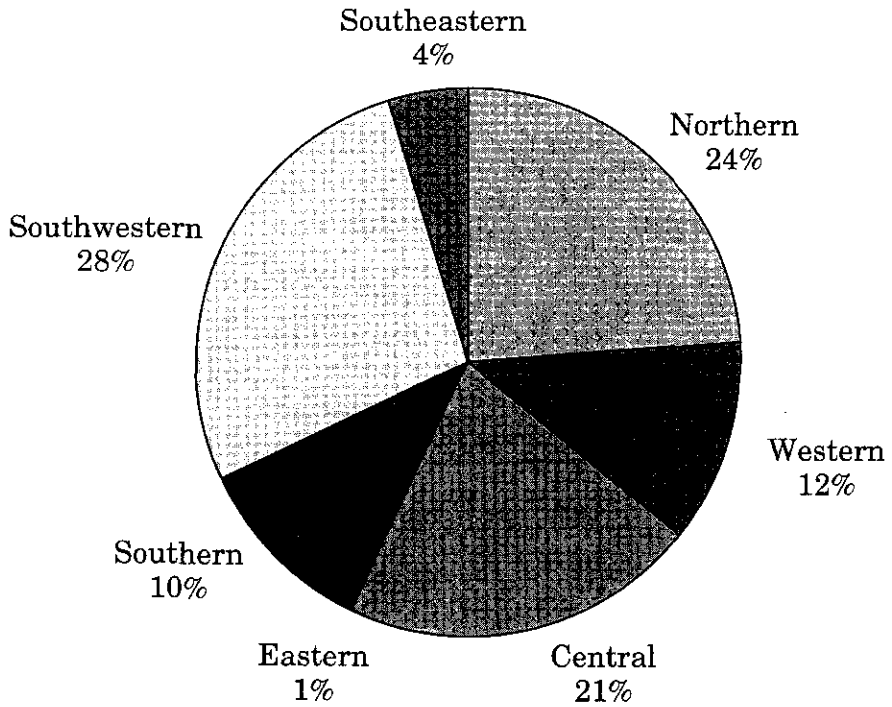

Figure 5. Virginia agricultural statistic district shares of beef cattle production employment, 1991.

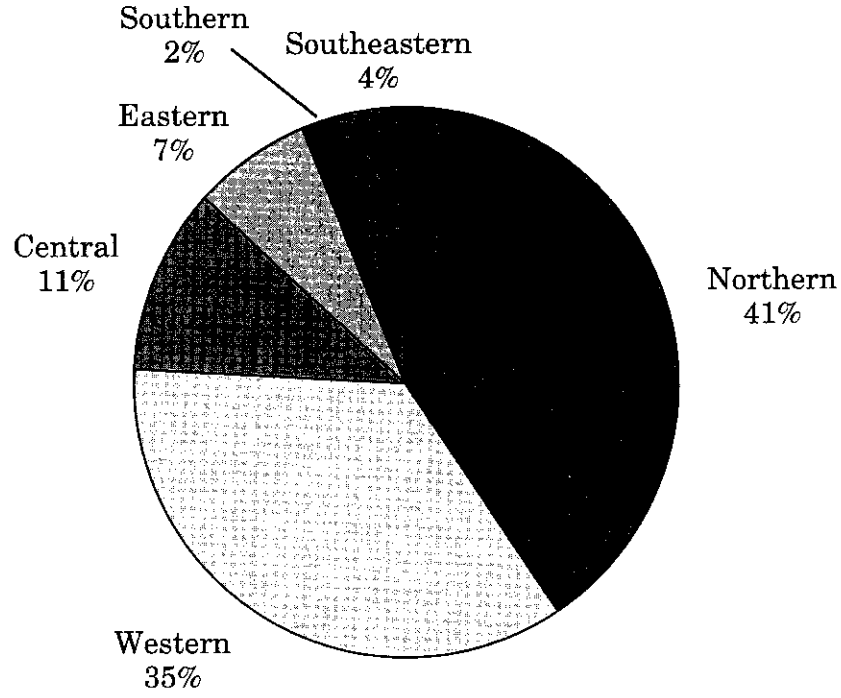

Figure 6. Virginia agricultural statistic district shares of poultry production employment, 1991.

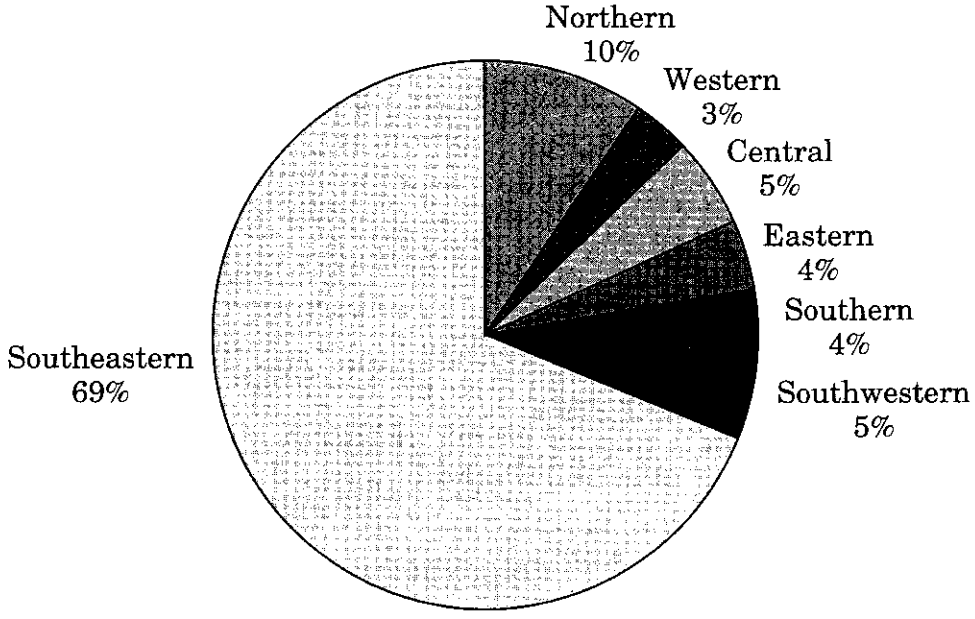

Figure 7. Virginia agricultural statistic district shares of hog and sheep production employment, 1991.

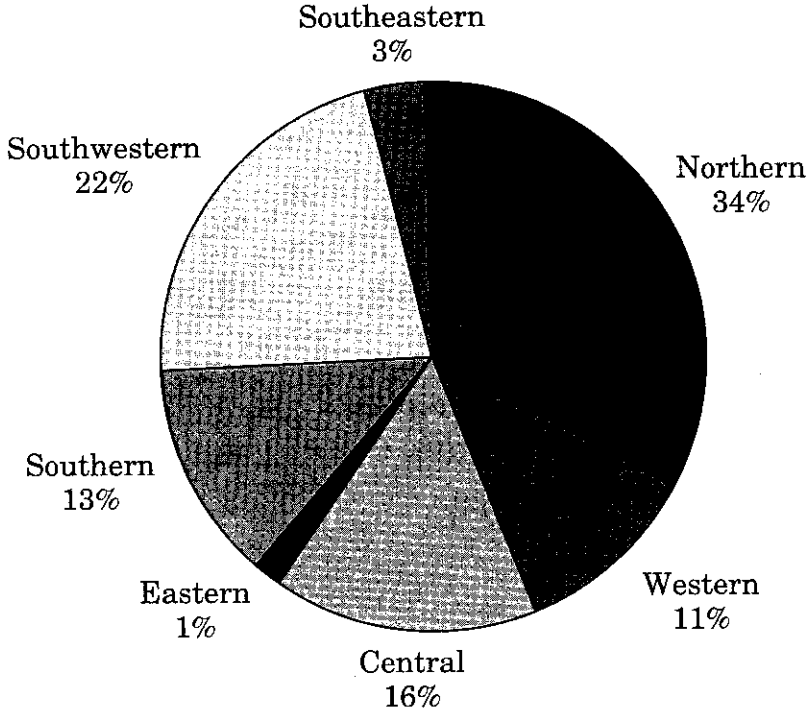

Figure 8. Virginia agricultural statistic district shares of milk production employment, 1991.

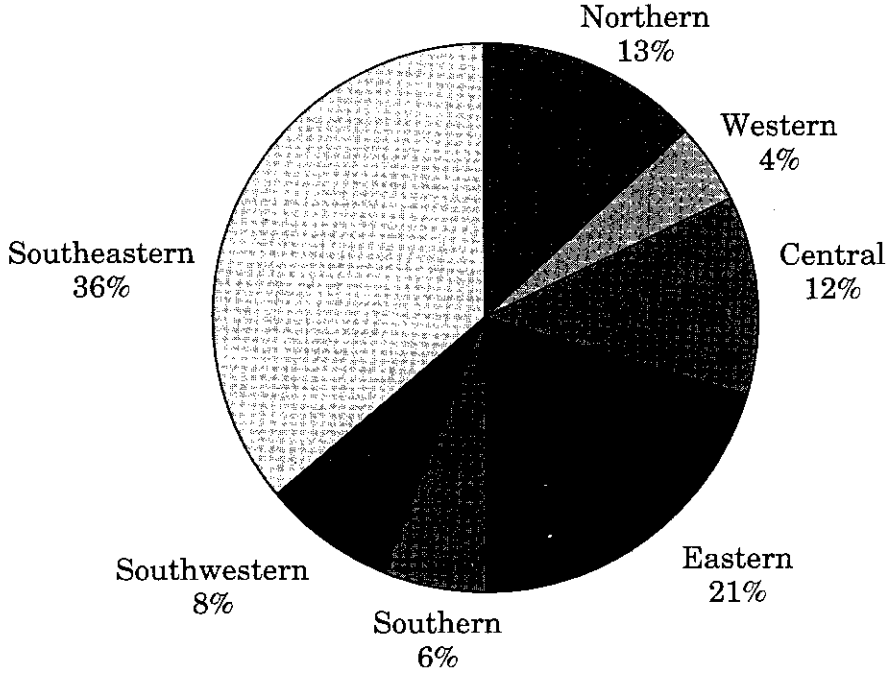

Figure 9. Virginia agricultural statistic district shares of (major) crop production employment, 1991.

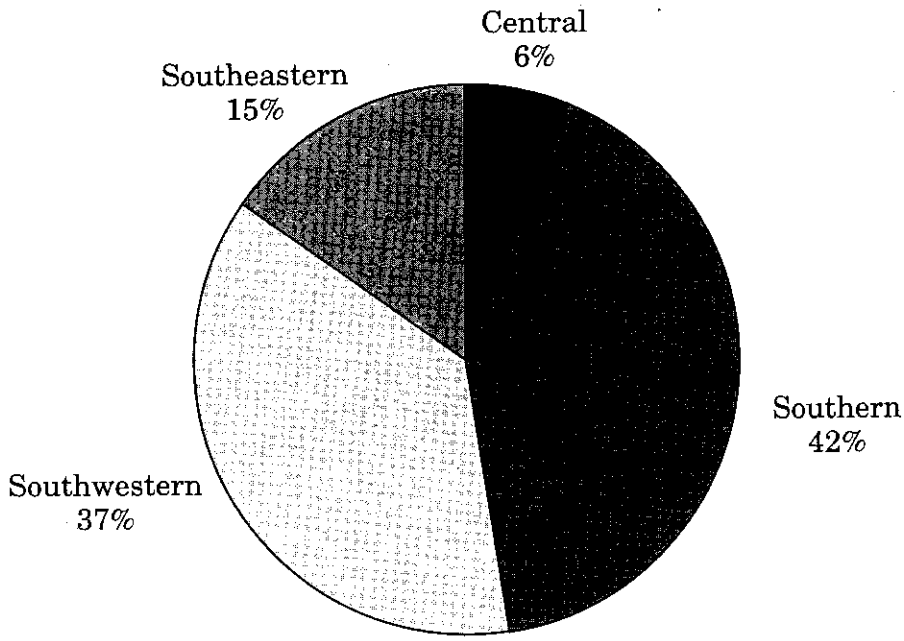

Figure 10. Virginia agricultural statistic district shares of tobacco production employment, 1991.

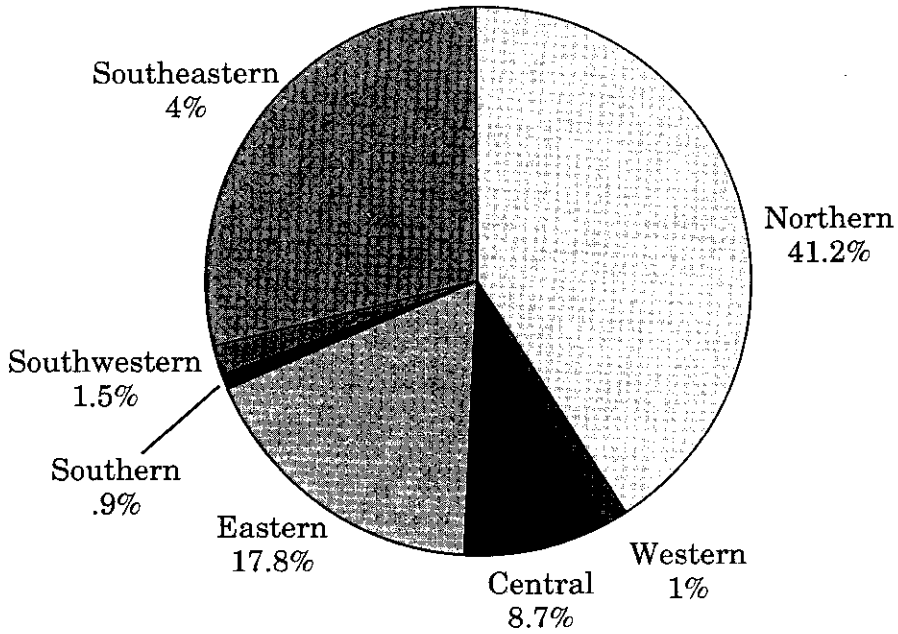

Figure 11. Virginia agricultural statistic district shares of meat processing employment, 1992.

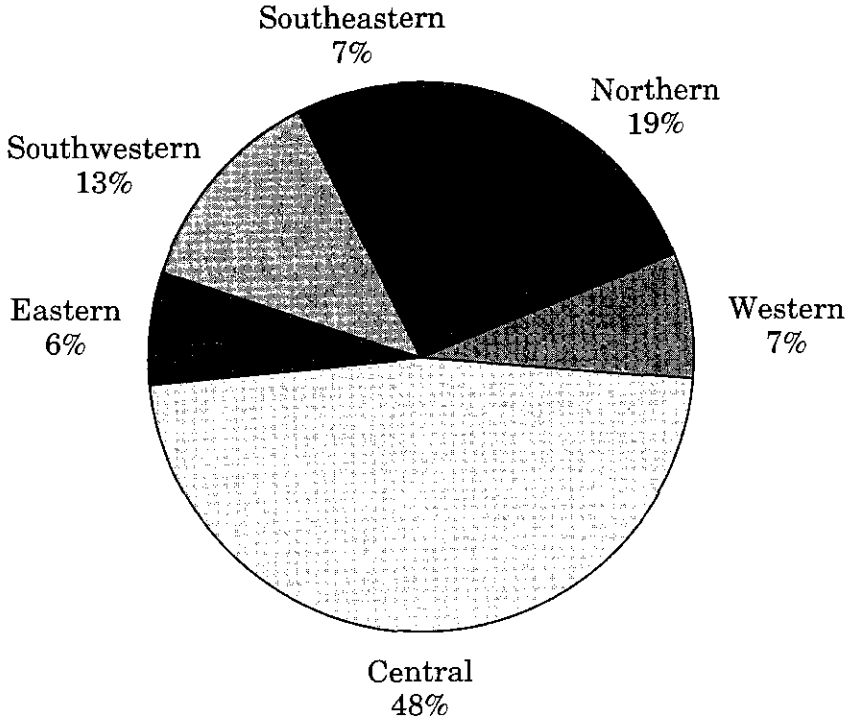

Figure 12. Virginia agricultural statistic district shares of milk processing employment, 1992.

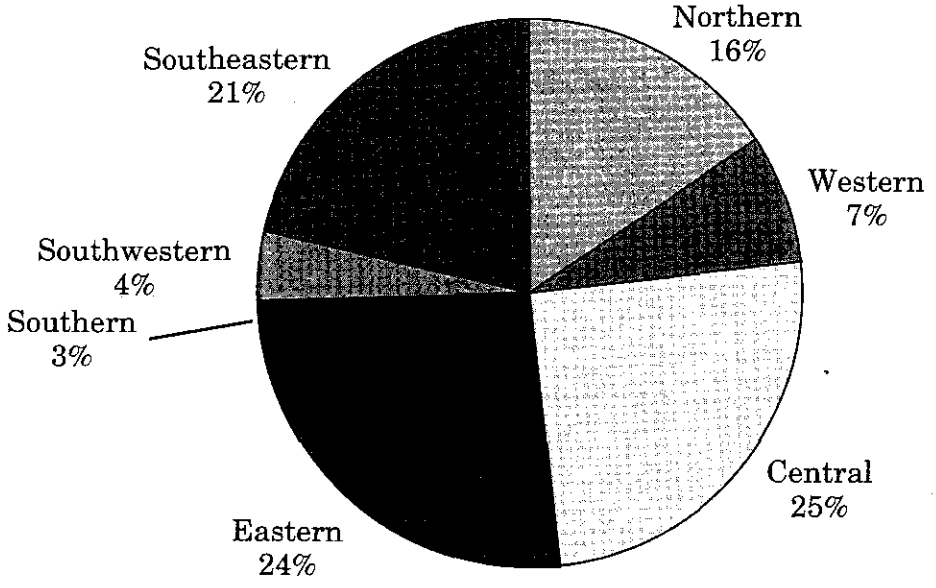

Figure 13. Virginia agricultural statistic district shares of employment in processing of foods other than meat and milk, 1992.

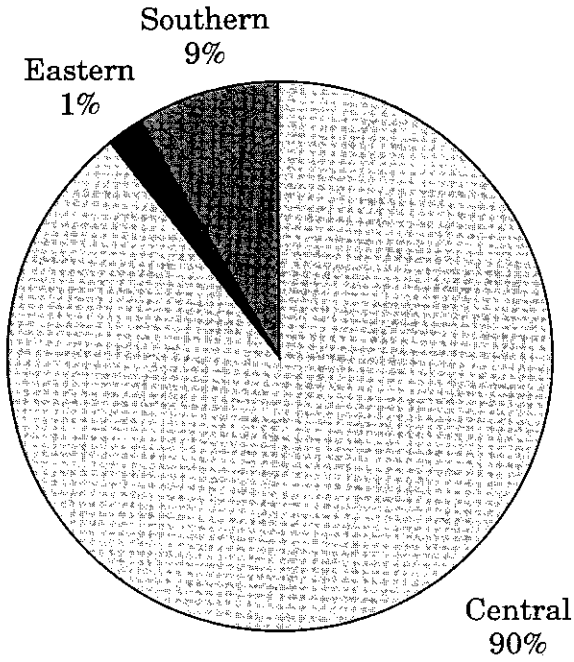

Figure 14. Virginia agricultural statistic district shares of tobacco processing employment, 1992.

Figures 15 through 21 show direct farm-production employment by major commodity for each district. Cattle production employs the most people in the northern, western, central, and southwestern districts. Poultry production employment is more concentrated in the northern and western districts. In the southeastern district, the hogs and sheep combined category is the largest farm-production employer, followed closely by major crops. Total employment in tobacco farming is relatively high in the southern and southwestern districts.

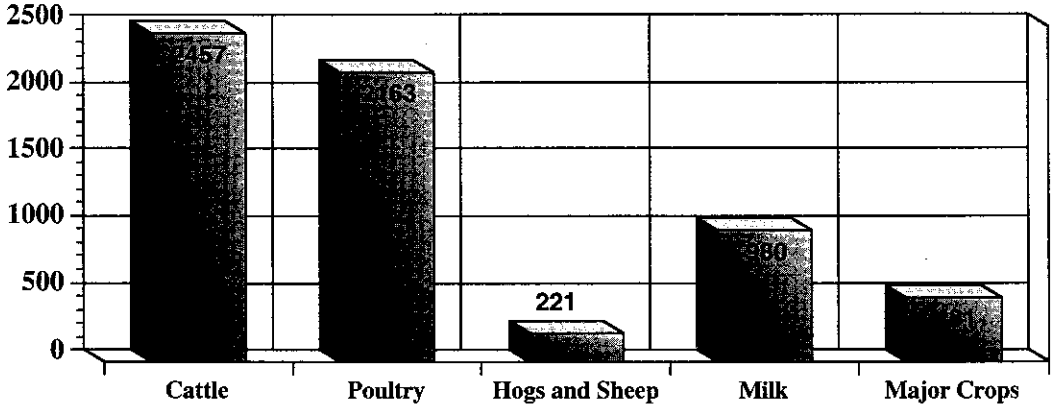

Figure 15. Farm-production employment in the northern Virginia agricultural statistic district, by major commodity, 1991.

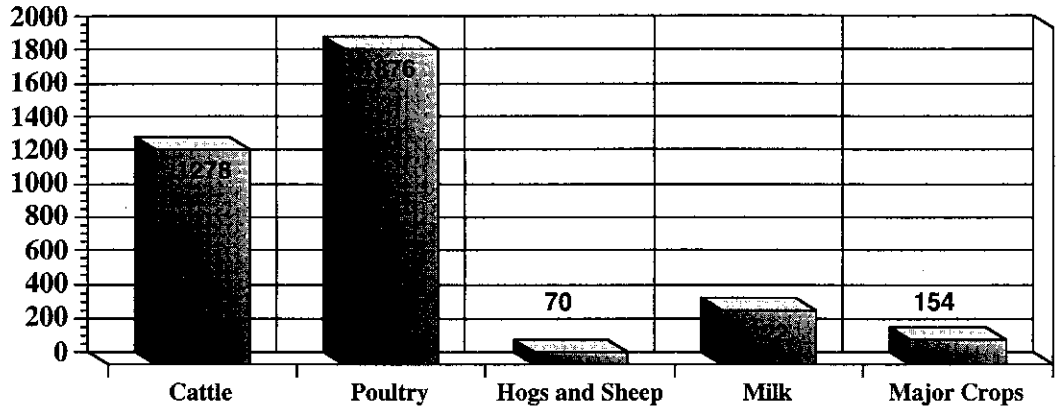

Figure 16. Farm-production employment in the western Virginia agricultural statistic district, by major commodity, 1991.

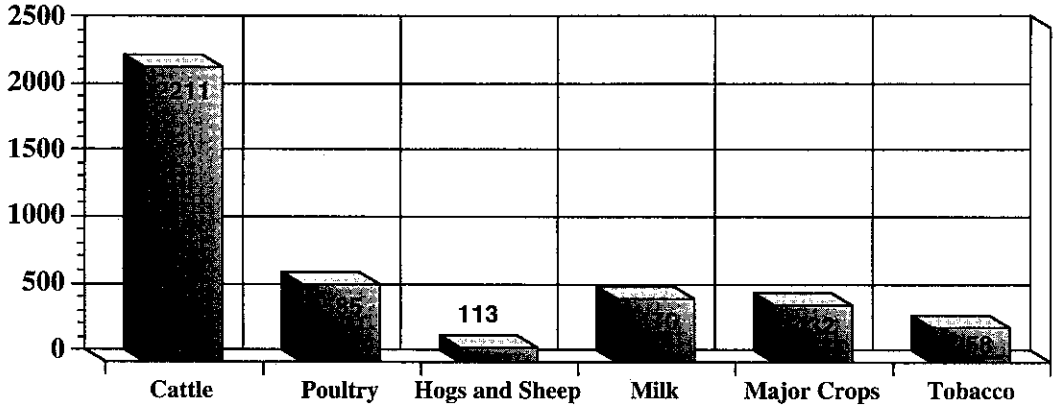

Figure 17. Farm-production employment in the central Virginia agricultural statistic district, by major commodity, 1991.

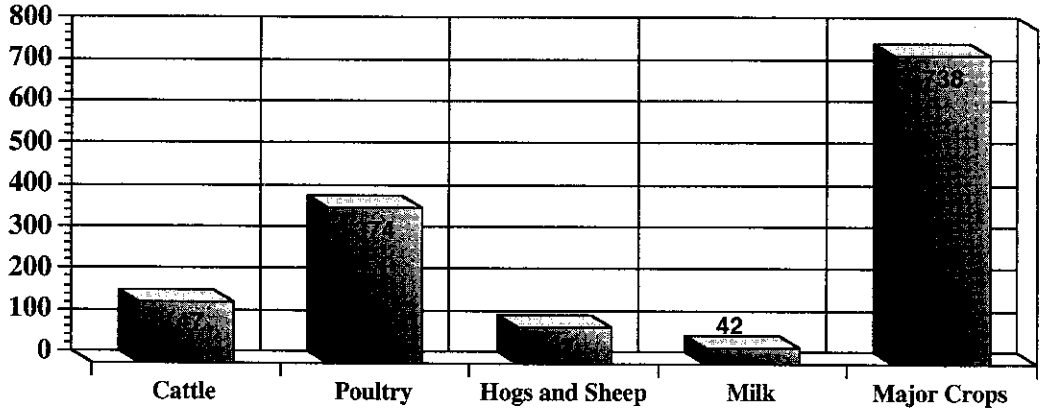

Figure 18. Farm-production employment in the eastern Virginia agricultural statistic district, by major commodity, 1991.

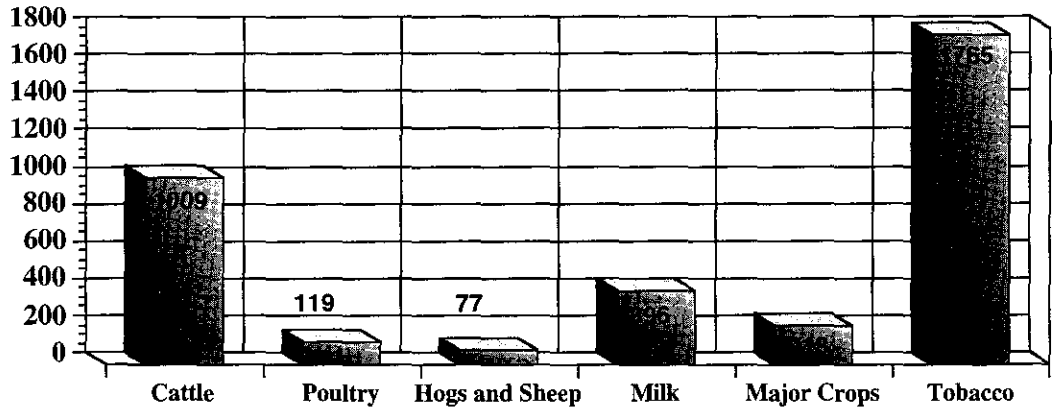

Figure 19. Farm-production employment in the southern Virginia agricultural statistic district, by major commodity, 1991.

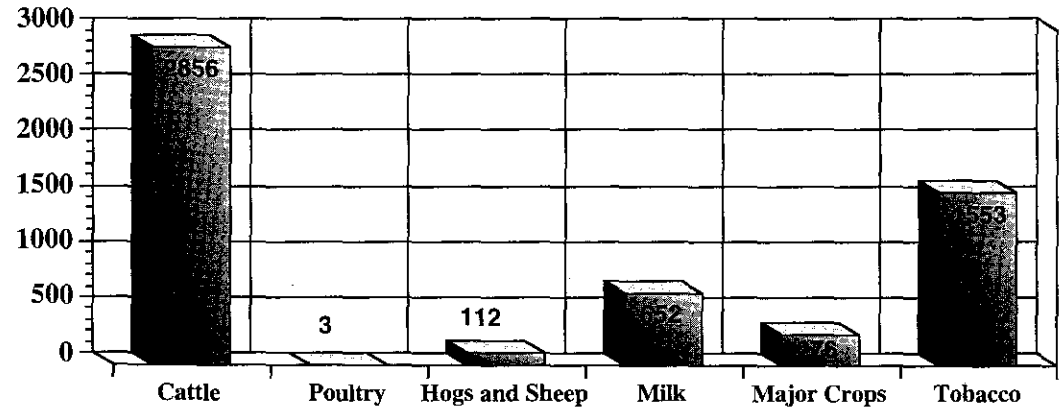

Figure 20. Farm-production employment in the southwestern Virginia agricultural statistic district, by major commodity, 1991.

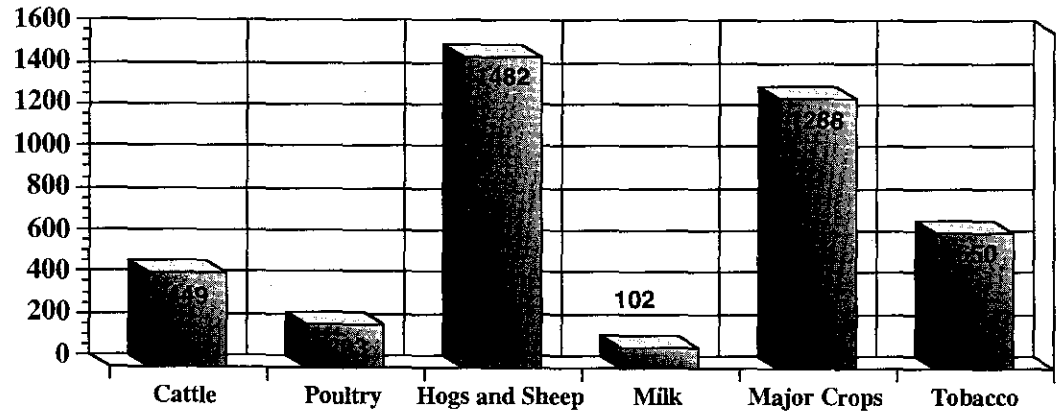

Figure 21. Farm-production employment in the southeastern Virginia agricultural statistic district, by major commodity, 1991.

Figures 22 through 28 show the direct agricultural-processing employment for each district. Poultry processors are major employers in the northern and eastern districts. Tobacco processing tends to dominate agricultural-processing employment in the central and southern districts. Meat processing is the major source of agricultural-processing employment in the southeastern district.

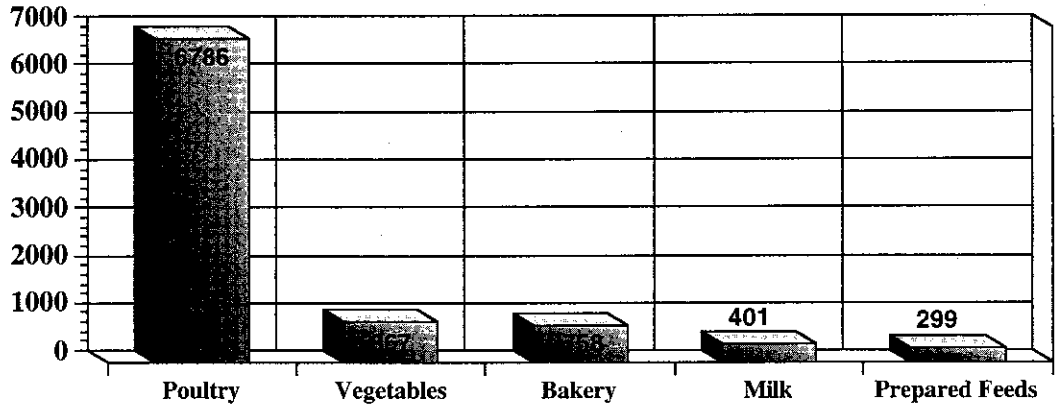

Figure 22. Agricultural-processing employment in the northern Virginia agricultural statistic district, by major commodity, 1992.

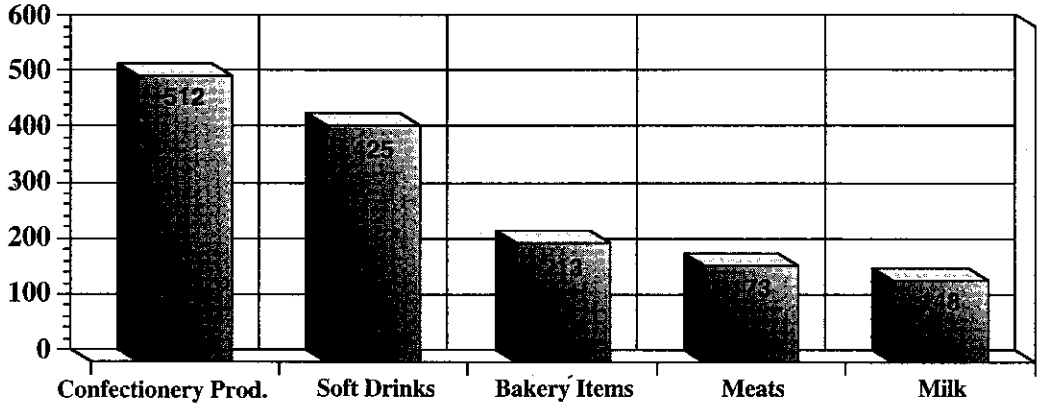

Figure 23. Agricultural-processing employment in the western Virginia agricultural statistic district, by major commodity, 1992.

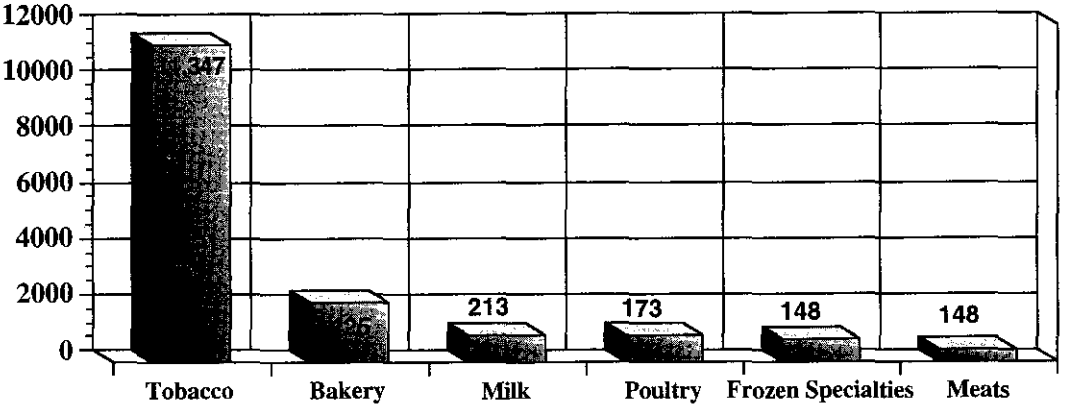

Figure 24. Agricultural-processing employment in the central Virginia agricultural statistic district, by major commodity, 1992.

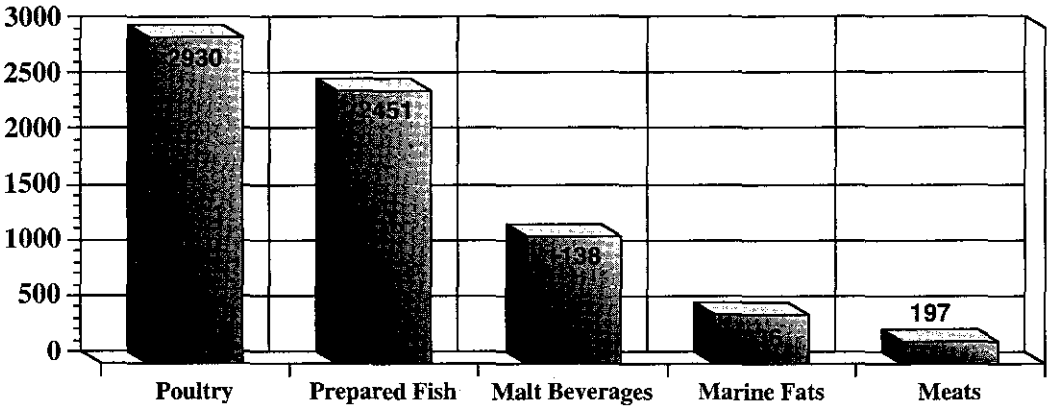

Figure 25. Agricultural-processing employment in the eastern Virginia agricultural statistic district, by major commodity, 1992.

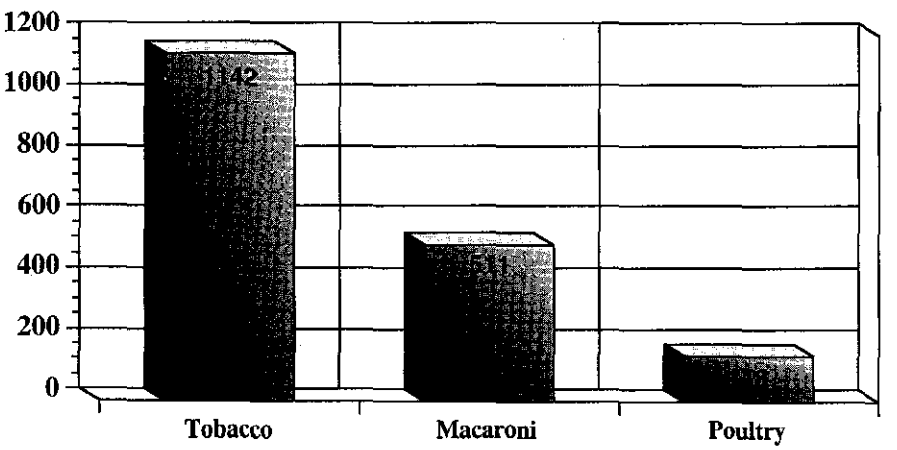

Figure 26. Agricultural-processing employment in the southern Virginia agricultural statistic district, by major commodity, 1992.

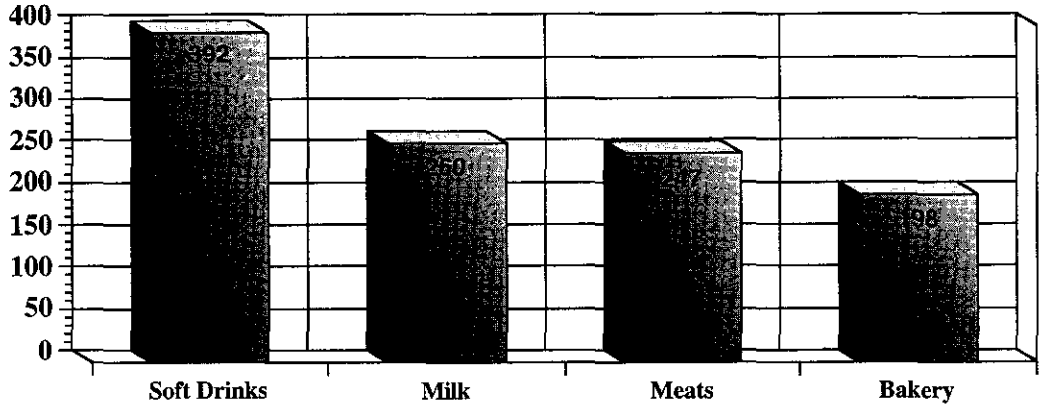

Figure 27. Agricultural-processing employment in the southwestern Virginia agricultural statistic district, by major commodity, 1992.

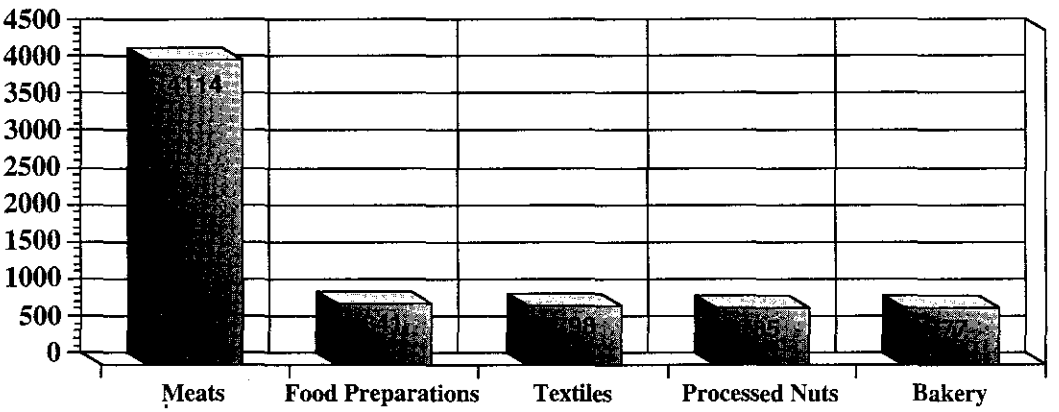

Figure 28. Agricultural-processing employment in the southeastern Virginia agricultural statistic district, by major commodity, 1992.

CONCLUSIONS

Many people have the false impression that agriculture is a minor part of Virginia's economy. The truth is that agriculture is a significant industry in the state. Approximately one of every seven jobs in Virginia is related to agriculture. Over nine percent of the state work force is employed in farm production, agricultural processing, distribution of agricultural goods, and supply of inputs to production, processing, and distribution. The four components of the agricultural economic system account directly for over 7 percent of GSP. When multiplier effects are considered, agriculture-related activities account for as much as 11.6 percent of the state economy.

These estimates of agriculture's contribution are significant. Even so, they are conservative (that is, perhaps underestimated), because of several factors: 1) published estimates of employment in farming fails to account for most unpaid, family, and operator labor; 2) the IMPLAN input-output model generates impact estimates that are generally considered to be conservative; 3) double-counting has been painstakingly removed; 4) estimates of agricultural investment expenditures were not included in this study; 5) the value and impact of products consumed by farm families were not considered; and 6) the impacts of government subsidies were excluded.

Some people might also be surprised that most of the jobs in Virginia's agricultural system occur in the state's urban areas. Cities and metropolitan counties are where most agricultural inputs are produced, services are offered, and processing and distribution of products occurs.

Agriculture in Virginia is a vibrant economic sector, closely tied to Virginia's quality of life by the sector's history, economic contributions, and importance as a predominant land use. This study indicates that Virginia has a vital interest in a prosperous agricultural sector.

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APPENDIX A. NOTES on METHODS

Definitions

The **multiplier effect** refers to the following process: 1) a sector creates jobs that provide income to otherwise unemployed and underemployed people or to new workers; 2) those people spend much of their income on goods and services bought within the local community; 3) this increase in demand for goods and services purchased in the local economy eventually results in the creation of other new jobs in the region (in retail establishments, service industries, suppliers of raw materials to the new company, producers of new products using the new firm's output as input, etc.); and 4) the cycle continues with more income being spent, creating more demand and more new jobs. The effect eventually ends because, at each stage, some of the newly employed people's incomes will be used to purchase goods and services *outside* the region. This loss is known as **leakage**. Once the new income has leaked out of the county, there is no more driving force behind the multiplier effect, and the cycle ends. The sum of all activity that has occurred during the cycle is the **output multiplier**.

Input-output models distinguish between output, income, and Gross State Product. **Output**, often called economic activity, includes all sales by all firms. Output is the most commonly used measure of impact, but it is not the best measure because it includes a lot of intermediate products produced in other regions. **Gross State Product** (GSP) is a more meaningful measure of impact because it takes out the part of output not produced locally. **Income** measures the portion of GSP that becomes the gross income of individuals.

Description of the IMPLAN Model

IMPLAN (Impact Model for PLANing), an input-output modeling system developed by the U.S. Forest Service, was used to generate a series of economic multipliers for the Commonwealth of Virginia. Industries within an economy are interdependent in the sense that goods and services are traded among firms. An increase in the demand for an existing sector's output, or the location of a new firm in the region, will result in increased output in many other sectors of the economy. These resulting effects are quantified by calculating input-output multipliers. The IMPLAN system provides the data necessary to construct an input-output model of any county, or grouping of counties, in the country. IMPLAN provides multipliers for any of 528 economic sectors, some or all of which may exist in a given region under study. When a new firm is anticipated in a sector for which there are no current firms, the IMPLAN system can be adjusted to include the new firm.

Avoiding Double Counting

The monetary flows from farming to processing and distribution (see Figure 2 above) were estimated for this study from coefficients generated by the IMPLAN model. These flows were then used to eliminate double counting in the estimates of inputs. For example, of the estimated $2,855 million in farm sales, about $1,106 million was sold to Virginia processors – the rest constituted direct sales to consumers, and "exports" to buyers outside the state. The $1,106 million, plus the inputs used by farms to produce it, are indirect inputs of the processing sector. If the inputs of farms are added to the inputs of processors, $1,106 million plus its inputs are counted twice. In order to correct for this, $1,106 million in farm sales, and the inputs required to produce them, were subtracted from the estimate of system inputs. In addition, processors purchased an estimated $1,272 million from the distribution sector which, with the associated inputs, were subtracted from total inputs to avoid double counting. Many studies have failed to make corrections such as these and thus tend to over-estimate the level of inputs used by the system and

NOTES

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