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America's Farms and Ranches at a Glance: 2024 Edition

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Overview

Farms in the United States represent a diverse set of business operations and farm operators. This annual report describes the characteristics of U.S. farms and ranches with the most recent data from the Agricultural Resource Management Survey (ARMS), an annual survey conducted by USDA, National Agricultural Statistics Service (NASS) and USDA, Economic Research Service (ERS). Statistics for calendar year 2023 are presented using a farm classification developed by USDA, ERS to categorize farms into groups with some common characteristics (each farm's annual gross cash farm income, the main occupation of the farm's principal operator, and ownership (family versus nonfamily)). This edition also contains two new sections: (1) a section documenting farmers' unpriced inventory held both onfarm and off-farm for the three largest (by volume) stored commodities (corn, soybeans, and wheat), and (2) a section outlining the adoption rates for key precision agriculture technologies and the reasons provided by producers for their precision technology adoption decisions.

Farm Typology

The farm typology, updated in 2013 by USDA, ERS, first distinguishes between nonfamily and family farms, where a family farm is a farm in which the majority of the business is owned by an operator and/or any individual related by blood, marriage, or adoption, including relatives who do not live in the operator's household. Since the 1970s, USDA has defined a farm as any place that, during a given year, produced and sold (or normally would have produced and sold) at least \$1,000 of agricultural products (not adjusted for inflation). USDA uses acres of crops and head of livestock to determine whether a farm or ranch with sales of less than \$1,000 could normally produce and sell the minimum amount required to be categorized as a farm. Among family farms, farms are divided by farm size, which is measured by gross cash farm income (GCFI), a measure of the farm's revenue that includes sales of crops and livestock, government payments, other farm related income, and fees received by operators from production contracts. Small family farms are further divided into categories based on the primary occupation of the principal operator.

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This report used data from the Agricultural Resource Management Survey (ARMS), an annual survey conducted by USDA, National Agricultural Statistics Service (NASS) and USDA, Economic Research Service (ERS). The analysis in this report is based on a total sample of approximately 14,700 farms from the 2023 ARMS.

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Small family farms (GCFI less than \$350,000)

- **Retirement farms:** Farms whose principal operators report having retired from farming while continuing to farm on a small scale.
- **Off-farm-occupation farms:** Farms whose principal operators report a primary occupation other than farming.
- **Farming-occupation farms:** Farms whose principal operators report farming as their primary occupation. Farming-occupation farms are further sorted into two classes:
 - **Low sales:** Farms with a GCFI of less than \$150,000.
 - **Moderate sales:** Farms with a GCFI between \$150,000 and \$349,999.

Midsize family farms (GCFI between \$350,000 and \$999,999)

Large-scale family farms (GCFI of \$1,000,000 or more)

- **Large farms:** Farms with a GCFI between \$1,000,000 and \$4,999,999.
- **Very large farms:** Farms with a GCFI of \$5,000,000 or more.

Nonfamily farms

- Any farm where any operator and any related individuals do not own a majority (50 percent) of the business.



Table 1

Number of farms and distribution of farms, value of production, and acres operated by farm type, 2023

Farm type		Number of farms	Percentage of farms	Percentage of acres operated	Percentage of value of production
Small	Retirement	209,812	11.1	2.8	0.7
	Off farm	741,922	39.3	12.3	4.4
	Low sales	573,411	30.3	15.7	4.4
	Moderate sales	101,463	5.4	9.9	7.7
Midsize		112,185	5.9	18.2	18.5
Large-scale	Large	75,110	4.0	26.0	27.7
	Very large	8,919	0.5	4.7	19.9
Nonfamily		66,977	3.5	10.5	16.8
All Farms		1,889,800			

Note: Acres operated is equal to owned land plus leased land minus leased land to others. The total acres operated were 893.8 million, and the total value of production was \$493.4 billion in 2023. Due to rounding, percentages may not sum to 100 or match values reported in figure 1.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.

Farms, Production, and Farmland

Most U.S. farms (86 percent) are small family farms; these farms operate on 41 percent of U.S. agricultural land and account for 17 percent of the total value of production (figure 1).

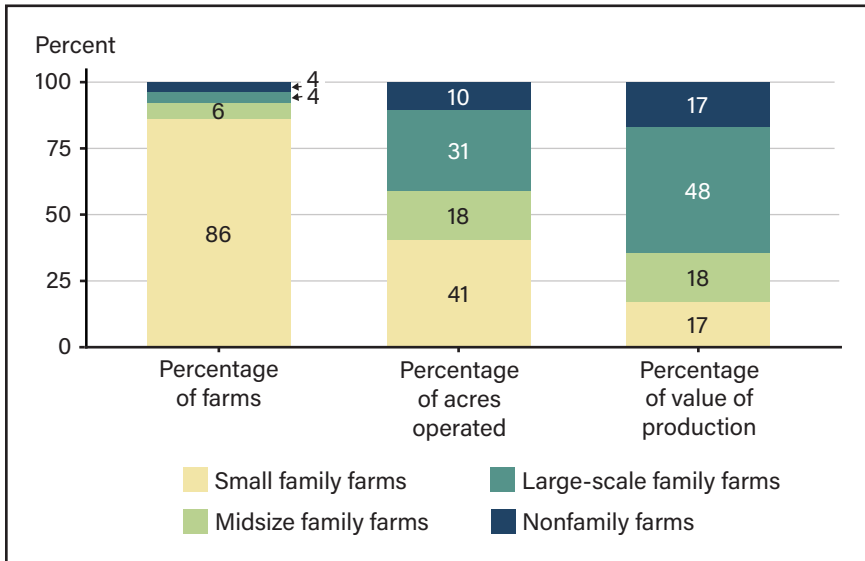
- In 2023, approximately 86 percent of all farms were small family farms and operated 41 percent of U.S. agricultural land. The number of small farms and their operated acres fell slightly relative to 2022 when small family farms represented 87 percent of all farms and operated 44 percent of agricultural land.
- Large-scale family farms accounted for 48 percent of the total value of production and 31 percent of agricultural land in 2023. Midsize fam-

ily farms accounted for 18 percent of agricultural land and 18 percent of the total value of production.

- In total, family farms accounted for about 96 percent of total farms and 83 percent of total production in 2023.
- Nonfamily farms accounted for the remaining 4 percent of farms. Among nonfamily farms, 16 percent had a GCFI of \$1 million or more. Nonfamily farms vary widely in size, income, and ownership structure and include partnerships of unrelated persons, nonfamily corporations, and farms with a hired manager unrelated to the owners.
- Nonfamily farms' share of value of production increased from 11 percent of the total value of production in 2022 to 17 percent in 2023. Production was concentrated in large-scale nonfamily farms, which accounted for 16 percent of nonfamily farms and 93 percent of all nonfamily farms' production.

Figure 1

Distribution of farms, acres operated, and value of production by farm type, 2023



Note: Acres operated is equal to owned land plus leased land minus leased land to others.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.



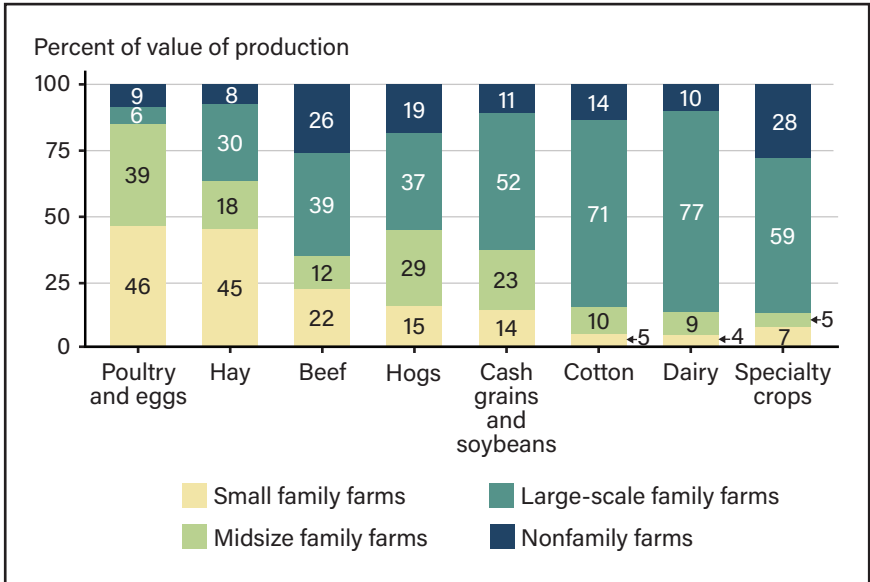
Large-scale family farms dominate the production of many selected commodities (figure 2).

- Large-scale family farms accounted for the majority of the value of cash grains and soybeans (52 percent), cotton (71 percent), dairy (77 percent), and specialty crops (59 percent) production in 2023.
- Small family farms produced 45 percent of the value of hay and 46 percent of the total value of U.S. poultry and egg output in 2023. Most poultry and egg production is done under contracts, with a contractor paying a fee to a farmer who raises poultry to maturity or manages the egg-laying operation. Many of these farms are considered small because their GCFI includes only the fee received and not the value of the poultry or eggs produced.
- In 2023, 22 percent of the value of beef production occurred on small family farms, while 39 percent occurred on large-scale family farms. Small family farms often have cow/calf operations, while large-scale family farms are more likely to operate feedlots.
- In 2023, the value of production by nonfamily farms ranged from 8 percent for hay to 28 percent for specialty crop production.
- Compared with 2022, nonfamily farms comprised a larger share of the value of production, with their value of beef production increasing from 11 percent in 2022 to 26 percent in 2023.



Figure 2

Value of production of selected commodities by farm type, 2023



Note: Cash grains include barley, corn, rice, sorghum, wheat, and oats. Specialty crops is a broad term that includes fresh or dried fruits, tree nuts, vegetables, beans (pulses), and horticulture nursery crops. Due to rounding, numbers may not add to 100 percent.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.

Farm Financial Performance

Overall, 2023 was an above average year for agricultural sector net cash income relative to the previous 10-year average: 2023 net cash income was 11 percent larger than the 2013–22 average, adjusted for inflation.¹ One measure of a farm’s financial performance is the operating profit margin (OPM), the share of gross income that is profit. Most small family farms and nonfamily farms (76 percent of which are small) have an OPM of less than 10 percent, indicating potentially more financial vulnerability, whereas most midsize, large, and very large family farms reported OPMs above 10 percent in 2023 (figure 3).

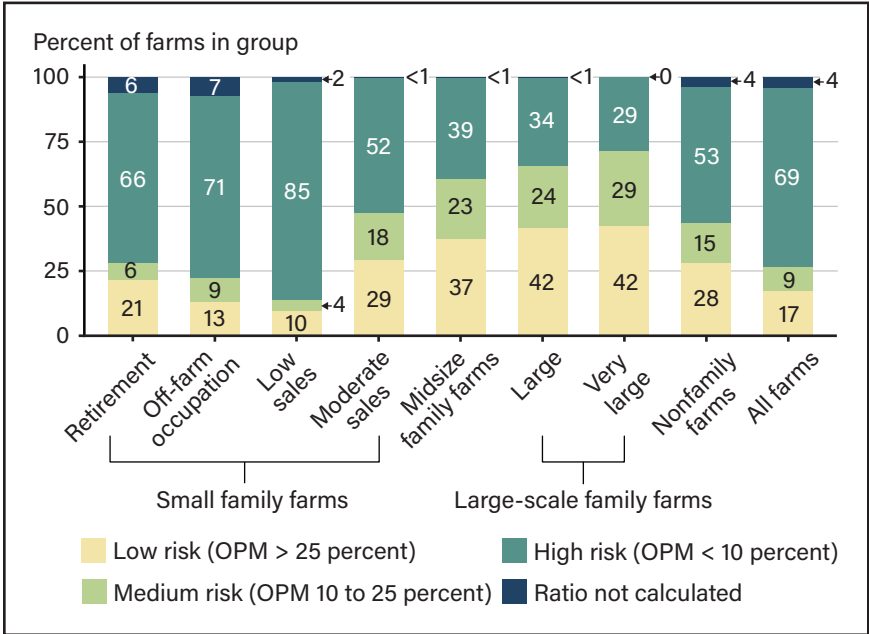
¹ USDA, Economic Research Service, Farm Income and Wealth Statistics (as of September 5, 2024).

- In 2023, between 52 and 85 percent of small family farms, depending on the farm type (retirement, off-farm occupation, low sales, moderate sales), had an OPM in the high-risk zone (less than 10 percent OPM). Around 53 percent of nonfamily farms had an OPM in the high-risk zone.
- Midsize, large, and very large family farms in 2023 were most likely to have OPMs in the low-risk zone (OPM of at least 25 percent) at 37 percent, 42 percent, and 42 percent, respectively. These farms were least likely to be in the high-risk zone at 39 percent, 34 percent, and 29 percent, respectively.
- The share of farms in the medium-risk zone (OPM between 10 and 25 percent) ranged from 4 percent (low-sales family farms) to 29 percent (very large family farms). For many farm types, the percentage of farms in the medium-risk zone was smaller than the share of high-and low-risk farms, highlighting the highly varied financial positions of farms even within type.
- In 2023, the percentage of small and large family farms in the low-risk zone decreased relative to 2022.



Figure 3

Farms by operating profit margin and farm type, 2023



Note: The Operating Profit Margin (OPM) ratio is defined as:

$$100 * \left(\frac{\text{net farm income} + \text{interest expense} - \text{returns to unpaid labor and management}}{\text{gross farm income}} \right)$$

OPM ratios are not calculated for operations with 0 or negative gross farm income as the OPM for these operations are undefined or do not reflect the financial position of the farm operation. Gross farm income can be negative due to decreases in the value of inventory. Due to rounding, numbers may not add to 100 percent.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.

Farm Use of Credit and Loan Amounts

Debt is an important resource for farmers and ranchers to support the capital needs of their operations. This section reports the share of farms in each farm type that held farm debt at the end of 2023 to highlight differences in the use of agricultural credit across operations. The average loan amounts reported and the size of debt relative to GCFI are also examined. Producers

provide details for up to five loans. The share of debt is shown from traditional credit sources, which include the Farm Credit System, USDA, Farm Service Agency (FSA), commercial banks, credit unions, and all levels of government. Nontraditional sources of credit include trade credit (includes input suppliers, implement dealers, co-ops, and other merchants), life insurance companies, contractors, individuals, credit unions, credit cards, and other debts such as unpaid bills. Finally, this report shows the average share of debt that has a maturity of 1 year or less and the average dollar weighted interest rate across farms of reported debt by farm type.

About 28 percent of all U.S. farms used debt in 2023, with larger farms being more likely to use debt.

- The share of farms (28 percent) using credit in 2023 was lower than the previous 10-year average of 31 percent. Credit usage varied by farm type, with 5.5 percent of retirement farms holding any debt compared with 79.5 percent of very large family farms (table 2).
- Large and very large family farms with loans had higher average loan amounts relative to small and midsize family farms. This is consistent with the fact that farming is capital intensive, and large-scale family farms require a great deal of capital to generate their disproportionate share of U.S. agricultural production.
- On average, small family farms had more debt relative to their GCFI, while large and very large family farms had the smallest amount of debt relative to GCFI.
- Within every type of farm, on average, 80 percent or more of debt came from traditional lending sources, including the Farm Credit System, USDA, FSA, and commercial banks, compared with trade credit or other sources.
- The share of debt that had less than a 1-year loan length ranged from 8.5 percent for off-farm occupation farms to 29.2 percent for large family farms.
- The average dollar-weighted interest rate associated with debt varied by farm type, with off-farm occupation debt having the lowest average interest rate at 5.2 percent (table 2).

Table 2

Farm debt by farm typology, 2023

Farm type		Share with any debt	Conditional average debt U.S. dollars (thousands)	Average ratio of debt to GCFI	Share of debt held by commercial banks, Farm Credit System, or USDA, FSA	Share that is short term (<1 year) debt	Dollar-weighted interest rate (percent)
Small	Retirement	5.5	181.0	6.3	88.7	15.6	5.5
	Off farm	24.1	189.7	22.5	79.9	8.5	5.2
	Low sales	21.2	162.4	7.3	82.7	23.5	5.6
	Moderate sales	58.7	479.0	2.1	85.0	18.9	5.7
Midsize		67.6	779.4	1.4	86.7	24.2	5.6
Large-scale	Large	74.6	1,378.6	0.8	84.1	29.2	5.9
	Very large	79.5	3,727.1	0.4	82.3	20.9	5.8
Nonfamily		26.3	1,120.4	1.8	87.0	27.7	6.0
All Farms		28.0	504.9	9.6	83.0	18.5	5.5

Note: Conditional average debt is the average debt across farms with debt in each farm type. The average debt-to-gross cash farm income (GCFI) ratio is the average ratio across farms with debt in each farm type. The first 3 columns include all debt for the operation, while columns 4–6 include up to 5 loans whose detail is reported in the Agricultural Resource Management Survey (ARMS). In the sample, 0.6 percent of farms reported more than 5 loans. The share of debt from traditional credit sources is calculated as the average across farms with debt in each farm type from the Farm Credit System, USDA, Farm Service Agency (FSA), commercial banks, Small Business Administration, State and county governments, credit unions, and savings and loan associations. Other sources of debt not considered traditional are trade credit, credit cards, life insurance companies, contractors, individuals, and other debts such as unpaid bills. Trade credit includes loans serviced by input suppliers, implement dealers, co-ops, and other merchants. The share of short-term debt is the average across farms within farm type of debt with a 1-year or less loan term relative to all debt reported. The dollar-weighted interest rate is the average dollar-weighted interest rate across farms reporting debt within a farm type.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.



Government Payments and Federal Crop Insurance

Distribution of direct government payments varied by farm and program type in 2023 (figure 4).

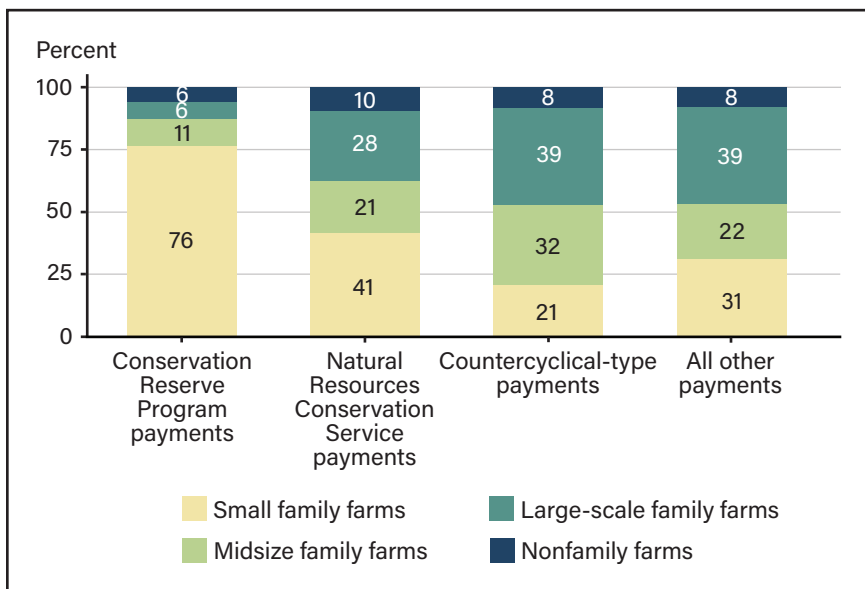
- Overall, 24 percent of all farms reported receiving some type of government payment in 2023. The percentage of farms receiving government payments ranged from 21 percent for small family farms to 44 percent for midsize and large family farms.
- Small family farms received 76 percent of all payments from USDA's Conservation Reserve Program (CRP), which removes environmentally sensitive cropland from production and increasingly enrolls grasslands in support of grazing operations. In contrast, 41 percent of all USDA, Natural Resources Conservation Service (NRCS) working lands program payments were received by small family farms. These programs include the USDA, NRCS Environmental Quality Incentives Program (EQIP) and Conservation Stewardship Program (CSP), both of which incentivize adopting certain conservation practices.
- Countercyclical payments are made when prices or revenue for a particular commodity are low.² The shares of countercyclical and other types of government payments received by farm type are similar to each farm type's contribution to the total value of U.S. agricultural production. Mid-sized and large-scale family farms accounted for 66 percent of the total value of production and received 71 percent of countercyclical-type payments, which include Agricultural Risk Coverage (ARC) and Price Loss Coverage (PLC) and 61 percent of all other payments, which include Dairy Margin Coverage, agricultural disaster, and ad-hoc payments.

² Some programs, such as Agricultural Risk Coverage (ARC) and Price Loss Coverage (PLC), are based on historical plantings; in contrast loan deficiency payments, if available, are associated with current plantings.

- The distribution and receipt of government payments across farm type could be driven by differences in the underlying commodities produced. Relative to all other farm types, small family farms tend to account for a larger percentage of poultry and egg and hay production, which are not covered under countercyclical-type payment programs. Midsize and large-scale family farms account for most of the value of production of cash grains (barley, corn, rice, sorghum, wheat, and oats) and soybeans, cotton, and dairy, which are commodities targeted by countercyclical-type programs.

Figure 4

Distribution of selected government agricultural program payments by farm type, 2023



Note: USDA, Natural Resources Conservation Service (NRCS) payments include payments from the Environmental Quality Incentives Program (EQIP) and the Conservation Stewardship Program (CSP). Countercyclical-type payments include payments from the USDA, Farm Service Agency (FSA) Price Loss Coverage and Agriculture Risk Coverage program. All other payments include those from programs, such as the USDA, FSA's Dairy Margin Coverage program, as well as agricultural disaster payments and ad hoc programs. Due to rounding, numbers may not add to 100 percent.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.



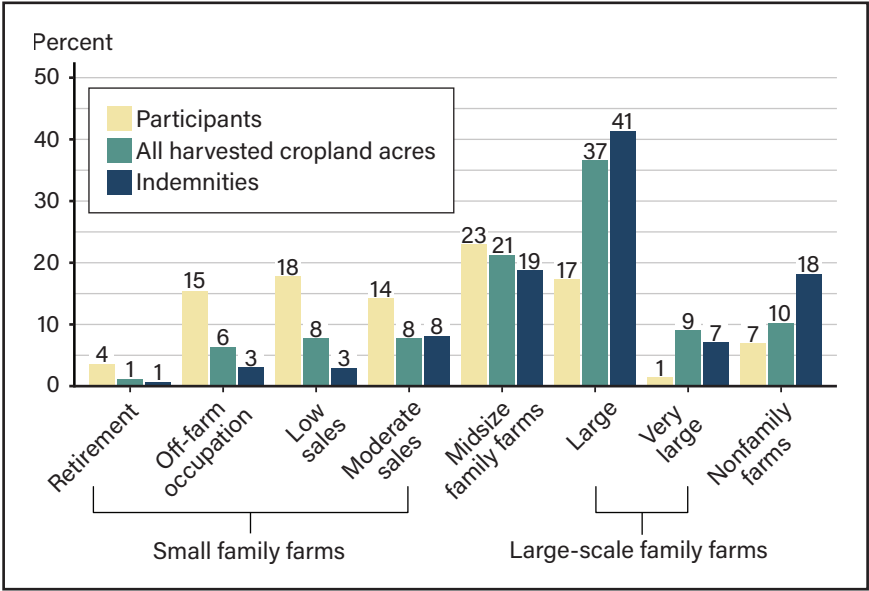
Indemnities from Federal crop insurance were roughly proportional to the acres of all harvested cropland and were concentrated among mid-size and large-scale farms in 2023 (figure 5).

- Overall, 16 percent of U.S. farms participated in Federal crop insurance programs, up from 14 percent of farms in 2022.
- Participation in Federal crop insurance varied widely across commodity production. In 2023, 66 percent of farms producing row crops (cotton, corn, soybeans, wheat, peanuts, rice, or sorghum) purchased Federal crop insurance. In contrast, 17 percent of farms growing specialty crops, such as fruits, vegetables, and nursery crops, and 12 percent of farms producing livestock purchased Federal crop insurance.
- Small family farms (retirement, off-farm occupation, low-sales, and moderate-sales farms) comprised 86 percent of farms but 51 percent of participants in Federal crop insurance. These farms represented 23 percent of all harvested cropland acres and received 15 percent of indemnity payments.
- Although midsize and large-scale family farms comprised 10 percent of all U.S. farms in 2023, these farms accounted for 42 percent of Federal crop insurance participants, 67 percent of all harvested cropland acres, and received 67 percent of indemnities from Federal crop insurance. These family farms were also the most likely to participate in Federal crop insurance.
- Nonfamily farms received 18 percent of indemnity payments in 2023, up from 8 percent in 2022.



Figure 5

Distribution of Federal crop insurance participants, total harvested cropland, and indemnities by farm type, 2023



Note: The bars of the same color may not add to 100 percent because of rounding.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.

Farm Operator Household Well-Being

This section presents information on the farm household for the principal operator (i.e., the operator most responsible for decision making) of each farm operation. Only family farm households are included here since household-level statistics are not calculated for nonfamily farm operations.

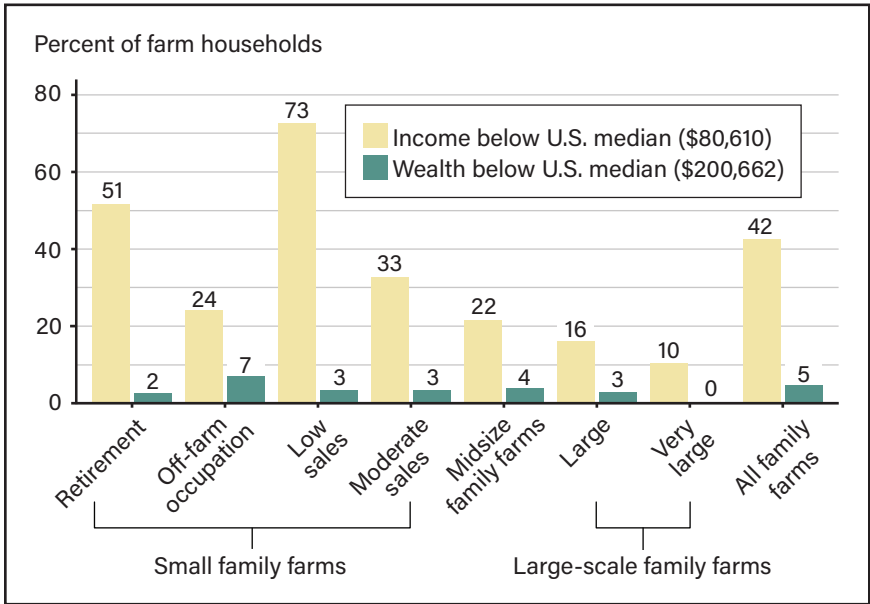
As in previous years, the median total income of all U.S. family farm households (\$97,984) was greater in 2023 than the median income of all U.S. households (\$80,610) (figure 6). Median farm household income in 2023 also exceeded the previous 10-year average of \$95,025 (adjusted for inflation).

- Median total farm household annual income varied across farm types, with very large family farms having the largest median household income at more than \$1.02 million compared with low-sales family farm households at \$58,300 (table 3). Low-sales and retirement farm households (\$78,200) had median household incomes below all U.S. households (\$80,610) and also below U.S. households with self-employment income (\$104,949).
- The percentage of family farm households with income below the U.S. median income level varied from 10 to 73 percent, depending on the type of farm.
- Most family farm households had higher wealth than the median household in the United States (95 percent). The share of family farm households that had wealth below the median of all U.S. households ranged from less than 1 percent to 7 percent, depending on the type of farm.
- Median total household wealth for family farm households in 2023 was \$1.44 million, which exceeded the previous 10-year average, adjusted for inflation, of \$1.16 million. Within each type of family farm median total, household wealth was higher than that for all U.S. households (\$0.20 million) and self-employed U.S. households (\$0.46 million). The value of land comprises the largest share of most farm households' wealth.
- Operators of small family farms, especially off-farm occupation and low-sales farms, often reported losses from farming. In 2023, the average farm income among off-farm occupation farm households was -\$3,700, and among low-sales farm households, it was -\$5,700 (table 3).



Figure 6

Share of principal operator households with income and wealth below the U.S. median by farm type, 2023



Note: Farm households are the households of the principal operator on family farms. Operator household income and wealth are not estimated for nonfamily farms. Wealth is the value of household assets minus household debt. Operator household income includes both the farm and off-farm income household that members received. Given that net income is a calendar-year flow, all income and expenses are included when they occur from January 1 to December 31. U.S. median wealth was adjusted to 2023 dollars using the Consumer Price Index.

Sources: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data; U.S. Department of Commerce, Bureau of the Census, 2023 Current Population Survey data; and the Federal Reserve Board, Board of Governors in cooperation with the U.S. Department of the Treasury, 2022 Survey of Consumer Finances.



Table 3

Principal operator household income and assets by source and farm type, 2023

Farm type		Median total household income	Average income			Median total wealth	Average total wealth
			Total	Farm	Off farm		
U.S. dollars (thousands)							
Small	Retirement	78.2	98.1	8.0	90.0	1,264.3	1,976.5
	Off farm	124.5	149.6	-3.7	153.3	1,220.5	1,790.7
	Low sales	58.3	72.3	-5.7	78.0	1,376.1	2,168.4
	Moderate sales	114.4	111.7	44.8	66.9	2,272.2	4,109.1
Midsize		196.6	224.2	131.8	92.4	2,929.6	4,507.4
Large-scale	Large	392.0	558.2	416.8	141.4	4,750.3	7,764.4
	Very large	1,018.2	1,982.5	1,894.4	88.1	10,038.8	15,666.7
All family farms		98.0	147.6	34.7	113.0	1,439.1	2,541.2

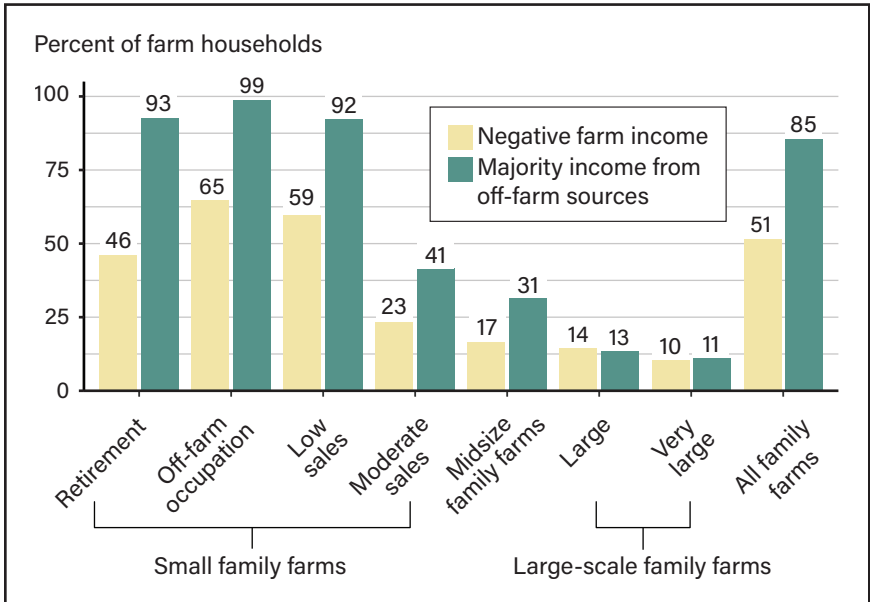
Note: Operator household income is not estimated for nonfamily farms. Off-farm income includes off-farm self-employment, or wage/salary jobs, interest and dividends, benefits from Social Security and other public pensions, alimony, annuities, net income of estates or trusts, private pensions, unemployment income, and other income. Components may not sum to 100 percent due to rounding.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.

- About 85 percent of all U.S. farm households earned the majority of their total household income from off-farm sources in 2023. Off-farm income can be used to cover some portion of farm expenses if necessary. As farm size increases, the percentage of households relying on off-farm sources for the majority of their income decreases, and the share of households with positive farming income increases. Although more than 90 percent of retirement, off-farm occupation, and low sales farm households receive over half of their income from off-farm sources, that was also true for 11 percent of households operating very large family farms (figure 7).

Figure 7

Share of principal operator households with negative farm income and a majority of their income from off-farm sources by farm type, 2023



Note: The percent of households earning 50 percent or more of total household income from off-farm sources is calculated using households with positive total household income. Off-farm income includes off-farm self-employment, wage/salary jobs, interest and dividends, benefits from Social Security and other public pensions, alimony, annuities, net income of estates or trusts, private pensions, unemployment income, and other income.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.



Unpriced Stored Commodity

The most recent Agricultural Resource Management Survey (ARMS) included a new section asking farm operations to report the amount of their unpriced stored corn, soybeans, and wheat for each quarter in the calendar year. Unpriced stored commodity are crops intended for sale that have not been pledged under a forward contract. Farm operations can place unpriced commodity either in onfarm storage or pay for off-farm storage. Grain storage capacity has been increasing over the past 20 years, which allows farm operations to delay sales beyond the harvest period. Holding unpriced commodity is a strategy that farms may use to protect farm income because local cash prices tend to be lowest after harvest and typically rise in the months following harvest.

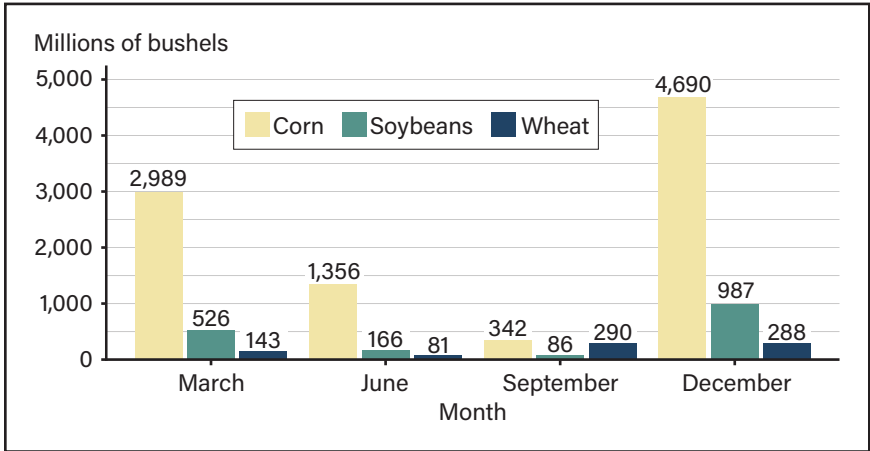
- The total amount of unpriced corn, soybeans, and wheat stored by farms differed widely across calendar year 2023, with larger volumes in postharvest months (figure 8).
- By total volume, corn volumes comprised the largest amount of unpriced commodity stored by farm operations in 2023, from approximately 342 million bushels in September to 4.7 billion bushels in December. Depending on the quarter, soybeans and wheat comprised the second largest amount of unpriced commodity.
- USDA reported above-average levels of grain stocks in 2023, and producers responding to ARMS reported that a significant portion of those stocks remained unpriced. The average share of total stocks as of December 2023 that was unpriced was 38.6 percent for corn, 32.9 percent for soybeans, and 20.4 percent for wheat.³



³ For total stocks, the authors used data reported by USDA, National Agricultural Statistics Service in their January 12, 2024, Grain Stocks Report. These data include both unpriced and priced inventory.

Figure 8

Total unpriced stored corn, soybeans, and wheat in 2023, by quarter



Note: Commodity quantities are reported as of the first of the month listed.

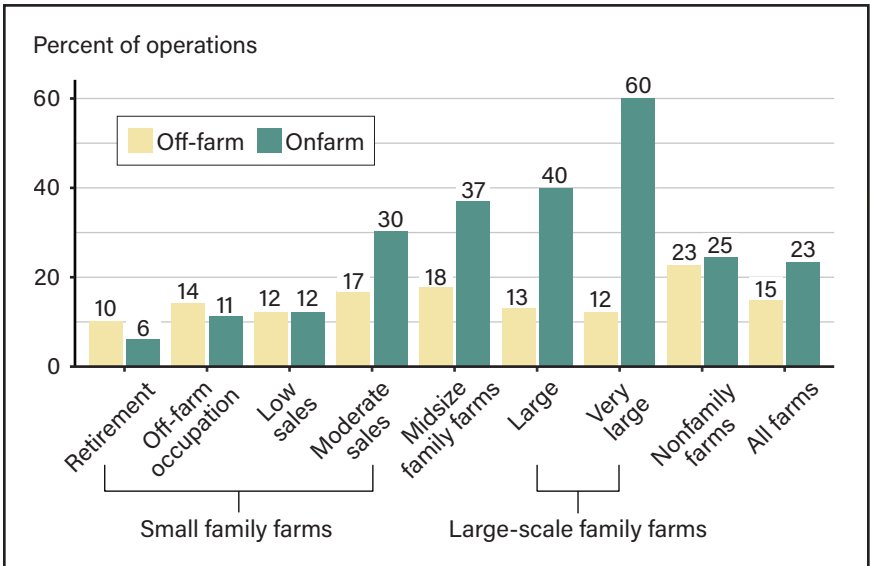
Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.

- As of December 1, 2023, 23 percent of corn, soybeans, and wheat operations reported having unpriced stored commodity located onfarm; 15 percent reported unpriced stored commodity located off farm (figure 9).
- The percent of family farms that reported unpriced stored commodity located onfarm (as of December 1, 2023) increased with farm size, from 6 percent for retirement farms to 60 percent for very large farms.
- Retirement farms were also the least likely to report off-farm storage of unpriced commodity at 10 percent.
- The largest share of family-run operations reporting off-farm unpriced commodity were moderate sales (17 percent) and midsize (18 percent) farms.
- The share of nonfamily farms reporting onfarm unpriced stored commodity (25 percent) was similar to the share of nonfamily farms reporting off-farm unpriced stored commodity (23 percent).



Figure 9

Percent of corn, soybean, and wheat operations that stored unpriced commodity in December 2023, by farm type and position

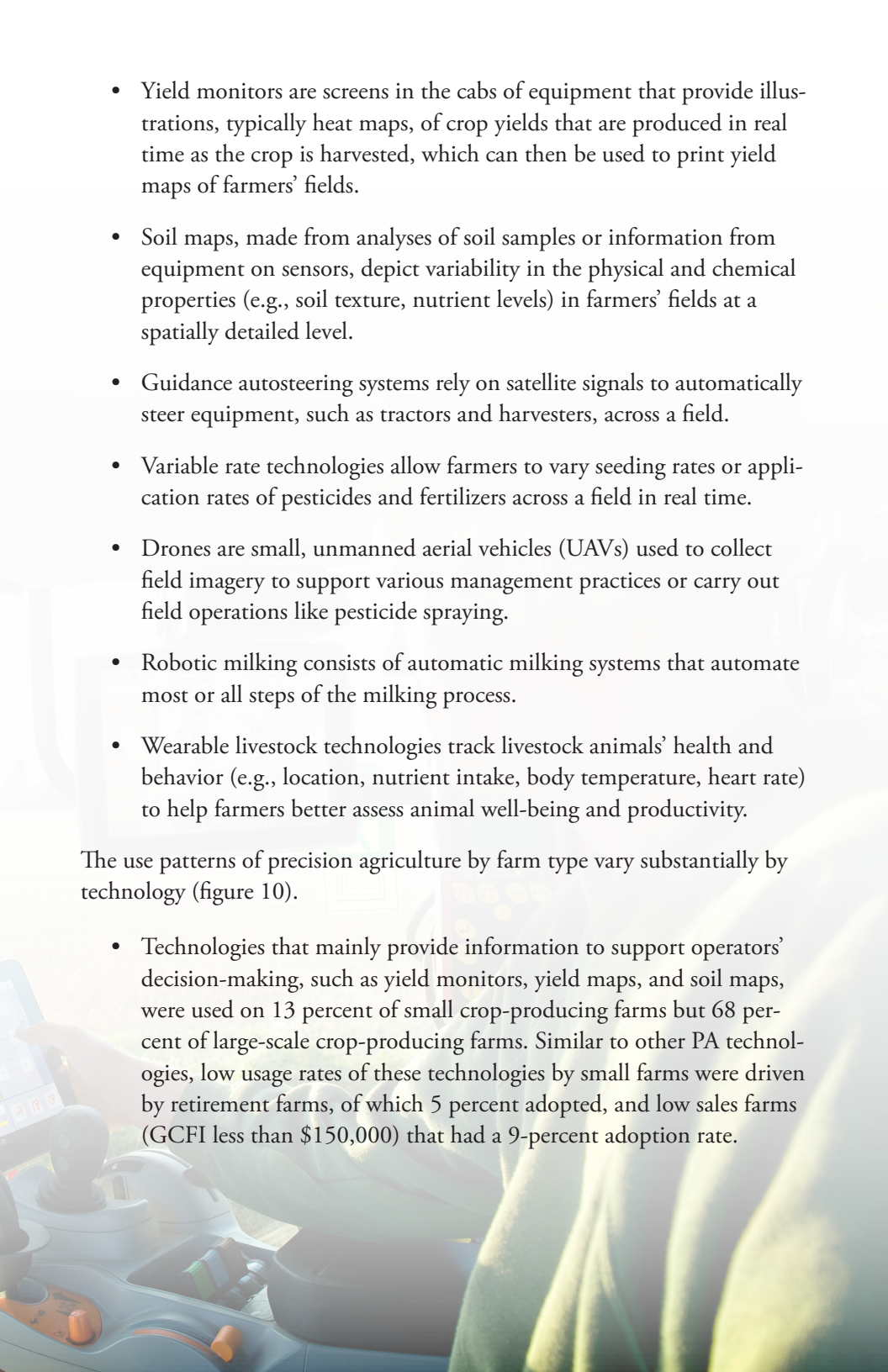


Note: Only corn, soybean, and wheat operations are included. An operation is categorized based on the value of production for the target commodity being the majority share of total value of production.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.

Precision Agriculture Adoption

Since the mid-1990s and 2000s, U.S. farm operators have been increasingly using precision agriculture (PA) technologies to boost their farm's productivity, reduce certain input use, and help streamline day-to-day management on their operations. PA technologies encompass a suite of sophisticated tools that incorporate detailed data from various sources to improve farmers' site- and livestock-specific management practices. USDA asked farm operators in each of the contiguous 48 States about their use of a wide variety of PA technologies, including the following, for the first time in 2023:

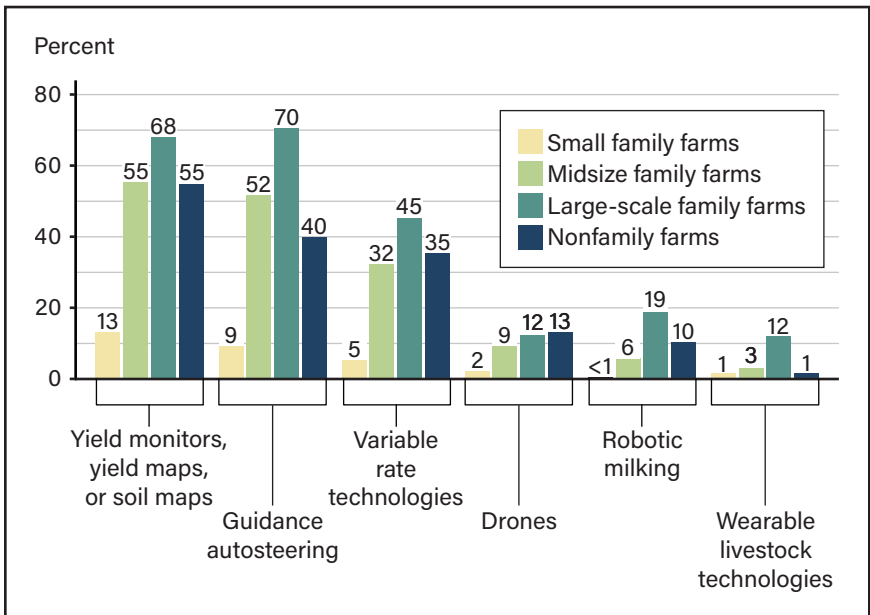
- 
- Yield monitors are screens in the cabs of equipment that provide illustrations, typically heat maps, of crop yields that are produced in real time as the crop is harvested, which can then be used to print yield maps of farmers' fields.
 - Soil maps, made from analyses of soil samples or information from equipment on sensors, depict variability in the physical and chemical properties (e.g., soil texture, nutrient levels) in farmers' fields at a spatially detailed level.
 - Guidance autosteering systems rely on satellite signals to automatically steer equipment, such as tractors and harvesters, across a field.
 - Variable rate technologies allow farmers to vary seeding rates or application rates of pesticides and fertilizers across a field in real time.
 - Drones are small, unmanned aerial vehicles (UAVs) used to collect field imagery to support various management practices or carry out field operations like pesticide spraying.
 - Robotic milking consists of automatic milking systems that automate most or all steps of the milking process.
 - Wearable livestock technologies track livestock animals' health and behavior (e.g., location, nutrient intake, body temperature, heart rate) to help farmers better assess animal well-being and productivity.

The use patterns of precision agriculture by farm type vary substantially by technology (figure 10).

- Technologies that mainly provide information to support operators' decision-making, such as yield monitors, yield maps, and soil maps, were used on 13 percent of small crop-producing farms but 68 percent of large-scale crop-producing farms. Similar to other PA technologies, low usage rates of these technologies by small farms were driven by retirement farms, of which 5 percent adopted, and low sales farms (GCFI less than \$150,000) that had a 9-percent adoption rate.

Figure 10

Percent of farms adopting precision agriculture technologies by technology and farm type, 2023



Note: Farms that did not harvest any cropland are not included in the estimates of yield monitors, yield maps, soil maps, guidance autosteering, variable rate technologies, and drones. Farms that did not produce milk in 2023 are not included in the estimates of robotic milking adoption. Only farms with sales of livestock commodities (cattle, hogs, dairy, poultry, and other livestock) are included in the estimates of wearable livestock technologies.

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.

- Guidance autosteering systems on tractors, harvesters, and other equipment were used on 9 percent of small farms, 52 percent of midsize farms, and 70 percent of large-scale crop-producing farms. The adoption of these systems, as with several other PA technologies, increases with farm size primarily because larger farms can benefit more from employing these tools than smaller farms.
- Variable rate technology (VRT) was used moderately across the crop farm size distribution, with adoption rates of 5 percent for small farms, 32 percent for midsize farms, and 45 percent for large-scale farms. The scale, structure, and soil variability of farms play a large role in explaining these usage patterns.

- The adoption of drones was quite limited, plateauing at 12 percent of large-scale, crop-producing family farms and 13 percent of nonfamily farms.
- Precision livestock farming use was low but mixed across farm sizes. Robotic milking was adopted on 19 percent of large-scale farms that produced milk. The adoption rates for wearable technologies on farms with livestock commodity sales ranged from 1 percent of small farms to 12 percent of large-scale farms.
- The motivations underlying farmers' PA adoption were diverse and broadly consistent with the stated benefits of the technologies (table 4). For instance, of the farms that adopted yield monitors, yield maps, or soil maps, many did so to increase yields (55 percent), reduce purchased input costs (41 percent), and/or improve soils or reduce environmental impacts (40 percent).
- These same three factors were among the most common for VRT, although a greater share of VRT adopters were motivated by reducing purchased input costs (62 percent).
- On the other hand, reduced labor time and operator fatigue spurred farmers to adopt PA technologies having substantial labor-saving potential. Half of all farms on which guidance autosteering systems were used indicated that saving labor time was a reason for adoption, while the share of farms with robotic milking indicating this as a reason was 77 percent. Likewise, reduced operator fatigue was a decision factor for 64 percent of farms using guidance autosteering and 41 percent of those using robotic milking.
- While 52 percent of farms using wearable livestock technologies tended to indicate yield increases as a reason for adoption, many adopting farms were also influenced by broadband internet access (38 percent). Although high-speed internet is not necessary for some wearable devices that collect data locally and transmit smaller amounts of data to a central hub, it is necessary if large amounts of information need to be sent virtually for real-time analysis and decision making. However, farms indicating broadband access as a reason to adopt these technologies also tended to indicate other reasons for adoption, such as to increase yields.



Table 4

Percent of farms adopting precision agriculture technologies for a specific reason by technology and reason type, 2023

Reason for adopting	Yield monitors, yield maps, or soil maps	Guidance auto-steering	Variable rate technologies	Drones	Robotic milking	Wearable livestock technologies
	Percent					
Increase yields	55	31	58	40	26	52
Save labor time	23	50	22	40	77	34
Reduce purchased input costs	41	28	62	25	8	13
Reduce operator fatigue	14	64	12	23	41	11
Improve soils or reduce environmental impacts	40	14	36	29	4	3
Broadband internet access	3	3	3	7	1	38
Came standard on equipment	33	21	11	4	NA	NA

Note: For each column, only farms that adopted the specific technology are included in the estimates. Since robotic milking and wearable livestock technologies are not standard equipment on livestock farms, these cells are indicated as not applicable (NA).

Source: USDA, Economic Research Service (ERS) using USDA, National Agricultural Statistics Service and USDA, ERS, 2023 Agricultural Resource Management Survey data.



Conclusions and Implications

- **Family farms remain the dominant type of farm in the United States.** In 2023, 96 percent of U.S. farms were family farms, accounting for 83 percent of farm production (figure 1).
- **Small family farms comprised 86 percent of all farms and operated 41 percent of the farmland but generated 17 percent of the total value of production.** The largest share of the value of farm production (48 percent) occurred on large-scale family farms. However, small family farms accounted for 46 percent of the value of poultry and eggs and 45 percent of the value of hay production (figure 2).
- **The share of farms with a low-risk operating profit margin (operating profit margin of at least 25 percent) varied by farm size in 2023, with midsize and large-scale family farms being most likely to have low-risk operating profit margins (OPM).** Less than 30 percent of small family farms of each type operated in the low-risk zone compared with 42 percent of large-scale family farms. Between 52 and 85 percent of small family farms had an OPM in the high-risk zone (OPM less than 10 percent), depending on the farm type, compared with 34 percent of large and 29 percent of very large family farms, respectively (figure 3).
- **USDA Conservation Reserve Program (CRP) payments continued to be more concentrated among small farms than other government payments.** CRP payments target environmentally sensitive cropland and increasingly enroll grasslands in support of grazing operations, with most payments going to retirement farms, off-farm occupation farms, and low-sales farms. In contrast, most countercyclical-type and USDA, Natural Resources Conservation Service (NRCS) payments went to family farms with a gross cash farm income (GCFI) of \$350,000 or more (figure 4).
- **Overall, 16 percent of farms participated in Federal crop insurance in 2023, up from 14 percent in 2022. Participation varied by production, with 66 percent of farms producing row crops purchasing insurance compared with 12 percent of farms producing livestock.** Indemnities from Federal crop insurance were roughly



proportional to the acres of harvested cropland. Midsize and large-scale family farms together accounted for 67 percent of all harvested cropland acres and received 67 percent of indemnities from Federal crop insurance in 2023 (figure 5).

- **Farm households, in general, were not considered low income or low wealth compared with U.S. households.** In 2023, median farm household income (including both farm and off-farm income sources) exceeded that for all U.S. households but was lower than the median income of all U.S. households with self-employment income. About 42 percent of farm households had income below the median for all U.S. households, and 5 percent had wealth below the U.S. median in 2023 (figure 6).
- **Most farm households, 85 percent, received over half of their income from off-farm sources, and 51 percent had negative income from farming.** Reliance on off-farm income sources ranges from 99 percent of households associated with off-farm occupation farms to 11 percent of households that were the principal operator of a very large family farm (figure 7).
- **The percent of farms that held onfarm unpriced corn, soybean, or wheat commodity (as of December 2023) increased in line with farm size, with very large farms being the most likely to have onfarm unpriced commodity (60 percent).** However, no similar trend was observed with off-farm storage, with 12 percent of low sales farms and 12 percent of very large farms reporting unpriced off-farm commodity (figure 9).
- **Use of precision agriculture (PA) technologies varied by technology and farm type, as did the motivations underlying their use.** Adoption of yield monitors, maps, guidance autosteering systems, and variable rate technologies tended to be higher than that for drones, robotic milking, and wearable livestock technologies, with usage rates increasing with farm size (figure 10). Although many PA technologies were adopted for reasons related to increasing yields, reducing purchased input costs, or improving environmental quality, other PA technologies were adopted to save on labor time and reduce operator fatigue (table 4).