

Agriculture in Fauquier County: Characteristics, Trends, and Economic Impacts



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May 2014



WELDON COOPER
CENTER FOR PUBLIC SERVICE
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**AGRICULTURE IN FAUQUIER COUNTY:
CHARACTERISTICS, TRENDS,
AND ECONOMIC IMPACTS**

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Center for Economic and Policy Studies**

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INTRODUCTION

The Fauquier County agricultural landscape has undergone many changes throughout its history. In the early part of the 20th Century, the area transitioned from apple and peach orchards and field crops to livestock and pasture and forage crops. Sheep and hogs were succeeded by beef and dairy cattle (Brown, Nicklin, and Toler 2008). Throughout the period, the horse industry has grown to play an increasingly important role, building on the area's venerable fox hunt, horse show and race heritage, including the nation's first hunt club (Piedmont Foxhounds), first horse show (Upperville Colt and Horse Show), and one of the largest steeplechase races (Virginia Gold Cup Race). In recent years, the county has seen a marked increase in value-added and specialty products such as wine and mushrooms.

In 1969 farm employment was 2,475 and made up approximately 21 percent of total employment. Livestock sales represented over 86 percent of total farm income. By 1987, farm employment had decreased to around 1,600 farmers and began to stabilize. Livestock continue to be the largest source of sales in 2012, but represented just 54 percent of total farm income. Sales of crops and farm-related income such as equine and agritourism related income were increasingly important. In 2012, Fauquier County's farms generated an estimated average \$54 million in agricultural commodity sales. \$1.4 million of this amount was sold directly to consumers.

The purpose of this study is to describe the agricultural sector in Fauquier County and gauge the contribution that it makes to the county economy. This study takes a comprehensive approach to measuring the economic contribution of agriculture. Not only does it gauge the economic impact of agriculture sales, but also it looks at the role of closely related value-added industries such as wine

and animal slaughtering and processing. In addition, the economic impacts of visitor expenditures connected to farms, wineries and horse shows and competitions are counted. These economic impacts are broken out by source so that the reader can evaluate the relative importance of each component. In addition, the study discusses other economic benefits that result from Fauquier County agriculture.

To analyze economic impacts, the study uses a methodology (input-output analysis) and a software tool (IMPLAN) that have been applied often in agribusiness impact analysis, including recent economic impact studies of Virginia's agricultural and forest industries (Rephann 2013) and the horse industry (Rephann 2011). The methodology accounts not only for the direct spending attributable to agriculture but also for indirect spending attributable to backward linkages in the supply chain. As a result of these linkages, the original expenditures cause a "ripple effect" or "multiplier effect" when money is re-spent in Fauquier County. The study presents economic impacts in terms of employment, total industrial output, and value-added. Impacts are presented for agriculture-related industries in terms of farm production, closely related primary manufacturing such as wineries and animal slaughtering, the horse industry, and agritourism.

The study is divided into five sections. The first section describes the Fauquier County economy and trends in key economic and demographic data. The second section discusses features and changes in the area's agriculture sector. The third section describes the input-output methodology. The fourth section presents the economic contribution of agriculture to the county economy. The fifth section describes briefly other economic benefits of agriculture for the area.

SECTION ONE THE FAUQUIER COUNTY ECONOMY

Fauquier County is located in northern Virginia (see **Figure 1.1**) and forms part of the southwestern boundary of the Washington–Arlington–Alexandria, DC–VA–MD–WV metropolitan statistical area. The county’s population was an estimated 66,542 in 2012, which is up 20 percent from a level of 55,470 in 2000. Population growth patterns reflect, in part, residential decentralization from the inner ring metropolitan counties (see **Box 1.1**) that tends to track above the statewide average growth rate during periods of economic expansion and lag during recession (see **Figure 1.2**). The county seat of Warrenton is the largest incorporated town in the county, with an estimated 9,802 residents in 2012, up from 6,670 in 2000 for a growth rate of 47 percent.

As an outer-ring metropolitan county, the county experiences a significant net outflow of workers each day. Approximately 56 percent of local residents or 18,198 workers commuted outside the county to employment during the period 2006-2010, mostly to Fairfax County (5,542), Prince William County (4,038), and Loudoun County (1,726).¹ The county also experienced an inflow of 9,149 in-commuters

for a net outflow of 9,049 workers during the period, which highlights the county’s continued role as a bedroom community for the DC metropolitan area.

Fauquier County has a diversified economy built on numerous small businesses. Unlike many localities, the county is not highly dependent on a handful of large private or public employers. Non-farm proprietors, including the self-employed, make up a relatively large share of total employment, 37.8 percent in 2012 compared to just 18.6 percent statewide.² The farm, construction, and arts, entertainment, and amusement sectors form a relatively larger share of local employment than they do statewide. **Figure 1.3** shows the size and change in wage and salary employment of the major sectors in the region from 1990-2012. The health care and educational services industries experienced the highest absolute growth during this period. Among higher paying sectors, employment in professional, scientific, and technical services expanded by more than 1,000 jobs. Numerous other sectors have also increased employment in the region. Only the public administration, agriculture, forestry, fishing, and hunting, and finance and

1 U.S. Census Bureau, 2006-2010 American Community Survey, Table I. Residence County to Workplace County Flows for the United States and Puerto Rico Sorted by Residence Geography: 2006-2010.

2 Bureau of Economic Analysis, Local Area Personal Income, 2011, CA25N Table. <http://www.bea.gov/regional/histdata/releases/1112lapi/index.cfm>

Figure 1.1. Fauquier County Location

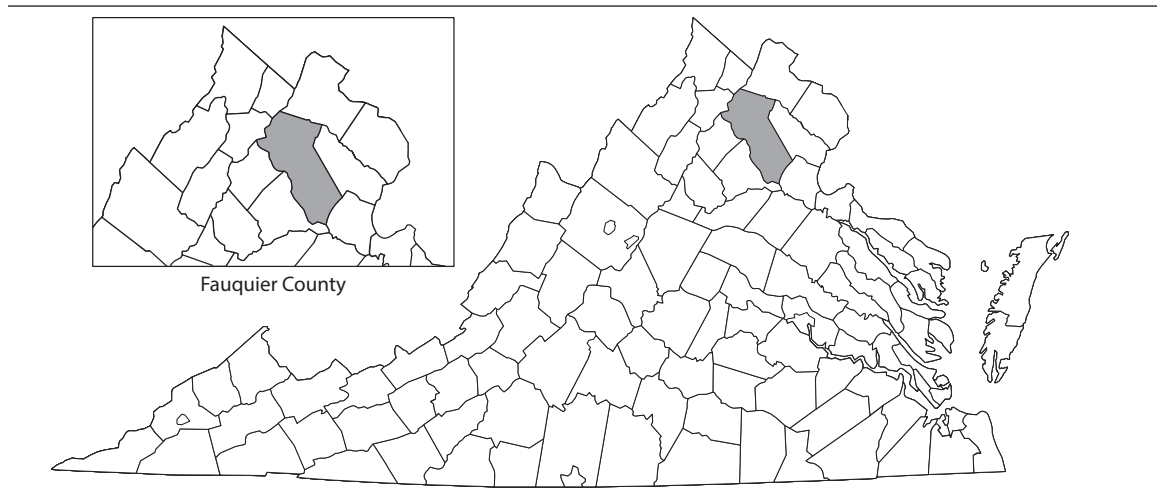
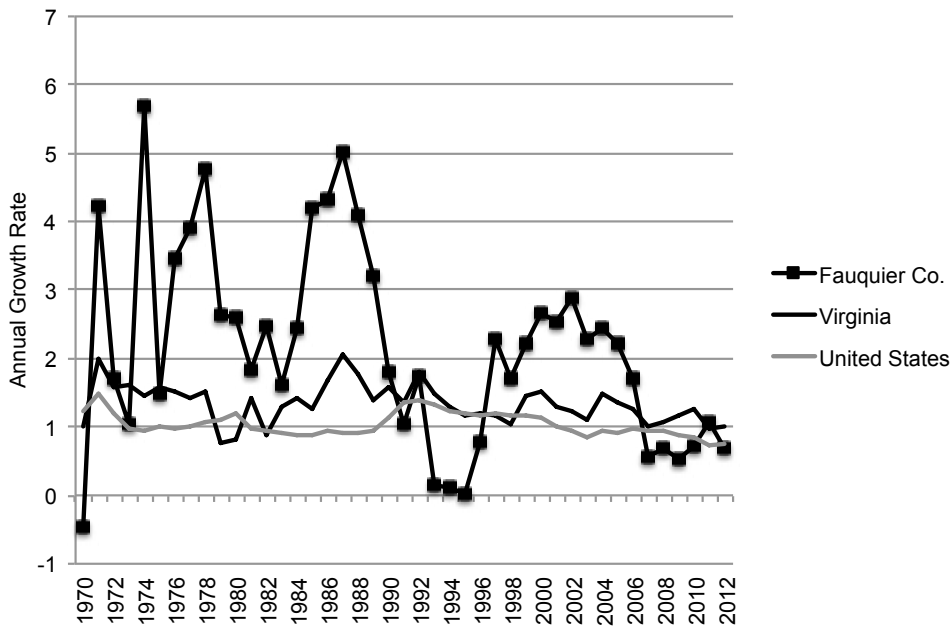
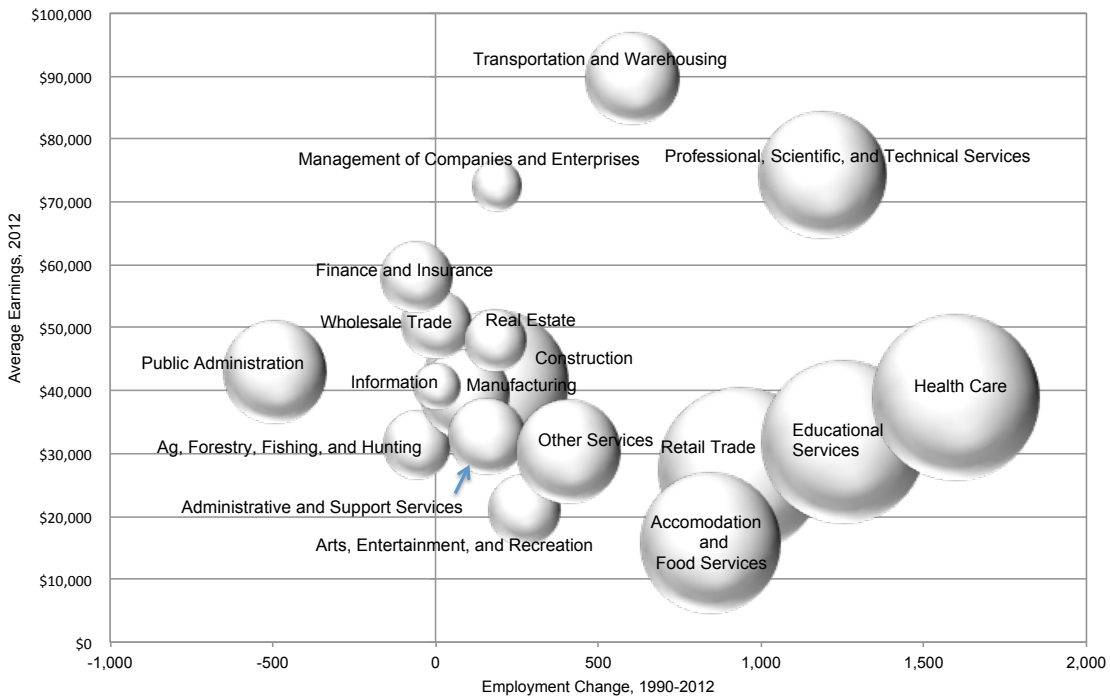


Figure 1.2. Annual Population Growth Rate, Fauquier County, Virginia, and United States, 1970-2012



Source: Bureau of Economic Analysis, Local Area Personal Income

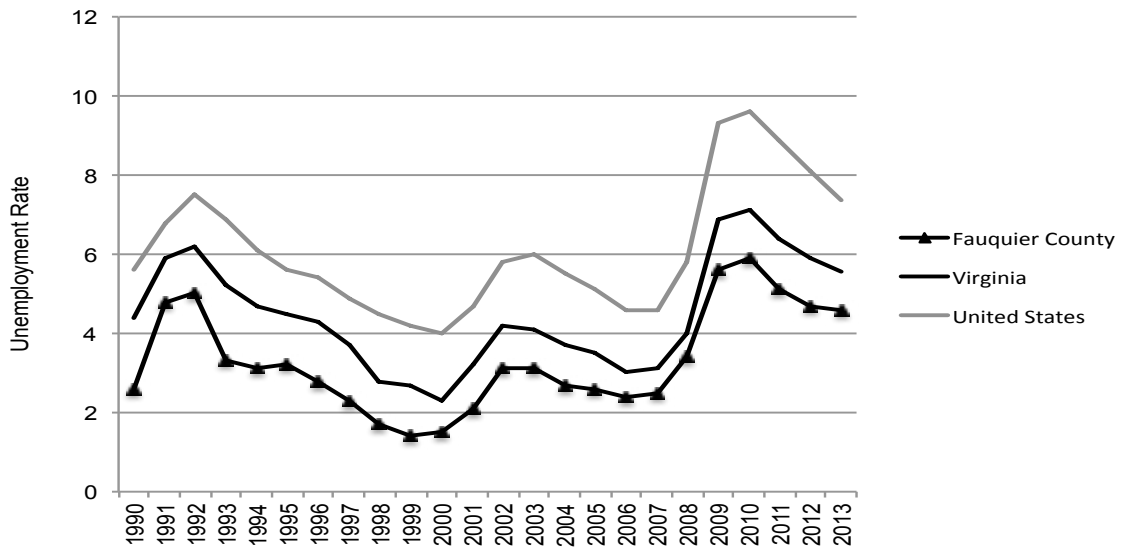
Figure 1.3. Size of Sector, Change in Employment 1990-2012, and Average Annual Wages 2012, Fauquier County



Source: Virginia Employment Commission, Quarterly Census of Employment and Wages.

Note: Size of sphere is proportional to 2012 employment.

Figure 1.4. Unemployment Rate, Fauquier County, Virginia, and United States, 1990-2013

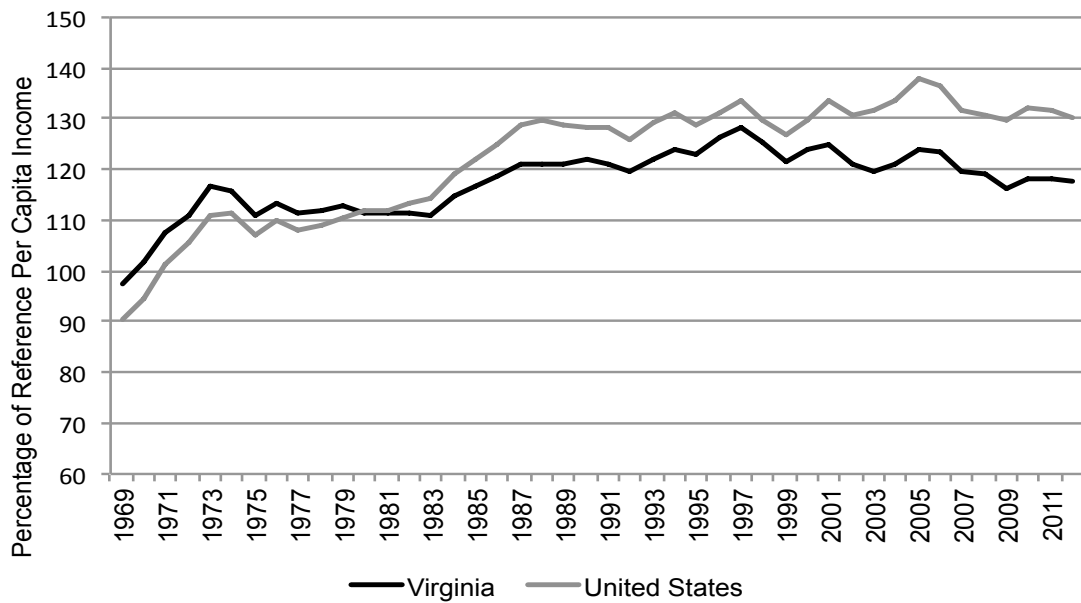


Source: Bureau of Labor Statistics, Local Area Unemployment Series

insurance sectors shed jobs during the period. Fauquier County compares very favorably with the state and nation on various socioeconomic metrics. Although the unemployment rate rises and falls with

changes in national economic conditions, rates have remained much lower than the state and nation for the last two decades (see **Figure 1.4**). Moreover, per capita income is significantly higher (see **Figure 1.5**).

Figure 1.5. Fauquier County Per Capita Income as Percentage of Virginia and United States, 1969-2012



Source: Bureau of Economic Analysis, Regional Economic Information System

Table 1.1 Economic, Social and Demographic Characteristics, Fauquier County, Virginia, and United States, 2008-2012

	Median Household Income	Poverty Rate	High school degree or greater	College degree or greater	% Minority	% 65 Years and Older
United States	\$53,046	14.9%	85.7%	28.5%	36.3%	13.2%
Virginia	\$63,636	11.1%	86.9%	34.7%	35.2%	12.3%
Fauquier County	\$88,687	5.3%	91.0%	32.0%	18.3%	12.9%

Source: U.S. Census Bureau, American Community Survey

Table 1.1 compares several demographic and economic characteristics of the region with that of state and the nation. Fauquier County has a significantly higher median household income than both Virginia and the United States at \$88,687 and less than half the poverty rate at 5.3 percent. Educational achievement levels are comparable to the state and nation. The county has a significantly

higher percentage of high school graduates than these benchmarks, but the percentage of the population with a college degree lies midway between the state and nation. The county is similar to the state and nation in terms of age demographics but has a smaller minority population. Racial/ethnic minorities make up 18.3% of the population, though the county has experienced a recent influx of Hispanic/Latino residents of whom some are employed by local farms and farm-related businesses.

Box 1.1 Land Conservation and Preservation

As an ex-urban county on the fringe of a rapidly growing metropolitan area and traversed by a major interstate highway (Interstate 66) and national highway (US Route 29), Fauquier County is under significant development pressures. In response to these forces, county residents have been enthusiastic supporters of state land preservation programs such as the Virginia Land Preservation Tax Credit Program. The county has also devised one of the state's most successful Purchase of Development Rights (PDR) programs. Since its inception in 2002 it has preserved nearly 10,000 acres of agricultural land. In addition, the county has implemented land use taxation policy for agriculture, horticultural, forestal and open space real estate with an assessment of \$180 per acre per 100 acres. This value is higher than the State Land Evaluation Advisory Council (SLEAC) recommended use value of \$140

for the same size parcel. The county has 13 agriculture and forestal districts, a slightly different category of land protection allowed by state statute that requires participating land tracts to constitute at least 200 acres of contiguous land area dedicated to farm or forestry and provides additional landowner protections against state and local government encroachments on property for public utilities and facilities. The county had 211,108 acres with use value designation and 80,037 acres were protected in agriculture and forestal districts (together representing approximately 70 percent of the total land area) in FY 2013 (Knapp and Kulp 2013). Approximately 88,042 acres (or 21 percent of the land area—the highest percentage of any county in the state) was under permanent conservation easement in FY 2013 compared to approximately 3.6 percent of land area statewide.³



Fauquier County Horse Farm

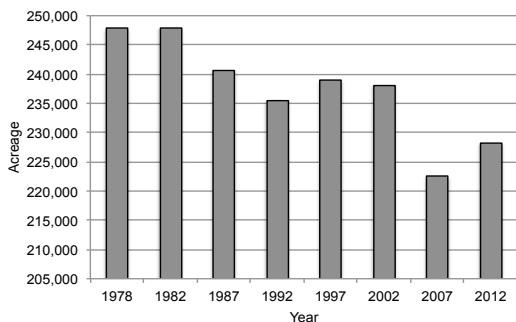
³ Information from David Boyd, GIS Conservation Lands Planner at the Virginia Department of Conservation and Recreation.

SECTION 2 AGRICULTURE IN FAUQUIER COUNTY

Fauquier County has a strong agricultural heritage and the farm sector continues to play an important role in the local economy. It is supported by an abundant supply of relatively level, fertile, arable land. Its topography consists of level and rolling terrain in the southern and eastern portions with mountain ridges in the far western portion. Despite continued urbanization pressures from the north, the agriculture natural resource base remains largely intact. Approximately 54 percent of county land area is farmland. **Figure 2.1** shows that total farm acreage actually increased 2.6 percent between 2007 and 2012, a slightly faster rate of increase than the 2.4 percent for the state at large. Agricultural preservation programs adopted by the state and county have no doubt played a key role—large contiguous tracts of preserved farmland in the north of the county have served as an effective bulwark against the sprawling development that characterizes parts of adjacent counties such as Prince William and Loudoun. The county has also supported the continued growth and viability of local agriculture by providing funding to the Fauquier County Department of Agricultural Development (see **Box 2.1**).

Although farm employment has shrunk in both absolute size and relative to total employment in recent decades from 2,475 farmers and laborers and 21 percent of total employment in 1969 to 1,407 and

Figure 2.1 Fauquier County Farm Acreage, 1978-2012



Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Census of Agriculture, Various Years; Note: 1992 and earlier years are not adjusted for survey nonresponse error

Box 2.1 County Agricultural Development Support

Fauquier County has a department dedicated to agricultural development. The department is charged with “promoting county agriculture industry, increasing the economic viability of farming, and advising the County Board of Supervisors on agricultural economic development issues.” Among its duties are administering the county’s purchase of development rights program, promoting area products by publishing a farm product and services directory, maintaining the Fauquier Agriculture HomeGrown program, coordinating the annual Fall Farm Tour, and serving as a county liaison for agricultural advocacy and business groups. It is only one of only five Virginia localities (the others being Pittsylvania, Halifax, and Loudoun counties, and the City of Virginia Beach) with an office dedicated to agriculture.



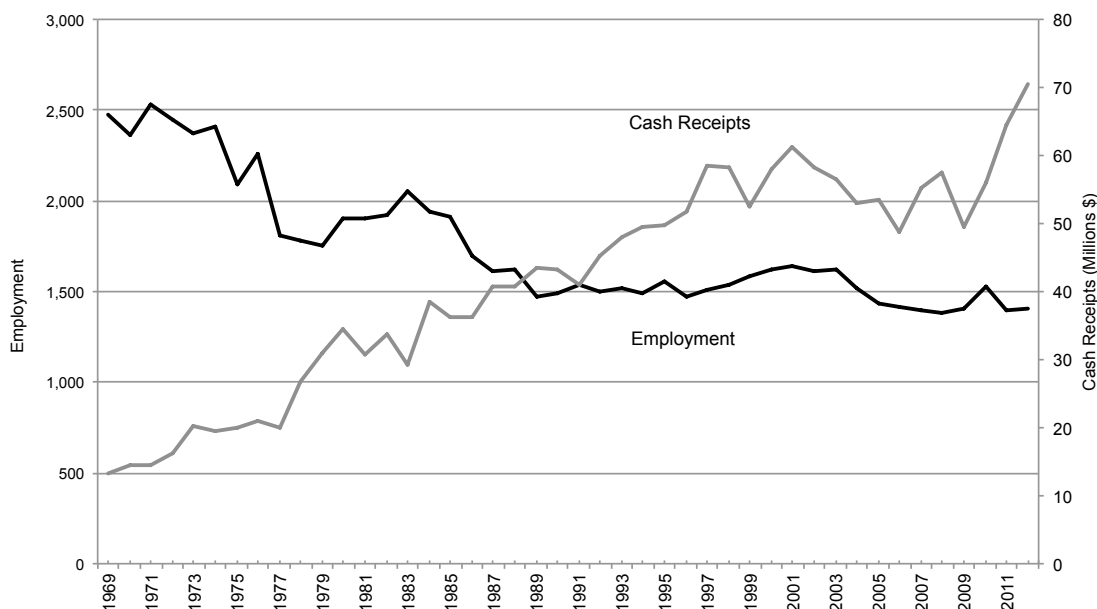
Moo Thru in Remington Aided by Farmer Participation in County PDR Program

4 percent in 2012, the rate of decline decelerated rapidly in the 1980s (see **Figure 2.2**). As elsewhere in the state and nation, rising productivity made possible by farm consolidation and improved economies of scale, increased use of capital and adoption of new technology and improved education and training have enabled area farmers to produce comparable amounts of output with fewer workers. Also in line with national trends, farm operators are more likely to spend some time employed off farm than in earlier decades. On the downside, the local farm operators continue to become more aged. The average age of principal operators in the county increased from 53.3 to 60.2 between 1978 and 2012, and now thirty-seven percent of Fauquier County farmers have reached retirement age (65 years or older).⁴ This situation creates a farm succession problem moving forward, an issue that the county government and partner organizations have tackled by redoubling efforts to train and infuse new farmers into the region (see **Box 2.2**) Fauquier County's agricultural product mix and

geography is increasingly diverse. Farm cash receipts sources have shifted during the last 40 years (see **Figure 2.3**) with the percentage of farm income from livestock and related product sales dropping from 85 percent of total income in 1969 to 54 percent in 2012 while crop sales and miscellaneous income (e.g., home consumption, sales of forest products, and other farm related income such as agritourism sales) shares have expanded over that period. This picture is consistent with data that show county cattle herds have decreased in the last 15 years (see **Figure 2.4**) while major feed crops and grains have been stable or growing in recent years (see **Figure 2.5**). Whereas over half of farms were centered on beef and dairy cattle in 1997, they constitute just 35 percent of all farms in 2012 (see **Figure 2.6**). Area farmers have diversified into a variety of different crops, including fruits, vegetables, forage crops and specialty crops such as mushrooms, herbs, and flowers, and sod, and livestock such as horses, goats, sheep, alpacas, emus and other animal products such as honey. Local farms also account for a large share of local timber sales. Geographically, two distinct agricultural regions have emerged:

⁴ National Agricultural Statistical Service, Census of Agriculture, Various Years.

Figure 2.2 Fauquier County Farm Employment and Cash Receipts from Marketings, 1969-2012



Source: Bureau of Economic Analysis, Local Area Personal Income

Box 2.2 Agriculture Education and Training

Fauquier County offers several agricultural programs for youth. Auburn Middle School provides a “Farm 2 Table program” which teaches students about food and agriculture and provides hands-on gardening experience. All three high schools offer a vocational-technical agriculture program and host a chapter of Future Farmers of America, which provides agriculture career development opportunities for secondary schools. The local 4-H chapter provides agricultural and leadership education through activities organized by Virginia Cooperative Extension.

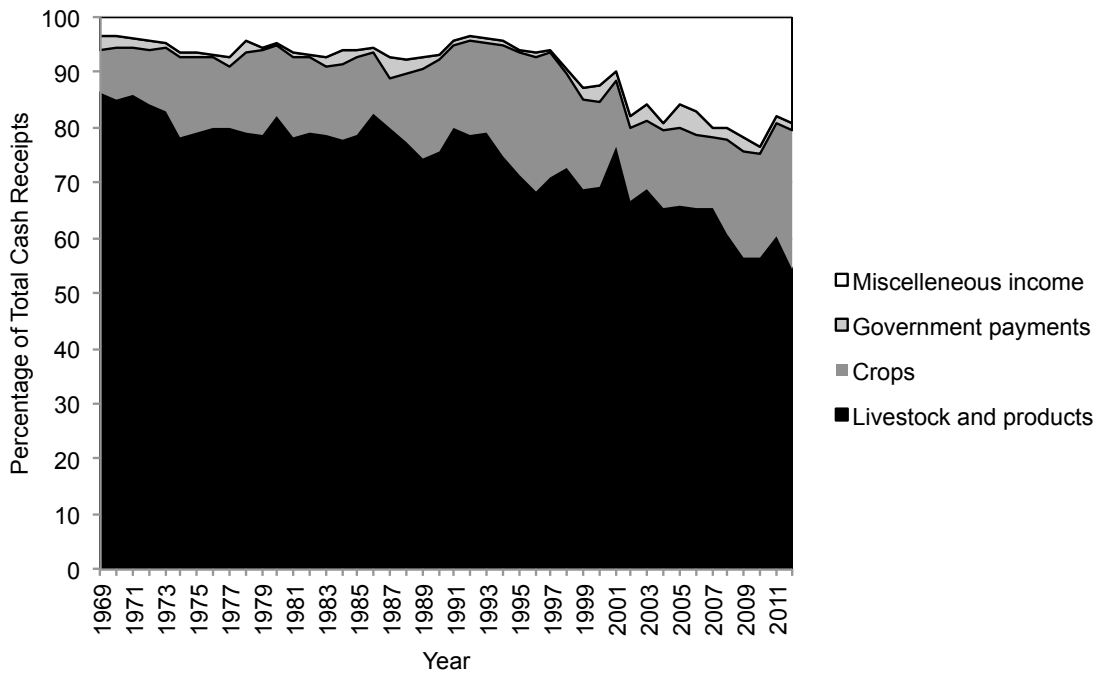
A number of agencies and organizations, often in partnership, offer coursework and workshops relevant to the agriculture industry. Loud Fairfax Community County has offered a credit course “Introduction to Agribusiness and Financial Management” that explores ways to start and sustain an agribusiness. It also provides online non-credit coursework for biofuel production. Virginia Cooperative Extension in combination with the Fauquier Education Farm and Fauquier County Department of Agriculture Development offer a farmer training program that provides coursework

on farm planning, land acquisition, management, marketing, and sustainable farming practices. The program accepts approximately 20 students each year and has enrolled almost 50 participants since it started in 2012. In addition, the Piedmont Environmental Council offers an “Exploring the Small Farm Dream” course as well as a number of other workshops on land conservation and natural resource protection. The Fauquier County Agricultural Development Department, the Fauquier Farm Bureau, Farm Credit and Virginia Tech Cooperative Extension Office have partnered with the Fauquier County Chamber of Commerce to form a new Agricultural Education Council. The goal of the council is to provide information and professional development opportunities to enhance farm operations and has recently developed a series of regular seminars. Lastly, Virginia Tech operates an Agricultural Research and Extension Center near Middleburg (MARE Center). The center conducts research in the area of equine health and nutrition, provides a venue for undergraduate experiential education, and offers educational seminars and events to the equine community on equine-related topics.



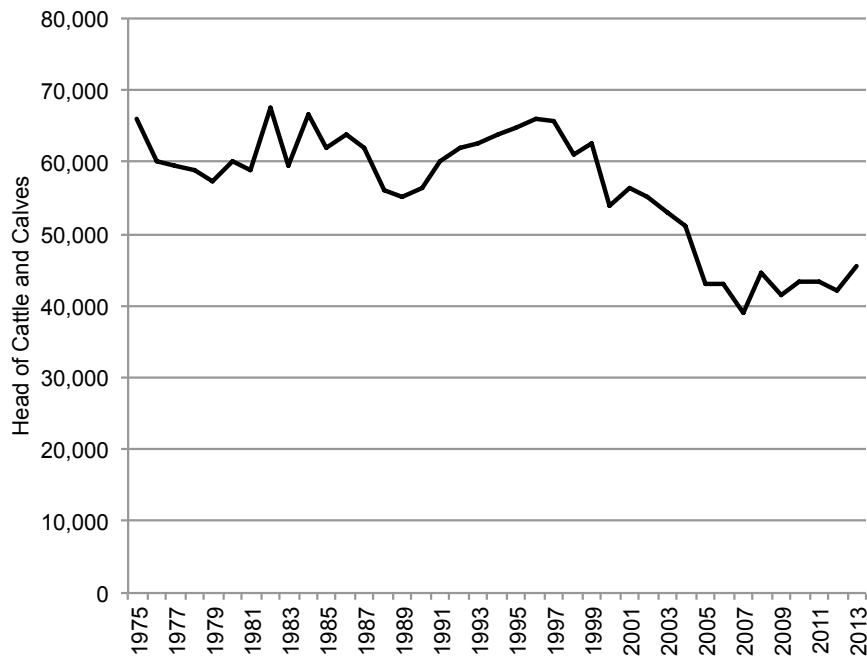
Sweet Corn Picking at Fauquier Education Farm in Warrenton

Figure 2.3 Fauquier County Cash Receipts by Source, Percentage of Total, 1969-2012



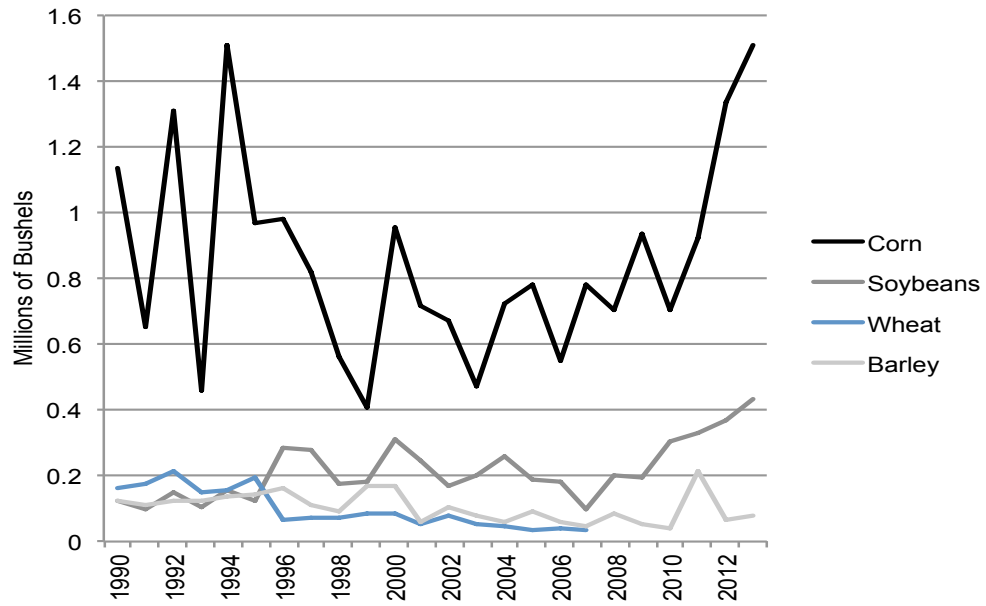
Source: Bureau of Economic Analysis, Local Area Personal Income

Figure 2.4 Fauquier County Cattle and Calf Inventory, 1975-2013



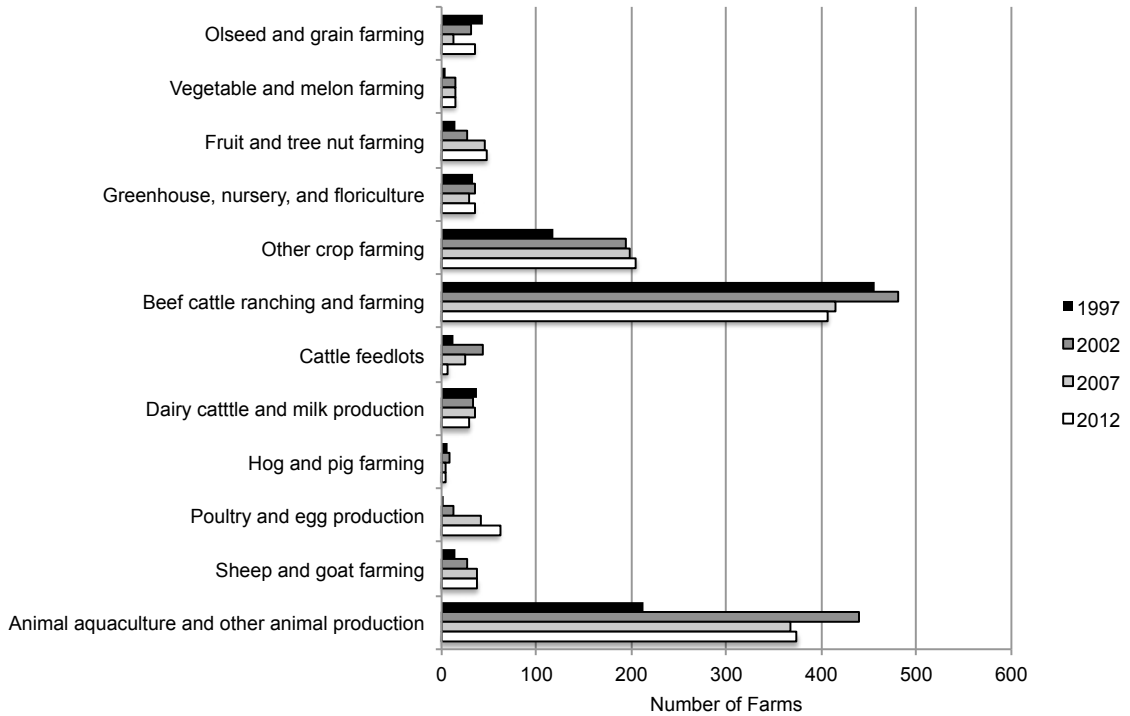
Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Quickstats

Figure 2.5 Fauquier County Grain Production, 1990-2013



Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Census of Agriculture, Various Years

Figure 2.6 Number of Fauquier County Farms by Industry Category, 1997-2012



Source: U.S. Department of Agriculture, National Agricultural Statistics Service, Census of Agriculture, Various Years

traditional farms producing livestock and field crops are more common in the southern part of the county while a consumer and residential oriented non-traditional agriculture focusing on the horse industry, specialty agriculture, and agritourism is more prominent in the north in closer proximity to the major population centers, although many large livestock farms can be found there as well.

More Fauquier County farmers are also selling their products directly consumers and retailers. One-hundred and forty-three farms reported sales directly to consumers in 2012, up from 95 farms in 2007. Direct sales to consumers were \$1.387 million in 2012, the fourth highest among Virginia counties but down from \$1.748 million reported in 2007. In addition, 67 farms sold products directly to retail outlets. Local direct sales are supported by marketing and technical assistance initiatives such as the Fauquier Agriculture Development Department's HomeGrown program, the County's "Buy Local" program, the Virginia Department of Agriculture and Consumer Services' Virginia Grown program, the Piedmont Environmental Council's "Buy Fresh, Buy Local" campaign, and the Virginia Cooperative Extension's Community Food Systems program. The area also benefits from favorable conditions for local food sales such as close proximity to the burgeoning Washington, DC area, farmland availability, access to distribution systems, and favorable demographics.

Fauquier County offers a number of local food marketing venues. The county hosts three regular farmers markets that cover the northern, central, and southern regions. The Town of Warrenton sponsors the Warrenton Farmers Market on Saturdays from April to November in the Old Town section and a Wednesday Market from May through October near the Fauquier Hospital. The Archwood Green Barns Farmers Market is held indoors in a historic horse barn from April through November. The Southern Fauquier Farmers Market is held from May through October at the Liberty Station Center in Bealeton. Area farms utilize other distributional

channels as well. The Buckland Farm Market and Messick's Farm Market are large, privately owned indoor stores that sell their own and area farm produce and products. Several area farms offer U-pick opportunities. Twelve farms use Community Supported Agriculture (CSA) to distribute their products according to the 2012 Census of Agriculture. CSAs offer fresh locally grown farm product allotments to consumers on a subscription basis.

Three additional industries are also closely connected with Fauquier County agriculture. A large local horse industry features numerous horse boarding, riding and training, and show and competition venues (see **Box 2.3**). But, less than half of the local horse population is located on a farm. Two primary processing industries, wineries (employing 122 in 2012) and animal slaughtering and processing (employing 23 in 2012) would likely not exist without area vineyards and livestock herds. Fauquier County has no other sizeable agricultural value-added activities. However, the potential exists to recruit or grow such industries based on favorable national growth trends and area needs (see **Box 2.4**).

The winery and horse industries have followed divergent paths in recent years. The most complete horse inventory surveys showed that the Fauquier equine population increased from 13,700 to 14,800 from 2001 to 2006. However, the most recent agriculture census indicated that the farm equine population contracted by 11.1% from 2007 to 2012 (from 6,060 to 5,457 equine).⁵ This pattern is supported further by employment data from the Virginia Employment Commission which reflects wages paid to employees covered by unemployment insurance (see **Figure 2.7**). It shows that horse and other equine farm production employment dropped precipitously in 2009 and had recovered little by 2012. On the other hand, winery employment more than tripled over the same period from 36 to 122 employees.

⁵ The *Virginia Equine Survey* (USDA, NASS 2008) measures the entire county equine population while the *Agriculture Census* (USDA, NASS 2014) measures only the county farm-based equine population.

Box 2.3 Fauquier County Horse Industry

Fauquier County has one of the nation's most prominent horse industries that dates back to the mid 1800s. Along with its neighbor, Loudoun County, it forms part of Virginia Horse Country that centers on Middleburg, which has gained a reputation as the nation's "horse and hunt capital." It is the location of the nation's first horse show (Upperville Colt and Horse Show) and the first hunt club (Piedmont Foxhounds). It also hosts two of the largest Steeplechase races in the country (the Virginia Gold Cup Race and International Gold Cup Race), the Warrenton Horse Show (started in 1899), and the Casanova, Orange County and Warrenton Hunts. Fauquier County equestrian centers and horse farms feature a wide range of equine recreational and training activities, including trail-riding, sanctioned and schooling horse shows, polo, and fox hunts. The area is served

several regional equine organizations including: the Nokesville Horse Society, the Fauquier Equestrian Forum, Trailblazers Riding Club, Warrenton Pony Club, Fauquier County 4-H Club; and the Northern Virginia Chapter of the Virginia Dressage Association. In addition, several national and state horse organizations make their home here (e.g., Virginia Horse Show Association, Virginia Horsemen's Association, and Virginia Thoroughbred Association in Warrenton; Mid-Atlantic Lipizzaner Association in Catlet; Virginia Horse Journal in Marshall). The county housed an estimated 14,800 equine in 2006 (2nd only to next door Loudoun County at 15,500) with a market value of \$268 million (the highest in the state). However, the horse population has likely dropped from this number with the recent economic downturn and reported decrease in breeding and sales.



Virginia Gold Cup at Great Meadow in The Plains

Box 2.4 Agriculture-related Industry Targets for Fauquier County

Industry targeting methods attempt to identify types of firms that would be good fits for a particular region based on industry characteristics and needs and that would also assist local economic development by offering favorable growth prospects and higher wages. Using screening criteria developed by Barkley and Henry (2009) and Deller (2009), we identified agriculture-related industries that met three of four conditions using IMPLAN data for Fauquier County: (1) industry employment grew over the period of 2008 to 2011, (2) industry employee compensation was above the average level of \$47,793 found in Fauquier County, (3) the county demonstrates an advantage in the industry by having by a higher percentage of local employment in the industry as a share of total local employment than the share of the industry in the U.S. compared to total U.S. employment (also known as having a location quotient greater than one) and (4) the county imports at least \$5 million in industry output from elsewhere. The rationale for using these criteria was to identify industries that grew in the face of

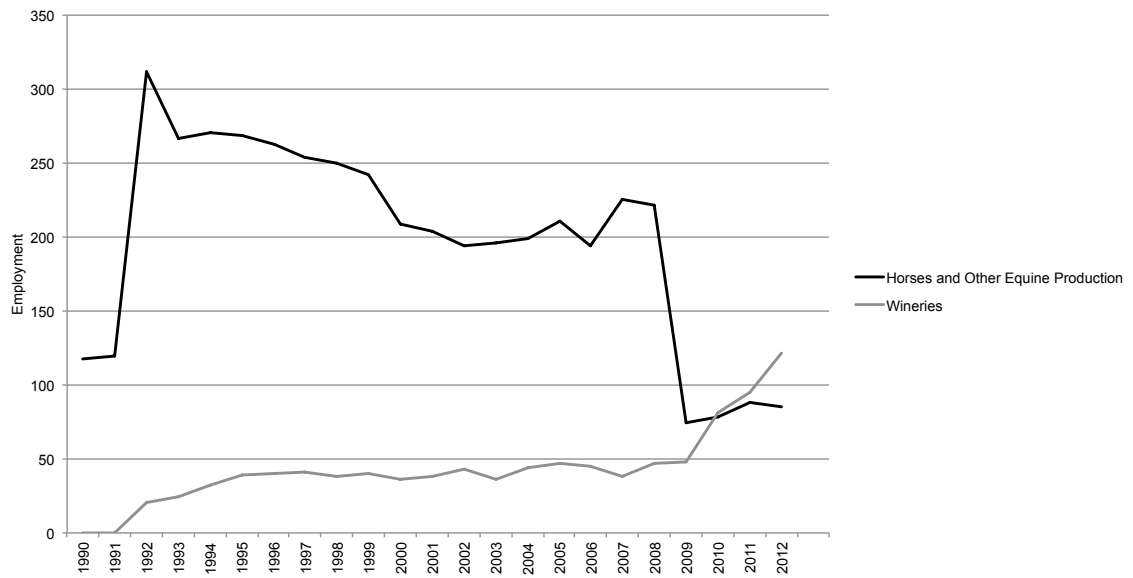
recent economic headwinds, are relatively high paying, and which might find Fauquier County attractive because of pre-existing competitiveness or gaps in the local supply chain. Using these criteria, the following five agriculture-related industries were identified of which only wineries and environmental and other technical services were present in the county.

This list does not reflect the most recent year's data or other local planning considerations. For example, Fauquier County now has a brewery called Old Bus Head Brewery at Vint Hill that opened this year. Also, the animal slaughtering and processing industry did not make the target list because of slightly lower average wages (\$43,398) than the county average and a lower level of industry concentration in the county. However, the Fauquier County Agricultural Survey (Fauquier County Agricultural Development, 2013) showed strong farmer support for additional animal processing facilities in the county as farmers attempt to capture more direct to consumer or retailer markets for meat products.

Industry	Employment Growth, 2008-2011	Average Compensation, 2011 (\$)	Location Quotient	Imports (Millions \$)
Dog and cat food manufacturing	12.7	70,861	0.00	5.748
Other animal food manufacturing	2.1	55,228	0.00	11.449
Snack food manufacturing	9.8	53,750	0.00	7.352
Breweries	7.8	84,370	0.00	7.324
Wineries	18.0	52,736	9.31	8.172
Environmental and other technical consulting services	24.0	55,082	2.19	0.0152

Source: IMPLAN

Figure 2.7. Employment in Equine Production and Wineries



Source: Virginia Employment Commission, Quarterly Census of Employment and Wages

SECTION 3 DATA AND METHODOLOGY

This section describes how agriculture is defined for this study and the economic impact methodology used. We divide the Fauquier County agricultural economy into five different components that represent either farm production or activities closely identified and supported by area farms. These components include: (a) farm production, (b) vineyards and wineries, (c) animal slaughtering and processing, (d) the equine industry, and (e) agritourism. Farm production consists largely of traditional farm production, including livestock and crop production. To this we add timber sales, since a large portion of such sales originate from farms, and agricultural support services. Vineyards and wineries include grape as well as winery production. The equine industry is defined by the expenditures of equine owners on the care and use of their equine. The equine may be based on or off farms. Agritourism is defined by the expenditures of non-resident visitors on local goods and services when they visit local agriculture-related venues such as farms, horse shows and competitions, and wineries. Eighty-four farm respondents to the Fauquier County Agricultural Survey reported offering agritourism activities including farm tours, hayrides, petting zoos, corn mazes, pumpkin patches, events and festivals, camping, fishing, hunting, and horse riding, training and boarding (Fauquier County Agricultural Development 2013). Horse shows and competitions are held at 15 sites. Furthermore, there are 24 wineries in Fauquier County.

This study examines the economic impact of Fauquier County agriculture using input-output analysis, a research tool that allows one to quantify the impact of an economic activity or expenditure in a region.⁵ For this study, area agriculture-related

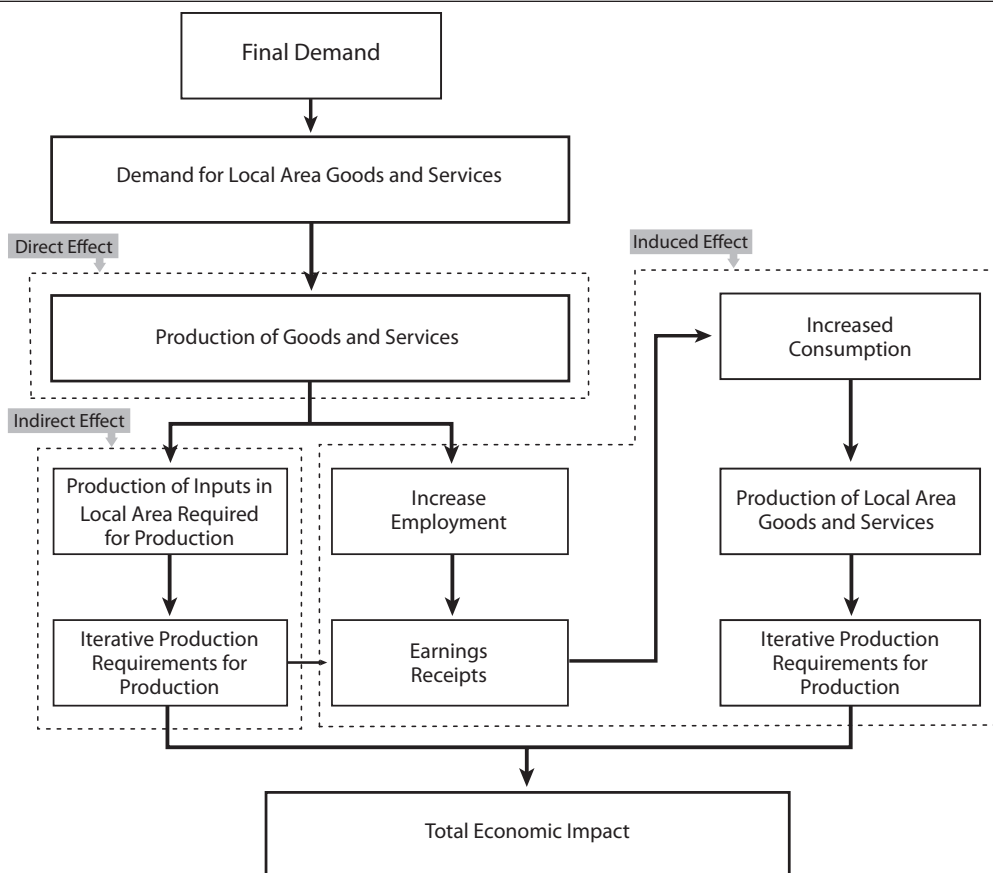
spending made on local goods and services are counted as direct injections into the local economy. Linkages with other industries in the area mean that this initial injection has further stimulative effects that result from the purchases of goods and services and payments to employees. The stimulus causes a “multiplier effect” that results when money is re-spent in the local economy.

This study uses IMPLAN (IMpact analysis for PLANning), an industry standard input-output model that has been utilized in many economic impact studies including similar studies of agriculture in other Virginia localities such as the City of Virginia Beach, the Danville Metropolitan Area, and Clarke County (Rephann et al. 2013; Rephann 2012; Lamie, Benson, and Pease 2005). Input output models are based on input-output tables, which show flows of purchases and sales among sectors of the economy (Miller and Blair 2009). Economic multipliers are derived from these tables. These multipliers allow one to measure the total impact of changes in agricultural and forestry activity on the local economy.

The total impact of this activity consists of three parts, a “direct effect,” “an indirect effect,” and an “induced effect” (see **Figure 3.1**). The “direct effect” consists of the injection of economic activity or expenditure into the region. For example, agricultural product sales in Fauquier County would count as the direct effect. This direct expenditure then causes a “ripple effect” on the local economy when money is re-spent. For instance, local businesses provide supplies and services to farms such as seeds, fertilizer, veterinarian services, utilities and insurance. These businesses spend a portion of their sales revenues on their supplies and services from other local firms who, in turn, purchase a portion of their supplies and services from other local firms. This cascading sequence of spending continues until the subsequent rounds of spending dissipate due to leakages in the form of spending outside the area. The cumulative effect of these cascading rounds of inter-industry purchases

5 Like most studies of this type, this one is called an economic impact study. From a technical standpoint the phrase “economic contribution” or “economic footprint” would better describe results of the analysis (Watson et al. 2007). An “economic contribution” analysis traces the gross economic activity that results from a given expenditure. It does not consider whether the expenditure used to generate the economic activity might have been used elsewhere in the economy to generate economic activity and gauge the comparative effect of that alternative activity.

Figure 3.1 Economic Impact Diagram



is referred to as the “indirect effect.” The final component of total impact (the “induced effect” or “induced impact”) is attributable to the spending of households and other economic agents. For instance, businesses pay households for their labor services. These households and governments then purchase goods and services from area firms who in turn receive a portion of their labor, material and public service inputs from within the region. Again leakages occur at each round due to purchases of goods and services outside the area. The “induced effect” is the sum of the impacts associated with these household purchases. The first stage of estimating the economic impacts of agribusiness is to convert economic activity as measured by industry employment, sales, or consumer spending into local final demand. These conversions are performed with

IMPLAN. A more detailed description of the input data, including data sources and how the various components were mapped onto IMPLAN sectors is provided in **Appendix A**. In the second stage, adjustments are made to the model to ensure that inputs and outputs are not double counted.⁶ The third stage involves running the IMPLAN model and generating the results.

⁶ Double counting occurs when you include the impact of a sector as a direct effect and then count it again as the indirect effect of another sector because it serves as an input to that sector. Double counting was avoided by suppressing interindustry purchases for the farm production and agricultural manufacturing sectors included. This suppression was accomplished by setting regional purchase coefficients (RPCs), which represent the portion of local demand purchased from local producers, to zero for each farm production and agricultural manufacturing sector in the model. This approach is recommended by Miller and Blair (2009), pp. 621-625.

Results are presented for three different economic measures (a) total sales or total industrial output, (b) value-added, and (c) employment. Total sales or industry output is the total value of industry production. It measures sales of intermediate inputs for use in production as well as sales of products to final consumers. Value added is a subset of total industrial output. It reflects only sales to final consumers and therefore avoids the

double counting that occurs when intermediate inputs are included. It is the most commonly used measure of economic activity. Value-added is the concept behind gross domestic product (GDP) and can be compared to the GDP numbers provided by the Bureau of Economic Analysis for states and metropolitan areas. Employment includes full-time and part-time. All dollar values reported are denominated in terms of 2014 dollars.

SECTION 4 ECONOMIC IMPACTS

Table 4.1 shows the direct, indirect, induced and total impacts of Fauquier County agriculture in 2012. The direct effect includes the economic activity of the farms and agriculture-related businesses plus activity associated with the initial expenditure by horse owners and agritourists on Fauquier County goods and services. It shows that these activities account for 2,253 jobs, \$61.4 million in value-added, and \$162.5 million in total industrial output. The indirect and induced effects measure the additional rounds of spending that result from the direct effect. When these effects are counted, the total economic contribution of agriculture is 2,653 jobs, \$93.1 million in value-added, and \$215.1 million in output. This employment impact figure represents 6.8 percent of total Fauquier County employment in 2012.

Table 4.2 presents the economic impacts of agriculture by industry. The effects of area agriculture are felt in every sector of the economy. Agriculture, forestry, fishing and hunting and manufacturing industries direct impacts are large and reflect primarily the direct impact of farm and firm employment in these sectors. However, the horse industry and agritourism also have large direct impacts on services, retail, and construction sectors. The indirect and induced impacts result from the secondary, tertiary, and subsequent rounds of spending that occur when firms and farms purchase business inputs and make labor payroll. These impacts are largest in the professional, scientific and technical services industry (51 jobs), which includes varied professions such as accountants, attorneys, architects and engineers, computer programmers, agricultural and environmental consultants, and veterinarians. The real estate and rental industry (50 indirect and induced jobs), retail trade (47 jobs), health and social services (41 jobs) also experience relatively sizeable economic impacts.

Fauquier County agriculture helps to support several hundred jobs that are not identified with agriculture. For example, large total employment impacts are found in accommodation and food service and retail trade (182 jobs), arts, entertainment and recreation (104 jobs), professional and technical services (153 jobs), and construction (86 jobs). Agriculture (primarily agritourism) also accounted for 45 jobs in the hotel and motel industry (IMPLAN sector 411—not shown in the table but subsumed in the “accommodation and food services” sector). This employment impact represents approximately 16% of 2012 employment in the hotel and motel industry.

Table 4.3 presents the economic impacts by agriculture industry component (**Appendices B1-B3** further disaggregates component economic impacts by industry). Slightly over half of the total employment impact (52 percent) can be attributed to traditional farm production, 41 percent of value-added and 39 percent of total industrial output. The horse industry is the next largest component (27 percent of employment, 31 percent of value-added, and 23 percent of output) followed by agritourism and vineyards and wineries.

The agritourism components can also be summed together with the industry components with which they are most closely identified. For example, the total employment impact of vineyards and wineries and wine tourism is 252 jobs. Approximately 26 percent of this total impact is associated with traveller spending on local goods and services like lodging, food, and fuel. When equine industry is combined with the total horse shows and competitions, the total employment impact is 954 jobs. Collectively, these two agricultural-related activities account for 1,206 jobs or 45 percent of the entire agriculture employment impact.

Table 4.1. Fauquier County Agriculture Economic Impacts, Employment, Value-added, and Total Industrial Output

	Direct	Indirect	Induced	Total
Employment	2,253	199	201	2,653
Value-added	\$61,403,653	\$16,776,486	\$14,897,054	\$93,077,193
Total Industrial Output	\$162,452,780	\$28,156,647	\$24,475,524	\$215,084,950

Table 4.2 Fauquier County Agriculture Economic Impacts by Industry, Employment, Value-added, and Total Industrial Output

Sector	Direct	Indirect	Induced	Total
Employment				
Total	2,253	199	201	2,653
Agriculture, forestry, fishing & hunting	1,520	0	0	1,520
Mining	0	0	0	0
Utilities	0	1	0	2
Construction	75	9	2	86
Manufacturing	145	2	0	147
Wholesale trade	10	9	3	23
Retail trade	135	5	42	182
Transportation & warehousing	10	17	3	30
Information	0	4	1	5
Finance & insurance	9	21	15	44
Real estate & rental	3	37	14	53
Professional, scientific & technical services	102	39	12	153
Management of companies	0	2	0	3
Administrative & waste services	0	24	8	32
Educational services	0	1	8	8
Health & social services	0	0	41	41
Arts, entertainment & recreation	88	8	8	104
Accommodation & food services	149	9	23	182
Other services	6	7	17	29
Government & other	0	6	3	9
Value-added				
Total	\$61,403,653	\$16,776,486	\$14,897,054	\$93,077,193
Agriculture, forestry, fishing & hunting	\$29,371,355	\$499	\$2,449	\$29,374,303
Mining	\$0	\$50,992	\$2,009	\$53,001
Utilities	\$37,894	\$692,084	\$240,836	\$970,814
Construction	\$4,558,058	\$549,382	\$194,236	\$5,301,676
Manufacturing	\$5,574,666	\$144,350	\$13,051	\$5,732,067
Wholesale trade	\$1,307,649	\$1,095,481	\$417,216	\$2,820,346
Retail trade	\$8,566,754	\$239,759	\$2,022,470	\$10,828,983
Transportation & warehousing	\$329,085	\$886,607	\$160,654	\$1,376,346
Information	\$39,938	\$559,817	\$247,393	\$847,148
Finance & insurance	\$814,554	\$2,813,604	\$1,399,526	\$5,027,684
Real estate & rental	\$375,725	\$4,632,904	\$4,487,978	\$9,496,607
Professional, scientific & technical services	\$3,000,080	\$2,767,234	\$835,034	\$6,602,347
Management of companies	\$0	\$262,943	\$15,426	\$278,370
Administrative & waste services	\$0	\$800,295	\$290,013	\$1,090,308
Educational services	\$0	\$14,592	\$177,978	\$192,570
Health & social services	\$0	\$13,330	\$2,427,628	\$2,440,958
Arts, entertainment & recreation	\$1,139,160	\$190,180	\$191,576	\$1,520,916
Accommodation & food services	\$6,001,433	\$302,707	\$728,013	\$7,032,153
Other services	\$287,300	\$343,452	\$738,362	\$1,369,114
Government & other	\$0	\$416,274	\$305,207	\$721,481

Table 4.2 (Continued)

Sector	Direct	Indirect	Induced	Total
Output				
Total	\$162,452,780	\$28,156,647	\$24,475,524	\$215,084,950
Agriculture, forestry, fishing & hunting	\$69,680,277	\$1,200	\$8,669	\$69,690,146
Mining	\$0	\$74,008	\$2,930	\$76,938
Utilities	\$61,105	\$1,115,996	\$388,352	\$1,565,453
Construction	\$7,748,463	\$928,340	\$293,431	\$8,970,234
Manufacturing	\$47,290,278	\$975,288	\$37,797	\$48,303,363
Wholesale trade	\$1,785,892	\$1,496,128	\$569,803	\$3,851,822
Retail trade	\$11,999,655	\$338,597	\$2,852,677	\$15,190,928
Transportation & warehousing	\$498,161	\$2,035,030	\$345,923	\$2,879,114
Information	\$70,336	\$1,080,056	\$460,505	\$1,610,898
Finance & insurance	\$1,255,607	\$4,909,092	\$3,088,751	\$9,253,449
Real estate & rental	\$577,756	\$6,396,518	\$6,610,538	\$13,584,812
Professional, scientific & technical services	\$5,672,807	\$4,384,935	\$1,289,012	\$11,346,753
Management of companies	\$0	\$480,321	\$28,179	\$508,501
Administrative & waste services	\$0	\$1,529,342	\$554,998	\$2,084,339
Educational services	\$0	\$26,518	\$288,847	\$315,365
Health & social services	\$0	\$19,830	\$4,071,178	\$4,091,008
Arts, entertainment & recreation	\$3,580,791	\$438,796	\$411,619	\$4,431,206
Accommodation & food services	\$11,606,292	\$570,924	\$1,370,245	\$13,547,461
Other services	\$625,361	\$530,979	\$1,187,139	\$2,343,479
Government & other	\$0	\$824,750	\$614,932	\$1,439,682

* Table direct, indirect, and induced columns may not sum exactly to total column due to rounding error

Table 4.3 Fauquier County Agriculture Economic Impacts by Component, Employment, Value-added, and Total Industrial Output

Sector	Direct	Indirect	Induced	Total
Employment				
Total	2253	199	201	2653
Farm production	1232	60	78	1370
Animal slaughtering and processing	23	6	4	33
Vineyards and wineries	126	41	19	186
Equine	593	45	73	711
Agritourism	279	47	28	354
Wine tourism	54	7	5	66
Horse shows and competitions	188	35	20	243
Farm tourism	36	5	3	45
Value Added				
Total	\$61,403,653	\$16,776,486	\$14,897,054	\$93,077,193
Farm production	\$26,351,611	\$6,300,066	\$5,744,098	\$38,395,775
Animal slaughtering and processing	\$490,577	\$440,164	\$279,118	\$1,209,858
Vineyards and wineries	\$5,364,279	\$3,490,993	\$1,400,336	\$10,255,608
Equine	\$20,372,300	\$3,386,355	\$5,386,113	\$29,144,769
Agritourism	\$8,824,885	\$3,158,908	\$2,087,390	\$14,071,183
Wine tourism	\$1,560,037	\$477,744	\$367,299	\$2,405,080
Horse shows and competitions	\$6,203,291	\$2,356,942	\$1,470,128	\$10,030,361
Farm tourism	\$1,061,558	\$324,222	\$249,963	\$1,635,742
Output				
Total	\$162,452,780	\$28,156,647	\$24,475,524	\$215,084,950
Farm production	\$63,842,973	\$10,626,087	\$9,436,193	\$83,905,253
Animal slaughtering and processing	\$6,928,612	\$778,415	\$458,815	\$8,165,843
Vineyards and wineries	\$40,865,389	\$5,871,000	\$2,300,555	\$49,036,943
Equine	\$32,980,551	\$5,546,238	\$8,849,866	\$47,376,654
Agritourism	\$17,835,254	\$5,334,906	\$3,430,097	\$26,600,257
Wine tourism	\$2,970,802	\$794,133	\$603,551	\$4,368,485
Horse shows and competitions	\$12,846,714	\$4,001,914	\$2,415,805	\$19,264,433
Farm tourism	\$2,017,738	\$538,860	\$410,741	\$2,967,339

SECTION 5

OTHER ECONOMIC CONTRIBUTIONS

Fauquier County agriculture's effects on the community extend well beyond the economic impacts reported in this study. These other contributions are briefly discussed in the areas of "other economic impacts," economic diversification, health, environment, education, and community engagement. We also address social costs that are sometimes connected to agricultural activities.

Other Economic Impacts

The economic impacts reported in the previous section did not fully capture some economic activities often identified with agriculture and related spin-off economic impacts. For instance, Fauquier County farmers derive some income from farm-related activities such as value-added products, renewable energy production, and federal and state government payments. According to the 2012 Agricultural Census, 119 Fauquier County farms produced value-added products and farms received \$865,000 in federal government payments. The economic activity resulting from the spending of this income was not reported in the previous results. Also not included were parts of the "green industry" which has much in common with commercial agriculture. The green industry includes activities such as landscaping, golf course and sport facility turf grass maintenance services, and retail/wholesale trade and distribution of horticultural products such as garden centers and florists (Hughes and Hinson 2000). We also did not capture the full impact of agritourism in the local economy. Tourism associated with agriculturally themed events and festivals held at non-farm venues such as the Delaplane Strawberry Festival and Fall Farm Fest at Sky Meadows State Park and the Fauquier County Fair was not counted. Nor was tourism connected with fox hunting.

Fauquier County agriculture also likely creates some "synergistic" economic effects that are difficult to measure. While many visitors do not come to Fauquier County for the primary purpose of agritourism, the availability of agritourism venues likely boosts the attractiveness of the region for

general tourism and contributes toward the critical mass of activities needed to encourage longer stays and additional local spending. In a similar manner, farmer markets contribute to the buzz or ambience that supports other local businesses. Downtown farmers markets offer diverse vendors, unique specialty products, and entertainment options that attract additional customers to shopping districts. Some studies estimate that farmers markets generate sales for nearby businesses that are equal or more than the farmers market sales (Hughes et al. 2008).

Economic Diversification

Fauquier County agriculture helps to diversify the local economy. Such economic diversification can have a countercyclical employment effect. For instance, during the recent recession, Virginia agriculture was buoyed by increased international demand for food and fiber and higher prices brought on by drought elsewhere in the country. While Fauquier County total employment decreased from 37,654 in 2008 to 37,104 in 2010, farm employment actually increased from 1,383 to 1,531 during the same time period.

Health

A vibrant local farm sector can have a positive effect on local health and wellbeing of the community. Local food production can improve local food security and the availability of fresh, nutritious and high quality farm products. (Denckla Cobb 2011) Agricultural open space also provides accessible venues for outdoor recreation. The availability of these venues can possibly boost levels of household physical activity participation (Rephann 2011). For example, Rephann (2014) shows that the number of local equestrian and other horse competition events available is positively associated with the rate of local household participation in horse riding. Increased involvement in horse riding and other outdoor activities by local residents in turn could produce various physical, psychological, and other therapeutic benefits.

Environment

Fauquier County's agriculture and forested landscape provides important environmental services to the community. These environmental benefits include improved water quality and flood control, air quality, conservation of wildlife habitat, and containment of urban sprawl. The more orderly development patterns resulting from open space preservation can help lower costs of development such as the provision of public utilities and reduce the costs associated with urbanization such as pollution and traffic congestion. Farm protection helps to preserve the scenic beauty of the region sustain agrarian and historic landscapes, and maintain a sense of place. Evidence suggests that farmland creates amenities for non-farm dwellers that support higher property values (Ready, Berger and Blomquist 1997).

Education

Fauquier County agriculture provides learning, experiential and recreational opportunities that promote educational, physical, and social benefits for children. For example, the Fauquier County 4-H program offers workshops, shows and competitions and camping activities for area youth. Involvement in 4-H can have a positive effect on youth including improved school performance, leadership skill development and enhanced self-esteem (Kress n.d.). Natural areas are also an important resource for children. The term "nature deficit disorder" was coined to describe the increasing alienation of children from nature due to the lack of "free play" opportunities in natural areas, partly attributable to the loss of nearby green space for exploration due to urban sprawl and poor urban planning (Louv 2005). As a result of the detachment from nature, children

have fewer experiential learning opportunities that build knowledge about science and environmental stewardship and may be more prone to physical and psychological disabilities and ailments such as attention deficit hyperactivity disorder (ADHD) and obesity. The preservation of natural landscapes may be important to child development.

Community Engagement

Many agriculture-related organizations help raise funds for worthwhile charitable causes. For instance, the Upperville Colt and Horse Show is a 501(c)(3) organization that donates its proceeds to local charities. Agricultural festivals and events also promote community social capital by building "community pride, sense of place, or identity, volunteerism, and the general benefit of pulling people together" (Marcoiller 1995).

Costs

We would not be complete without acknowledging social costs that can arise from unregulated farm activities or poor planning. For instance, agritourism visits, events, and festivals can increase automobile road volumes and traffic congestion and place higher demands on public safety personnel during peak activity periods (Crompton 2006). With increasing juxtaposition of farming and housing, more residents may complain about negative externalities such as smoke, odors, and chemical use. Poorly managed farmland can also contribute to water pollution. The adoption of Best Management Practices for crops and livestock can alleviate nutrient and sediment runoff that contributes to surface water and groundwater pollution.

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APPENDIX A DATA SOURCES

We divide the Fauquier County agricultural economy into five components: (a) farm production, (b) vineyards and wineries, (c) animal slaughtering and processing, (d) the equine industry, and (e) agritourism. Farm production consists largely of traditional farm production, including livestock and crop production. To this we add agricultural support services and timber sales. The latter is included because a large portion of area sales originate from farms and silviculture is closely related to agriculture. Vineyards and wineries include grape as well as winery production. The equine industry is defined by the expenditures of equine owners on the care and use of their equine. The equine may be based on or off farms. Agritourism is defined by the expenditures of non-resident visitors on local goods and services (excluding agricultural goods to avoid double counting) when they visit local agriculture-related venues such as farms, horse shows and competitions, and wineries. The data sources for each component and IMPLAN sector mapping for each component is summarized in **Table A.1**. The manner in which the data was used to construct IMPLAN data inputs is described in greater detail further below.

For the farm production component, market values of agricultural products sold in 2012 from Table 2. (Market Value of Agricultural Products Sold Including Direct Sales) of the Census of Agriculture were assigned to the corresponding IMPLAN sectors. Sales for IMPLAN sector 15 (Forestry nurseries, forest products, and timber tracts) were estimated using tax data from the Virginia Department of Forestry for the value of standing timber, also known as forest stumpage. Finally, Virginia Employment Commission Quarterly Census of Employment and Wages (QCEW) employment file was used to identify employment in business establishments providing support activities for animal and crop production. These figures were adjusted by a proportionality factor using IMPLAN and QCEW data to estimate proprietors not counted in the employment security records.

For the vineyards and winery component, the Virginia Employment Commission Quarterly Census of Employment and Wages (QCEW) employment file was used to identify employment in wineries. The Census of Agriculture does not report grape sales by county, but it does report statewide sales of \$9,466,000 and grape crop acreage by county. Therefore, we estimated the value of Fauquier County vineyard grape sales based on its share of state grape bearing acres (5.25 percent or \$497,009). QCEW employment data was also used to identify employment in animal slaughtering and processing establishments.

Horse operations and households owning horses are another important component of Fauquier County agriculture. This equine industry component is treated differently from the agricultural product sector. It captures all expenditures involved in maintaining and supporting horses, donkeys, mules, and burros. Most horse owners value horses beyond their income producing value as evidenced by studies that show that owners incur significant net operating losses on average (Deloitte Consulting 2005; Swinker et al. 2003; Gamrat and Sauer 2000). Therefore, expenditures on horses are used as the basis for estimating economic impact rather than horse sales. However, since horse and other equine sales are considered part of IMPLAN Sector 14 (Animal production, except cattle and poultry), they were backed out of Sector 14 sales for the farm production component using data on equine sales in 2012 from Table 18 (Equine—Inventory and Sales: 2012 and 2007) of the Census of Agriculture so as not to double-count.

Equine sales were, however, used to estimate the direct output of Sector 14 for the equine industry. In order to make the farm sales representative of all county-wide sales, we extrapolated farm-based sales based on the farm based equine inventory to total county inventory. The indirect and induced impacts of the equine industry, on the other hand, were estimated using a method called “Analysis-by-parts” (ABP). This method separates the economic

Table A.1 Data Sources and IMPLAN Assignments by Component

Component	Data Sources	IMPLAN Assignment
Farm production	National Agricultural Statistics Service, 2012 Census of Agriculture; Virginia Employment Commission, Quarterly Census of Employment and Wages (QCEW), 2012; Virginia Department of Forestry (VDAF), 2012	Agriculture Census sales data was used for IMPLAN Sectors 1 (Oilseed farming), 2 (Grain farming), 3 (Vegetable and melon farming), 4 (Fruit farming), 6 (Greenhouse, nursery, and floriculture production), 10 (All other crop farming), 11 (Cattle ranching and farming), 12 (Dairy cattle and milk production), 13 (Poultry and egg production) and 14 (Animal production, except cattle and poultry and eggs). VDAF tax data was used to estimate output for IMPLAN Sector 15 (Forest nurseries, forest products, and timber tracts); QCEW employment data was used to estimate employment IMPLAN Sector 19 (Support activities for agriculture and forestry).
Vineyards and Wineries	Virginia Employment Commission, QCEW, 2012; National Agricultural Statistics Service, 2012 Census of Agriculture	QCEW employment data was used for IMPLAN sector 72 (Wineries) and sales estimates based on agriculture census information was used for IMPLAN sector 4 (Fruit farming)
Animal Slaughtering and Processing	Virginia Employment Commission, QCEW, 2012	IMPLAN sector: 59 (Animal, except poultry, slaughtering, rendering, and processing)
Equine	National Agricultural Statistics Service, 2006 Virginia Equine Survey Report expenditures adjusted for inflation and 2006 Virginia Equine Survey Report estimated horse inventory adjusted downward to reflect 11.1% 2007-2012 drop in county farm-based equine population according to 2012 Census of Agriculture	Expenditures were mapped to IMPLAN categories using equine budget information and other information as explained on page 28 of Rephann (2011).
Agritourism	Fauquier County Agricultural Survey (2013); Telephone contacts with horse show and competition venues; Rephann (2011) horse show and competition expenditures adjusted for inflation; A. Frank, Rimerman and Co. LLP (2012); Virginia Tourism Corporation (2013)	Visitor figures estimated from Fauquier County Agricultural Survey, information obtained from Fauquier County horse show and competition venues, and estimation of winery visitors based on A. Frank, Rimerman and Co., LLP (2012); Visitor expenditure patterns were based on data from Virginia Tourism Corporation (2013) and Rephann (2011). Expenditure patterns were mapped onto the following IMPLAN sectors: 323, 326-330 (retail stores), 335 (transport by truck), 362 (automotive equipment rental and leasing), 379 (veterinary services), 402-410 (amusement and recreation), 411 (hotels and motels), 412 (other accommodations), 413 (food services and drinking places)

impact modeling into two tasks: modeling the purchase of goods and services from local firms as an expenditure for IMPLAN industries and the payment of wages and salaries as an increase in labor income. We estimated county equine expenditures

using data from the National Agricultural Statistics Service. Average expenditures per equine were obtained from the 2006 Virginia Equine Survey (U.S. Department of Agriculture, National Agricultural Statistics Service 2008). The same survey estimated

the Fauquier County horse inventory at 14,600 in 2006. This inventory figure was decreased by 11.1% based on the drop in Fauquier County farm-based equine from the 2012 and 2007 Censuses of Agriculture. This inventory of 13,158 equine was then multiplied by an average expenditure pattern adjusted for inflation to obtain total equine expenditures. The expenditures by category of were then assigned to IMPLAN industries using the same crosswalk as used in Rephann (2011). Since, the equine survey did not reported the proportion of expenditures made in Virginia but not locally, we estimated these proportions using IMPLAN Regional Purchase Coefficients (RPCs). RPCs represent the share of industry demand that is provided by area producers and are estimated within IMPLAN using a trade flow method described in Thorvaldson, Olson, and Alward (2011).

Agritourism is a particularly important and growing feature of Fauquier County agriculture. Agritourism as defined here included non-resident farm visitors (e.g., hunting, tours, pumpkin patches, petting zoos, trail riding, horse boarding and training), horse shows and competition attendees (e.g., hunters, jumpers, dressage, steeplechase) and winery visitors. We estimate these different facets with varying degrees of precision. Since this category is the least satisfactory in terms of quality of data, we strived to provide conservative estimates. Farm agritourism estimates (102,735) are computed based on non-winery and horse show/competition venue responses to the Fauquier County Agriculture Survey conducted by the Fauquier County Agriculture Department. No effort was made to impute the visitation figures for incomplete surveys or non-responding farms. Therefore, the visitor figures provide a conservative estimate of actual county farm visitors. Winery visitations are based on the average number of winery visitations per Virginia winery (8,383) from a recent statewide winery economic impact study (A Frank, Rimmerman and Co., LLP. 2012) and average residential visitor patterns reported by two wineries that responded to the Fauquier County Agriculture Survey. Since visitors can be expected to visit more than one local winery as part of a local winery tour, each visitor was assumed to attend an average 1.79 county

wineries based on a survey of North Carolina winery visitors (Evans, Pollard, and Holder 2008). Therefore, the total visitor headcount was divided by 1.79 to producing an unduplicated visitor estimate of 112,398 to the county's 24 wineries. For horse shows and competitions, we obtained attendance headcounts and/or 2013 event calendars from 15 Fauquier County venues that totaled 90 events. We obtained attendance headcounts for the largest events such as the Upperville Horse and Colt Show, the Virginia Gold and International Cups, and Warrenton Horse Show as well as all polo and hunter/jumper events hosted at the Great Meadow. For smaller venues we obtained calendar events and estimated their size based on average attendance at similar venues from *The Economic Impact of the Horse Industry in Virginia* (Rephann 2011). Residential visitor patterns were also drawn from that study. We estimate that there were 110,846 horse show and competition non-resident attendees, including 3,652 horse show and competition participants and 107,194 spectators. Therefore, in total, we estimate approximately 326 thousand non-resident visitors roughly evenly divided among the three types of venues.

Not all agritourism visitors to Fauquier County are there for the primary purpose of agritourism. There are likely numerous other reasons for visiting such as conducting business, attending a trade show or convention, visiting a state park, attending a high school reunion or visiting family members. We heed the advise of Crompton (2006) to not include such "casual" visitors) when computing the non-resident agritourism visitor headcount. Therefore, we incorporate an additional adjustment to count only those who likely visited the area for the specific purpose of attending the agritourism event or venue. We based the percentage of such visitors on figures obtained from survey data of horse shows and competitions derived from *The Economic Impact of the Horse Industry in Virginia* (Rephann 2011). According to that survey, 78.15% of in-state, out-of-county and 90.32% of out-of-state participants were in the show host area specifically to attend the event and 72.04% of in-state, out-of-county and 96.43% of out-of-state spectators were in the show host area specifically to attend the event.

We used these percentages to trim the tourism estimates. For horse shows and competitions, we applied these percentages to the participant and spectator estimates by residence. For winery tourism and farm tourism, we applied the spectator percentages to the visitor estimates by residence.

To estimate agritourism expenditures, we used the adjusted estimates for in-state and out-of-state visitors combined with expenditure patterns for non-resident agritourists. Estimates of average trip expenditures for Fauquier County agritourists were not available. For winery and farm visitors, we used 2013 leisure traveller expenditure estimates provided by market research firm TNS to the Virginia Tourism Corporation (Virginia Tourism Corporation 2013). These estimates are based on survey data for households that travelled at least 50 miles to arrive at a destination in Virginia. These TNS traveller spending estimates are often used in tourism economic impact studies when tailor made survey results are not available. Since the estimates do not disaggregate spending by residence or identify

the location of spending, this information was estimated for the purposes of this analysis. The average daily spending for a travel party averaging 2.6 individuals was \$82.68. We assumed that in-state visitors spent an average 1.2 days in the local area and out-of-state visitors an average 2.3 days.

For horse shows and competitions, attendee expenditures were estimated based on residency and whether they attended as a participant and spectators. Estimates of average participant and attendee spending at equestrian events were obtained from a horse event attendance survey conducted as a part of the Virginia horse industry economic impact study (Rephann 2011). It consisted of surveys of 365 horse show and competition attendees conducted by on-site interviews at eight randomly sampled horse shows and competitions around the state. We account for the fact that spending is generally much higher for participants in equestrian activities than spectators because of the additional costs associated with showing, transporting, sheltering, feeding, and caring for the horses.

Appendix B.1 Fauquier County Agriculture Direct and Total Economic Impacts by Component and Industry

Description	Farm production	Animal		Vineyards and wineries	Equine	Wine tourism	Horse shows		Farm tourism	Total
		slaughtering and processing	processing				and competitions	competitions		
Direct Employment Impact										
Total	1,232	23	126	593	54	188	36	2,253		
Agriculture, forestry, fishing & hunting	1,232	0	4	284	0	0	0	1,520		
Mining	0	0	0	0	0	0	0	0		
Utilities	0	0	0	0	0	0	0	0		
Construction	0	0	0	75	0	0	0	75		
Manufacturing	0	23	122	0	0	0	0	145		
Wholesale trade	0	0	0	10	0	0	0	10		
Retail trade	0	0	0	105	6	19	4	135		
Transportation & warehousing	0	0	0	0	6	0	4	10		
Information	0	0	0	0	0	0	0	0		
Finance & insurance	0	0	0	9	0	0	0	9		
Real estate & rental	0	0	0	3	0	0	0	3		
Professional, scientific & technical services	0	0	0	97	0	5	0	102		
Management of companies	0	0	0	0	0	0	0	0		
Administrative & waste services	0	0	0	0	0	0	0	0		
Educational services	0	0	0	0	0	0	0	0		
Health & social services	0	0	0	0	0	0	0	0		
Arts, entertainment & recreation	0	0	0	1	17	58	12	88		
Accommodation & food services	0	0	0	8	21	106	14	149		
Other services	0	0	0	0	4	0	2	6		
Government & other	0	0	0	0	0	0	0	0		

Appendix B.1 (Continued)

Description	Animal				Horse shows and competitions			Total
	Farm production	Slaughtering and processing	Vineyards and wineries	Equine	Wine tourism	Farm and tourism	Farm tourism	
Total Employment Impact								
Total	1,370	33	186	711	66	243	45	2,653
Agriculture, forestry, fishing & hunting	1,233	0	4	284	0	0	0	1,520
Mining	0	0	0	0	0	0	0	0
Utilities	1	0	0	0	0	0	0	2
Construction	4	0	2	77	0	2	0	86
Manufacturing	1	23	122	0	0	0	0	147
Wholesale trade	3	0	6	12	0	1	0	23
Retail trade	17	1	5	124	7	24	5	182
Transportation & warehousing	6	1	7	3	6	2	4	30
Information	1	0	2	2	0	1	0	5
Finance & insurance	16	1	3	19	1	5	0	44
Real estate & rental	26	1	5	14	1	5	1	53
Professional, scientific & technical services	12	1	11	113	2	13	1	153
Management of companies	0	0	2	0	0	0	0	3
Administrative & waste services	7	1	5	9	1	7	1	32
Educational services	3	0	1	3	0	1	0	8
Health & social services	16	1	4	15	1	4	1	41
Arts, entertainment & recreation	4	0	2	6	18	62	12	104
Accommodation & food services	10	1	3	19	22	111	15	182
Other services	8	1	3	8	4	3	3	29
Government & other	3	0	1	2	0	2	0	9

Appendix B.2 Fauquier County Agriculture Direct and Total Economic Impacts by Component and Industry, Value-added

Description	Farm production	Animal		Vineyards and wineries	Equine	Wine tourism	Horse shows and competitions		Farm tourism	Total
		slaughtering and processing	and processing				and competitions	and competitions		
Direct Value-Added Impact										
Total	\$26,351,611	\$490,577	\$5,364,279	\$20,372,300	\$1,560,037	\$6,203,291	\$1,061,558	\$61,403,653		
Agriculture, forestry, fishing & hunting	\$26,351,611	\$0	\$280,190	\$2,739,554	\$0	\$0	\$0	\$29,371,355		
Mining	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Utilities	\$0	\$0	\$0	\$37,894	\$0	\$0	\$0	\$37,894		
Construction	\$0	\$0	\$0	\$4,558,058	\$0	\$0	\$0	\$4,558,058		
Manufacturing	\$0	\$490,577	\$5,084,090	\$0	\$0	\$0	\$0	\$5,574,666		
Wholesale trade	\$0	\$0	\$0	\$1,307,649	\$0	\$0	\$0	\$1,307,649		
Retail trade	\$0	\$0	\$0	\$7,384,187	\$287,302	\$693,103	\$202,163	\$8,566,754		
Transportation & warehousing	\$0	\$0	\$0	\$0	\$187,951	\$14,223	\$126,911	\$329,085		
Information	\$0	\$0	\$0	\$39,938	\$0	\$0	\$0	\$39,938		
Finance & insurance	\$0	\$0	\$0	\$814,554	\$0	\$0	\$0	\$814,554		
Real estate & rental	\$0	\$0	\$0	\$350,584	\$0	\$25,141	\$0	\$375,725		
Professional, scientific & technical services	\$0	\$0	\$0	\$2,866,710	\$0	\$133,370	\$0	\$3,000,080		
Management of companies	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Administrative & waste services	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Educational services	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Health & social services	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		
Arts, entertainment & recreation	\$0	\$0	\$0	\$19,429	\$133,979	\$895,285	\$90,467	\$1,139,160		
Accommodation & food services	\$0	\$0	\$0	\$253,742	\$779,307	\$4,442,169	\$526,215	\$6,001,433		
Other services	\$0	\$0	\$0	\$0	\$171,498	\$0	\$115,802	\$287,300		
Government & other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0		

Appendix B.2 (Continued)

Description	Animal					Horse shows and competitions			Total
	Farm production	Slaughtering and processing	Vineyards and wineries	Equine	Wine tourism	Farm tourism	Farm tourism	Farm tourism	
Total Value-Added Impact									
Total	\$38,395,775	\$1,209,858	\$10,255,608	\$29,144,769	\$2,405,080	\$10,030,361	\$1,635,742	\$93,077,193	
Agriculture, forestry, fishing & hunting	\$26,352,706	\$63	\$280,475	\$2,740,613	\$75	\$320	\$51	\$29,374,303	
Mining	\$21,739	\$188	\$1,132	\$28,765	\$170	\$891	\$116	\$53,001	
Utilities	\$383,526	\$28,778	\$180,124	\$200,585	\$25,446	\$135,081	\$17,274	\$970,814	
Construction	\$281,398	\$25,692	\$142,390	\$4,706,249	\$19,906	\$112,525	\$13,516	\$5,301,676	
Manufacturing	\$68,491	\$491,865	\$5,110,109	\$34,650	\$4,256	\$19,806	\$2,889	\$5,732,067	
Wholesale trade	\$433,153	\$41,384	\$696,974	\$1,546,626	\$18,598	\$70,974	\$12,636	\$2,820,346	
Retail trade	\$810,698	\$39,741	\$219,983	\$8,265,963	\$342,361	\$910,609	\$239,628	\$10,828,983	
Transportation & warehousing	\$323,330	\$76,970	\$369,461	\$175,162	\$204,422	\$88,883	\$138,118	\$1,376,346	
Information	\$140,926	\$16,476	\$194,939	\$282,249	\$33,913	\$155,619	\$23,027	\$847,148	
Finance & insurance	\$2,245,536	\$74,468	\$274,841	\$1,873,318	\$67,338	\$446,337	\$45,847	\$5,027,684	
Real estate & rental	\$4,231,441	\$137,067	\$1,030,552	\$2,765,733	\$227,280	\$949,955	\$154,579	\$9,496,607	
Professional, scientific & technical services	\$815,862	\$106,884	\$798,567	\$3,923,176	\$132,943	\$734,730	\$90,186	\$6,602,347	
Management of companies	\$12,224	\$16,097	\$190,243	\$23,437	\$5,519	\$27,113	\$3,738	\$278,370	
Administrative & waste services	\$243,118	\$29,616	\$163,726	\$329,015	\$50,706	\$239,721	\$34,407	\$1,090,308	
Educational services	\$68,875	\$3,477	\$16,903	\$67,175	\$4,892	\$27,919	\$3,329	\$192,570	
Health & social services	\$935,938	\$45,458	\$228,847	\$889,071	\$59,839	\$241,084	\$40,723	\$2,440,958	
Arts, entertainment & recreation	\$89,659	\$6,526	\$31,043	\$113,603	\$166,314	\$1,001,434	\$112,337	\$1,520,916	
Accommodation & food services	\$328,577	\$25,222	\$103,324	\$606,456	\$811,394	\$4,609,173	\$548,006	\$7,032,153	
Other services	\$352,560	\$27,136	\$136,480	\$378,503	\$202,595	\$134,911	\$136,929	\$1,369,114	
Government & other	\$256,018	\$16,750	\$85,494	\$194,423	\$27,114	\$123,277	\$18,405	\$721,481	

Appendix B.3 Fauquier County Agriculture Direct and Total Economic Impacts by Component and Industry, Output

Description	Animal		Horse shows and competitions		Wine tourism		Equine		Vineyards and wineries		Farm production		Farm and Tourism		Total
	Farm production	slaughtering and processing	Animal slaughtering and processing	and competitions	Wine tourism	Equine	Vineyards and wineries	Farm production	Farm and Tourism	Farm production	slaughtering and processing	Farm production	Farm and Tourism		
Direct Total Industrial Output															
Total	\$63,842,973	\$6,928,612	\$40,865,389	\$32,980,551	\$2,970,802	\$32,980,551	\$40,865,389	\$32,980,551	\$2,970,802	\$12,846,714	\$2,017,738	\$162,452,780	\$69,680,277	\$0	\$0
Agriculture, forestry, fishing & hunting	\$63,842,973	\$0	\$503,724	\$5,333,580	\$0	\$5,333,580	\$503,724	\$5,333,580	\$0	\$0	\$0	\$69,680,277	\$0	\$0	\$0
Mining	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Utilities	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Construction	\$0	\$0	\$0	\$61,105	\$0	\$61,105	\$0	\$61,105	\$0	\$0	\$0	\$61,105	\$0	\$0	\$0
Manufacturing	\$0	\$6,928,612	\$40,361,665	\$7,748,463	\$0	\$7,748,463	\$40,361,665	\$7,748,463	\$0	\$0	\$0	\$55,038,740	\$0	\$0	\$0
Wholesale trade	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Retail trade	\$0	\$0	\$0	\$1,785,892	\$406,327	\$1,785,892	\$0	\$1,785,892	\$406,327	\$1,076,510	\$286,116	\$3,554,845	\$0	\$0	\$0
Transportation & warehousing	\$0	\$0	\$0	\$10,230,702	\$276,585	\$10,230,702	\$0	\$10,230,702	\$276,585	\$34,816	\$186,760	\$10,728,863	\$0	\$0	\$0
Information	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Finance & insurance	\$0	\$0	\$0	\$70,336	\$0	\$70,336	\$0	\$70,336	\$0	\$0	\$0	\$70,336	\$0	\$0	\$0
Real estate & rental	\$0	\$0	\$0	\$1,255,607	\$0	\$1,255,607	\$0	\$1,255,607	\$0	\$41,817	\$0	\$1,297,424	\$0	\$0	\$0
Professional, scientific & technical services	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$257,583	\$0	\$793,522	\$0	\$0	\$0
Management of companies	\$0	\$0	\$0	\$5,415,224	\$0	\$5,415,224	\$0	\$5,415,224	\$0	\$0	\$0	\$5,415,224	\$0	\$0	\$0
Administrative & waste services	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Educational services	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Health & social services	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Arts, entertainment & recreation	\$0	\$0	\$0	\$0	\$418,723	\$0	\$0	\$0	\$418,723	\$2,813,041	\$282,736	\$3,514,500	\$0	\$0	\$0
Accommodation & food services	\$0	\$0	\$0	\$66,290	\$1,495,869	\$66,290	\$0	\$66,290	\$1,495,869	\$8,622,947	\$1,010,063	\$11,195,169	\$0	\$0	\$0
Other services	\$0	\$0	\$0	\$477,413	\$373,297	\$477,413	\$0	\$477,413	\$373,297	\$0	\$252,063	\$1,102,774	\$0	\$0	\$0
Government & other	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Appendix B.3 (Continued)

Description	Animal		Vineyards		Equine	Wine tourism	Horse shows and competitions	Farm Tourism	Total
	Farm production	slaughtering and processing	and wineries						
Total Industrial Output Impact									
Total	\$83,905,253	\$8,165,843	\$49,036,943	\$47,376,654	\$4,368,485	\$19,264,433	\$2,967,339	\$215,084,950	
Agriculture, forestry, fishing & hunting	\$63,846,675	\$205	\$504,672	\$5,337,132	\$248	\$1,044	\$169	\$69,690,146	
Mining	\$31,535	\$275	\$1,693	\$41,723	\$248	\$1,296	\$168	\$76,938	
Utilities	\$618,442	\$46,405	\$290,452	\$323,446	\$41,032	\$217,821	\$27,855	\$1,565,453	
Construction	\$461,166	\$42,911	\$238,064	\$7,985,963	\$32,789	\$187,079	\$22,263	\$8,970,234	
Manufacturing	\$759,449	\$6,932,311	\$40,438,983	\$98,713	\$11,645	\$54,356	\$7,905	\$48,303,363	
Wholesale trade	\$591,569	\$56,519	\$951,876	\$2,112,269	\$25,400	\$96,932	\$17,258	\$3,851,822	
Retail trade	\$1,143,546	\$56,058	\$310,346	\$11,474,483	\$484,023	\$1,363,487	\$338,984	\$15,190,928	
Transportation & warehousing	\$751,261	\$183,583	\$870,282	\$371,670	\$312,094	\$179,313	\$210,910	\$2,879,114	
Information	\$261,660	\$30,756	\$379,419	\$527,511	\$65,319	\$301,879	\$44,353	\$1,610,898	
Finance & insurance	\$4,088,220	\$147,405	\$554,308	\$3,334,783	\$138,025	\$896,757	\$93,951	\$9,253,449	
Real estate & rental	\$6,011,048	\$197,124	\$1,448,457	\$4,029,760	\$323,766	\$1,354,454	\$220,203	\$13,584,812	
Professional, scientific & technical services	\$1,249,714	\$163,354	\$1,310,046	\$7,100,702	\$203,687	\$1,181,067	\$138,183	\$11,346,753	
Management of companies	\$22,330	\$29,405	\$347,519	\$42,812	\$10,081	\$49,527	\$6,828	\$508,501	
Administrative & waste services	\$471,611	\$58,040	\$319,556	\$611,666	\$95,929	\$462,452	\$65,086	\$2,084,339	
Educational services	\$111,597	\$5,645	\$27,524	\$109,509	\$8,039	\$47,581	\$5,471	\$315,365	
Health & social services	\$1,569,653	\$76,214	\$383,828	\$1,488,721	\$100,342	\$403,963	\$68,287	\$4,091,008	
Arts, entertainment & recreation	\$195,809	\$14,427	\$75,291	\$272,456	\$486,895	\$3,057,480	\$328,847	\$4,431,206	
Accommodation & food services	\$619,217	\$47,478	\$194,586	\$1,141,452	\$1,556,288	\$8,937,347	\$1,051,095	\$13,547,461	
Other services	\$561,415	\$42,712	\$215,475	\$601,642	\$423,532	\$212,511	\$286,191	\$2,343,479	
Government & other	\$539,339	\$35,015	\$174,565	\$370,240	\$49,103	\$238,087	\$33,333	\$1,439,682	

