

**Economic Impacts of the Pigs and Pork Sector  
In North Carolina and Selected Counties**

Final Report Submitted to:

**NORTH CAROLINA PORK COUNCIL**

Updated July 15, 2019

By: Kelly Zering

Project Leader

Dept. of Agricultural and Resource Economics

North Carolina State University

**Contributors to this report:**

Kelly Zering, PhD is a Professor and Extension Specialist in the Department of Agricultural and Resource Economics at North Carolina State University. He is the Project Leader and is responsible for the contents of this report.

Ms. Lei Pan is an Economics Graduate Student at North Carolina State University and was employed part time by this project to collect data and literature and to use the IMPLAN data set for North Carolina and associated analytical tools offered by IMPLAN to support this project. Ms. Pan did outstanding work and the results reported here could not have been completed without her excellent contributions and insights.

We gratefully acknowledge the important contributions of Mr. Andy Curliss of the North Carolina Pork Council in convening industry experts and soliciting feedback on estimated values that are critical to this analysis.

We also gratefully acknowledge the provision of a grant by the North Carolina Pork Council that allowed us to acquire licenses to use IMPLAN data and provided research assistant support for Ms. Lei Pan.

We gratefully acknowledge the support of the North Carolina Cooperative Extension Service, the North Carolina Agricultural Research Service, and College of Agriculture and Life Sciences at North Carolina State University for providing Kelly Zering's time and the infrastructure support required for this work.

## **Executive Summary:**

This report summarizes research methods, data sources, estimation methods, and results of an assessment of the economic effects of the pig and pork sectors in North Carolina and in four selected counties. Major areas of contributions include compilation of data from a wide diversity of published sources to transparently estimate the value of sales, employment and value added for the pig production sector and pig slaughter and pork processing sector in North Carolina and selected counties, the modification and application of IMPLAN to estimate indirect, induced and total effects of these sectors at the state and county levels, and the interpretation of the results in the context of local and global grand challenges of rising demand for animal products, the need for greater resiliency and growth of the economies of rural communities, and the economies of rural communities in North Carolina. We find that these sectors make very large, critical contributions of employment, income, and tax base to agricultural and rural communities in North Carolina.

We estimate that the pig production sector and the pig slaughter and pork processing sector together directly contribute \$5.9 billion in sales (value of outputs), \$1.7 billion in value added (wages and salaries and benefits, taxes, payments to capital, returns to proprietors, and profits), and 19,298 jobs. When indirect and induced effects are added, the total contribution of these two sectors is estimated at \$9.5 billion in sales, \$3.5 billion in value added, and 43,611 jobs in North Carolina. These estimates do not capture the entire contribution of the pigs and pork industry. For example, we report an additional \$1.2 billion in sales, \$0.17 billion in value added, and 2,313 jobs directly contributed by two sectors labelled “Meat Processed from Carcasses” and “Rendering and meat byproduct processing”. These numbers more than triple when indirect and induced effects are added. We kept these sectors separate as we did not acquire sufficient data to document pork’s share of these two sectors in North Carolina although we know pork’s share is substantial.

We also found that pig production and pig slaughter and processing make critical contributions to the economies of rural counties and surrounding counties in North Carolina. For example, these two sectors contributed 50% of the value added and 44% of the employment in Bladen County and 26% of the value added and 23% of the employment in Sampson County.

A major challenge we encountered after acquiring IMPLAN is that IMPLAN and the US Census do not offer complete economic profiles of the pig production sector or the pork slaughter and processing sector. Both of these sectors are combined with other sectors to create merged sectors. Most importantly, the economic profiles presented for the merged sectors do not correspond well with what we know about the pig production sector and the pork slaughter and processing sector. Our approach to overcoming this obstacle was to collect as much publicly available data as possible to create new economic profiles of the two sectors, modify their profiles in IMPLAN, and re-run IMPLAN to create new credible estimates of the direct, indirect, and induced effects of these sectors in North Carolina. We did not receive nor did we use any proprietary data in developing our estimates. We delivered three interim reports and a public presentation inviting feedback the industry and the public. Andy Curliss of the NC Pork Council convened small groups of industry experts who provided us with critical feedback. As a result of

that feedback and other expert insights, we substantially reduced IMPLAN estimates of employment by the pig producing sector and substantially reduced IMPLAN estimates of the value of output (sales) for the pig slaughter and pork processing sector in North Carolina. We conducted far more research into public data to generate new estimates of critical variables, modified IMPLAN data, re-ran IMPLAN analyses and generated new results reported here.

There is much more work to be done, mostly building from the county level and individual business level, to create a more specific picture of the diverse and important contributions that the pigs and pork sectors make to the economy and social fabric of agricultural and rural communities in North Carolina.

## Introduction

The goal of this project is to estimate the effect of the North Carolina pig production and pork processing sectors on the economies of North Carolina and selected counties in North Carolina. This project creates new estimates using current data and builds on a study conducted in 1993 and 1994 by Brandt et al. This study includes new focus on transparency regarding data sources and calculations. Transparent data and calculations allow simpler comparison to other studies of similar effects and improved ability to explain differences between estimates. This study was partially supported by a grant from the North Carolina Pork Council.

Two sectors of the economy are studied intensively in this project. One is the pig production sector. The second is the pork slaughter and processing sector. These two sectors are closely linked and a combined effect is estimated with care to avoid double counting indirect and induced effects.

## The Importance of Agriculture, Livestock, and Pigs: Globally, Nationally, and in North Carolina

The primary industries of agriculture, forestry, and fishing accounted for 3.6% of global GDP in 2016. The share of national GDP for these sectors ranges from 1% in US to 49% in some developing countries. Note that this is just the farming or primary production portion of these sectors. Source: World Bank at <https://data.worldbank.org/indicator/NV.AGR.TOTL.ZS>

When broadened to include agriculture, food, and related industries. US agriculture accounted for 5.4% of US GDP in 2017, valued at \$1.053 trillion. These sectors accounted for 11% of US employment in 2017; about 21.6 million full and part time jobs. Source USDA ERS Ag and Food Sectors and the US Economy. <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy.aspx> .

Agriculture, food, and related industries are the largest sector of the North Carolina economy, accounting for 17.1% of North Carolina GDP or \$91.8 billion in 2017. Farming provided \$17.5 billion and manufacturing \$31.3 billion of the Agriculture and Food industries total. These sectors contributed 728,000 jobs in 2017, 16.5% of the North Carolina total.

Source: Mike Walden NCSU, Agriculture and Agribusiness 2019 at <https://cals.ncsu.edu/agricultural-and-resource-economics/wp-content/uploads/sites/12/2019/05/agribusiness2019Brochure.pdf> .

## Livestock's Contribution

FAO states that "Livestock contribute 40% of the global value of agricultural output and support the livelihoods and food security of almost 1.3 billion people. The livestock sector is one of the fastest growing parts of the agricultural economy." Source: Food and Agriculture Organization of the United Nations. 2019. <http://www.fao.org/animal-production/en/> .

In the US, livestock contributed \$371.4 billion in farm cash receipts; about 47% of the total in 2017. Source USDA Economic Research Service 2019 at <https://data.ers.usda.gov/reports.aspx?ID=17832> .

In 2016, the US Food and Beverage manufacturing sector employed 1.5 million people; about 14% of all US manufacturing jobs. About 30.5% of the 1.5 million were employed in meat and poultry sector jobs. USDA ERS 2019 at <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/ag-and-food-sectors-and-the-economy.aspx> .

In North Carolina, livestock contributed \$7.74 billion (67.7%) of the \$11.4 billion of cash receipts from farming in 2017. Source: NCDA / USDA NASS, NC Agricultural Statistics Book 2018, section 3. At <http://www.ncagr.gov/stats/AgStat/Section03.pdf> .

### **The importance of pigs and pork in global, national, and state of NC**

Pork has been the most produced and consumed meat globally in recent years with chicken meat production expanding quickly and likely surpassing pork in 2019. Global pork production was 113 million metric tons (carcass weight) in 2018. The United States produced 11.9 million tons carcass weight in 2018. Sources: Food and Agriculture Organization of the United Nations. 2019. <http://www.fao.org/animal-production/en/> and USDA World Agriculture Outlook Board April 2019 at [https://apps.fas.usda.gov/psdonline/circulars/livestock\\_poultry.pdf](https://apps.fas.usda.gov/psdonline/circulars/livestock_poultry.pdf) .

North Carolina is the second largest producer of pigs among US States despite inventory being capped by State legislative restrictions since 1997. North Carolina produced 4.25 billion pounds liveweight of pigs valued at \$2.27 billion in 2017. Pig production accounted for 20.5% of cash receipts from farming in North Carolina in 2017, second only to broilers. Source: NCDA / USDA NASS, NC Agricultural Statistics Book 2018, sections 3 and 4 at <http://www.ncagr.gov/stats/AgStat/Section03.pdf> and <http://www.ncagr.gov/stats/AgStat/Section04.pdf> .

### **The economic development challenges facing rural communities**

A grand challenge facing North Carolina, the US, and the globe is that rural economies are typically weaker and slower growing than non-rural economies. Any loss of employment, income, and tax base may create a downward spiral as tax revenue shrinks, government services are reduced, people move away, and customer base for local businesses declines. The US Census reported that 34 of 100 North Carolina counties lost population in 2017.

Source: U.S. Census Bureau, County Population Totals and Components of Change: 2010-2017 (2018).

And, for example, Stef W. Kight, Why Rural Counties Are Dying in America, AXIOS (June 20, 2018), <https://www.axios.com/the-dying-rural-counties-of-america-0fbcaa2f-dae5-47e3-99f7-e14693397e2a.html> .

In this context, livestock production and processing of livestock products are critical components of the economic base of many rural communities, locally and globally.

### **Direct Farm Level and County Level Effect of a Farm Adding a Pig Production Enterprise**

The addition of a commercial pig production enterprise to an existing farm adds employment, income, and property tax base to the farm. Appraised value was analyzed for 130 sales of existing farms with pig enterprises in eastern North Carolina between 1997 and 2010. The farms average 110 acres in size. The appraised value of used buildings and equipment was equal to about half of the total value of the farm; slightly less for nursery operations and slightly more for farrowing operations. In other words, the addition of a pig production enterprise approximately doubled the asset value of those farms.

Source: van der Hoeven, G., K. Zering, S. Kotsiri, "To be or not to be Premium Pricing of Swine Facility Farm Sales in a de facto Moratorium Environment: the Case of North Carolina," paper in proceedings, 18th International Farm Management Congress, IFMA, Volume 1 (Peer Reviewed), pages 427 – 436. ISBN no. 978-92-990056-6-8. March, 2011.

[http://www.ifmaonline.org/pages/con\\_full\\_articles.php?abstract=606](http://www.ifmaonline.org/pages/con_full_articles.php?abstract=606) .

### **Structure and Organization of the Pig and Pork Production Sectors**

Understanding of the structure and organization of the pig and pork production sectors is necessary to model the economic effects of the sectors, to collect and analyze relevant data, and to present results. Structural change in these sectors occurred rapidly in North Carolina and in the US in the 1980s and 1990s. Pig farms grew larger, employed indoor production systems, became more specialized in phase of pig production, were organized into networks of farms coordinated via production contracts and marketing contracts, and reallocated production responsibilities and ownership across different businesses and individuals via production contracts.

The pig slaughter and pork processing sector also changed rapidly in the 1980s and 1990s, with plants becoming fewer and larger, with mergers of companies, with more integration of primary and further processing, packaging, and distribution, with more exports, with a rapid shift to marketing contracts with pig producers as the primary form of coordination, and in some cases, with the acquisition of pig production companies.

The North Carolina pig production and pork processing sectors are made up of 2 large pork slaughter and processing plants, a few smaller pig slaughter and pork processing operations, several large pig production companies, over 2,000 permitted pig production sites most of which are operated by farmer owners under production contract with one of the pig production companies, and a number of smaller pig farms. Related businesses include companies that use pig products to create a wide variety of products, companies that provide goods and services to pig production and pork processing businesses, and a range of companies providing professional services, transportation and storage, wholesaling and retailing, and other related goods and services. Finally, North Carolina pig production provides a major market for corn,

wheat, other feed grains and soybean meal, consuming amounts similar to annual production in North Carolina.

### **Estimated Direct Output, Employment and Value Added of the North Carolina Pig Production Sector**

Important measures of the economic effects of any sector include output or sales, employment, and value added. These three variables are also important inputs to input-output analysis of sectors in an economy (such as the analysis supported by IMPLAN).

NCDA and USDA NASS provide estimates of annual pig production in North Carolina by number of head, pounds liveweight, and value (\$). NC Value of Marketings of Pigs:

Year	2010	2011	2012	2013	2014	2015	2016	2017	Average
Value (\$ billions)	2.236	2.483	2.570	2.861	2.888	2.263	2.097	2.344	2.468

This study uses the 8 year average of nominal values of pigs marketed in North Carolina (\$2.468 billion) as an estimate of the output of the NC pig production sector. (Note 2018 data were not available at time of analysis so are omitted from this estimate). There is substantial year to year variation in prices and quantities of pig and pork production so 8 and 9 year averages were adopted to provide a more robust estimate of size and effects.

A public source of data on employment in the NC pig production sector was not found by the authors. IMPLAN provided estimates of employment in a sector labelled “Animal Production Except Cattle and Poultry and Eggs” in North Carolina in 2016 at 20,813 jobs. This number seems high compared to other estimates and is peculiar in that only 36% of these jobs are in 9 counties that house 68.6% of the pigs in the state. The estimated number of jobs in the pig production sector was calculated to be proportional to the number of pigs housed and produced in pig producing counties: as  $20,813 \times 36\% / 68.63\%$  ( equal to 52.5% ) = 10,927 jobs. This estimate is consistent with an earlier estimate (Brandt, Vukina, Zering, Roka 1994) of FTEs per unit of pig housing capacity plus an estimate of off-farm jobs that are an important component of modern pig production (fieldmen, feed ingredient procurement and risk management, genetic stock production and semen production and distribution, feed milling and delivery, equipment repair and maintenance, veterinary services, engineering services, laboratory services, research, data management and analysis, accounting and payroll, legal and regulatory compliance services, public relations, policy, pig marketing and transportation, mortality management, residuals and land management, general management, and other services). The 10,927 FTEs estimate of pig production employment was adopted for this analysis.

Value added is comparable to Gross Domestic Product or a measure of net income. In input-output analysis, it may include wages and salaries and benefits, payments to providers of capital, payments to managers and proprietors, taxes, and other profits. A public source of value added data for pig production in NC was not found by the authors. An estimate of average value added over the past several years was developed by multiplying the average value of pig marketings in North Carolina by an average percentage of returns above costs other than

payroll, payments to capital, taxes, and profits. The payroll for the pig production sector in North Carolina was estimated as \$28,000 per FTE implying an average compensation of \$13.46 per hour including benefits. This estimate is likely below the actual average hourly compensation when higher paid off-farm jobs are included but in the absence of better data, this rate was adopted. The Iowa State University benchmark farrow-to-finish cost and returns estimates for the period 2010 through 2018 were analyzed and found to generate a value added margin of 26.33% of pig price or pig revenue. <http://www2.econ.iastate.edu/estimated-returns/Farrow%20to%20Finish%20Excel.xlsx> . This estimate includes labor as a cost (excluded from the value added margin and later replaced by the North Carolina payroll estimate listed above). The 26.33% value added margin includes 75% of the ISU feed processing cost which is treated as part of the NC payroll, taxes, and returns to capital as pig production companies own feed mills in NC. In summary, average annual value added in the North Carolina pig production sector is estimated at \$955.7 million.

### **Estimated Direct Output, Employment and Value Added of the North Carolina Pork Processing Sector**

Public data on the value of output from the pork processing sector in North Carolina was not found by the authors of this study. IMPLAN provided estimated value of output in 2016 for their sector 89 labelled “Animal, except poultry, slaughtering” at \$5.396 billion. Feedback from pork industry people suggested that IMPLAN number is too high to serve as an estimate of the pork processing sector output in North Carolina in 2016. An alternative approach was to estimate the quantity and value of pigs slaughtered in North Carolina and then add the farm to wholesale margin estimated and reported by USDA for pork in the US. The ratio of wholesale pork price to farm pork price (both in \$ per retail pound) averaged 1.58 during the 2010 through 2018 period. <https://www.ers.usda.gov/data-products/meat-price-spreads/meat-price-spreads/> .

Only a fraction of pigs sold in North Carolina are slaughtered in the state (roughly 12 million slaughtered of 17.5 million marketed in recent years). An estimate of the value of pigs slaughtered in North Carolina was calculated by multiplying average pounds slaughtered per year by average market price. Annual pig slaughter data in North Carolina was reported by USDA up until 2013. Average annual pig slaughter data from 2010 through 2018 was estimated using USDA Livestock Slaughter data for North Carolina and imputing values for pork slaughter after 2013 from total slaughter and slaughter of other species. <https://usda.library.cornell.edu/concern/publications/r207tp32d?locale=en> . This estimation method yields annual averages of 2.37 billion pounds dressed weight slaughtered, 11.55 million pigs slaughtered, dressed weight to live weight ratio of 0.7484, live weight slaughtered of 3.17 billion pounds, and average live weight per head of 274.55 pounds. Trends were not accounted for in these averages although average weight per hog was higher in the last 5 years of the period. Estimated number of hogs slaughtered also increased slightly in 2017 and 2018.

The Iowa State University Benchmark Farrow-to-Finish Costs and Returns price received for slaughter hogs during the period 2010 through 2018 was used to value hogs slaughtered in North Carolina on the assumption that both locations use the same USDA daily price quote as a

base and use similar premium and discount functions. <http://www2.econ.iastate.edu/estimated-returns/Farrow%20to%20Finish%20Excel.xlsx> . The Iowa State Benchmark average price per live pound was 59.33 cents during 2010 through 2018.

The resulting estimate of annual average value of pigs slaughtered in North Carolina 2010 through 2018 is \$1.88 billion. When multiplied by the ratio of wholesale to farm price of 1.58 and adding \$0.51 billion of output from a further processing plant in Wilson County (that IMPLAN includes in this sector), the estimated annual output of the North Carolina pig slaughter and pork processing sector is \$3.48 billion.

Average annual Value Added by the North Carolina pig slaughter and pork processing sector 2010 through 2018 was estimated as the US Census Annual Survey of Manufacturers national ratio of value added to output for their sector with NAICS code 311611 "Animal Slaughtering (not poultry)" multiplied by estimated Annual Output of the North Carolina Pig Slaughter and Pork Processing sector. The resulting estimate is \$743,276,169 in annual value added.

IMPLAN data indicates that there were 7650 jobs in their Sector 89 "Animal, except poultry, slaughtering" in North Carolina. Feedback from industry people suggested this number was 'in the ballpark' for North Carolina pig slaughter and pork processing as was the employment estimate for Bladen County NC where the largest processing plant is located. However, industry people also suggested that the IMPLAN employment estimate in this sector for Sampson County NC, location of the second largest processing plant, was too low at 836. Our revised estimate for Sampson County NC was calculated as a ratio of estimated daily packing capacity at the 2 plants (10,600 in Sampson County divided by 32,000 in Bladen County) multiplied by the employment estimate for Bladen County (4705). The estimated employment in Sampson County in this sector is raised to 1557 jobs; an addition of 721 jobs to the IMPLAN estimate. Adding the 721 jobs to the IMPLAN estimate for employment in this sector in North Carolina raises the total to 8371 jobs. This estimate and our estimate of value of output by this sector result in a ratio of \$ output to jobs suggested to be 'in the ballpark' by industry people. We also used the salary and benefits estimate provided by IMPLAN for this sector adjusted upward in proportion to the number of jobs added.

### **Indirect, Induced, and Total Effects in North Carolina of the North Carolina Pig Production and Pork Processing Sectors**

IMPLAN is a software package and data provider widely used to estimate the effects of a sector of the economy (or changes in a sector) on the overall economy in a specified region. Key indicators of economic activity include value of output or sales, value added, and numbers of jobs. Broader effects of a sector in the economy are calculated by estimating indirect effects and induced effects and adding them to direct effects. Direct effects are the actual value of sales or output, value added, and employment by the sector being studied. Indirect effects are the output, value added, and jobs supported or created when a sector purchases goods and services and makes other payments to people, companies, and institutions in the specified region. Induced effects are the output, value added, and jobs supported or created when people, companies, and institutions that receive money from the sector (both directly and indirectly) and then purchase goods and services and make other payments to people,

companies, and institutions across the entire economy of the specified region. Total effects of a sector are the sum of direct effects, indirect effects, and induced effects. The 2016 IMPLAN dataset was the most recent available for North Carolina when this analysis of state level effects began in summer 2018 and was the version purchased for this study.

Results are presented here for combined effects of IMPLAN sectors 14 (as pig production) and 89 (as pig slaughter and pork processing) using only the modified estimates of value of output, value added, and employment for the pig production and pork processing sectors described previously in this report. Analysis of the combined effects of the 2 sectors eliminates double counting of some indirect and induced effects of the pig slaughter sector that arise from purchases from the pig production sector, as those effects are already counted as part of the pig production sector effects.

The results presented here are for IMPLAN’s ‘Contribution Analysis’. That is, the results are estimates of the total contributions of these sectors to the North Carolina economy, as opposed to estimates of the effects of a change in a sector. (Note that a component of this analysis is to zero out feedback effects of the pig and pork sectors on themselves. In other words the direct effect of these sectors is the effect calculated as described above in this report and does not increase due to feedback from other sectors as it might in an analysis of marginal change in the sector.)

**Estimated Data and State-wide Contribution Effects of the NC Pig Production Sector**

<b>Estimated Data Described Above</b>		<b>Estimated NC Total Effects Using IMPLAN</b>	
<b>Annual Pig Production Values in NC</b>		<b>Annual State Economy Values in NC</b>	
Value of Outputs (Sales)	\$2.468 Billion	Value of Outputs (Sales)	\$4.34 Billion
Value Added	\$0.956 Billion	Value Added	\$1.92 Billion
Employment	10,927 FTEs	Employment	23,617 jobs

**Estimated Data and State-wide Contribution Effects of the North Carolina Pig Production Sector and the NC Pig Slaughter and Pork Processing Sector Combined**

<b>Estimated Data Described Above</b>		<b>Estimated NC Total Effects Using IMPLAN</b>	
<b>Annual Combined Values for Pig Production and Pig Slaughter and Pork Processing in NC</b>		<b>Annual State Economy Values in NC</b>	
Value of Outputs (Sales)	\$5.9 Billion	Value of Outputs (Sales)	\$9.5 Billion
Value Added	\$1.7 Billion	Value Added	\$3.5 Billion
Employment	19,298 jobs	Employment	43,611 jobs

The two tables above summarize our estimates for value of output, value added and employment; first for the pig production sector alone and then for the pig production sector combined with the pig slaughter and pork processing sector in North Carolina. The left side columns in each table summarize the estimates generated by us as described previously in this report. The right side columns in both tables summarize the estimates of total state-wide effects including the effects in the left side columns.

We estimate that the NC pig production sector employs about 10,927 full-time equivalent people, produces annual output that averages \$2.47 billion in value, and provides annual value added of about \$0.956 billion in North Carolina. When indirect and induced effects in other sectors of the North Carolina economy are added, we estimate that the NC pig production sector contributes total effects of 23,617 jobs, annual value of output or sales of \$4.34 billion, and annual value added of \$1.92 billion.

Combining the NC pig production sector and the NC pig slaughter and pork processing sectors, we estimate that these two sectors directly provide about 19,298 jobs, generate annual output or sales valued at \$5.9 billion, and generate annual value added of about \$1.7 billion. When indirect and induced effects as estimated with IMPLAN are added, the total contribution of these two sectors to the economy of North Carolina includes 43,611 jobs, \$9.5 billion annually in value of sales or outputs, and \$3.5 billion in value added.

### **Other Pig and Pork Related Sectors**

Other sectors of the economy as defined by the NAICS system and by IMPLAN include significant portions of pig and pork related activity in North Carolina. Two in particular that we summarize here are IMPLAN sectors 90 “Meat Processed from Carcasses” and 91 “Rendering and meat byproduct processing”.

These sectors include processing of products other than pork and we have no data with which to allocate impacts of these sectors to the NC pork industry. Clearly, a substantial portion of these sectors in North Carolina is derived from the pork industry. We present the IMPLAN estimates for these sectors here to inform readers.

**Estimated Direct and State-wide Contribution Effects of the NC Sectors “Meat Processed from Carcasses” and “Rendering and meat byproduct processing”**

<b>IMPLAN Data for “Meat Processed from Carcasses” in NC in 2016</b>		<b>Estimated NC Total Effects Using IMPLAN For “Meat Processed from Carcasses”</b>	
Value of Outputs (Sales)	\$0.928 Billion	Value of Outputs (Sales)	\$TBA Billion
Value Added	\$0.133 Billion	Value Added	\$0.42 Billion
Employment	1,783 jobs	Employment	5,415 jobs
<b>IMPLAN Data for “Rendering and meat byproduct processing” in NC in 2016</b>		<b>IMPLAN Estimated NC Total Effects for “Rendering and meat byproduct processing”</b>	
Value of Outputs (Sales)	\$0.265 Billion	Value of Outputs (Sales)	\$TBA Billion
Value Added	\$0.04 Billion	Value Added	\$0.149 Billion
Employment	530 jobs	Employment	1,950 jobs

- TBA = to be added

IMPLAN sector 90 “Meat Processed from Carcasses” employed 1783 people, had sales of \$928 million and generated value added of \$133 million in North Carolina in 2016 and stimulated total value added and employment at over 3 times those amounts. Several famous North Carolina brands of sausage makers, ham curers, and bacon cookers are likely among the companies in this sector. More information is needed to document the share of this sector attributable to pork. IMPLAN sector 91 “Rendering and meat byproduct processing” directly employs 530 people, has sales of \$265 million, and value added of \$40 million in 2016 in North Carolina. It too supports total contributions to the North Carolina economy that are between 3 and 4 times its direct effects. More information is needed to document the share of this sector attributable to pork. Companies in this sector create useful products from otherwise lower valued by-products.

**County Level Effects: Direct and total**

We use IMPLAN to analyze county level effects for four counties in North Carolina of the pig production sector and the pig slaughter and pork processing sector. County level estimates are a combination of those provided by IMPLAN and selected amendments as noted at the State level previously in this report. The estimated data and resulting IMPLAN estimates of Total effects are presented here along with the percentage of county totals to quantify importance to each county’s economy.

Bladen County

**Estimated Data and Total Contribution Effects of the Bladen County North Carolina Pig Production Sector Combined with the Pig Slaughter and Pork Processing Sector**

<b>Estimated Data for Combined Values for Pig Production and Pig Slaughter and Pork Processing in Bladen County</b>		<b>IMPLAN Estimated Total Effects for Combined Pig Production and Pig Slaughter and Pork Processing in Bladen County NC</b>		<b>% of County Total</b>
Value of Outputs (Sales)	\$2.34 Billion	Value of Outputs (Sales)	\$2.54 Billion	
Value Added	\$0.53 Billion	Value Added	\$0.63 Billion	50.2%
Employment	5,574 jobs	Employment	7,448 jobs	43.8%

The pig production sector and the pig slaughter and pork processing sector directly contribute an estimated 5,574 jobs, \$2.34 billion in sales or value of output, and \$0.53 billion in value added per year to Bladen County’s economy. When indirect and induced effects are added, total contributions are \$2.54 billion in value of output, 7,448 jobs, and \$0.63 billion annually in value added. The estimated total contribution of jobs by these sectors is 43.8% of the county total and the estimated value added (wages and benefits, taxes, payments to capital, payments to proprietors, and other profits) is 50.2% of the county total. Bladen County is home to the largest pig slaughter and pork processing plant in North Carolina and that sector directly contributes an estimated \$2.14 billion in value of output, 4,705 jobs, and \$0.457 billion in value added annually. Clearly these sectors are critical components of the economy of Bladen County and make important contributions to the economies of neighboring and nearby counties.

Note that indirect and induced effects at the county level tend to be smaller than at the state level. The indirect and induced effects of businesses contribute substantially to neighboring and nearby counties as well as to the local economy.

Sampson County

**Estimated Data and Total Contribution Effects of the Sampson County North Carolina Pig Production Sector Combined with the Pig Slaughter and Pork Processing Sector**

<b>Estimated Data for Combined Values for Pig Production and Pig Slaughter and Pork Processing in Sampson County</b>		<b>IMPLAN Estimated Total Effects for Combined Pig Production and Pig Slaughter and Pork Processing in Sampson County NC</b>		<b>% of County Total</b>
Value of Outputs (Sales)	\$1.24 Billion	Value of Outputs (Sales)	\$1.48 Billion	
Value Added	\$0.36 Billion	Value Added	\$0.48 Billion	26.2%
Employment	3,919 jobs	Employment	6,094 jobs	23.2%

The pig production sector and the pig slaughter and pork processing sector directly contribute an estimated 3,919 jobs, \$1.24 billion in sales or value of output, and \$0.36 billion in value

added per year to Sampson County's economy. When indirect and induced effects are added, estimated total contributions are \$1.48 billion in value of output, 6,094 jobs, and \$0.48 billion annually in value added. The estimated total contribution of jobs by these sectors is 23.2% of the county total and the estimated value added (wages and benefits, taxes, payments to capital, payments to proprietors, and other profits) is 26.2% of the county total. Sampson County is home to the second largest pig slaughter and pork processing plant in North Carolina and that sector directly contributes an estimated \$0.79 billion in value of output, 1,557 jobs, and \$0.151 billion in value added annually. Sampson County is also one of the largest pig producing counties in North Carolina with roughly 20% of the state's inventory of pigs. Clearly these sectors are critical components of the economy of Sampson County and make important contributions to the economies of neighboring and nearby counties.

Duplin County

**Estimated Data and Total Contribution Effects of the Duplin County North Carolina Pig Production Sector Combined with the Pig Slaughter and Pork Processing Sector**

<b>Estimated Data for Combined Values for Pig Production and Pig Slaughter and Pork Processing in Duplin County</b>		<b>IMPLAN Estimated Total Effects for Combined Pig Production and Pig Slaughter and Pork Processing in Duplin County NC</b>		<b>% of County Total</b>
Value of Outputs (Sales)	\$0.62 Billion	Value of Outputs (Sales)	\$0.79 Billion	
Value Added	\$0.23 Billion	Value Added	\$0.30 Billion	17.6%
Employment	2,583 jobs	Employment	4,020 jobs	15.0%

The pig production sector and the pig slaughter and pork processing sector directly contribute an estimated 2,583 jobs, \$0.62 billion in sales or value of output, and \$0.23 billion in value added per year to Duplin County's economy. When indirect and induced effects are added, estimated total contributions are \$0.79 billion in value of output, 4,020 jobs, and \$0.30 billion annually in value added. The estimated total contribution of jobs by these sectors is 15% of the county total and the estimated value added (wages and benefits, taxes, payments to capital, payments to proprietors, and other profits) is 17.6% of the county total. Duplin County is one of the largest pig producing counties in North Carolina and that sector directly contributes an estimated \$0.54 billion in value of output, 2,409 jobs, and \$0.211 billion in value added annually. These sectors are a leading component of the economy of Duplin County and make important contributions to the economies of neighboring and nearby counties.

**Estimated Data and Total Contribution Effects of the Wayne County North Carolina Pig Production Sector Combined with the Pig Slaughter and Pork Processing Sector**

<b>Estimated Data for Combined Values for Pig Production and Pig Slaughter and Pork Processing in Wayne County</b>		<b>IMPLAN Estimated Total Effects for Combined Pig Production and Pig Slaughter and Pork Processing in Wayne County NC</b>		<b>% of County Total</b>
Value of Outputs (Sales)	\$0.157 Billion	Value of Outputs (Sales)	\$0.23 Billion	
Value Added	\$0.059 Billion	Value Added	\$0.09 Billion	2.3%
Employment	676 jobs	Employment	1,328 jobs	2.3%

The pig production sector and the pig slaughter and pork processing sector directly contribute an estimated 676 jobs, \$0.16 billion in sales or value of output, and \$0.06 billion in value added per year to Wayne County’s economy. When indirect and induced effects are added, estimated total contributions are \$0.23 billion in value of output, 1,328 jobs, and \$0.09 billion annually in value added. The estimated total contribution of jobs by these sectors is 2.3% of the county total and the estimated value added (wages and benefits, taxes, payments to capital, payments to proprietors, and other profits) is 2.3% of the county total. Wayne County is an important pig producing county in North Carolina and that sector directly contributes an estimated \$0.15 billion in value of output, 658 jobs, and \$0.057 billion in value added annually. Wayne County is home to a large military sector and a major regional center; Goldsboro. Wayne County is also a leading agricultural county and the pig production sector is a leading component of the rural and agricultural economies of Wayne County and makes important contributions to the economies of neighboring and nearby counties.

**Summary**

This report summarizes research methods, data sources, estimation methods, and results of an assessment of the economic effects of the pig and pork sectors in North Carolina and in selected counties. Major areas of contributions include compilation of data from a wide diversity of published sources to transparently estimate the value of sales, employment and value added for the pig production sector and pig slaughter and pork processing sector in North Carolina and selected counties, the modification and application of IMPLAN to estimate indirect, induced and total effects of these sectors at the state and county levels, and the interpretation of the results in the context of local and global grand challenges of rising demand for animal products, the need for greater resiliency and growth of the economies of rural communities, and the economies of rural communities in North Carolina. We find that these sectors make very large, critical contributions of employment, income, and tax base to agricultural and rural communities in North Carolina.