Analysis of 2017 Census of Agriculture Data

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EXECUTIVE SUMMARY

This study examined the agricultural industry in Pennsylvania and provides descriptive profiles of farm operations and farmers, as well as trends in Pennsylvania agriculture.

The researchers used Pennsylvania data from the 2017, 2012 and 2007 Censuses of Agriculture (Ag Census). They also interviewed representatives from key farm organizations to gain additional perspectives about the current state and future trends in agriculture.

Key Findings

- Between 2012 and 2017 the number of farms in Pennsylvania decreased 10 percent, land in farms declined 6 percent, and average farm size increased 5 percent.
- In 2017, the largest number of farms (42 percent) were small-sized, between one and 49 acres, followed by medium-sized farms between 50 and 179 acres (38 percent). These farms were mostly (74 percent) family-owned or individual proprietorships.
- Pennsylvania farms sold $6.5 billion (adjusted for inflation, using 2007 as the deflator) in agricultural products in 2017, down 2 percent since 2012. Sales from livestock outpaced crop sales in 2017, and within livestock, dairy constituted the largest sector.
- Organic product sales increased substantially over the prior decade. The number of farms producing organic products increased from 680 in 2007 to 1,048 in 2017. Total organic product sales increased from $70.9 million in 2012 to $598 million in 2017 (data adjusted for inflation, using 2007 dollars). Federal initiatives, such as the U.S. Department of Agriculture Organic Research Extension program, and, more recently, the Agriculture Improvement Act of 2018 (2018 Farm Act) have helped support and expand the organic sector.
- There has been an increase in the number of farms using renewable energy systems in recent years, with the greatest increase being in the use of geothermal and geo-exchange systems.
- More recently (2012-2017), there has been a surge in the number of new primary producers, reversing the previous trend (2007-2012). However, there was a 12 percent decline in primary producers with more than 10 years on the present farm.
- The average age of primary producers in 2017 was 57 years, a year higher than 2012. More than one-third (33 percent) of primary producers in Pennsylvania were 65 years or older. This trend is similar to the overall U.S. figures.
- A little over half (51 percent) of primary producers' reported farming as their primary occupation in 2017. Out of these, 35 percent operated on large farms of more than 500 acres.
- In 2017, about 21 percent of primary producers were female, a substantial increase from 14 percent in 2007 and 2012. This indicates a trend toward an increased number of female primary producers in the commonwealth over time.

- Dairy cattle and milk production represented the higher share of net farm income as reported in the last three Ag Censuses (2017, 2012 and 2007). The relative contribution of poultry and egg production, as well as hog and pig farming, have increased significantly between 2007 and 2017.
- In the regional analysis, comparing Pennsylvania to the 13 states in the northern crescent farm resource region, only two states (Ohio and New Jersey) had an increase in farmland acres between 2012 and 2017. The commonwealth saw an increase of 5 percent in average farm size between 2012-2017, and was one of six states with an overall increase in average farm size.
- In the Pennsylvania county analysis, the 10 counties with the largest decreases in the number of farms between 2012 and 2017 were: Clinton, Forest, Warren, Montour, Lehigh, Delaware, Wyoming, Crawford, Jefferson, and Luzerne (listed in descending order).

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INTRODUCTION

Agriculture is a major industry in Pennsylvania and an essential segment of the state's economy. However, with prices of commodities decreasing steadily from 2012 to 2017, the question arises as to which farms can adjust and continue operating successfully. Prices of milk, soybeans, corn, and wheat have all fallen, lowering revenues, and affecting profits. The revenue loss has been most pronounced for corn, which lost 13.8 percent of sales revenue between 2012 and 2017. The current COVID-19 pandemic further aggravated the challenges faced by farmers and has negatively impacted farm profitability. The long-run trends in Pennsylvania point toward a reduction in the number of farms, and farmland acres, and an increase in the number of larger farms (Alter et. al, 2017). In particular, Alter et. al (2017) established that farm incomes are closely linked to farm sizes, with large farms (sales over $100,000) having the majority (95 percent) of farm product sales and farm income in 2012.

The recent shifts in consumer demand for organic products has initiated a surge in organic agriculture (Pennsylvania Department of Agriculture, 2018). The commonwealth has become a national leader in organic food production, ranking second nationally in organic farm sales since 2008 (Pennsylvania Department of Agriculture, 2018). Dimitri and Greene (2002) summarized the growth pattern in the U.S. organic sector in recent years, reporting a surge in demand for organic food in conventional supermarkets, with its growth in retail sales being more than 20 percent since 1990. The U.S. Department of Agriculture (USDA) has expanded research, regulatory, and other programs on organic agriculture, including facilitating organic product marketing, and new government activities in research and education on organic farming systems (Dimitri and Greene, 2002). Conner and Rangarajan (2009) analyzed the market premiums that currently exist for many organic crops, discussing the profitability of organic farming, and the incentives to transition to such organic practices. Evaluating crop budgets from two Pennsylvania organic farms as case studies, their research identified production costs as vital information for production and pricing decisions. They further established that longer-term budgets measuring multi-year rotations would better capture the tradeoffs made by diversified organic farmers. Given that organic farming practices have gained relevance in recent years, this research presents profiles of organic farmers and organic farm practices in Pennsylvania.

The Commonwealth has long established itself as a farming state. Agriculture and food-related industries make substantial contributions to the statewide economy. In 2015, these industries employed about 500,000 people across the state, with a $40 billion value-added impact on the Pennsylvania economy (Pennsylvania Department of Agriculture, 2016). Global economic factors influence farm operations in Pennsylvania, and therefore it is important to analyze the impact of federal policy changes on revenues. Of specific interest is the impact of U.S. trade relations with China, and the retaliatory tariffs that China and other countries have imposed on major American agricultural exports, particularly soybeans (Paschal, 2019). In addition to agricultural products, the impact of tariffs and trade policy

uncertainty results in higher farm equipment costs, thus lowering profitability (Paschal, 2019). This study conducted interviews with key farm organizations (identified with input from the Center for Rural Pennsylvania), to inquire whether there were any tariff-related impacts on agricultural exports for the commonwealth.

In recent decades, Pennsylvania, reflecting the national trend, has experienced a shift in farmer demographics, with the average age of operators rising over time (Census of Agriculture, 2017). With young Pennsylvania farmers indicating the need for structural changes to address their challenges and concerns, specifically regarding accessing land, the National Young Farmers Coalition has focused more on state-level work (Gardner et al, 2019). Holding listening sessions, and conducting statewide surveys, the report by Gardner et. al (2019) identified three main barriers for young farmers in the Commonwealth: land access, agricultural workforce development, and farmer business services.

As farm operators age, they could quit farming due to retirement. Using Ag Census farm-level data, Griffin, Hartarska, and Nadolnyak, (2018) evaluated factors that affected farmers' exit, focusing on the entire population of retirement-age farmers. They found that farmers with larger operations were less likely to exit, and that farms with higher sales (more than $250,000) were more likely to disinvest, i.e., rescale their operations. Their findings also confirmed that female farmers were one percent more likely to exit, but two percent less likely to scale down or disinvest, compared to their male counterparts.

Katchova and Ahearn (2016) showed that, after entry into agriculture, beginning farmers and especially young farmers tend to rapidly increase the size of their farming operations in the first decade of operating their businesses. The type of farming practices has also been changing over time. After examining the 2017 Census of Agriculture data, Hannah Smith-Brubaker (2019) reported positive trends for sustainable agriculture in Pennsylvania, as there was an increase in the number of farms in Pennsylvania employing sustainable farming practices.

Over the past three decades, the number of women-operated farms have increased substantially (Hoppe and Korb, 2013). The 2017 Census of Agriculture indicated that 35 percent of primary operators of Pennsylvania farms are females, and 56 percent of all farms have at least one female decision maker. In recent decades, with the percentage growth in female labor force participation surpassing that of males (Bureau of Labor Statistics, 2017), a relevant question arises: are increasing numbers of women adopting farming as an occupation? Additional analysis of the characteristics of female farmers were conducted as part of this research. Operator demographics such as farmers' age, gender, and economic characteristics, including economic class of farms, type of operation and farm size, are presented in this report. This provides an intuitive understanding of the current state of agriculture in Pennsylvania.

GOALS AND OBJECTIVES

The purpose of this research was to develop a series of profiles of Pennsylvania farmers and farm operations, and to describe existing trends and conditions in the agriculture. The study used data from the 2017, 2012 and 2007 Censuses of Agriculture (Ag Census), and data collected from interviews of key farm organizations in Pennsylvania. For the study, the researchers used USDA's definition of farm (any place from which $1,000 or more of agricultural products were produced and sold, or normally would have been sold, during the year). The following are the research goals and objectives:

1. Analyze how farm profiles have changed over time using data from the 2007, 2012, and 2017 Ag Census.
    a. Identify changes in the number and percent of Pennsylvania farmers over time.
    b. Identify changes in the number and percent of farmland acres and average size of farms to understand how land use for agriculture has varied over time.
    c. Compare changes in the value of agricultural sales by different categories of products over the past decade.
2. Determine how primary producer demographics have changed over time based on selected observable characteristics.
    a. Identify trends in the average age and gender distribution of farmers in Pennsylvania over the years and observe whether these vary across other farmer characteristics such as beginner farmers and primary occupation.
    b. Identify trends in beginning farmers (those on their current farm for fewer than 10 years) and the number of farm operators who considered farming their primary occupation over the previous 10 years in the state.
3. Present a summary of these changes at the county level and compare the Commonwealth with some of the Northern Crescent states[1] with respect to the number of farms, farmland acres and average farm sizes (USDA Economic Research Service Farm Resources Regions, 2000).
4. Conduct a qualitative analysis of existing trends and future prospects of agriculture in Pennsylvania by interviewing farm organizations. The interviews will discuss recent U.S. trade policy changes with China, with particular emphasis on the impact of current tariffs on Pennsylvania agricultural exports and whether that impacts farm profitability.

[1] USDA divides the country into nine farm resource regions, which are areas with similar types of farms intersected with areas of similar physiographic, soil, and climatic traits. Pennsylvania is in the Northern Crescent region along with New York, Ohio, Michigan and others (https://www.ers.usda.gov/webdocs/publications/42298/32489_aib-760_002.pdf?v=42487).

RESULTS

Farms and Farmland

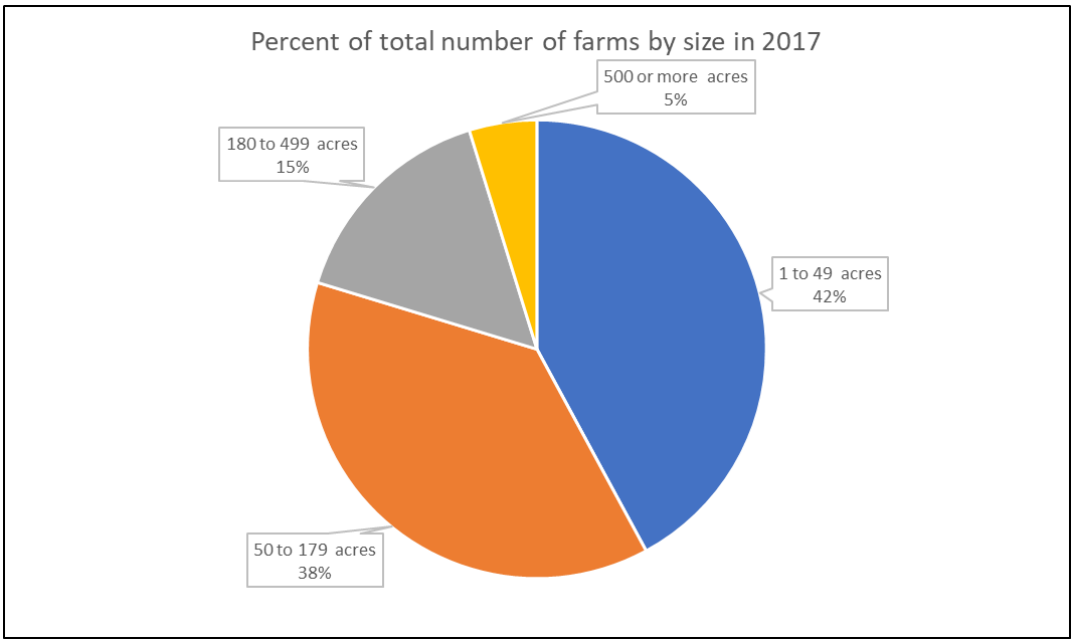
In 2017, there were 53,157 farms in Pennsylvania, covering 7,278,668 acres of farmland. The average size per farm was 137 acres. Out of 53,157 farms, 42 percent were small farms, or those between one and 42 acres in size. Only five percent were large farms of more than 500 acres. Nationwide, farms have an average size of about 441 acres, much larger than the average size in Pennsylvania. In line with the commonwealth, 42 percent of U.S. farms are small (fewer than 50 acres), while 15 percent are large farms of more than 500 acres. Changes in farmland acres and average farm size over the previous decade indicate an altering landscape of the state's agriculture (See Table 1). The number of farms in the state decreased 10 percent (6,152 farms) between 2012 and 2017. This decrease was more pronounced than the six percent decrease between 2007 and 2012. On the other hand, average farm sizes have consistently grown (by five percent) over the same time. Between 2012 and 2017, farmland in Pennsylvania declined from 7.7 million to 7.2 million acres. This six percent decrease was significant compared to the one percent decrease in farmland between 2007 and 2012. The recent trend reflects a decrease in the number of farms and a decline in acres of farmland. These changes are consistent with national trends. There was a nationwide decrease of three percent in the number of farms, and about two percent in farmland acres between the 2012 and 2017 Ag Censuses. The trend in average farm sizes in Pennsylvania is aligned with the U.S., with the national average farm size growing two percent between 2012 and 2017.

Table 1: Farms Numbers, Acres, Average Size in Pennsylvania, and Percent Change

All PA farms	**2007**	**2012**	**2017**	**% Change 2017-2012**	**% Change 2012-2007**
Number of Farms	63,163	59,309	53,157	-10%	-6%
Land in Farms (acres)	7,809,244	7,704,444	7,278,668	-6%	-1%
Average Farm Size (acres)	124	130	137	5%	5%

Source: Censuses of Agriculture 2007, 2012 and 2017.

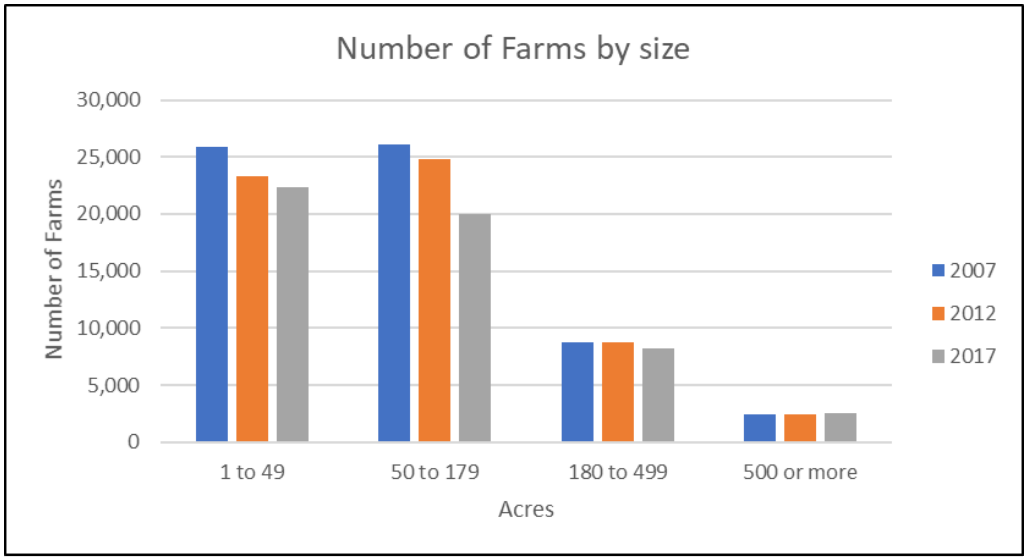
Figure 1 illustrates the variation in the percent of farms by size in Pennsylvania. In 2017, about 80 percent of farms were under 179 acres each. The highest number of farms were small, between one and 49 acres (42 percent), closely followed by farms between 50 and179 acres (38 percent). While the number of farms between one and 49 acres increased by three percent between 2012 and 2017, the number of farms between 50 and179 acres fell by four percent. The larger farms (500 acres or more) comprise about five percent more of the total share of farms than they did a decade ago.



Source: Census of Agriculture 2017.

Figure 2 shows the trend in Pennsylvania farm sizes over the previous decade. While the proportion of small farms increased in 2017, the actual number of small- and medium-sized farms declined over time, as there was a decline in the total number of farms, from 59,309 farms in 2012 to 53,157 in 2017. The number of large farms (500 acres or more) however, consistently increased over the previous decade. The current trend appears to be fewer farms, with larger average farm sizes.

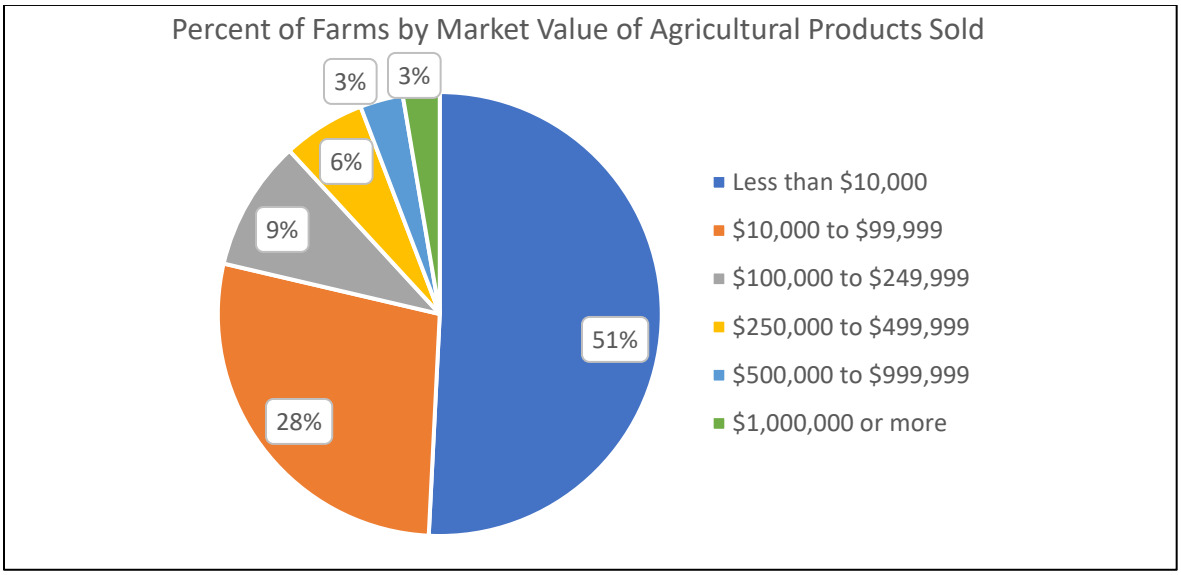
Figure 2: Number of Farms by Size in Pennsylvania, 2007-2017



Source: Censuses of Agriculture 2007, 2012 and 2017.

Farms also vary by agricultural sales (See Figure 3). The majority (51 percent) of farms in Pennsylvania sold less than $10,000 of agricultural products in 2017, and around 28 percent sold between $10,000 and $99,999 of agricultural products. About three percent of farms sold more than $1,000,000 worth of agricultural products. The share of farms selling less than $10,000 of agricultural products decreased significantly between 2007 (62 percent) and 2017 (51 percent). Nationwide, 58 percent of farms sold less than $10,000 of agricultural products in 2017, while seven percent sold $500,000 or more.

Figure 3: Percent of Farms by Market Value of Agricultural Products Sold, 2017



Source: Censuses of Agriculture 2017.

In 2017, the total market value of agricultural products sold in Pennsylvania was $7.75 billion ($6.56 billion in 2007 dollars).[2] Farms with $500,000 or more in sales generated 67 percent of all sales, followed by 26 percent from farms with sales between $100,000 to $499,999. While farms with sales of less than $99,999 account for 79 percent of all farms in the state, they represent only eight percent of the total market value of agricultural products sold.

There are a variety of different ownership types of farms in Pennsylvania (See Table 2). In 2017, most farms, 86 percent, were family-owned or individual sole proprietorships. There has been a steady decline in the proportion of family-owned farms over the years, however, from 91 percent in 2007 to 88 percent in 2012, and to 86 percent in 2017. During the same period, partnerships, the second most common type of ownership, have steadily increased from five percent in 2007 to seven percent in 2017. The proportion of farms classified as corporations increased as well, from three percent in 2007 to five percent in 2017. The remaining one percent of farms in 2017 were under other types of ownership, such

[2] Agricultural sales were adjusted for inflation using 2007 as the deflator. A detailed explanation is provided in the Agricultural Sales section.

as cooperatives, institutions, and estates or trusts. A similar trend was observed in the U.S., except for partnerships. At the national level, the proportion of farms classified as partnerships fell by 21 percent between 2007 and 2012, and an additional six percent between 2012 and 2017.

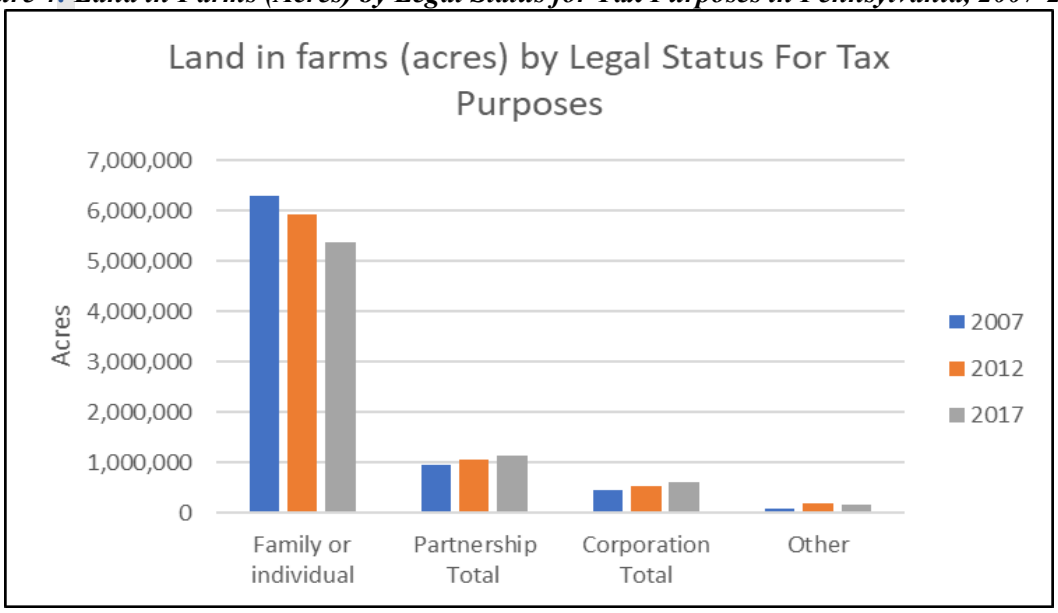
Table 2:Number of Farms by Ownership Type in Pennsylvania, 2007-2017

	2007	2012	2017
Family or individual	57,749	52,390	46,172
Partnership	3,265	3,808	3,688
Corporation	1,719	2,294	2,452
Other (cooperative, estate or trust, institutional)	430	817	845

Source: Censuses of Agriculture 2007, 2012 and 2017.

In terms of farmland acres, most land was owned by families or individual proprietors (74 percent). However, the total number of acres in family- or individually owned farms decreased steadily since 2007, while partnered and corporate farm acreage increased (See Figure 4).

Figure 4: Land in Farms (Acres) by Legal Status for Tax Purposes in Pennsylvania, 2007-2017

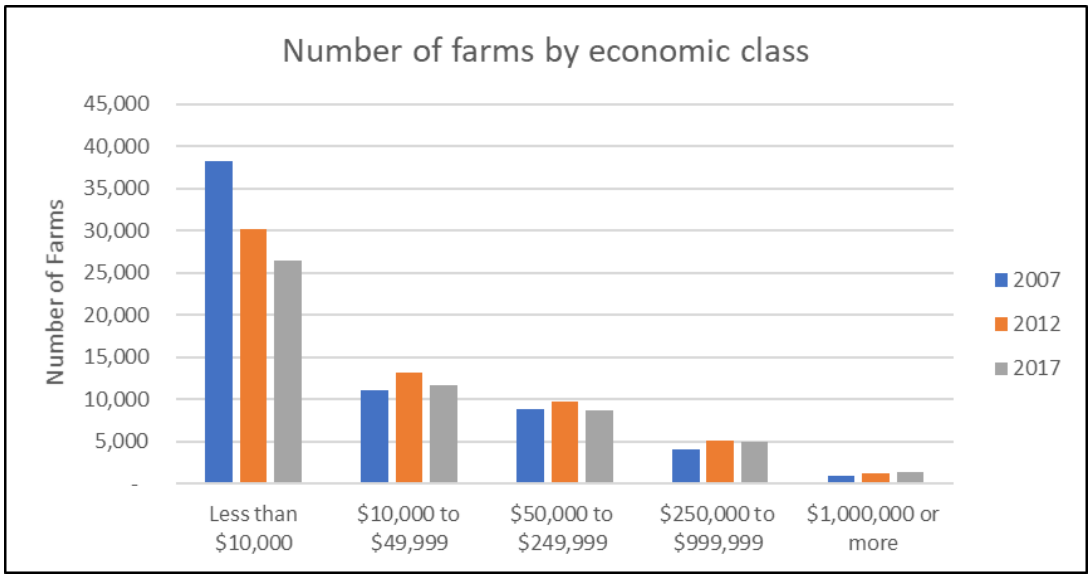


Source: Censuses of Agriculture 2007, 2012 and 2017.

Economic class is the classification of farms by the sum of market value of agricultural products sold and federal farm program payments received. The total value of products sold combines total sales not under production contract and total sales under production contract. Government payments consist of remittance received from the Conservation Reserve Program (CRP), Wetlands Reserve Program (WRP), Farmable Wetlands Program (FWP), or Conservation Reserve Enhancement Program (CREP) plus government payments received from federal, state, and local programs other than the CRP, WRP, FWP, CREP, and Commodity Credit Corporation loans. Figure 5 reports the number of farms by economic class

in 2017. Most farms (about 50 percent) have sales and government payments of less than $10,000, and 22 percent have sales and government payments between $10,000 and $49,999. This indicates that there are essentially many farms with smaller sales in Pennsylvania. The number of farms with the smallest sales (less than $10,000) decreased significantly between 2007 and 2017 (by 10 percent). However, the number of farms with sales between $10,000 and $49,000 increased by four percent between 2007 and 2017. The other economic classes of farms have undergone slight increases over the 2002-2017 period.

Figure 5:Number of Farms by Economic Class, 2007-2017



Source: Censuses of Agriculture 2007, 2012 and 2017.

Agricultural Sales

The state's market value of agricultural sales was $6.5 billion in 2017 (in 2007 dollars). Out of the total agricultural sales, crop sales accounted for $2.3 billion, and livestock sales were $4.2 billion. Hence, livestock sales contributed about 65 percent of total agricultural sales in 2017. Agricultural sales were adjusted for inflation (Bureau of Labor Statistics measure of Consumer Price Index, CPI measure), using 2007 as the deflator.[3]

The value of agricultural sales increased by 15 percent between 2007 and 2012, while it decreased by

[3] All agricultural sales values are in 2007 dollars. The implications would not change if another year was chosen as the base index year. The real values calculated would change, but the trend of the real prices would remain unchanged. Using 2007 as the deflator would enable the discussion to be about real movement in agricultural sales since 2007, which was the initial year in the analysis. The CPI measure of inflation calculates the average change over time in the prices paid by urban consumers for goods and services that they purchase. The CPI measures the price changes for all consumer goods and services, including food. Since agricultural products are purchased by consumers through the retail market, this measure reflects the accurate change in such retail prices over time. Hence this is the chosen measure of inflation for this study. The Producer Price Index (PPI) is like the CPI in that it measures price changes over time. However, instead of measuring changes in retail prices, the PPI measures the average change in prices paid to domestic producers for their output.

two percent between 2012 and 2017 (See Table 3). This decrease in recent years was lower compared to the nationwide eight percent decrease in value of agricultural sales between 2012 and 2017. Between the different categories of agricultural products, crops had a higher increase (34 percent) compared to livestock (six percent) between 2007 and 2012. More recently, from 2012 to 2017, crop sales decreased by six percent, while livestock sales increased by one percent. The increase in the value of livestock sales in Pennsylvania was higher than the U.S. average (which had no change). The decrease in the value of crop sales in Pennsylvania was also lower compared to the national average (15 percent).

Table 3:Value of Agricultural Sales in Pennsylvania, 2007-2017

	2007	2012	2017	% Change 2007-2012	% Change 2012-2017
All Products ($ thousands)	$5,808,803	$6,683,806	$6,563,114	15%	-2%
Crops ($ thousands)	$1,869,706	$2,513,307	$2,352,681	34%	-6%
Livestock ($ thousands)	$3,939,097	$4,170,498	$4,210,434	6%	1%

Data adjusted for inflation, using 2007 dollars*. *Data adjusted for inflation with 2007=100. Source: *Censuses of Agriculture 2007, 2012 and 2017.*

Selected categories of agricultural products and their relative contribution to total sales are shown in Table 4. Dairy (milk from cows), constituted the largest portion of the livestock category in 2017, representing 26 percent of total sales, followed by poultry and eggs (22 percent). Whereas the other subcategories of livestock saw no meaningful change over the previous decade, the relative contribution of poultry and eggs increased substantially from 18 percent in 2012 to 22 percent in 2017. Within crop products, the largest contribution has been from the nursery, greenhouse, floriculture, and sod category (13 percent), and the biggest drop in relative contribution to total sales has been in corn (from 11 percent in 2012 to eight percent in 2017).

Table 4:Market Value of Agricultural Products Sold in Pennsylvania, 2007-2017

	Sales in $1,000			Percent of Total Sales		
	2007	2012	2017	2007	2012	2017
Crops, including nursery and greenhouse crops	$1,869,706	$2,513,307	$2,352,681	32.2%	37.6%	35.8%
Livestock, poultry, and their products	$3,939,097	$4,170,498	$4,210,434	67.8%	62.4%	64.2%
Livestock products with higher total sales						
Milk from cows	NA	$1,776,343	$1,674,310	NA	26.6%	25.5%
Poultry and eggs	$1,015,843	$1,230,087	$1,424,921	17.5%	18.4%	21.7%
Cattle and calves	$556,192	$647,615	$529,126	9.6%	9.7%	8.1%
Hogs and pigs	$336,437	$413,554	$484,264	5.8%	6.2%	7.4%
Crops Products with higher total sales						
Nursery, greenhouse, floriculture, and sod	$892,279	$853,344	$859,374	15.4%	12.8%	13.1%
Corn	$319,930	$723,244	$523,991	5.5%	10.8%	8.0%
Other crops and hay	$149,392	$238,655	$305,044	2.6%	3.6%	4.6%
Soybeans	$122,103	$279,861	$242,667	2.1%	4.2%	3.7%
Vegetables, melons, potatoes, and sweet potatoes	$125,623	$127,227	$158,450	2.2%	1.9%	2.4%
Fruits, tree nuts, and berries	$151,101	$144,952	$145,133	2.6%	2.2%	2.2%
Total	$5,808,803	$6,683,806	$6,563,114			
Average per farm in dollars	$91,965	$112,694	$123,467			

Data adjusted for inflation, using 2007 dollars*. *Data adjusted for inflation with 2007=100. NA: Data not available for that year.*Source: Censuses of Agriculture 2007, 2012 and 2017*

Over the previous decade, organic product sales increased substantially. Farms producing organic products increased from 680 in 2007 to 1,048 in 2017. Table 5 reports the number of farms selling organic products by economic class. Far more farms in the highest economic class ($250,000 or more) were producing organic products. This increase was most pronounced between 2012 and 2017. The total number of farms selling organic products decreased slightly between 2007 and 2012 (by 12 percent). This trend reversed, however, and increased substantially (by 75 percent) between 2012-2017. The lower sales of organic products between 2007-2012 reflected a nationwide trend, with the most plausible cause being

an impact of a weaker U.S. economy. While frequent buyers of organic products might not have changed their organic purchasing habits even with the economic slowdown, infrequent buyers limited their purchases of organic products, and the rate of gain for new organic consumers declined (USDA Economic Research Service, 2009). Further, organic food costs more to produce, and organic producers faced competition from new labels like the "locally grown" label (USDA Economic Research Service, 2009). These factors contributed to the fall in organic sales between 2007 and 2012, both nationally and at the state level.

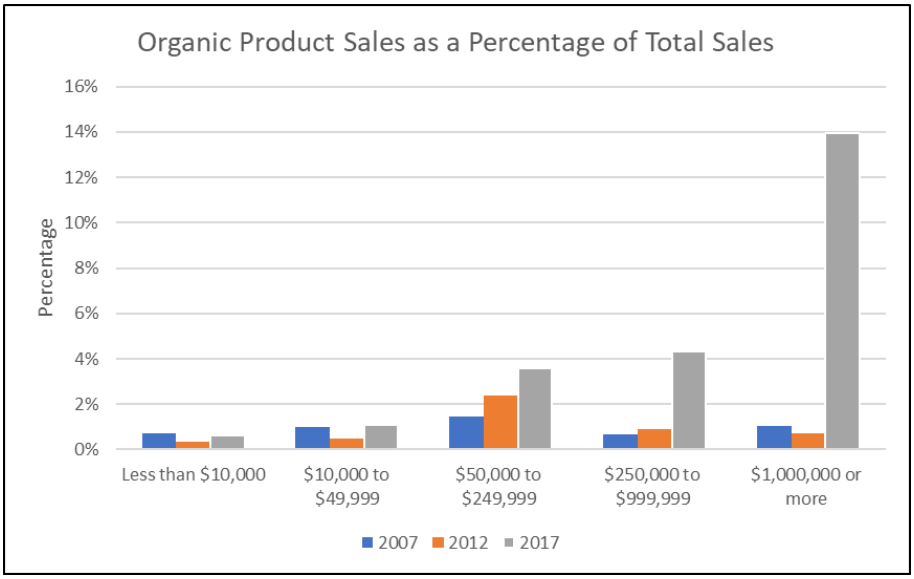
Table 5:Total Number of Farms Selling Organic Products in Pennsylvania, 2007-2017

	2007	2012	2017	% Change 2007 - 2012	% Change 2012 - 2017
Less than $10,000	214	86	114	-60%	33%
$10,000 to $49,999	202	118	148	-42%	25%
$50,000 to $249,999	180	290	351	61%	21%
$250,000 to $999,999	66	84	244	27%	190%
$1,000,000 or more	18	22	191	22%	768%
Total	680	600	1,048	-12%	75%

Source: Censuses of Agriculture 2007, 2012 and 2017.

In terms of dollar value of sales, total organic product sales have increased from $70.9 million in 2012 to $598 million in 2017 (data adjusted for inflation using 2007 dollars). This indicates a significant growth in agricultural sales of organic products in Pennsylvania over the past few years. Figure 6 depicts organic sales as percentage of total agricultural sales. The share of organic products among total agricultural sales has increased dramatically. In 2017 organic products represented 14 percent of sales for farms in the economic class of $1 million or more. This trend in the sale of organic products is indicative of the growing importance of this agricultural sector. Federal initiatives, such as the USDA Organic Research Extension program, dedicate part of its funding for organic research. Congress has continued to boost funding for organic research as the organic farm sector has expanded. More recently, the Agriculture Improvement Act of 2018 (2018 Farm Act) created a permanent funding status and provided nearly $400 million in funding for USDA's extramural grant program, the Organic Agriculture Research and Extension Initiative (OREI), over the next 10 years to help address the unique challenges of organic production (Agriculture Improvement Act of 2018, USDA Economic Research Service).

Figure 6: Organic Sales as Percent of Total Sales, 2007-2017



Source: Censuses of Agriculture 2007, 2012 and 2017.

Table 6 describes the characteristics of organic farmers.[4] In 2017, most organic farmers were male (65 percent). A majority of these farmers reported farming as their primary occupation (about 72 percent), and about 58 percent of farmers had spent 10 years or more on their present farms. About 24 percent of organic farmers were aged 35 to 44 years, with 44.6 years being the average age reported for this group.

Table 6: Characteristics of Organic Farmers, 2017

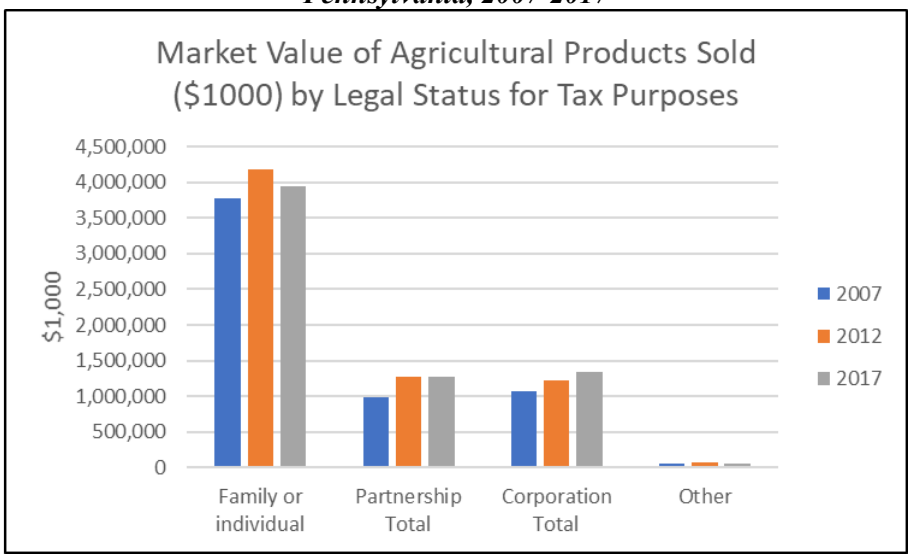
Characteristics of Organic Farmers	Percent of Total Organic Farmers
Male Farmers	65.4%
Primary Occupation Farming	71.9%
Ten years or more on present farm	57.9%
Between 35-44 years	24.1%

Source: Census of Agriculture 2017.

Figure 7 shows the market value of agricultural products sold by ownership types. A majority of sales accrue to family or individual proprietorships, followed by corporations and partnerships. This trend is observed for each of the years, 2007, 2012 and 2017, in the Censuses of Agriculture data.

[4] The information for characteristics of organic farmers is available only for the 2017 Census of Agriculture.

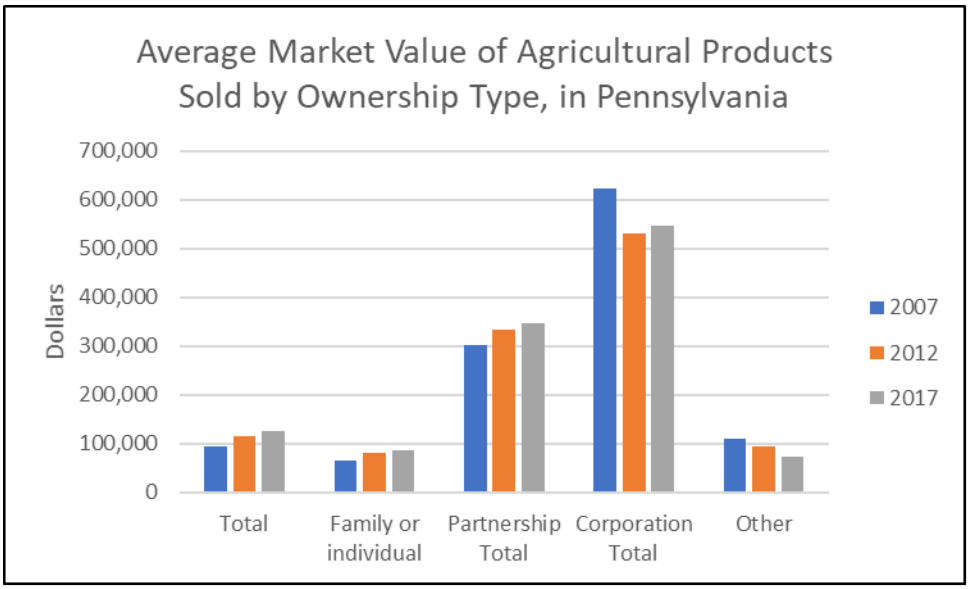
Figure 7: Market Value of Agricultural Products Sold by Legal Status for Tax Purposes in Pennsylvania, 2007-2017



Data adjusted for inflation, using 2007 dollars.* *Data adjusted for inflation with 2007=100.
Source: Censuses of Agriculture 2007, 2012 and 2017.

Interestingly, corporations have a larger average market value of agricultural products sold per farm. Figure 8 shows the average market value of agricultural products sold per farm and for farms with different ownership models (legal status for tax purposes).

Figure 8: Average Market Value of Agricultural Products Sold by Ownership Type, in Pennsylvania, 2007-2017



Data adjusted for inflation, using 2007 dollars.* *Data adjusted for inflation with 2007=100.
Data source: Censuses of Agriculture 2007, 2012 and 2017.

The reported net farm cash income of operations was used as a measure of profitability. For the Agricultural Census all farms (farms, ranches, nurseries, greenhouses, etc.) were classified by type of activity or activities using the North American Industry Classification System (NAICS) code. Each

NAICS code comprises establishments primarily engaged in growing or producing an agricultural product. Table 7 includes the net cash farm income of operations by farms under different NAICS codes.[5] All net cash income values are reported in 2007 dollars. Dairy cattle and milk production represented a higher share of net cash farm income of operations for each year in the data, however, the relative contribution of poultry and egg production, as well as hog and pig farming increased substantially in Pennsylvania between 2007 and 2017. On the other hand, the relative share of oilseed and grain farming in net cash farm income decreased significantly (by 54 percent) between 2012 and 2017. There was a net loss reported from the beef cattle ranching and farming category in 2017, for which the decrease in net cash farm income has been evident since the past decade.

Table 7: Net Cash Farm Income (in $1000) in Pennsylvania, by Agricultural Products

	2007	**2012**	**2017**
Dairy cattle and milk production	709,070	649,230	690,849
Poultry and egg production	211,505	295,183	570,223
Hog and pig farming	32,794	103,964	132,536
Beef cattle ranching and farming	14,462	1,064	-12,739
Greenhouse, nursery, and floriculture production	101,881	194,117	240,713
Oilseed and grain farming	78,567	270,182	125,632
Other crop farming	2,090	48,032	96,752
Total	**1,172,716**	**1,585,079**	**1,889,430**

Data adjusted for inflation, using 2007 dollars.* *Data adjusted for inflation with 2007=100.
Source: Censuses of Agriculture 2007, 2012 and 2017.

Table 8 shows the number of farms in Pennsylvania that reported using different categories of renewable energy producing systems. A single farm could report using more than one system. Between 2012 and 2017, the highest increase was in the use of geothermal and geo-exchange systems (by 197 percent), and there was a decrease in biodiesel production systems (by 34 percent). The use of renewable energy producing systems has gained importance in recent years, as evidenced by the significant increase in the number of farms adopting these systems.

[5] Agricultural products classified by NAICS: Dairy cattle and milk production (11212), Poultry and egg production (1123), Hog and pig farming (1122), Beef cattle ranching and farming (112111), Greenhouse, nursery, and floriculture production (1114), and Oilseed and grain farming (1111).

Table 8: Number of Farms in Pennsylvania using Renewable Energy Producing Systems, 2012-2017

	2012	2017	% Change
Renewable energy producing systems	2,234	4,161	86%
Solar panels	1,528	2,857	87%
Wind turbines	176	204	16%
Methane digesters	37	56	51%
Geothermal/Geo exchange systems	378	1,124	197%
Small hydro systems	36	62	72%
Biodiesel production systems	138	91	-34%
Ethanol production systems	58	65	12%
Other	34	154	353%
Wind rights leased to others	111	136	23%

Note: a single farm could use more than one system; figures represent farms using each category of system.
Source: Censuses of Agriculture 2012 and 2017.

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There was an increase in the proportion of farms using renewable energy systems in recent years. Table 9 shows the number and percentage of farms in Pennsylvania using renewable energy resources, by economic class. Most farms (50 percent) using renewable energy systems had sales and government payments of less than $10,000, followed by farms selling between $10,000-$49,999 (22 percent).

Table 9: Number and Percentage of farms in Pennsylvania using Renewable Energy Resources, 2017

Economic Class	Number of farms	Percentage of Farms (%)
Less than $10,000	26,416	50
$10,000 to $49,999	11,703	22
$50,000 to $249,999	8,698	16
$250,000 to $999,999	4,900	9
$1,000,000 or more	1,440	3
Total	**53,157**	**100**

Source: Census of Agriculture 2017.

Cross tabulations of percentage of producers by their age and different economic classes of farms are reported in Table 10. About 48 percent of all producers worked on farms that operated with sales and government payments of less than $10,000. Within that group, the highest proportion of producers were between 65 to 74 years old (56 percent). About 21 percent of all producers worked on farms that operated with sales and government payments between $10,000 to $49,999. Out of these producers, 28 percent were 75 years or older. Only three percent of all producers worked on farms that operated with sales and government payments of more than $100,000.

Table 10: Percentage of Farms in Pennsylvania in 2017 (Age of Principal Farm Operator Cross-tabulated with Economic Class of Farms)

Economic Class of Farm	All Producers	Under 25 Years	25 to 34 Years	35 to 44 Years	45 to 54 Years	55 to 64 Years	65 to 74 Years	75 Years and over
Less than $10,000	48%	30%	36%	40%	47%	51%	56%	53%
$10,000 to $49,999	21%	16%	19%	18%	20%	22%	24%	28%
$50,000 to $249,999	17%	26%	24%	22%	17%	15%	13%	13%
$250,000 to $999,999	11%	23%	17%	16%	11%	10%	5%	4%
$1,000,000 or more	3%	5%	4%	5%	4%	3%	2%	1%

Note: Percentages are values within columns. *Source: Census of Agriculture 2017.*

In 2017, about 13 percent of the total number of workers reported as hired farm labor worked on farms that operated with sales and government payments of less than $10,000 (See Table 11). That same year, 32 percent of the total number of workers reported as hired farm labor worked on farms with sales and government payments of more than $1 million.

Table 11: Percentage of Workers Reported as Hired Farm Labor by Economic Class of Farm

	2007	2012	2017
Less than $10,000	12%	15%	13%
$10,000 to $49,999	12%	13%	12%
$50,000 to $249,999	20%	20%	20%
$250,000 to $999,999	24%	21%	24%
$1,000,000 or more	31%	31%	32%
Total	100%	100%	100%

Source: Censuses of Agriculture2007, 2012 and 2017.

Primary Producers (Farmers)

The 2017 Ag Census defines "Producer" as: "a person who is involved in making decisions for the farm operation. Decisions may include decisions about such things as planting, harvesting, livestock management, and marketing. The producer may be the owner, a member of the owner's household, a hired manager, a tenant, a renter, or a sharecropper. If a person rents land to others or has land worked on shares by others, he/she is considered the producer only of the land which is retained for his/her own operation. The census collected information on the total number of male producers, the total number of female producers, and demographic information for up to four producers per farm" (Census of Agriculture, 2017).

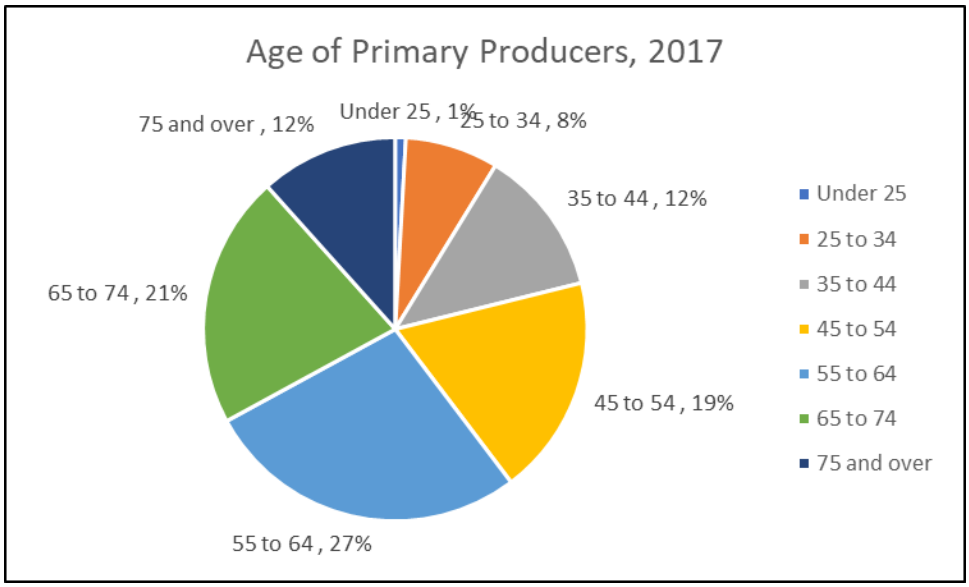
The 2017 Ag Census defines "Primary Producer" as: **"**One primary producer is designated for each

farm. A primary producer is a principal producer (comparable to 2012 principal operator). If multiple principal producers were reported on a farm, a primary producer was chosen by designating the person who made the most decisions for the farm. If equal decisions were made, the primary producer was the person who worked off the farm the least. If multiple principal producers worked the least off the farm, a random choice was made as to which producer was the single designated primary producer" (Census of Agriculture, 2017).

On average, primary producers in Pennsylvania were 57 years in 2017, up from 56 years in 2012 and 55 years in 2007. In 2017, about 21 percent of primary producers were between 65 and 74 years old and 12 percent were over age 75. On the other hand, only one percent of farmers in 2017 were under age 25, which has remained constant over the previous decade (See Figure 9). The overall trend indicates an increase in the age of primary producers in Pennsylvania, with the proportion of older producers (above age 65) increasing steadily over the previous decade. The trend was similar to the overall U.S. figures.

At the national level, farmers were 57.5 years old, on average, up one year from 2012. More than one-third (33 percent) of primary producers are age 65 or older, and about 27 percent are between 55 and 64 years old. Pennsylvania farmers are younger compared to the national average, according to the most recent census.

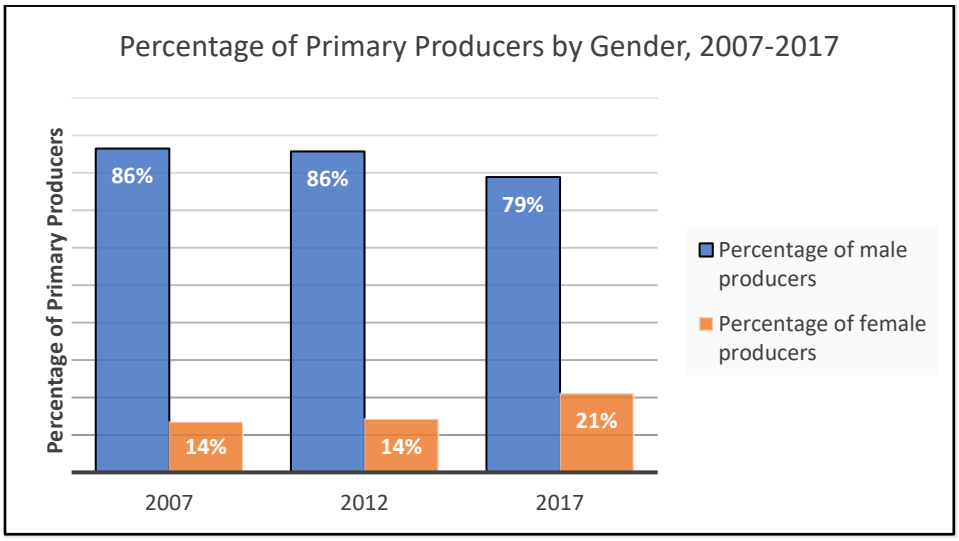
Figure 9: Age of Primary Producers in Pennsylvania, 2017 (n= 53,157)



Source: Censuses of Agriculture 2007, 2012 and 2017.

Among primary farm producers in Pennsylvania in 2017, about 11,200 were female, which accounts for 21 percent of the state's primary producers, compared to 26 percent nationwide. There has been an increase in the proportion of female primary producers. After remaining steady at 14 percent between 2007 and 2012, the percent of female producers increased to 21 percent in 2017, which is a substantial increase in the previous five years. This indicates a trend toward increased numbers of female primary producers in Pennsylvania over time (See Figure 10).

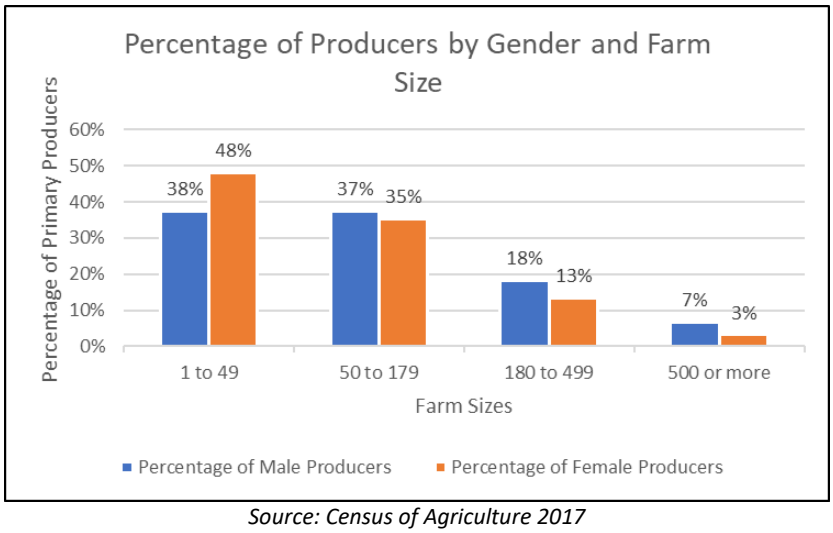
Figure 10: Percentage of Primary Producers by Gender in Pennsylvania, 2007-2017



Source: Censuses of Agriculture 2007, 2012 and 2017.

In terms of farm sizes[6], about half (48 percent) of female producers operated smaller farms of one to 49 acres, which was higher in proportion compared to male producers (38 percent), in 2017. Figure 11 reports the percentage of producers in 2017 by gender and farm size. Thirty-five percent of female producers operated medium-sized farms (50-179 acres). Very few female producers (three percent) operated large farms of 500 acres or more, compared to seven percent of male producers.

Figure 11: Percentage of Producers by Gender and Farm Size in Pennsylvania, 2017

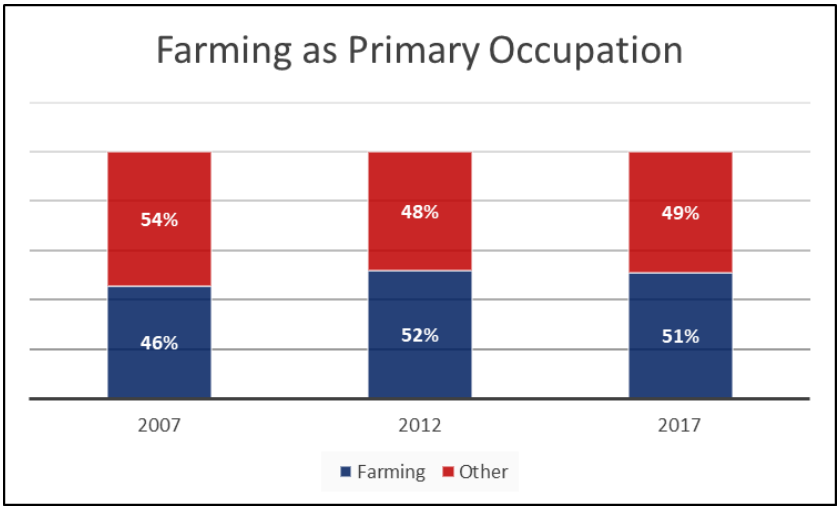


Source: Census of Agriculture 2017

[6] Farm sizes are no longer comparable with previous years because of change in definitions. Hence all tabulations involving farm sizes with operator information were limited to 2017.

Figure 12 shows the percent of primary producers who reported farming as their primary occupation in 2007 and 2017. While the proportion of primary producers who reported farming as their primary occupation increased from 46 percent in 2007 to 51 percent in 2017, the percentage declined slightly (by one percent) from 2012.

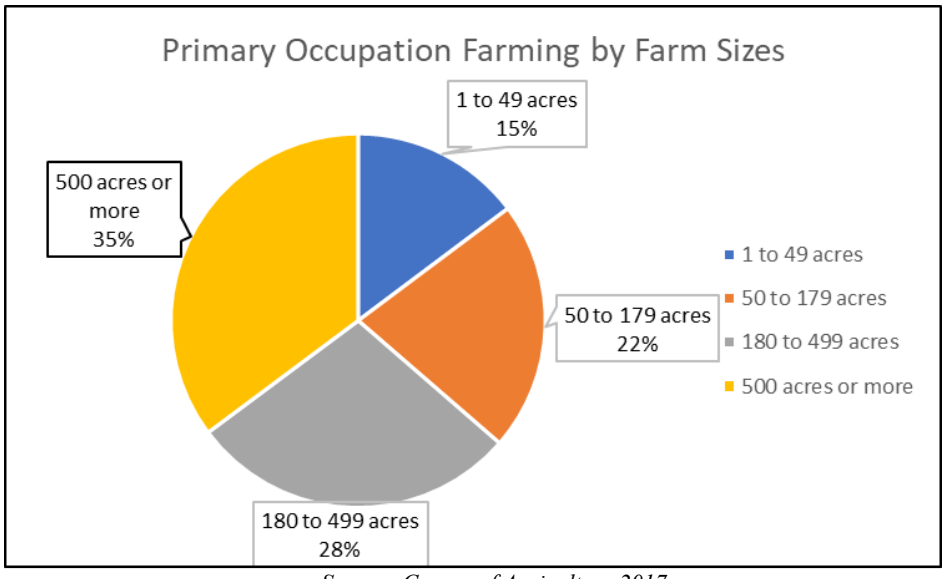
Figure 12: Percentage of Primary Producers by Occupation in Pennsylvania, 2007-2017



Source: Censuses of Agriculture 2007, 2012 and 2017.

Among producers who reported farming as their primary occupation, most operated on large farms of 500 acres or more (35 percent), followed by farms of 180-499 acres (28 percent), and farms of one to 49 acres (15 percent). Producers who said that farming was their main occupation tended to operate larger farms, possibly due to higher investments in farming machinery and equipment. Figure 13 reports the percent of producers whose main occupation was farming, according to farm size, in 2017.

Figure 13: Percent of Producers with Farming as Primary Occupation, by Farm Size, 2017



Source: Census of Agriculture 2017.

Far fewer primary producers have been on their current farms for more than 10 years than a decade ago. Table 12 shows producers by number of years spent on their current farms and the percent change in these totals. There were significantly more primary producers with 10 or more years of experience their present farm compared to other categories; however, that number declined by 12 percent between 2012 and 2017. Concurrently, there was a substantial increase in the percent of primary producers (30 percent) who spent two years or fewer on their present farm in 2017. This illustrates an increase in the number of new primary producers in recent years. There has been a similar uptick in the percent of primary producers who have been on their present farm for three or four years in 2017. This was a reversal of the 2007-2012 trend, when there was a decline across all categories in the number of years on present farm. The most recent Ag Census data indicate an optimistic trend where more primary producers are remaining on their present farms.

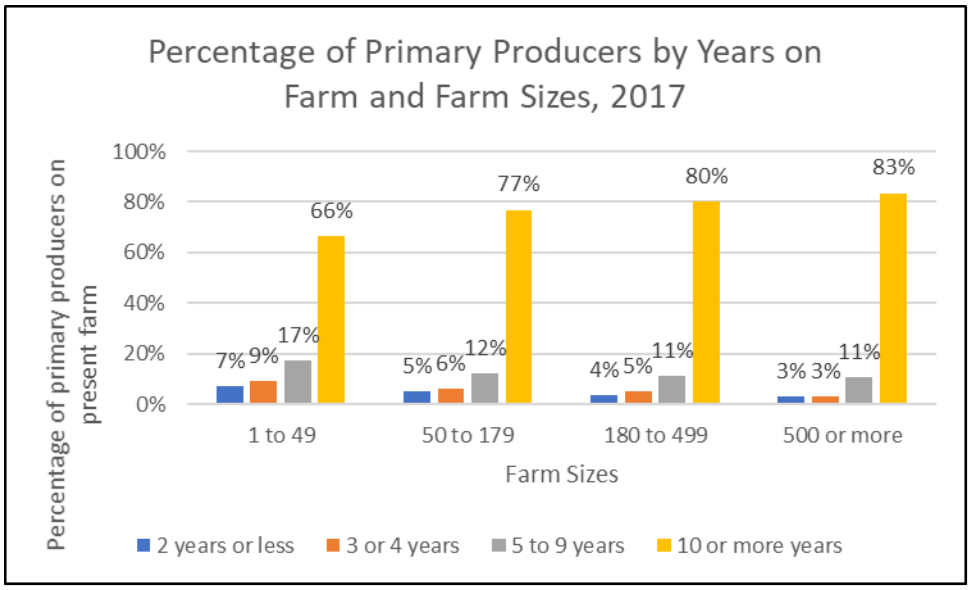
Table 12: Number of Years on Present Farm in Pennsylvania, 2007-2017

Years on present farm	**2007**	**2012**	**2017**	**Percentage change (2007-2012)**	**Percentage change (2012-2017)**
2 years or fewer	2,361	1,720	2,243	-27%	30%
3 or 4 years	3,657	2,828	3,103	-23%	10%
5 to 9 years	10,039	8,038	6,597	-20%	-18%
10 years or more	47,106	46,723	41,214	-1%	-12%

Source: Censuses of Agriculture 2007, 2012 and 2017.

Further analysis of the years on present farm by farm size indicated a majority of producers have been on their present farm for more than 10 years across all farm sizes in 2017. The largest proportion of primary producers (83 percent) who have been on their present farm for more than 10 years operated on farm sizes of more than 500 acres (See Figure 14).

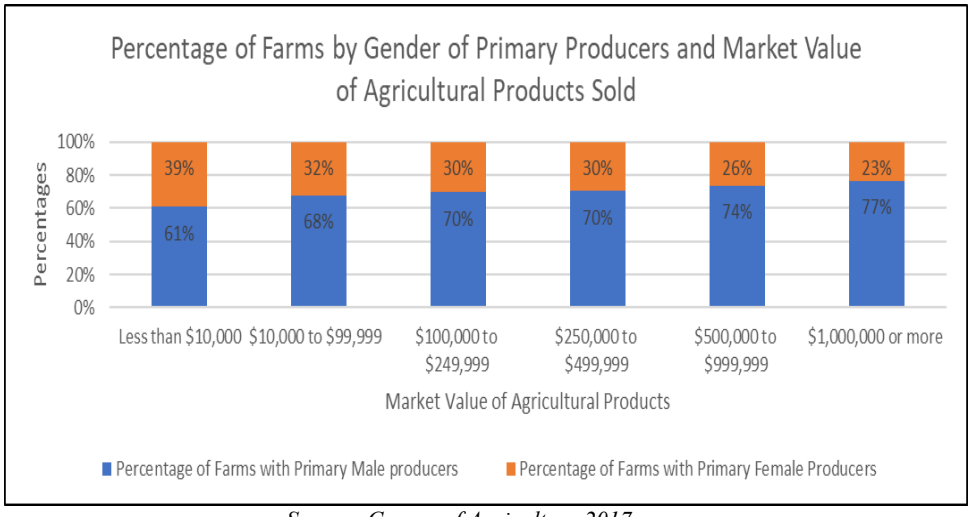
Figure 14: Percentage of Primary Producers in Pennsylvania by Years on Present Farm and Farm Sizes (Acres), 2017



Source: Census of Agriculture 2017.

In 2017, about 39 percent of farms with female primary producers sold agricultural products whose market values were less than $10,000, while 23 percent of farms sold agricultural products of $1 million or more. On the other hand, 77 percent of farms with male primary producers sold agricultural products of $1 million or more, and 61 percent sold agricultural products valued less than $10,000. Therefore, 2017 data indicated that farms with male primary producers were selling agricultural products whose market values were much higher compared to farms with female primary producers during the same time (See Figure 15).

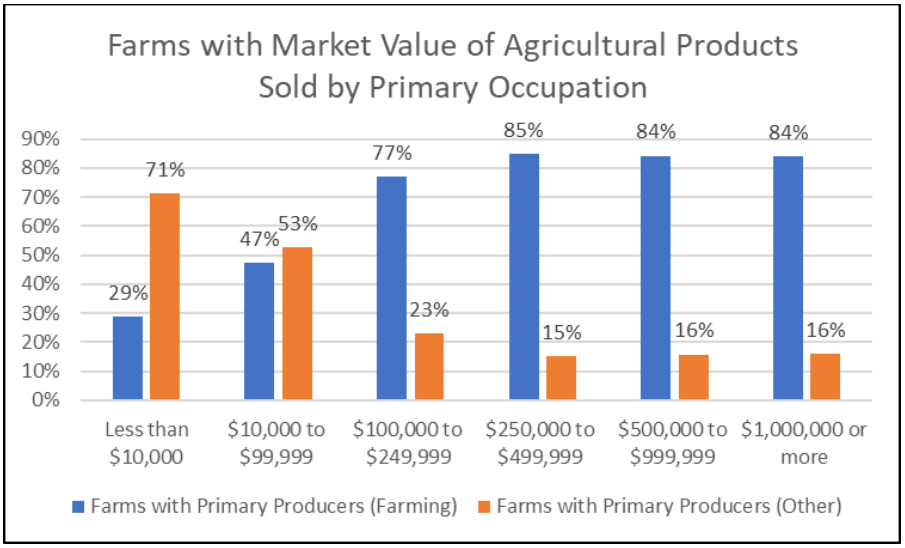
Figure 15: Percent of Farms by Gender of Primary Producers and Market Value of Agricultural Products Sold in Pennsylvania, 2017



Source: Census of Agriculture 2017.

Figure 16 reports farms with market value of agricultural products sold according to producers' primary occupation in 2017. A majority (85 percent) of farms with primary producers who reported farming as their primary occupation sold $250,000 or more in agricultural products. Among farms with producers whose primary occupation was not farming, a majority (71 percent) sold less than $10,000 in agricultural products.

Figure 16: Farms with Market Value of Agricultural Products Sold by Primary Occupation, 2017



Source: Census of Agriculture 2017.

Further analysis of the market value of agricultural sales by primary producers' years on the present farms revealed that a significant majority of producers have been on their present farms for 10 or more years, across all categories of sales for 2017 (See Table 13).

Table 13: Percent of Primary Producers by Market Value of Agricultural Sales and Years on Present Farm in Pennsylvania, 2017

	Fewer than 2 years	**3 or 4 years**	**5 to 9 years**	**10 years or more**
Less than $10,000	6%	8%	14%	72%
$10,000 to $99,999	4%	6%	13%	76%
$100,000 to $249,999	5%	7%	13%	75%
$250,000 to $499,999	6%	7%	14%	73%
$500,000 to $999,999	5%	5%	14%	76%
$1,000,000 or more	4%	5%	13%	77%

Source: Census of Agriculture 2017.

Table 14 reports the net cash farm income of primary producers between 2007 and 2017. The data were adjusted for inflation using 2007-dollar values. While net cash farm income increased substantially between 2007 and 2012 (48 percent), the increase was much more modest between 2012 and 2017 (13 percent). The number of primary producers reporting net losses increased in 2017 compared to 2012.

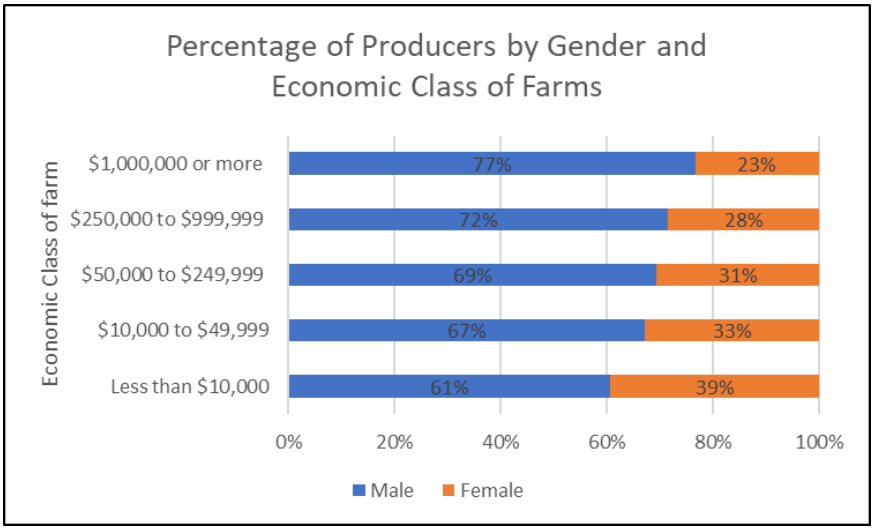
Table 14: Net Cash Farm Income* (Gains and Losses) in Pennsylvania, 2007-2017

	2007 Income ($1000)	2012 Income ($1000)	2017 Income ($1000)
Income of producers reporting a net gain	$1,468,593	$2,060,450	$2,285,800
Income of producers reporting a net loss	-$438,062	-$525,480	-$546,060
Net cash farm income of producers	$1,030,531	$1,534,971	$1,739,740

Data adjusted for inflation, using 2007 dollars. *Data adjusted for inflation with 2007=100. *Source: Censuses of Agriculture 2007, 2012 and 2017.*

Farms operating with sales and government payments of less than $10,000 had the highest proportion (39 percent) of female producers. Farms operating with sales and government payment of $1 million or more had the highest proportion of male producers (77 percent). Farms across every category of economic class had a higher proportion of male operators than female operators (See Figure 17).

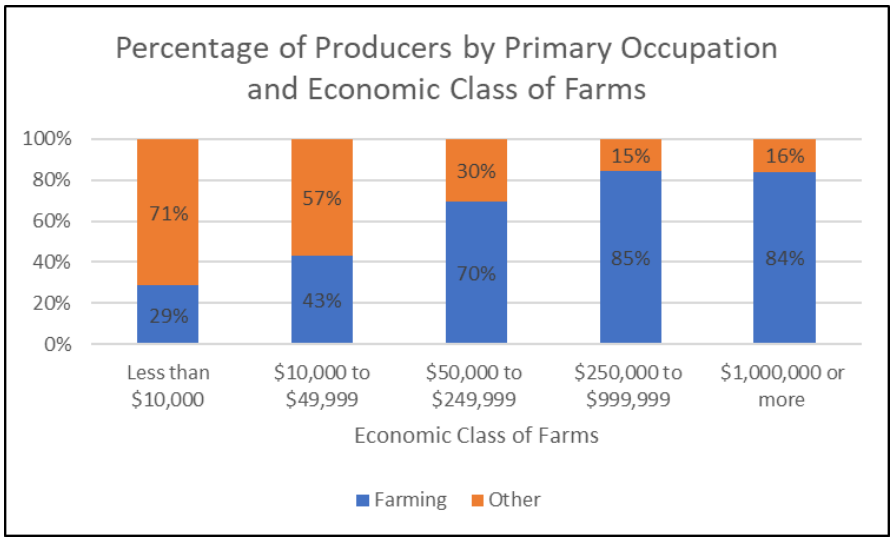
Figure 17: Percent of Producers by Gender and Economic Class of Farms in Pennsylvania, 2017



Source: Census of Agriculture 2017.

The majority of producers (71 percent) on farms with sales and government payments under $10,000 did not report farming as their primary occupation. However, for farms with sales and government payments of $50,000 or more, most producers reported farming as their primary occupation in 2017. In particular, 85 percent of producers who worked on farms with sales and government payments of $250,000 to $999,999 reported farming as their primary occupation. This indicates producers' commitment to farming as an occupation with increasing sales (See Figure 18).

Figure 18: Percent of Producers by Primary Occupation and Economic Class of Farms in Pennsylvania, 2017



Source: Census of Agriculture 2017.

While most producers in Pennsylvania were operating with sales and government payments of less than $10,000 (48 percent), within that group, the highest proportion (56 percent) reported being on their present farm for fewer than two years. For farms with producers operating with sales and government payments of $10,000-$49,999, the highest proportion of producers (22 percent) reported being on their present farm for more than 10 years (See Table 15).

Table 15: Percent of Producers by Years on Present Farm and Economic Class of Farms in Pennsylvania, 2017

	All Producers	2 years or fewer	3 or 4 years	5 to 9 years	10 years or more
Less than $10,000	48%	56%	52%	50%	46%
$10,000 to $49,999	21%	15%	20%	21%	22%
$50,000 to $249,999	17%	17%	15%	16%	17%
$250,000 to $999,999	11%	10%	10%	11%	11%
$1,000,000 or more	3%	2%	3%	3%	4%
	100%	100%	100%	100%	100%

Source: Census of Agriculture 2017.

Regional Analysis

The Northern Crescent[7] Farm Resource Region includes Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Ohio, Pennsylvania, Rhode Island,

[7] USDA divides the country into nine farm resource regions, which are areas with similar types of farms intersected with areas of similar physiographic, soil, and climatic traits. Pennsylvania is in the Northern Crescent region along with New York, Ohio, Michigan and others (https://www.ers.usda.gov/webdocs/publications/42298/32489_aib-760_002.pdf?v=42487).

Vermont, and Wisconsin. Comparing the market value of agricultural products sold in 2017 (Table 16), the research found that Michigan, New York, Ohio, and Wisconsin have comparable agricultural sectors to Pennsylvania in terms of volume of sales. The agricultural sector in Minnesota was more than double that in Pennsylvania. The agricultural sectors in New Jersey, Vermont, New Hampshire, and Rhode Island were small compared to Pennsylvania.

Table 16: Total Agricultural Sales of States in the Northern Crescent Farm Resource Region as a Percent of Pennsylvania's Agricultural Sales in 2017

State	Agricultural Sales as a Percent of PA (2017)
Minnesota	237%
Wisconsin	**147%**
Ohio	**120%**
Michigan	**106%**
Pennsylvania	**100%**
New York	**69%**
New Jersey	14%
Vermont	10%
New Hampshire	2%
Rhode Island	1%

When comparing the market value of agricultural products sold among the northern crescent region in 2012 and 2017, the research found that Pennsylvania had the smallest decrease (2 percent) compared with states that have similar sized agricultural sectors. New Jersey was the only state to witness a gain (2percent), but New Jersey's agricultural sector represents only a fraction of Pennsylvania's (See Table 17).

Table 17: Total Market Value of Agricultural Products Sold in $1,000 for States in the Northern Crescent Farm Resource Region (2012 and 2017)

State	2012	2017	% Change
Connecticut	497,277	490,709	-1%
Maine	689,138	564,172	-18%
Massachusetts	444,526	401,950	-10%
Michigan	7,837,335	6,953,956	**-11%**
Minnesota	19,218,595	15,560,363	-19%
New Hampshire	172,412	158,852	-8%
New Jersey	909,386	928,738	2%
New York	4,890,517	4,541,729	**-7%**
Ohio	9,089,093	7,901,591	**-13%**
Pennsylvania	6,683,806	6,563,114	**-2%**
Rhode Island	53,873	49,060	-9%
Vermont	700,917	660,608	-6%
Wisconsin	10,606,691	9,666,272	-9%

When comparing the average market value of agricultural products sold per farm (See Table 18), the research found that Pennsylvania had the largest increase (10 percent).

Table 18: Average Market Value of Agricultural Products Sold Per Farm in Dollars for States in the Northern Crescent Farm Resource Region

State	2012	2017	% Change
Connecticut	83,198	88,880	7%
Maine	84,319	74,233	-12%
Massachusetts	57,321	55,510	-3%
Michigan	150,158	145,966	**-3%**
Minnesota	257,822	226,095	-12%
New Hampshire	39,265	38,528	-2%
New Jersey	100,252	93,973	-6%
New York	137,618	135,825	**-1%**
Ohio	120,446	101,556	**-16%**
Pennsylvania	112,694	123,467	**10%**
Rhode Island	43,341	47,037	9%
Vermont	95,519	97,034	2%
Wisconsin	152,059	149,187	**-2%**

Pennsylvania had a 19 percent increase in total net cash farm income of operations from 2012 to 2017. Connecticut, and Massachusetts had a larger percent increase, but their agricultural sectors represent only a fraction of Pennsylvania's. Compared to states with similar sized agricultural sectors, Pennsylvania performed better (See Table 19).

Table 19: Total Net Cash Farm Income of the Operations in $1,000 for States in the Northern Crescent Farm Resource Region

State	2012	2017	% Change
Connecticut	23,091	69,777	202%
Maine	148,663	109,016	-27%
Massachusetts	35,672	48,140	35%
Michigan	2,014,576	1,266,000	**-37%**
Minnesota	6,351,336	3,827,858	-40%
New Hampshire	-9,066	8,787	-197%
New Jersey	160,071	146,016	-9%
New York	1,098,918	1,212,706	**10%**
Ohio	2,706,564	1,952,944	**-28%**
Pennsylvania	1,585,079	1,889,430	**19%**
Rhode Island	-911	4,849	-632%
Vermont	137,660	150,964	10%
Wisconsin	2,775,495	2,019,202	**-27%**

This improvement in farm financial performance was also reflected in the average net cash farm income of the operations per farm, where most states had a decrease in average net cash farm income and Pennsylvania had a 33 percent increase (See Table 20).

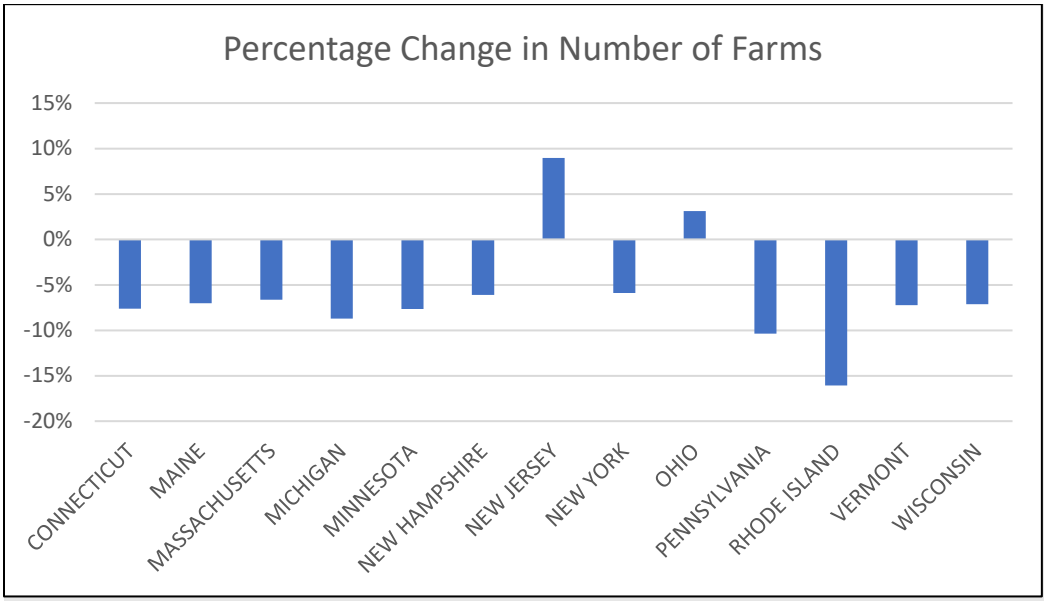
Table 20: Average Net Cash Farm Income of the Operations Per Farm in Dollars for States in the Northern Crescent Farm Resource Region

State	2012	2017	% Change
Connecticut	3,864	12,638	227%
Maine	18,190	14,344	-21%
Massachusetts	4,600	6,648	45%
Michigan	38,598	26,573	**-31%**
Minnesota	85,205	55,619	-35%
New Hampshire	-2,065	2,131	-203%
New Jersey	17,646	14,774	-16%
New York	30,923	36,267	**17%**
Ohio	35,867	25,101	**-30%**
Pennsylvania	26,726	35,544	**33%**
Rhode Island	-733	4,649	-734%
Vermont	18,760	22,175	18%
Wisconsin	39,790	31,164	**-22%**

These figures indicate that, when compared to states with similar sized agricultural sectors in terms of volume of sales within the northern crescent farm resource region, Pennsylvania farmers had a better economic performance.

Figures 19, 20, and 21 provide comparisons between Pennsylvania and some other states in the northern crescent region with respect to the number of farms, farmland acres, and average farm sizes. Rhode Island saw the greatest decrease (16 percent) in the number of farms between 2012 and 2017, followed by Pennsylvania (10 percent). Only two out of the 13 northern crescent states saw an increase in the percentage of farms, with a 9 percent increase for New Jersey and a 3 percent increase for Ohio.

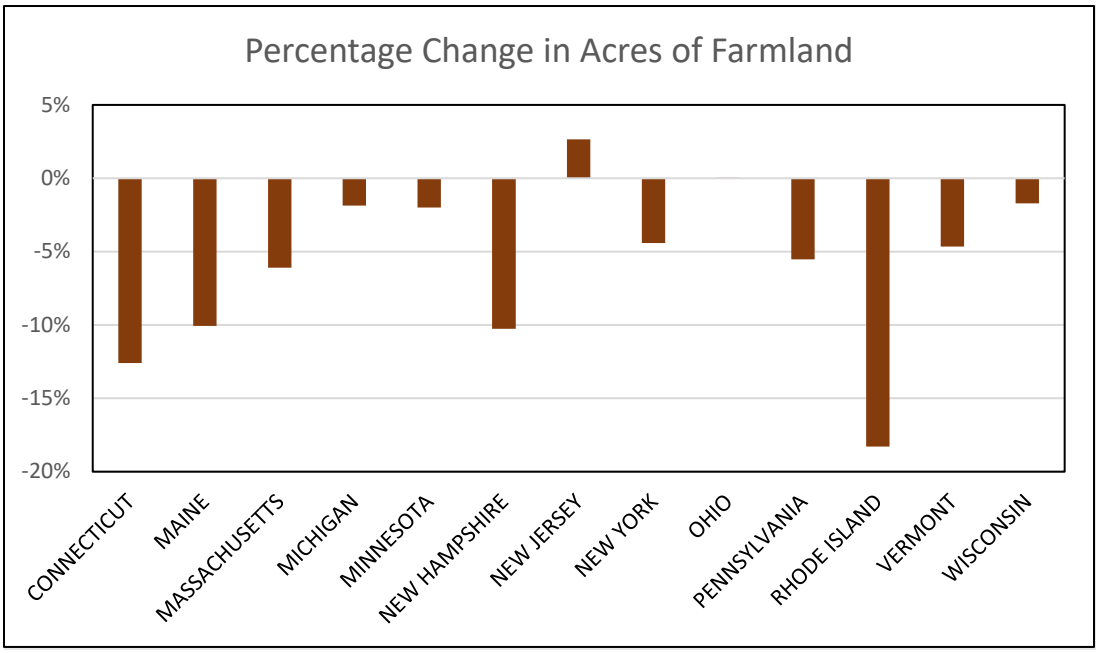
Figure 19: Comparison of Pennsylvania and Other States, Percentage Change in Number of Farms, 2012-2017



Source: Censuses of Agriculture 2012 and 2017.

All states except New Jersey and Ohio experienced a decline in total farmland acreage between 2012 and 2017. In Pennsylvania, total farmland acres decreased 6 percent between 2012 and 2017.

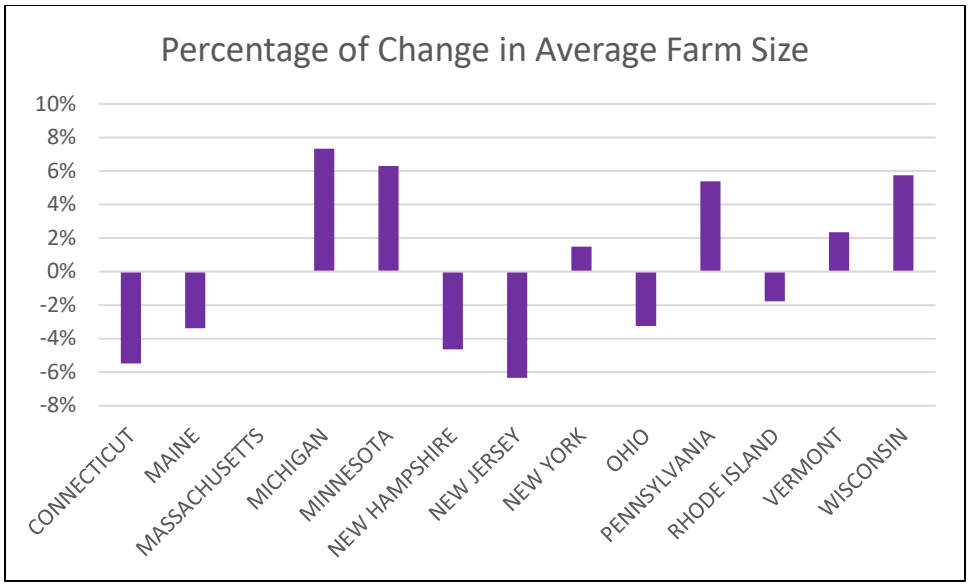
Figure 20: Comparison of Pennsylvania and Other States, Percentage Change in Acres of Farmland, 2012-2017



Source: Censuses of Agriculture 2012 and 2017.

More northern crescent states witnessed an increase in average farms sizes from 2012 to 2017. Michigan had the highest increase (7 percent) in average farm sizes, followed by Minnesota and Wisconsin (both by six percent), and Pennsylvania (5 percent). New Jersey experienced the largest decrease of 6 percent.

Figure 21: Comparison of Pennsylvania and Other States, Percentage Change in Average Farm Size, 2012-2017



Source: Censuses of Agriculture 2012 and 2017.

In summary, when comparing Pennsylvania to other northern crescent states (13 states), the research found that Pennsylvania's agricultural outlook is promising in terms of the number of farms, farmland acres, and average farm sizes. While a majority of northern crescent states saw a decrease in the number of farms and farmland acres, the decreases in Pennsylvania were modest compared to the others. Pennsylvania is also one of six states that had an increase in average farm sizes over the last 5 years.

County Analysis

Tables 21 and 22 show the number of farms, and the percent changes in the number of farms between 2012 and 2017, in rural and urban counties.

Table 21: Percent Change in Number of Farms in Rural Counties 2012 - 2017

County	2012	2017	% Change
CLINTON	469	267	-43%
FOREST	56	36	-36%
WARREN	602	452	-25%
MONTOUR	459	356	-22%
WYOMING	508	410	-19%
CRAWFORD	1351	1091	-19%
JEFFERSON	577	468	-19%
INDIANA	1166	951	-18%
MONROE	283	233	-18%
GREENE	876	722	-18%
COLUMBIA	944	779	-17%
FULTON	656	545	-17%
ARMSTRONG	783	668	-15%
PERRY	889	759	-15%
ELK	271	232	-14%
HUNTINGDON	833	714	-14%
CENTRE	1192	1023	-14%
NORTHUMBERLAND	847	728	-14%
LYCOMING	1207	1043	-14%
SCHUYLKILL	791	685	-13%
MIFFLIN	808	711	-12%
VENANGO	464	409	-12%
FAYETTE	941	834	-11%
BRADFORD	1629	1449	-11%
LAWRENCE	659	587	-11%
MCKEAN	290	259	-11%
BUTLER	1061	955	-10%
WAYNE	711	640	-10%
SUSQUEHANNA	1005	909	-10%
JUNIATA	737	670	-9%
CLARION	652	594	-9%
WASHINGTON	1915	1760	-8%
SNYDER	933	864	-7%
CLEARFIELD	533	497	-7%
UNION	613	574	-6%
TIOGA	1125	1056	-6%
BLAIR	525	496	-6%
BEDFORD	1210	1159	-4%
ADAMS	1188	1146	-4%

County	2012	2017	% Change
MERCER	1185	1168	-1%
FRANKLIN	1596	1581	-1%
SOMERSET	1140	1152	1%
CAMBRIA	551	557	1%
POTTER	442	447	1%
CARBON	195	200	3%
CAMERON	36	37	3%
PIKE	50	53	6%
SULLIVAN	179	190	6%

Source: Censuses of Agriculture 2012 and 2017.

Table 22: Percent Change in Number of Farms in Urban Counties 2012 - 2017

County	2012	2017	% Change
LEHIGH	486	381	-22%
DELAWARE	76	61	-20%
LUZERNE	556	451	-19%
ERIE	1422	1162	-18%
DAUPHIN	811	692	-15%
WESTMORELAND	1274	1099	-14%
LACKAWANNA	303	263	-13%
BERKS	2039	1809	-11%
CUMBERLAND	1415	1260	-11%
LANCASTER	5657	5108	-10%
ALLEGHENY	428	389	-9%
NORTHAMPTON	498	459	-8%
LEBANON	1219	1149	-6%
MONTGOMERY	596	565	-5%
BEAVER	646	613	-5%
CHESTER	1730	1646	-5%
YORK	2171	2067	-5%
BUCKS	827	824	0%
PHILADELPHIA	22	43	95%

Source: Censuses of Agriculture 2012 and 2017.

The 10 counties with the largest decreases in the number of farms were Clinton, Forest, Warren, Montour, Lehigh, Delaware, Wyoming, Crawford, Jefferson, and Luzerne.

Table 23: 10 Counties with the Largest Decreases in the Number of Farms in Pennsylvania, 2012-2017

County	2012	2017	% Change
CLINTON	469	267	-43%
FOREST	56	36	-36%
WARREN	602	452	-25%
MONTOUR	459	356	-22%
LEHIGH	486	381	-22%
DELAWARE	76	61	-20%
WYOMING	508	410	-19%
CRAWFORD	1351	1091	-19%
JEFFERSON	577	468	-19%
LUZERNE	556	451	-19%

Source: Censuses of Agriculture 2012 and 2017.

The counties with increases in number of farms were Philadelphia, Sullivan, Pike, Cameron, Carbon, Potter, Cambria, and Somerset. The increases in number of farms in these counties were not significant when compared with the overall state figures. The total increase in the number of farms in these countries (64) represented 0.12 percent of the total number of farms in Pennsylvania. The overall trend in the state was a decrease in the number of farms.

Table 24: Counties with Gains in the Number of Farms in Pennsylvania, 2012-2017

County	2012	2017	% Change
PHILADELPHIA	22	43	95%
SULLIVAN	179	190	6%
PIKE	50	53	6%
CAMERON	36	37	3%
CARBON	195	200	3%
POTTER	442	447	1%
CAMBRIA	551	557	1%
SOMERSET	1140	1152	1%

Source: Censuses of Agriculture 2012 and 2017.

Tables 25 and 26 show the percent change in urban and rural farmland acres from 2012 to 2017.

Table 25: Percent Change in Acres of Farmland in Rural Counties 2012 - 2017

	Acres of Farmland		
County	**2012**	**2017**	**% Change**
FOREST	8,283	4,170	-50%
UNION	93,241	65,719	-30%
HUNTINGDON	158,300	120,157	-24%
CLINTON	52,715	40,057	-24%
WARREN	82,419	68,153	-17%
CAMERON	6,215	5,278	-15%
PERRY	135,075	114,746	-15%
CRAWFORD	227,731	194,447	-15%
CLARION	115,976	100,344	-13%
VENANGO	61,531	53,338	-13%
COLUMBIA	122,743	106,748	-13%
PIKE	28,260	24,700	-13%
BLAIR	90,117	78,923	-12%
CLEARFIELD	69,250	60,957	-12%
JEFFERSON	91,288	80,411	-12%
MONTOUR	43,493	38,635	-11%
WAYNE	112,998	100,696	-11%
WYOMING	68,749	61,303	-11%
MIFFLIN	90,554	80,970	-11%
FULTON	112,210	100,465	-10%
SCHUYLKILL	105,749	96,886	-8%
CARBON	21,162	19,498	-8%
CENTRE	162,041	149,858	-8%
WASHINGTON	205,821	190,447	-7%
SUSQUEHANNA	166,399	154,409	-7%
JUNIATA	91,032	85,640	-6%
NORTHUMBERLAND	129,501	124,136	-4%
MERCER	163,148	156,397	-4%
INDIANA	153,752	148,288	-4%
ADAMS	171,305	166,227	-3%
ELK	23,488	22,982	-2%
ARMSTRONG	129,090	126,655	-2%
BUTLER	136,237	133,954	-2%
BRADFORD	307,990	303,601	-1%
FAYETTE	112,871	112,285	-1%
POTTER	96,689	97,780	1%
GREENE	112,358	114,089	2%
FRANKLIN	264,521	269,530	2%
LAWRENCE	80,468	82,125	2%

	Acres of Farmland		
County	**2012**	**2017**	**% Change**
SOMERSET	214,581	219,046	2%
CAMBRIA	76,889	79,341	3%
TIOGA	205,158	212,797	4%
MONROE	26,483	27,607	4%
BEDFORD	209,795	222,224	6%
SNYDER	91,179	98,978	9%
SULLIVAN	37,481	43,424	16%
LYCOMING	158,462	186,130	17%
MCKEAN	36,297	43,084	19%

Source: Censuses of Agriculture 2012 and 2017.

Table 26: Percent Change in Acres of Farmland in Urban Counties 2012 - 2017

	Acres of Farmland		
County	**2012**	**2017**	**% Change**
DELAWARE	4,725	2,385	-50%
DAUPHIN	129,378	81,252	-37%
LUZERNE	60,930	49,087	-19%
ALLEGHENY	34,837	28,970	-17%
LEBANON	121,413	107,577	-11%
LANCASTER	439,481	393,949	-10%
NORTHAMPTON	65,744	59,195	-10%
ERIE	168,634	153,403	-9%
CHESTER	164,495	150,514	-8%
BERKS	233,744	224,722	-4%
YORK	262,062	252,713	-4%
BEAVER	55,795	53,832	-4%
LEHIGH	76,331	74,511	-2%
PHILADELPHIA	285	284	0%
MONTGOMERY	30,780	30,896	0%
WESTMORELAND	143,062	144,278	1%
CUMBERLAND	154,879	169,654	10%
LACKAWANNA	32,750	36,556	12%
BUCKS	64,024	77,255	21%

Source: Censuses of Agriculture 2012 and 2017.

The 10 counties with the largest decreases in farmland were Forest, Delaware, Dauphin, Union, Huntingdon, Clinton, Luzerne, Warren, Allegheny, and Cameron.

Table 27: 10 Counties with the Largest Reduction in Farmland (Acres) in Pennsylvania, 2012-2017

	Acres of Farmland		
County	**2012**	**2017**	**% Change**
FOREST	8,283	4,170	-50%
DELAWARE	4,725	2,385	-50%
DAUPHIN	129,378	81,252	-37%
UNION	93,241	65,719	-30%
HUNTINGDON	158,300	120,157	-24%
CLINTON	52,715	40,057	-24%
LUZERNE	60,930	49,087	-19%
WARREN	82,419	68,153	-17%
ALLEGHENY	34,837	28,970	-17%
CAMERON	6,215	5,278	-15%

Source: Censuses of Agriculture 2012 and 2017.

The 10 counties with the largest increases in farmland were Bucks, McKean, Lycoming, Sullivan, Lackawanna, Cumberland, Snyder, Bedford, Monroe, and Tioga.

Table 28: 10 Counties with the Largest Increase in Farmland (Acres) in Pennsylvania, 2012-2017

	Acres of Farmland		
County	**2012**	**2017**	**% Change**
BUCKS	64,024	77,255	21%
MCKEAN	36,297	43,084	19%
LYCOMING	158,462	186,130	17%
SULLIVAN	37,481	43,424	16%
LACKAWANNA	32,750	36,556	12%
CUMBERLAND	154,879	169,654	10%
SNYDER	91,179	98,978	9%
BEDFORD	209,795	222,224	6%
MONROE	26,483	27,607	4%
TIOGA	205,158	212,797	4%

Source: Censuses of Agriculture 2012 and 2017.

Table 29 and 30 show the percent change in the average farm size, in acres, in urban and rural counties from 2012 to 2017.

Table 29: Percent Change in Average Farm Size (Acres) in Rural Counties 2012 - 2017

	Average Farm Size (Acres)		
County	**2012**	**2017**	**% Change**
LYCOMING	131	178	36%
CLINTON	112	150	34%
MCKEAN	125	166	33%
MONROE	94	118	26%
GREENE	128	158	23%
INDIANA	132	156	18%
SNYDER	98	115	17%
ARMSTRONG	165	190	15%
LAWRENCE	122	140	15%
MONTOUR	95	109	15%
ELK	87	99	14%
FAYETTE	120	135	13%
NORTHUMBERLAND	153	171	12%
BRADFORD	189	210	11%
WYOMING	135	150	11%
TIOGA	182	202	11%
BEDFORD	173	192	11%
WARREN	137	151	10%
SULLIVAN	209	229	10%
BUTLER	128	140	9%
JEFFERSON	158	172	9%
FULTON	171	184	8%
CENTRE	136	146	7%
COLUMBIA	130	137	5%
CRAWFORD	169	178	5%
SCHUYLKILL	134	141	5%
JUNIATA	124	128	3%
FRANKLIN	166	170	2%
SUSQUEHANNA	166	170	2%
MIFFLIN	112	114	2%
CAMBRIA	140	142	1%
SOMERSET	188	190	1%
WASHINGTON	107	108	1%
ADAMS	144	145	1%
POTTER	219	219	0%
PERRY	152	151	-1%
WAYNE	159	157	-1%
VENANGO	133	130	-2%
MERCER	138	134	-3%

	Average Farm Size (Acres)		
County	**2012**	**2017**	**% Change**
CLARION	178	169	-5%
CLEARFIELD	130	123	-5%
BLAIR	172	159	-8%
CARBON	109	97	-11%
HUNTINGDON	190	168	-12%
CAMERON	173	143	-17%
PIKE	565	466	-18%
FOREST	148	116	-22%
UNION	152	114	-25%

Source: Censuses of Agriculture 2012 and 2017.

Table 30: Percent Change in Average Farm Size (Acres) in Urban Counties 2012 - 2017

	Average Farm Size (Acres)		
County	**2012**	**2017**	**% Change**
LACKAWANNA	108	139	29%
LEHIGH	157	196	25%
CUMBERLAND	109	135	24%
BUCKS	77	94	22%
WESTMORELAND	112	131	17%
ERIE	119	132	11%
BERKS	115	124	8%
MONTGOMERY	52	55	6%
BEAVER	86	88	2%
YORK	121	122	1%
LUZERNE	110	109	-1%
LANCASTER	78	77	-1%
NORTHAMPTON	132	129	-2%
CHESTER	95	91	-4%
LEBANON	100	94	-6%
ALLEGHENY	81	74	-9%
DAUPHIN	160	117	-27%
DELAWARE	62	39	-37%
PHILADELPHIA	13	7	-46%

Source: Censuses of Agriculture 2012 and 2017.

The 10 counties with the largest decreases in average farm size were Philadelphia, Delaware, Dauphin, Union, Forest, Pike, Cameron, Huntingdon, Carbon, and Allegheny.

Table 31: 10 Counties with The Largest Decreases in Average Farm Size (Acres) in Pennsylvania, 2012-2017

	Average Farm Size (Acres)		
County	**2012**	**2017**	**% Change**
PHILADELPHIA	13	7	-46%
DELAWARE	62	39	-37%
DAUPHIN	160	117	-27%
UNION	152	114	-25%
FOREST	148	116	-22%
PIKE	565	466	-18%
CAMERON	173	143	-17%
HUNTINGDON	190	168	-12%
CARBON	109	97	-11%
ALLEGHENY	81	74	-9%

Source: Censuses of Agriculture 2012 and 2017.

The 10 counties with the largest increases in average farm size were Lycoming, Clinton, McKean, Lackawanna, Monroe, Lehigh, Cumberland, Greene, Bucks, and Indiana.

Table 32: 10 Counties with the Largest Increases in Average Farm Size (Acres) in Pennsylvania, 2012-2017

	Average Farm Size (Acres)		
County	**2012**	**2017**	**% Change**
LYCOMING	131	178	36%
CLINTON	112	150	34%
MCKEAN	125	166	33%
LACKAWANNA	108	139	29%
MONROE	94	118	26%
LEHIGH	157	196	25%
CUMBERLAND	109	135	24%
GREENE	128	158	23%
BUCKS	77	94	22%
INDIANA	132	156	18%

Source: Censuses of Agriculture 2012 and 2017.

Key Sectors and Informants

The researchers gathered additional information about the current state and future trends of Pennsylvania agriculture by interviewing some key sectors with substantial contributions. The researchers identified these key sectors with input from the Center for Rural Pennsylvania. Representatives from the following organizations were interviewed:

- Center for Dairy Excellence, Ms. Jayne Sebright, Executive Director.
- Pasa Sustainable Agriculture, Ms. Hannah Smith-Brubaker, Executive Director.
- Women's Ag Network, Dr. Kathryn Brasier, Professor of Rural Sociology, Director of Graduate Studies, The Pennsylvania State University.
- Pennsylvania Farm Bureau, Mr. Joel Rotz, Manager, Government Affairs & Communications Division.
- Pennsylvania Farm Link, Inc., Ms. Darlene Livingston, Executive Director.

The interviews were conducted between August 24 and August 28, 2020, and all the interviews were conducted by phone, with prior appointments. Following is a brief background on each of the participating organizations.

Center for Dairy Excellence: The Center for Dairy Excellence is a nonprofit organization created in 2004 to augment the profitability and viability of the dairy industry. The Center for Dairy Excellence assists dairy farm families in the decision-making process and serves as a catalyst for collaboration to strengthen the broader industry. In addition to the individual grants and programs offered to dairy farmers, the Center supports and encourages innovation within the processing sector. The Dairy Excellence Foundation supports programs that cultivate and inspire the next generation of Pennsylvania farmers through scholarships, curriculum, and internships, with the ultimate goal of a stronger, more vibrant dairy industry for Pennsylvania (source: Ms. Sebright).

Pasa Sustainable Agriculture: Pasa Sustainable Agriculture is a Pennsylvania-based sustainable agriculture association founded in 1992. The association works to build a more economically just, environmentally regenerative, and community-focused food system through education and research that directly supports farmers. Through year-round workshops and events, the association administers formal farming apprenticeships, and facilitates research that provides farmers with valuable information and data. Sustainable agriculture is defined as systems that are environmentally sound, community focused, and financially viable. Sustainable agriculture has some built-in financial benefits in terms of improving soil health, reducing erosion, and mitigating long-term risks introduced by climate change.

Women's Ag Network (WAgN): WAgN supports women in agriculture by providing positive learning environments, networking, and empowerment opportunities. The primary purposes of PA-WAgN are to encourage and support women in agriculture; provide and strengthen networks for women in agriculture; provide educational and mentoring opportunities for women in agriculture, including

organic certification and production practices; raise community awareness of agricultural related issues and concerns; and sustain farming livelihoods (WAgN[8]).

Pennsylvania Farm Bureau: Pennsylvania Farm Bureau is a general farm organization consisting of members who provide legislative support, information, and services to Pennsylvania's farmers and rural families since 1950 (Pennsylvania Farm Bureau). The bureau represents its members in lobbying government decision-makers and others for regulatory changes, and in educating the general public concerning agriculture.

Pennsylvania Farm Link, Inc.: Farm Link was established in 1994 with a vision for the future of Pennsylvania agriculture and a concern for the effective transition of Pennsylvania farm businesses. The three primary features of the organization are to provide: an online database with a list of farmers seeking farmland, and landowners with farmland they want to sell or lease; educational opportunities for farmers on farm succession and addressing beginning farmer needs; and consulting services to help farmers gain the knowledge and resources needed to move forward with their goal to farm.

Current Conditions in Pennsylvania Agriculture

The following information was gathered through the interviews.

In describing the current conditions of agriculture in the state, several organizations noted how farmers have been coping in different ways to address the challenges associated with the COVID-19 pandemic. Farmers who already had an online presence and were selling directly to their customers were able to pivot fairly well, and, in some cases, were able to capitalize on the increased interest in local foods. On the other hand, farmers that did not have an online presence or were selling into distribution systems that were highly disrupted during the COVID-19 pandemic were negatively impacted (Smith-Brubaker). Toward that end, Pasa organized numerous webinars helping farmers learn how to develop an online presence and introduce the idea of e-commerce for their farms (Smith-Brubaker).

Several organizations expressed concerns regarding the aging of Pennsylvania farmers. There has been an increase in the average age of Pennsylvania farmers over the years, and it is becoming harder for farm families to pass on farms to a younger generation (Rotz). Dr. Brasier pointed out that millennials, especially women and younger individuals, demonstrated increased interest in pursuing careers in agriculture and natural resource industries. This raises a novel and critical question: How best to integrate these interested millennials into the commonwealth's existing industries?

Mr. Rotz noted that family inheritance of farming is occurring less and less because of the existing challenges, people recognize that they cannot farm the way they did, and profits are dwindling, so they are not interested in farming and accept other jobs. Additional challenges to farm transitions include access to financing and lack of proper transition plans (Rotz). The Farm Bureau provides a business

[8] https://agsci.psu.edu/wagn/about-pa-wagn

service helping older farmers trying to transition to either the next generation in their family or to someone else who is interested. The bureau has a working relationship with an insurance company to provide discounts to its members, and the insurance company is also involved in estate planning type of services to help pass the farm along (Rotz). The high initial cost of entry makes it difficult even for small scale farmers to enter the agricultural sector, an added challenge for the future (Rotz). At the other end of the spectrum, older farmers who want to transition out of farming are struggling to find a new generation of farmers who are willing to fill their roles (Rotz).

Ms. Livingston noted that the Farm Vitality Grant Program in 2019 helped fund professional services for those planning for the future of their farms. A host of challenges, including complex regulations and licensing, complicate the process for farmers who want to migrate to more direct market systems where they sell directly to consumers (Livingston). The USDA Coronavirus Food Distribution Program, however, has benefitted smaller-scale, direct-to-market farmers, who are aggregating items from other farmers and selling produce boxes for families, instead of selling to restaurants (Livingston).

COVID-19 Implications on Pennsylvania Agriculture

Every organization interviewed expressed concerns about the challenges faced by farmers in Pennsylvania due to the COVID-19 pandemic. For agriculture, 2020 was also a particularly difficult year in Pennsylvania because of widespread drought, which provided challenges ranging from growing field crops to feeding livestock to having sufficient crops to sell on the market (Livingston). The COVID crisis has necessitated additional changes on the farm, which have added to the cost of farming. Whether or not farming would be considered an essential business during the pandemic added to farmers' concerns (Smith-Brubaker). An additional challenge is accessing a reliable workforce, with farms relying on local, including migrant, labor (Sebright). Increased unemployment benefits ($600 unemployment insurance benefits) during the pandemic made it harder for dairy farmers to find labor. Ensuring a safe workplace with pandemic restrictions further aggravating the problem (Sebright). These hardships, especially during the COVID pandemic, affected dairy farming profits.

The pandemic caused a sudden shift in consumer demand, from eating out to cooking at home, which had an impact on the entire agricultural industry. Dairy was negatively impacted, as consumption of dairy dropped when people ate at home (Rotz). With the onset of the pandemic, there was a sudden, dramatic change in the suppliers, away from restaurants and schools to home consumers (Rotz). The supply chain disruption resulted in excess supply (requiring farmers to dump milk), at the same time as consumers in stores were unable to find milk (Rotz). On a positive note, farmers who were able to establish direct marketing to consumers benefitted. Although some consumers would shift back to purchasing from large retailers, most farmers believe that people have recognized the value of a local food supply and appreciate the freshness of buying local (Rotz).

The pandemic posed additional challenges, which have especially impacted the processing business. When meatpacking or milk bottling processes came to a sudden halt due to pandemic restrictions, operations also backed up on farms (Rotz). Pennsylvania, through the Department of Agriculture, offered some financial support to farmers during the current pandemic. In particular, the Fresh Food Financing Initiative helped farmers with an on-farm retail presence sell directly to consumers (Smith-Brubaker). Also, the USDA Coronavirus Food Assistance Program (CFAP) offered a significant boost to dairy farmer income when dairy prices fell.

The future prospect for dairy is strong, with growth and diversification of dairy farms, particularly in milk production, herd size, income growth, and some consolidation (Sebright).

Women in Farming

Women farmers have unique needs regarding technical information and access to resources, since they have smaller, more diversified farms, with lower profit margins, and are more likely to be successful in identifying markets and working on business models that establish more direct contacts with consumers. Women generally want to have a farm that connects to their community, and this requires a great deal of adaptation, creativity, and innovation (Brasier). More female farmers are pushing new frontiers - pioneering conservation efforts and applying best practices to mitigate the environmental footprint of farming. The growing leadership of women in this area is expected to continue (Brasier). This sentiment is shared by the Pennsylvania Farm Bureau, which acknowledges increasing involvement of women farmers in a traditionally male-dominated field, and which is promoting ways to develop leadership among its female members (Mr. Rotz). With COVID-19 challenges, female farmers are leading efforts to provide online farmers' markets to help connect to consumers, as well as fostering collaboration between multiple farms so that these online farmers' markets are a one-stop-shop (Brasier).

Organic Farming in Pennsylvania

Organic farming has been gaining importance in Pennsylvania in recent years. There are federal initiatives, namely the USDA Organic Research Extension Program (OREI), which allocates a portion of funding to organic research. The state too, through the Pennsylvania Farm Bill, provides some incentives for transitioning to organic and other sustainable farming practices (Smith-Brubaker). The Conservation Stewardship Program of the National Resources Conservation Service (NRCS) encourages and incentivizes farmers to implement conservation practices on their farm (Smith-Brubaker). In recent years, women farmers have been a growing segment in sustainable agriculture (Smith-Brubaker). Currently, all state grants for farmers are reimbursement programs, which some of the smaller farms find difficult to access, as they do not have the funds for upfront payments (Smith-Brubaker). Pasa has been working with the Department of Agriculture and the legislature to try to create a system where businesses could sponsor a farm and pay for some expenses upfront in return for a tax credit. Afterward when farmers gets

reimbursed, they could pay back the sponsors (Smith-Brubaker). Pasa has also successfully changed the Resource Enhancement and Protection (REAP) Program, so that the program can now benefit many smaller farms with lower cost projects (Smith-Brubaker).

Impact of Trade Policy Changes in Agriculture

Recent trade policy changes have had varied impacts on Pennsylvania agriculture. Some policies have adversely affected farmers, particularly crop grain farmers who sell their crops internationally (Smith-Brubaker). Opaqueness on trade issues have also caused confusion among farmers. The trade policy changes, specifically concerning China, have affected commodity markets like corn and soybeans, and to a lesser extent, have impacted dairy and hardwoods (Rotz). Mr. Rotz noted, that on the whole, trade had a positive impact on agriculture, and apart from a few segments with negative impacts due to changes in trade policy, the Commonwealth has an agricultural surplus, and thus benefits from the net exports of agricultural products. The USDA Coronavirus Food Distribution Program has immensely benefitted farmers, especially in dairy, and these government payments have saved farmers from economic collapse (Rotz).

Dairy was impacted negatively in 2019, when the U.S. negotiated with China. However, the Market Facilitation Program payments covered some of the losses, and overall, dairy exports are up by 13 percent (Sebright).

Future Trends in Agriculture in Pennsylvania

Each of the organizations interviewed have a positive outlook for the future of agriculture in Pennsylvania. This includes a growth in sustainable agriculture, dairy, and the number of female farmers. The Center for Dairy Excellence believes that dairy will continue to be a strong industry in the state, and dairy farming is headed toward fewer, bigger farms in the future (Sebright). The Center for Dairy Excellence believes it is important that the legislature continues to support the Pennsylvania dairy industry, namely that it recognizes the need to offer programs, resources, and support to dairy farms to ensure strong, sustainable businesses. Another issue the legislature can help with is ensuring that legislation around environmental policies is friendly toward agriculture and rewarding farmers who implement sound environmental practices (Sebright). The legislature should also recognize dairy farming as small businesses and ensure that farms have access to programs directed to small businesses (Sebright). However, Mr. Rotz, observed that the commonwealth will continue to lose dairy farms and mid-sized farms as very large corn and soybean farms grow in number. He noted that, unless mid-sized farms diversify and reach out more directly to consumers, it will be hard for them to survive. At the same time, much smaller farm operations (those with only a few thousand dollars in farm income) will continue to be sustained in the near future (Rotz).

Consumer preferences is another important factor that Mr. Rotz mentioned. With increased demand for cage-free or free-range chickens by consumers, farmers are required to adopt costly farming practices, and hence, are forced to pass their significantly higher costs of production on to consumers, who end up paying higher prices. A topic that the Pennsylvania Farm Bureau would like to see addressed in the future is for the state to devote more money to help with environmental costs and regulations and create some limited liability laws for small farms to engage in direct marketing and agritourism types of activities (Rotz). Agritourism is popular in Pennsylvania, however, farmers who operate agritourism businesses are exposed to various liabilities. An example would be an agritourist who stumbles and falls because of uneven ground on a farm as they to walk to a corn maze (Rotz). Another area that Farm Bureau is pursuing is tax laws for small business owners, similar to the tax advantages enjoyed by big corporations (Rotz).

In discussing the future trends of agriculture, Ms. Livingston pointed out that excellent management will help farms survive and adapt to the changing conditions and challenges posed by the pandemic. One of the biggest contributions of Pennsylvania Farm Link is arranging farm succession planning meetings for younger farmers, which help them in transitioning assets and management (Livingston). This is important to the future of agriculture and helps both current and future generations of farmers (Livingston).

Dr. Brasier pointed out that the state legislature needs to understand the wide diversity among Pennsylvania farmers and consider their varied concerns. The state's farms range from large scale corn and grain production facilities to backyard and patio gardens, which clearly have different policy needs. Recognizing how to develop land and infrastructure access, helping support economic development activities around cooperatives, and supporting innovative business models, in such areas as online markets, are the greatest priorities in agriculture today.

Key Informant Summary

- The COVID-19 pandemic has negatively affected the dairy sector, causing milk price volatility. This, coupled with challenges in accessing a reliable workforce and maintaining safety regulations due to the pandemic, has hurt the profitability of the dairy sector. Other challenges currently faced by the dairy sector are dry weather, high land costs and higher costs due to environmental regulations. The recent trade policy changes (tariffs imposed by the U.S.) negatively impacted dairy in 2019, however, the Market Facilitation Program payments covered some of these losses. The USDA CFAP offered significant support to the incomes of dairy farmers to offset the fall in dairy prices during the pandemic.
- While farmers who had a pre-pandemic online presence have adjusted well to the disruptions caused by COVID-19, the ones who did not have that presence suffered greater losses. The Fresh Food Financing Initiative of the Department of Agriculture helped farmers during the pandemic. Recent

trade policy changes adversely affected crop grain farmers with international crop sales, and the lack of clarity on trade issues have confused farmers and affected their profitability. The uncertainty of whether farming is considered as essential business during the COVID-19 pandemic further added to farmers' distress.

- Women farmers generally want farms that connect to their community, which requires adaptation, creativity, and innovation. With the COVID-19 challenges, women farmers were ahead of the curve in leading efforts to establish online farmers' markets to help connect to consumers, facilitating curbside or personal deliveries, and collaborating to make it a one-stop-shop.
- While supply chain disruptions and sudden changes in consumer preferences (eating out less) during the COVID-19 pandemic negatively affected profitability, farmers were able to establish direct connections with consumers. Recent trade policy changes have affected commodity markets like corn and soybeans, and to a smaller extent, impacted dairy and hardwoods.
- COVID-19 posed a challenge for farmers to adopt a direct market system, as selling their products directly to consumers is hindered by regulations, licensing and other issues involved in the process. The USDA Coronavirus Food Distribution Program has benefitted smaller scale direct marketing farmers.
- Given the increases in the average age of Pennsylvania farmers, succession plans will be key to ensuring long-run profitability of the agriculture industry in the state.

CONCLUSIONS

Based on the study results, the researchers found that in Pennsylvania:

1. The number of farms decreased by 10 percent, land in farms declined 6 percent, and average farm sizes increased 5 percent between 2012 and 2017. These trends were consistent with national averages.
2. The largest number of farms (42 percent) were small-sized, between one and 49 acres, followed by medium-sized farms between 50 and-179 acres (38 percent). A majority of farms were family owned, or individual sole proprietorships (74 percent). The percentage of family-owned farms decreased about 12 percent between 2012 and 2017, and farms classified as corporations have been on a steady increase.
3. Pennsylvania farms sold $6.5 billion (adjusted for inflation, using 2007 as the deflator) in agricultural products in 2017. This was 2 percent less than agricultural sales in 2012. Livestock sales contributed about 65 percent of total agricultural sales. Within livestock, dairy constituted the largest sector, closely followed by poultry and eggs. About 50 percent of farms sold less than $10,000 of agricultural products in 2017, and about 22 percent sold between $10,000 and $50,000.
4. Organic product sales have increased substantially over the previous decade. The number of farms producing organic products increased from 680 in 2007 to 1,048 in 2017. The highest increase in the number of farms selling organic products was in operations with $250,000 or more in sales and

government payments. Total organic product sales have increased from $70.9 million in 2012 to $598 million by 2017 (data adjusted for inflation, using 2007 dollars). Federal initiatives, such as the USDA Organic Research Extension program, and more recently, the 2018 Farm Act have helped support and expand the organic sector. In describing farmer characteristics, most organic farmers were male (65 percent), spent 10 years or more on the present farm (58 percent), and reported farming as their primary occupation (72 percent).

5. There was an increase in the number of farms using renewable energy systems in recent years, with the greatest increase in the use of geothermal and geo-exchange systems, and a decrease in the use of biodiesel production systems.

6. Between 2012 and 2017, there was an increase in the percent of primary producers who spent fewer than 5 years on their present farms, indicating a surge in the number of new farmers. This is contrary to the direction of change in earlier years (2007-2012). However, there was a decline in primary producers with more than 10 years on the present farm in the most recent years (12 percent decrease. A majority of primary producers who have been on the present farm for more than 10 years operated large farms of more than 500 acres.

7. In 2017, the average age of principal producers was 57 years, up one year from 2012, and continuing a trend of steady increase. About 21 percent of primary producers were between 65 and74 years old, and 12 percent were over the age of 75. This, coupled with one percent of producers being under the age of 25, indicated the aging of primary producers in the state. This trend was similar to the national trends. However, producers in the commonwealth are younger compared to the national averages, in 2017.

8. A majority (51 percent) of primary producers in Pennsylvania reported farming as their primary occupation in 2017, down 1 percent from 2012: however, this was 5 percent increase compared to 2007. Within the group of producers who reported farming as their primary occupation, 35 percent operated large farms of more than 500 acres. The higher proportion could be attributed to the higher investment needed in farming machinery and equipment.

9. In 2017, about 21 percent of primary producers in Pennsylvania were female, compared to 26 percent nationwide. About 39 percent of farms with female primary producers sold agricultural products whose market values were less than $10,000. On the other hand, farms operating with sales and government payments of more than $1 million had the highest proportion of male producers (77 percent).

10. A majority (74 percent) of farms in Pennsylvania are family-owned or individual sole proprietorships. However, there has been a decline in the proportion of family-owned farms between 2007 and 2017. Partnerships have been on the rise during the same time period. A similar trend in ownerships was observed nationwide, with the exception of partnerships, which fell 6 percent between 2012 and 2017.

11. Dairy cattle and milk production represented a higher share of net farm income for all years of data in Pennsylvania. The relative contribution of poultry and egg production, and hog and pig farming have increased significantly between 2007 and 2017. Particularly for 2017, the beef cattle ranching and farming category reported a net loss.

12. In 2017, about 13 percent of the total number of workers were reported as hired farm labor for farms that had sales and government payments of less than $10,000. About 32 percent of workers were reported as farm labor for farms that had sales and government payments of more than $1 million, up one percent compared to 2012.

13. In the regional analysis that compared Pennsylvania with other states in the Northern Crescent Farm Resource Region, only two out of 13 states (Ohio and New Jersey) witnessed an increase in farmland acres between 2012 and 2017. In Pennsylvania, farmland acres decreased 6 percent during this time period. The commonwealth saw an increase of 5 percent in average farm size between 2012-2017 and was one of six states with an overall increase in average farm size.

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APPENDIX

METHODOLOGY

The data for this report was collected from the Census of Agriculture. The National Agricultural Statistical Service (NASS) conducts the Census of Agriculture and makes the results available to the public. There are 266,944 records at the county level for the state of Pennsylvania in the 2007, 2012, and 2017 censuses plus 148,384 at the state level.

The data available from the Census of Agriculture is provided in different formats:

- Publications such as the census report that can be accessed in PDF and text formats. The Pennsylvania state and county level census report for 2017 has 832 pages.
- A web interface Quick Stats 2.0 that can access both census and survey data.
- A Census Data Query Tool to query 2017 Census of Agriculture data.
- An Application Programming Interface (API) that allows access to census and survey data but requires the development of software to retrieve the data and the use of additional software to analyze, interpret, and present data in graphical form.

The methods for data retrieval included:

Publications in text format: It offers tables that are well organized. This presentation was designed for people and not computer data interchange. Data was received in .txt format and manipulated (imported, defining fields, selecting, and merging different tables from different years). The results were stored in CSV and XLSX file formats that were then read and manipulated using spreadsheet software.

Web interface Quick Stats 2.0: CSV files were retrieved using this tool and imported into spreadsheet software. Filters were used to extract the information required. This method requires a high level of knowledge of the dataset to successfully set the filter parameters and to interpret the results.

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