

# The Tennessee Pork Industry 2021: Current Structure and Economic Importance

by Holly Cook and Lee Schulz<sup>1</sup>



## Introduction

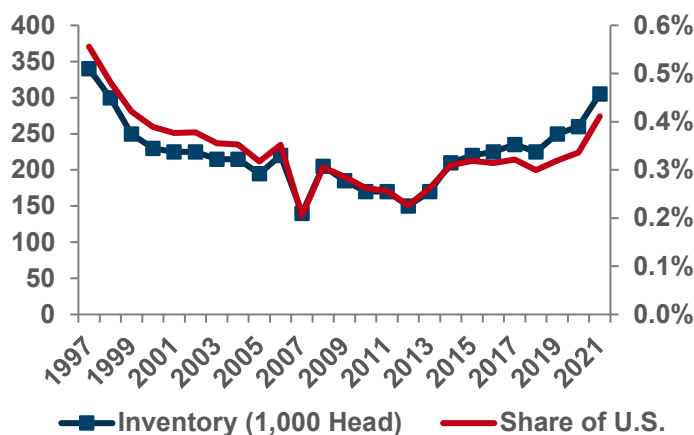
The Tennessee pork industry represents a significant value-added activity in the agricultural economy and a major contributor to the overall Tennessee economy. The \$121.53 million of gross cash receipts from hog marketings in 2021 represent only a portion of the total economic activity supported by the industry. Although the size and structure of the Tennessee pork industry has changed over time, increased levels of production have supported jobs and generated earnings in the state economy. An estimated 5,728 jobs are involved in various aspects of the Tennessee pork value chain ranging from input suppliers to producers, to processors and handlers as well as main street businesses that benefit from purchases by people in these industries. Overall, an estimated \$338.49 million of personal income and \$464.38 million of gross national product are supported by the Tennessee pork industry based on 2021 levels of production.

This report documents trends in Tennessee pork production and examines the current structure of production, input purchasing, and processing of the pork industry in Tennessee. The contribution of these activities to the overall Tennessee economy in terms of employment, income, and value added is also estimated and presented in detail.

## Hog Farms and Production

Hog inventories in Tennessee have varied over time but have trended upward from 230,000 head in 2000 to 305,000 head in December 2021 (Figure 1). Annual cash receipts from the sale of hogs were \$121.53 million in 2021, up 23.4% percent from the previous year. This figure was based on a pig crop of 0.75 million born in Tennessee and in-shipments from other states and Canada of 130,000 feeder pigs.

**Figure 1.** Tennessee December 1 Hog Inventory and Share of U.S. Total

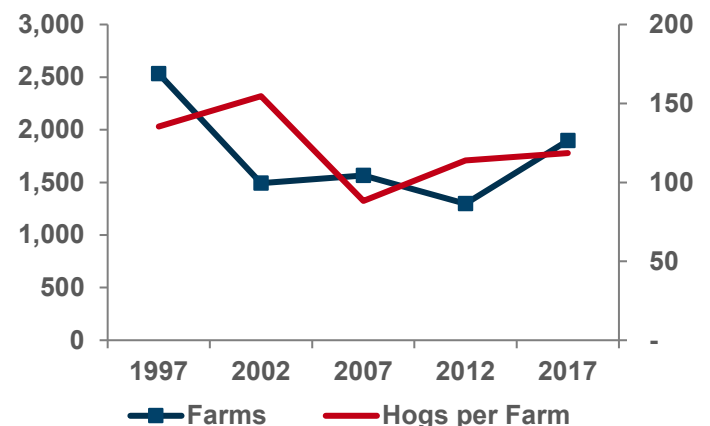


Source: USDA-NASS Hogs and Pigs Report

Total hog marketings in Tennessee have increased in recent years along with the number of farms

raising hogs. From 1997 to 2012, the number of farms with hogs decreased from 2,532 to 1,297, but by 2017 the number of farms increased to 1,898 (Figure 2). Meanwhile, the average inventory of hogs per farm has decreased from 135 to 119.

**Figure 2.** Tennessee Hog Farms and Hogs per Farm



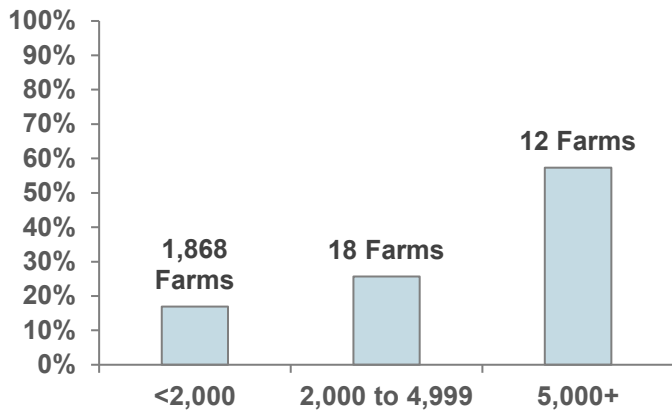
Source: USDA-NASS Census of Agriculture, 2017

Figure 3 illustrates the distribution of the Tennessee hog inventory. About 17 percent of Tennessee hogs are on farms with less than 2,000 head in inventory, 26 percent of the inventory is on

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farms with 2,000 to 4,999 head, and 57 percent are on farms with 5,000 or more hogs.

**Figure 3.** Tennessee Hog Inventory Distribution



Source: USDA-NASS Census of Agriculture, 2017

The prominence of the Tennessee pork industry and its growth in the global pork export market is no accident. Competitive production of feed grains, significant natural resources, and industry infrastructure have allowed Tennessee to position itself as an efficient producer for both domestic and global pork consumers. Because this report is concerned with the impacts and resources used in pork production, the analysis focuses on the value of hogs produced in Tennessee as the critical measure that drives expenditure levels for various hog-related inputs and investments.

### Hog Production Costs and Returns

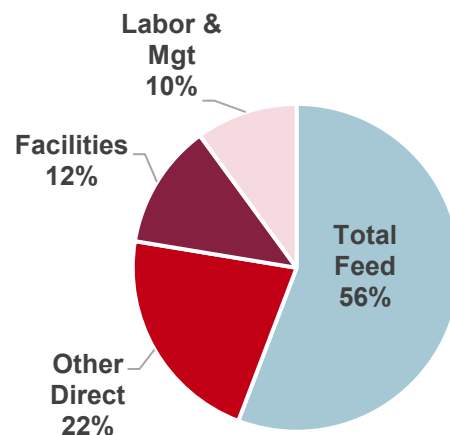
The \$121.53 million of hog marketings in 2021 represents the aggregate value of the pork industry at the farm level. In addition to these farm level effects, the industry's backward and forward linkages generate significant additional impacts throughout the Tennessee economy. The backward linkages include purchased inputs, supplies, and services used by hog producers. The forward linkages include further value-added activities occurring after the farm gate such as slaughter, processing, and food preparation. Total inputs, including labor, used by Tennessee hog industry were estimated based on aggregated cost of production budgets weighted according to the share of hog production occurring in different types and sizes of production systems.

Different budgets were developed for three production systems: farrow-to-finish, breed-to-wean, and wean-to-finish. The distribution of these systems is based on the relationship between pig crop, in-shipments, and out-shipments of pigs reported by USDA and represents a state level

measure rather than an average across all farms. Farrow-to-finish operations were further categorized by size because hog production is subject to economies of scale where per unit input use declines as hog operations increase in size. The share of pork production estimated to be in each classification of facility was based on the percent of inventory in three size groups reported in the 2017 Census of Agriculture and reflected in Figure 3. The breed-to-wean and wean-to-finish systems were not divided by size, but the share of each is reported in Table 1 along with aggregated costs and returns.

The cost of production and input usage was then calculated for each size of farrow-to-finish operation based on cost of production budgets developed by Iowa State University Extension and Outreach and were updated to reflect rising non-feed variable and fixed costs. The weighted cost and returns of production and totals of feed use, other direct inputs, annual depreciation on capital investments, labor requirements and returns to management and capital are presented in Table 1 and summarized in Figure 4. These aggregates are also depicted schematically in Figure 5. The prices used in the analysis are intended to reflect long-run conditions in the industry and are based on 10-year projections made by the Food and Agricultural Policy Institute (FAPRI) in March 2022. Based on these long-run prices, annual revenue from hogs is estimated to be \$94.74 million.

**Figure 4.** Estimated Share of Production Costs



Estimating the labor component involved in hog production presents a special challenge due to limited employment data being reported at the farm level and the mix of farm operators and employees involved in production. Because we are most interested in measuring labor on a comparable per unit basis, a Full Time Equivalent (FTE) of 2,080 hours per year per worker was deemed to be the

most appropriate measure of labor. This FTE standard was then applied to the total hog production in each size classification in Tennessee and then summed to arrive at a total labor requirement. The rate of labor (FTE) required per 10,000 hogs raised in farrow-to-finish operations ranged from 4.5 for the small facilities to 2.9 for the medium-scale facilities to 2.3 for the large systems.

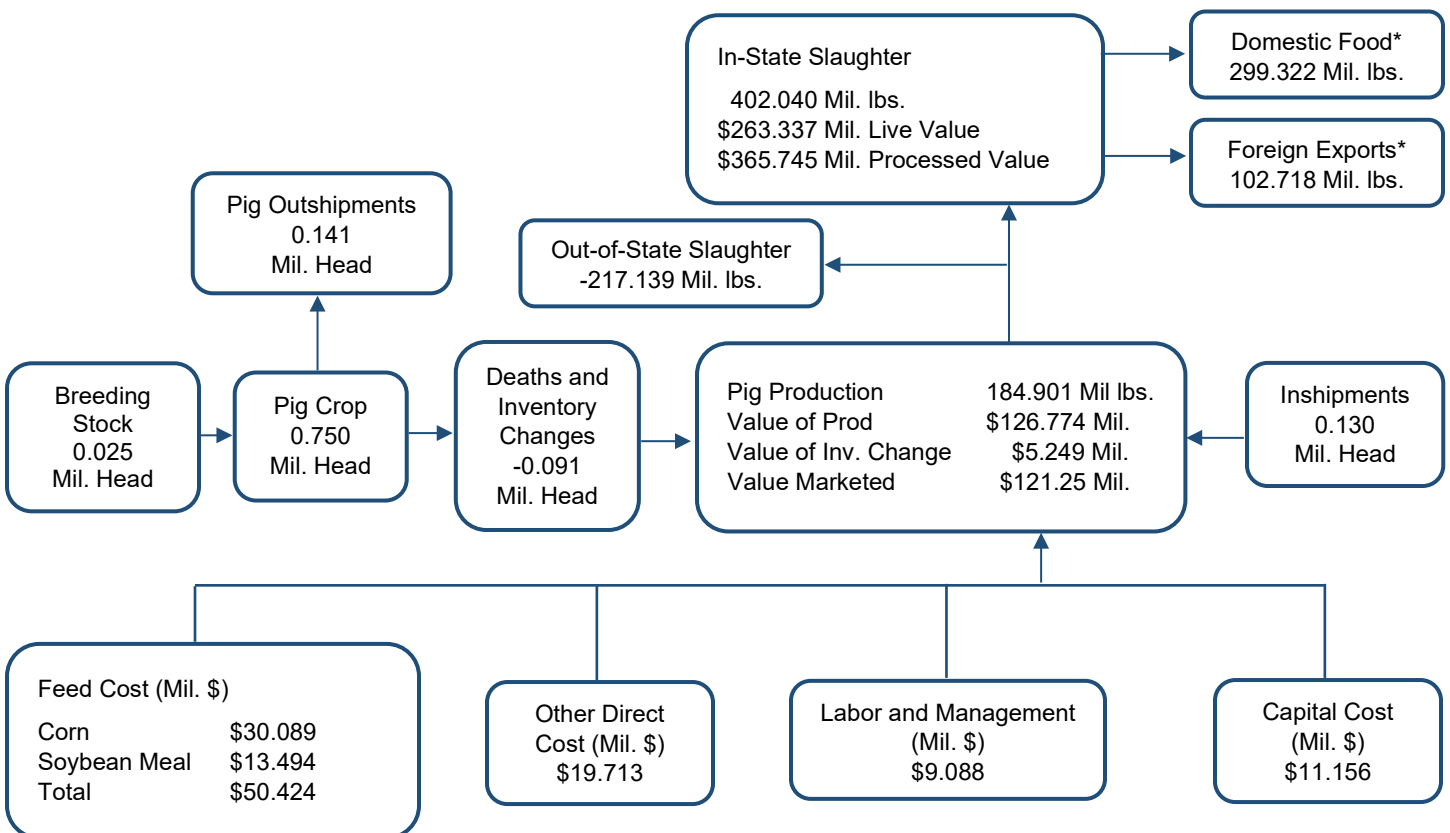
Although an estimated 1,898 farms are reported to be involved in hog production in 2017, based on the FTE standard of these budgets, an estimated 151 workers are required to produce the current volume of hogs in Tennessee (Table 1). Although the FTE numbers are used in our economic impact reports, it is important to recognize the larger number of Tennessee farms involved in some level of pork production.

The lower level of the schematic in Figure 5 represents purchased cash inputs used by producers at the farm level. A significant portion of purchased inputs are produced within the state, generating additional economic activity in the local economy.

The estimated total value of direct inputs used in Tennessee sum to \$70.14 million based on long-run feed prices. Additional costs for depreciation of fixed assets and facilities total an estimated \$11.16 million. Labor and management expenses add an additional \$9.09 million of costs for a total of \$90.38 million of aggregate input costs used in hog production in Tennessee. The residual value between inputs and marketings is estimated to total \$4.36 million and can be described as returns to capital.

The largest single category of expenditure is feed. With 648,163 head produced annually, 6.4 million bushels of corn valued at \$30.09 million and 41.8 thousand tons of soybean meal valued at \$13.49 million are used in Tennessee. Feed supplements and additives represent another \$6.84 million of purchased inputs from suppliers in Tennessee. Overall, the use of this scale of feed ingredients helps support the soybean processing industry, local elevators, transportation services, and others based in local communities

**Figure 5.** Tennessee Pork Industry Flow of Production



\*Final demand estimates based on prorating U.S. slaughter (lbs) proportionately to total end uses.

**Table 1.** Cost of Production and Returns Associated with Tennessee Average Farrow to Finish Operation, Long Run Prices and 648,163 Head Marketed

	Price	State Total
<b>REVENUE*</b>	\$60.83/cwt	\$94,737,616
<b>COST</b>		
Corn (\$/bu)	\$4.71/bu	\$30,088,720
Soybean Meal (\$/ton)	\$323.02/ton	\$13,494,466
Other Feed (\$/cwt)	\$43.00/cwt	\$6,840,836
<b>TOTAL FEED</b>		\$50,424,022
<b>Other Direct Cost</b>		\$19,713,083
<b>TOTAL DIRECT</b>		\$70,137,106
<b>Equipment</b>		\$2,236,379
<b>Building</b>		\$8,212,722
<b>Land and Other</b>		\$707,246
<b>Labor and Management</b>		\$9,087,869
<b>TOTAL INDIRECT</b>		\$20,244,216
<b>TOTAL COST</b>		\$90,381,322
<b>RETURN TO CAPITAL</b>		\$4,356,294

\*Revenue (\$/cwt liveweight) excludes the value of pigs purchased from out of state.

Estimated Aggregated Production System		
Farrow-Finish	Breed-Wean	Wean-Finish
21%	19%	60%

Input Summary		
<b>Corn</b>	Bu	6,382,785
<b>Soybean Meal</b>	Tons	41,776
<b>Other Feed</b>	Cwt	159,089
<b>Labor &amp; Mgt. per Hog</b>	\$/head	\$14.02
<b>Total Labor</b>	FTE	151

## Economic Contribution of Tennessee Pork Industry

In addition to the direct sales and purchases described above, the Tennessee pork industry generates further activity through its backward and forward linkages to other industries. Backward linkages include purchases of inputs, supplies, trucking, and other services required to produce hogs while forward linkages are tied to the hog slaughter and pork processing industries. When hog producers and pork processors make purchases from other industries, these expenditures support additional jobs and earnings beyond the pork industry and induce spending in a variety of sectors.

To capture the total economic contribution of the pork industry, this analysis uses a modified input-output (I-O) model of Tennessee within the IMPLAN modeling system. IMPLAN is a customizable system that utilizes a 546-industry matrix and an extensive database to account for all inter-industry transactions within the economy and calculates the impact of an initial industry change. When measuring the overall contribution of an entire industry, the final estimates essentially quantify the impact that would be lost if the pork industry was removed from the Tennessee economy.

The I-O model for Tennessee was driven by estimates of 2021 hog marketings, the employment level and production costs calculated in the previous section and estimates for employment and labor income within the hog slaughter and pork processing industries. For this portion of the analysis, FTE employees were converted to the annualized equivalents used by IMPLAN. Estimates for the hog slaughter and pork processing industries were based on plant location and size

information from federal and state inspection agencies, employment information from the U.S. Census Bureau, and state slaughter and production estimates produced by USDA. Because the IMPLAN-defined industries that represent hog production and pork processing include additional activity such as other animal production and beef processing, providing these industry-specific inputs helps customize the model for the pork industry.<sup>2</sup>

After estimating initial industry values, the model was carefully modified to avoid double counting the upstream impacts of hog production and to eliminate buybacks within and across the industries of interest. For example, the hog slaughter industry purchases live hogs as an intermediate input. The economic value of hog production is already fully accounted for as part of this analysis, so the model was adjusted to include only the additional value generated by slaughter and processing activity. The model also excludes additional effects from intra-industry purchases (i.e., hog producers buying feeder pigs, breeding stock, etc.) and purchases from the other industries being analyzed (i.e., the further processing industry purchasing carcasses from the slaughter industry).

After making these adjustments, the I-O model was run to calculate the multiplied-through effect of the entire pork industry on the Tennessee economy. The total contribution includes the direct, indirect, and induced values for the output, labor income, value added, and jobs supported by the industry. Direct impacts are the initial values of sales and employment in the industry, indirect impacts stem from expenditures on locally sourced inputs, and induced impacts are supported by purchases made with income earned in the direct or indirect industries. The results of this analysis are summarized in Table 2.

**Table 2.** Total Economic Contribution of Hog Production and Pork Processing Industry in Tennessee

	Jobs	Labor Income	Value Added	Output
<b>Direct</b>	2,965	\$183,985,364	\$216,789,593	\$1,061,784,818
<b>Indirect</b>	1,408	\$80,498,585	\$121,532,035	\$251,783,322
<b>Induced</b>	1,355	\$74,002,115	\$126,059,221	\$216,807,532
<b>Total</b>	<b>5,728</b>	<b>\$338,486,065</b>	<b>\$464,380,849</b>	<b>\$1,530,375,673</b>

Source: IMPLAN Model for Tennessee with inputs calculated by the user.

<sup>2</sup> This analysis uses IMPLAN's industry 14 (animal production except cattle, poultry, and eggs), 89 (animal, except poultry, slaughtering) and industry 90 (meat processed from carcasses). To further customize the model, purchases of beef cattle were removed from industry 89 and industry 90 spending patterns and output was derived from intermediate inputs (live hogs plus other non-durable goods) and labor costs.

Output, or gross sales, measures the value of production within an industry and is the broadest measure of economic activity. The estimated \$121.53 million in gross output, or sales, from hog production in 2021 supported additional sales in the state's hog slaughtering and processing sector, as well as additional input purchases and spending that totaled \$1.53 billion of direct, indirect, and induced sales in the Tennessee economy. In this analysis, total output excludes the indirect effects of purchased hogs and carcasses. However, this number should be used with caution because the value of the hog is still counted twice, both at the producer level and as part of the total value of pork sold at the processor level.

Value added is often a preferred measure of economic activity because it includes only the portion of output that exceeds the cost of intermediate inputs used in production, therefore eliminating the double-counting issue described above. This includes wages, taxes, and profits and represents the industry's contribution to gross domestic product (GDP). Overall, an estimated

\$464.38 million of value added in the Tennessee economy is linked directly and indirectly to the pork industry. Value added grows when sales and personal incomes increase faster than the cost of intermediate inputs.

The Tennessee pork industry supports a total of \$338.49 million in labor income paid to 5,728 workers across many industries. This includes the 151 FTE workers at the farm level and an estimated 2,788 employees in the hog slaughter and processing sectors. The estimate of \$9.09 million in direct labor income within the hog production industry includes wage and salary income as well as proprietor income. An estimated \$172.55 million is also paid to workers in the slaughter and processing industry. The pork industry supports additional jobs within agriculture and manufacturing, as well as in industries like trucking, finance, insurance, real estate, trade, and other service sectors. Estimates of the pork industry's total contribution are presented at an eight-sector level of detail in Table 3.

**Table 3.** Total Impact by Industry Group

	Jobs	Labor Income	Value Added	Output
<b>Agriculture</b>	425	\$11,764,409	\$35,563,708	\$140,927,741
<b>Construction</b>	21	\$1,452,918	\$1,593,956	\$4,143,502
<b>Manufacturing</b>	2,842	\$176,309,497	\$191,368,491	\$968,918,881
<b>Wholesale and Retail</b>	511	\$30,913,269	\$56,077,424	\$96,489,656
<b>Transport and Utilities</b>	435	\$28,108,573	\$35,194,864	\$69,372,662
<b>Finance, Ins., Real Estate</b>	214	\$12,197,767	\$22,697,373	\$52,851,833
<b>Services</b>	1,243	\$74,026,595	\$115,617,295	\$183,797,172
<b>Other</b>	37	\$3,713,038	\$6,267,738	\$13,874,225
<b>Total</b>	<b>5,728</b>	<b>\$338,486,065</b>	<b>\$464,380,849</b>	<b>\$1,530,375,673</b>

Source: IMPLAN Model for Tennessee with inputs calculated by the user.

## **Pork Exports**

The continued growth of the Tennessee pork industry is feeding growing demand from domestic and export customers. The final demand uses of processed pork products in 2021 were an estimated 102.7 million pounds going into foreign markets and 299.3 million pounds into domestic markets. These estimates are based on prorating Tennessee production proportionally to total end uses.

In 2021, about 25 percent of U.S. pork production was exported. Using this export share implies that a comparable share of the total economic contribution, or 1,454 jobs and \$85.9 million of personal income in Tennessee results from exporting pork and pork products to foreign markets.

## **Pork Industry Issues and Opportunities**

The pork industry has undergone significant changes over the last several decades, transforming from a commodity-oriented industry that relied largely on family labor, to a more capital-intensive, science-and-technology-driven industry producing products for many diverse consumers. The industry also faces considerable challenges in the coming years as it works to capture opportunities of increased consumer expectations and expanding markets for U.S. pork.

### ***Industry Size and Structure***

The average U.S. farm size has increased in recent years, though the trend toward fewer farms has slowed. In fact, from 2012 to 2017, the number of hog farms in the United States increased by almost 3,200. However, as global market conditions and competing demand for feed grain inputs push production costs higher, effective marketing, financial planning, and risk management strategies are becoming necessary ingredients for industry survival. Producers of all sizes are asking if they are large enough, and contract production arrangements are becoming increasingly popular. It remains true that effective management is key to success regardless of farm size or structure.

The family farm remains the dominant business structure for the U.S. hog industry. Family farms comprise 96% of all U.S. farms with hogs and account for 81% of the hog inventory according to the 2017 Census of Agriculture Farm Typology report.

Regardless of the size or ownership of the enterprise, hog and pork production does create economic activity in the state and community where it is located. If the firm is not locally owned the profits may not remain entirely in the community. However, major inputs (feed, labor, utilities, trucking, services, property taxes, etc.) will likely still be provided locally or within the region.

### ***Animal Health and Biosecurity***

Domestic disease pressure has heightened in recent years, which has led to a lag in productivity growth (pigs per litter, farrowings per sow, etc.) Staying prepared and having well thought out animal health and biosecurity programs in place remains critical to protecting against new, emerging, and foreign diseases. Genetic technology has advanced in recent years and reducing disease pressures may allow potential productivity gains to be realized. In addition, the industry must remain diligent in its efforts to prevent an outbreak of African Swine Fever (ASF) in the United States. Such an outbreak would be a devastating animal health crisis with extremely negative implications for market prices, export opportunities, and the overall economy.

### ***Worker Shortages***

Increased levels of production and the adoption of new technology have supported a greater demand for skilled, full-time workers on hog farms. Pork packing and processing plants also require more workers to operate at full, optimal capacity levels. However, maintaining adequate staffing levels on farms and in processing plants has been increasingly difficult in recent years despite higher wage offerings, bonus programs, and competitive benefits.

While current tightness in the broader U.S. labor market plays a role, many labor challenges are also tied to long-term demographic trends in rural America. Slowing U.S. population growth and increased levels of out-migration have caused populations of rural, farming counties to decline over time while the median age of the rural workforce continues to increase. The result is a shrinking and aging rural labor force that is increasingly unable to fill the workforce needs of the pork industry.

Current visa programs that allow foreign born workers to fill on-farm job openings in other industries are not well-suited for an industry that requires year-round animal care and technical

support. Without policy intervention, labor shortages

threaten to limit production in the years to come, undermining an important sector of the economy.

### ***Exports and Trade***

Exports are an important component of overall pork demand. The United States is one of three top pork producing and exporting countries in the world, accounting for about 26 percent of global pork exports in 2021. Despite rising breakeven price levels in recent years, the U.S. remains a relatively low-cost producer with significant natural resources and has been a reliable supplier amid world-wide supply-chain issues. These are all important considerations for global buyers.

More than 25 percent of all U.S. pork is exported, adding over \$62 per head to the value of each hog marketed. Expanding market access by removing non-tariff trade barriers for U.S. pork will be important for future industry growth. Relationships with major trade partners must be solvent for trade to remain the important component it is.

### ***Environment and Sustainability***

The environmental impact of pork production is an important matter that is not independent of the industry's economic contribution. The most recent retroactive life-cycle assessment of the pork industry shows that U.S. producers have significantly reduced the resources required to produce each pound of pork. According to the Environmental Protection Agency, hog production accounted for 0.47 percent of total U.S. greenhouse gas emissions in 2020, making the industry's carbon footprint per pound of pork produced nearly 21 percent smaller than in 1990.

Because of differences in climate, cropping patterns, and manure management practices across the country, uniform environmental standards may have differing regional impacts on hog production. For this reason, the pork industry's sustainability goals and metrics are focused on

outcomes rather than specific practices.<sup>3</sup> As a whole, the pork industry has established goals to continue improving water-use efficiency, soil, land, and biodiversity, and nutrient management while further reducing the industry's carbon footprint by 2030.

### ***Opportunities for Value-Added Production***

Markets for products with specific attributes (i.e., organic, antibiotic use, animal housing specifications, etc.) have expanded in recent years. As demand for these types of products increases, different segments of the marketing channel must communicate more closely with one another. This communication, whether formal (via specification contracts) or informal (through market signals) will coordinate to deliver specific characteristics for a given product line.

Process-verified programs present additional value-added opportunities for the pork industry. However, it is important that any market growth be based on consumer demand for differentiated products rather than imposed regulations, which inflict significant costs and inefficiencies on producers and the entire pork value chain. Each individual producer will face decisions at the farm level about which product channels they will supply based on the costs and incentives to produce.

### ***Looking Ahead***

The future size and structure of the U.S. pork industry will be determined by the individual decisions of over 60,000 farms, the devoted individuals who operate them, and their potential successors. With current demographics, including producer age and an equity distribution skewed to older producers, a large share of productive assets in the pork industry will likely change hands over the next decade. Future policy and educational efforts should be designed not only to encourage and assist beginning farmers entering pork production but also to address long-run challenges and enhance their chances of surviving, prospering, and growing as viable farm operators

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<sup>3</sup> For more information, see the [2021 Pork Industry Sustainability Report](#).



## References

Food and Agricultural Policy Research Institute. U.S. Agricultural Outlook. FAPRI-MU Report #02-22. University of Missouri. March 2022.

IMPLAN Group LLC. IMPLAN model, 2019/2020 data with inputs provided by the user.

Iowa State University Extension and Outreach. Estimated Livestock Returns.

Iowa State University Extension and Outreach. Livestock Enterprise Budgets for Iowa - 2021. Ag Decision Maker B1-21.

Purdue University. 1995. Positioning Your Pork Operation for the 21st Century. Purdue Cooperative Extension Service. ID-210.

University of Minnesota Center for Farm Financial Management. FINBIN | The Farm Financial Management Database.

U.S. Census Bureau. County Business Patterns. CBP Tables 2020.

U.S. Department of Agriculture. World Agricultural Supply and Demand Estimates.

U.S. Department of Agriculture Economic Research Service. Commodity Costs and Returns.

U.S. Department of Agriculture National Agricultural Statistics Service. Hogs and Pigs.

U.S. Department of Agriculture National Agricultural Statistics Service. Livestock Slaughter Annual Summary 2021. April 2022.

U.S. Department of Agriculture National Agricultural Statistics Service. 1997, 2002, 2007, 2012, 2017 Census of Agriculture. United States Summary and State Data. Volume 1—Geographic Area Series—Part 51.

U.S. Department of Agriculture National Agricultural Statistics Service. 2017 Census of Agriculture. Summary of Farm Typology Measured by Gross Cash Farm Income (GCFI) of Family Farm Producers and Non-Family Farms- United States.

U.S. Department of Agriculture National Agricultural Statistics Service. Meat Animals Production, Disposition, and Income 2021 Summary. April 2022.

U.S. Environmental Protection Agency. Greenhouse Gas Inventory Data Explorer. 2020.

U.S. Food Safety and Inspection Service. Meat, Poultry and Egg Product Inspection Directory.