Economic Research Service
U.S. DEPARTMENT OF AGRICULTURE

Economic Information Bulletin Number 296

April 2026

Risk Management Practices on U.S. Farms and Ranches, 1996–2020

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U.S. DEPARTMENT OF AGRICULTURE

Economic Research Service
www.ers.usda.gov

Recommended citation format for this publication:

Baldwin, K., Miller, N., Todd, J. E. (2026). *Risk management practices on U.S. farms and ranches, 1996–2020* (Report No. EIB-296). U.S. Department of Agriculture, Economic Research Service.

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Abstract

This report summarizes the utilization of agricultural risk management strategies by U.S. farms between 1996 and 2020, using data from the Agricultural Resource Management Survey (ARMS). The risk management strategies considered in this report fall into four categories: (1) on-farm strategies, such as income and production diversification, and storage; (2) market-based tools, including Federal Crop Insurance, marketing and production contracts; (3) other Government programs producers use for managing risk, including countercyclical-type programs and disaster programs; and (4) strategies to manage longer term strategic risk, including investments in farm improvements and succession planning. Results show that although some broad trends in risk management strategy utilization between 1996 and 2020 can be identified, these overall dynamics are often associated with factors related to farm size or commodity specialization. For the classes of strategies examined, results indicate that holding savings, engaging in off-farm employment, and purchasing insurance other than Federal Crop Insurance (such as private single-peril (e.g., hail or fire) policies, liability insurance, or property insurance) are the most frequently used strategies among all farms.

Keywords: risk management, on-farm strategies, crop insurance, Government payments, strategic risk

Acknowledgments

The authors would like to thank Jeffrey Hopkins, Benjamin Gramig, Jonathan McFadden, Saleem Shaik, Dylan Turner, Utpal Vasavada, and Thomas Worth of USDA, Economic Research Service (ERS); Joseph Cooper and Cynthia Nickerson of USDA, Office of the Chief Economist; Joy Harwood of USDA, Farm Production and Conservation Business Center; Christopher Aulbur, Xuan Pham, and David Zanoni of USDA, Risk Management Agency; and three anonymous reviewers for their review comments. The authors also thank USDA, ERS staff Casey Keel, Grant Wall, and Christoper Whitney for editorial services, and Jeremy Bell for layout and design.

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A report summary from the Economic Research Service

Risk Management Practices on U.S. Farms and Ranches, 1996–2020

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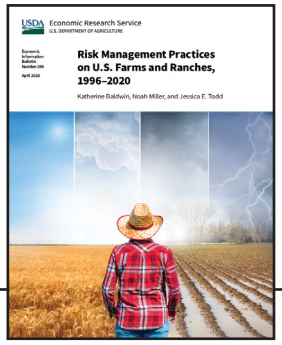


Key Points

- U.S. agricultural producers pursue a variety of strategies to manage risk, including on-farm strategies (such as income diversification and storage), market-based tools (including crop insurance and marketing contracts), other Government programs for managing risk (including countercyclical-type programs and disaster programs), and strategies to manage longer-term strategic risk (including investments in farm improvements and succession planning).
- This report analyzes risk management strategy utilization by U.S. farms from 1996 to 2020 using data from the USDA's Agricultural Resource Management Survey (ARMS).
- In many cases, usage of strategies varied by farm size and commodity specialization.
- Across all farms, savings (in the form of non-retirement financial assets) and engaging in off-farm employment were the most prominent risk management strategies utilized.
- The share of all farms participating in the Federal Crop Insurance Program (FCIP) has varied little since 2005, but participation has increased for very large farms and declined particularly for small farms.
- A small share of farms receives Government payments related to risk management. Although fewer than 15 percent of all farms received any countercyclical-type payment from the Agriculture Risk Coverage, Price Loss Coverage, or Dairy Margin Coverage programs in any given year, a higher share of midsize, large, and very large farms received such payments. Additionally, at most, 7 percent of farms received payments from any Federal disaster program in any year over the period analyzed.
- Fewer than one-third of producers had a succession plan in place in 2019, but the share rose over time among most age groups of farmers. The likelihood of elaborating a formal succession plan rose with farm size.

Why Does This Matter?

The last comprehensive analysis of risk management in U.S. agriculture was carried out in 1999. The years that followed witnessed evolutions in agricultural policy, changes in markets, and advances in technology that affected the risk environment in which producers operate. This study analyzes how utilization of risk management strategies has changed, and reports on what strategies were utilized by different types of U.S. farms from 1996 to 2020. It also examines the role of crop insurance and countercyclical-type programs in the wider context of a basket of strategies that producers use to manage risk.

Risk Management Practices on U.S. Farms and Ranches, 1996–2020

Introduction and Justification

Agriculture is often characterized as a risky business with farmers facing production uncertainty, price volatility, fluctuations in financial markets, and policy environment changes. In order to minimize downside risk,[1] producers employ a mix of risk management strategies based on their individual circumstances and aversion to risk. These risk management strategies include instruments that reduce the probability of economic loss from an adverse event (for example, adoption of technology or vaccinating animals against disease), mitigate the impact of said events (e.g., diversifying operations or purchasing insurance), or help to cope with the impact of an event once it occurs (including drawing down savings or accessing Government disaster assistance programs). In some cases, strategies employed may target other producer goals but may also perform a risk management function. For example, many farm households engage in off-farm employment as a mechanism to obtain health insurance, but the income earned off-farm also plays a role in smoothing farm household income.

As U.S. agricultural policy frameworks that provided price supports and supply controls for staple commodities were discontinued in the 1990s, a myriad of publications have sought to better understand risk management in U.S. agriculture. However, most of these analyses focused on risk management in a particular sector (Barham et al., 2011; Parsons, 2018; Pritchett et al., 2004) or region (Coffey & Schroeder, 2019; Tudor et al., 2014; Wahdat & Gunderson, 2021); risk management among particular groups of farmers (Hanson et al., 2004; Jablonski et al., 2022; Makus et al., 2007); the management of a particular type of risk (Shannon & Motha, 2015; Strzepek et al., 2010); or the utilization of a particular risk management strategy (Katchova, 2005a; Mishra et al., 2004; Prager et al., 2020).

Harwood et al. (1999) conducted the last comprehensive look at how U.S. producers managed risk in agriculture. The study found that producers operating the largest farms used more risk management strategies than small-scale operators, keeping cash on hand was the number one risk management strategy for farms of all sizes, and that most risk management tools addressed intrayear income uncertainty but had little effect on multiyear uncertainties. Since that report's release, technology has evolved, policy paradigms have progressed, and consumer preferences have shifted. Accordingly, the risk environment and the tools available to producers to manage risk differ from the 1990s.

[1] Various studies (for example, Chavas & Holt, 1996; Fausti & Gillespie, 2006; Saha et al., 1994) have concluded that producers are on average risk averse, and accordingly are more concerned with avoiding downside risk than maximizing upside risk.

This report provides an updated review of the farm-level risk management landscape by examining farm-level data from Phase III of the annual Agricultural Resources Management Survey (ARMS).[2] We compiled an inventory of the questions in ARMS related to risk management practices between 1996 and 2020. Identified practices were then grouped according to the concept of "risk layering," a heuristic concept that segments risks based on their severities and frequencies, and maps certain strategies for managing risks in the different layers (Antón et al., 2013; Ghesquiere & Mahul, 2010; Glauber et al., 2021; Skees & Barnett, 1999).[3] Strategies to manage risks that occur frequently but with minor losses characterize the normal business layer (or risk retention layer); strategies to manage higher-impact but less frequent losses fall under the marketable risk layer (or commercial risk layer); and strategies to manage risks that occur infrequently but with severe impacts are considered in the catastrophic risk layer. For normal business risks, on-farm risk management strategies, such as diversification or use of storage, can be effective. For marketable risks, market-based tools that transfer risk to other actors, such as insurance or contracting, can be used. For catastrophic risks, Government programs may be most effective at helping producers manage. This study also examined strategies for managing longer term strategic risk, including investment in farmland and farm succession planning. ARMS collected information on some risk management measures within these topic areas consistently across the entire period, whereas information on others changed frequently or was collected only periodically. Responses to these continuously and periodically asked questions formed the basis of our analysis. The results offer some insights into how certain types of farms have utilized various risk management strategies and, where possible, how the utilization of those strategies has evolved between the late 1990s and 2020 (for more information on the methodology and the characteristics of the data, see appendix A). The results also indicate that in some cases, ARMS may not be the most appropriate data source to examine the topic at hand, suggesting that further research may be necessary.

On-farm Risk Management Strategies

Farmers and farm households pursue a wide range of practices and strategies to mitigate income risk, including diversification, commodity storage, reliance on savings, and accessing credit. In addition to these strategies that are primarily pursued to manage income risk, producers make a wide variety of other farm management choices with risk reduction in mind, including choices related to fertilizers, seeds, pest management, irrigation, soil management, technology investments, software, business management, and labor. Because these choices often relate to production of a specific commodity or the physical growing conditions of an individual farm, questions in ARMS Phase III often do not allow an exploration of these topics in a systematic way across time. Accordingly, while the strategies explored in this section are not exhaustive, the analysis was as comprehensive as possible, given data availability.

[2] The Agricultural Resource Management Survey (ARMS) is sponsored jointly by USDA's Economic Research Service (ERS) and USDA, National Agricultural Statistics Service (NASS). The survey covers all farms in the 48 contiguous United States, excluding those on American Indian pueblos and reservations in Arizona and New Mexico. Since 1996, ARMS has collected information about land owned and rented by the farm operation; other farm assets; the area harvested with various crops; livestock sales; production expenses; spending on farm infrastructure; and income from various sources, including Government programs. In addition to the farm-level information, ARMS collects demographic information about the principal farm producer (the operator most responsible for decisions on the farm), and information about the principal producer's total household income, consumption spending, assets, and debt. Household-level data are only tabulated for family farms, which are farms where more than 50 percent of the farm's assets are owned by an operator and the extended family. Family farms comprise about 98 percent of all farms in the United States.

[3] The risk layering concept is used here to simplify and organize the discussion of the risk management strategies analyzed but should not be rigidly interpreted. Although certain strategies may be best suited for some types of risks, individual producers may employ different strategies for risks of varying frequencies and severities.

Diversification

"Diversification" refers to a group of strategies by which a producer can reduce overall income variation by earning income from different sources. Related to the financial concept of portfolio theory (Markowitz, 1952), diversification can reduce a farm household's income risk if returns from the different activities are not perfectly correlated (Kimura et al., 2010). Income of farm households can be diversified in different ways including raising a variety of crops and/or livestock; using multiple marketing channels; spreading production activities across multiple fields or other geographic units; pursuing other business activities related to the farm, such as offering custom agricultural services or renting out farmland; or earning income from off-farm activities. Despite the strong theoretical support for the notion of diversification as a risk management strategy, Mishra et al. (2004) noted that there has been comparatively little empirical analysis of the factors relating to the pursuit of diversification, with even fewer of these analyses specific to U.S. farms. Moreover, analyses have tended to focus only on one type of diversification (e.g., only crop diversification but not income diversification), which may overlook simultaneous pursuit of different strategies (Khanal, 2020). Acknowledging that farms pursue different strategies to achieve their goals in balancing risk reduction against their other business goals, we explored trends and data related to five diversification strategies: (1) production of a variety of commodities, (2) utilizing multiple sales outlets, (3) spreading production across multiple geographic areas, (4) diversification into other farm-related business activities, and (5) for the farm household, pursuit of off-farm income.

Producing a Variety of Commodities

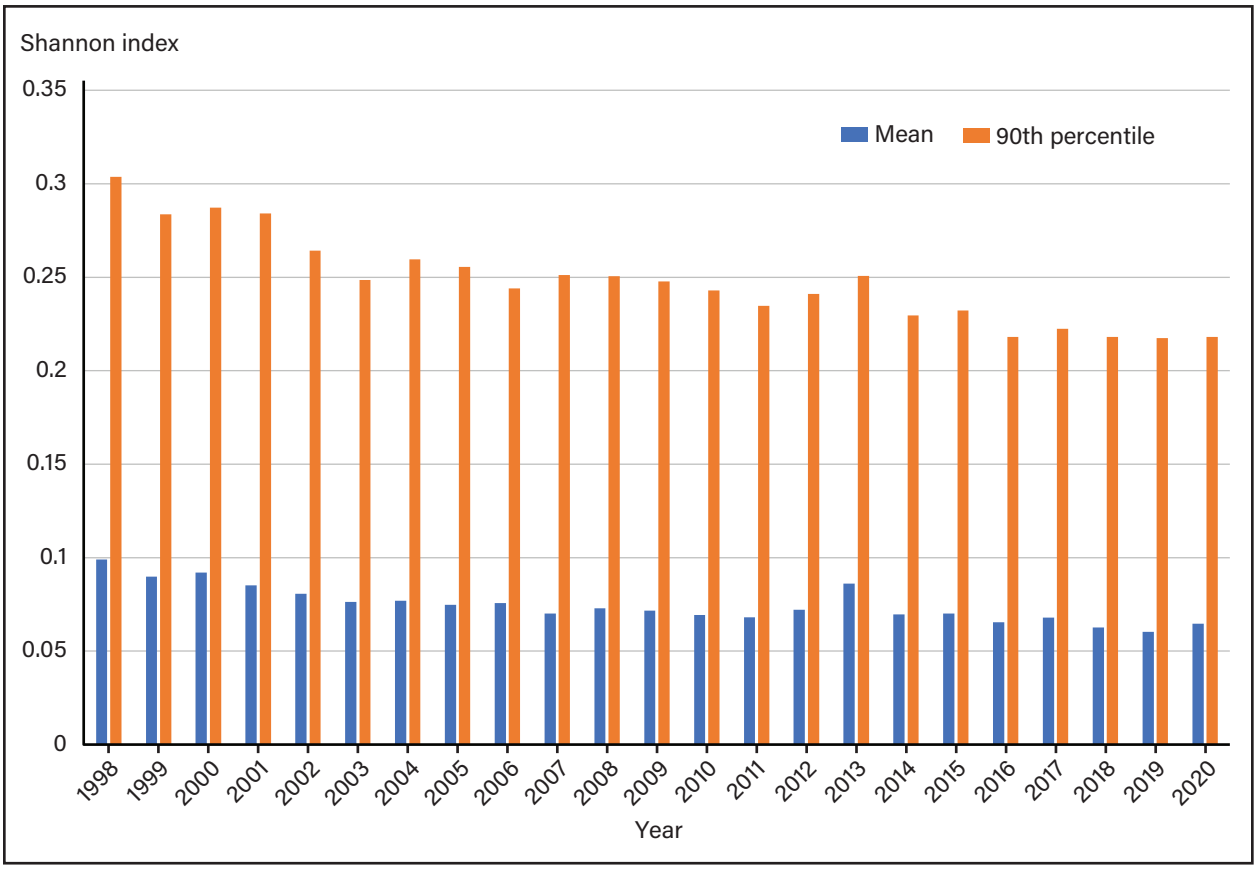
Producers can spread their income risk by diversifying the mix of commodities that they grow or raise. This production diversification is most effective if the yields or revenues of products are not strongly positively correlated. Previous work has found that diversification can reduce financial performance variability (Purdy et al., 1997) or raise the probability of achieving farm profitability (Mishra et al., 1999). At the same time, a decision to diversify production implies tradeoffs. As farms diversify production, they may be less able to capture efficiencies from economies of scale. For example, Katchova (2005b) found that production diversification was associated with lower farm assets, and Mishra et al. (2004) confirmed that farm size by value was inversely correlated to production diversification.

Although there can be tradeoffs between the benefits of diversification and maximizing economies of scale, previous studies of U.S. farm production diversification indicated that utilization of production diversification varies between different types of farms. Harwood et al. (1999) found that cotton farms were among the most diversified and poultry farms were the least diversified. Lancaster and Torres (2019) reported that small and medium-sized fruit and vegetable growers in 16 U.S. States raised 16.7 different crops on average, whereas Roesch-McNally et al. (2018) reported that most acreage in the Corn Belt region was devoted to either a corn-soybean rotation or continuous corn planting. MacDonald et al. (2018) looked at trends in crop production over time, finding that among both major and minor field crops (with the exception of potato farms), the share of farms producing both crops and livestock has fallen between 1996 and 2015. At the same time, the share of farms producing four or more crops has also declined for most commodity specializations. Aguilar et al. (2015) reported a nationwide decline in crop diversification from 1978 to 2012, but they also found that crop diversity varied regionally, based on where conditions made crop specialization more profitable.

Our analysis of ARMS data from 1998 through 2020 confirmed the decline of production diversification. Using data on each farm's value of production across different commodities, we constructed a Shannon diversification index (for more information, see appendix B), which quantifies farm diversi-

fication by considering the number of commodities produced by a farm and the relative importance of each commodity to the farm's total production value. The index ranges from 0 to 1, where a farm that completely specializes in one commodity would receive an index value of 0, whereas a farm that spreads production value equally across a basket of commodities would receive an index value of 1. With the mean farm's index estimated at less than 0.1 in 2020, production activities were highly concentrated into very few commodities for the average farm (figure 1). Even for the most diverse decile (e.g., the 90th percentile) of farms, production activities were increasingly concentrated among very few products.

Figure 1
U.S. farm production diversification, 1998–2020



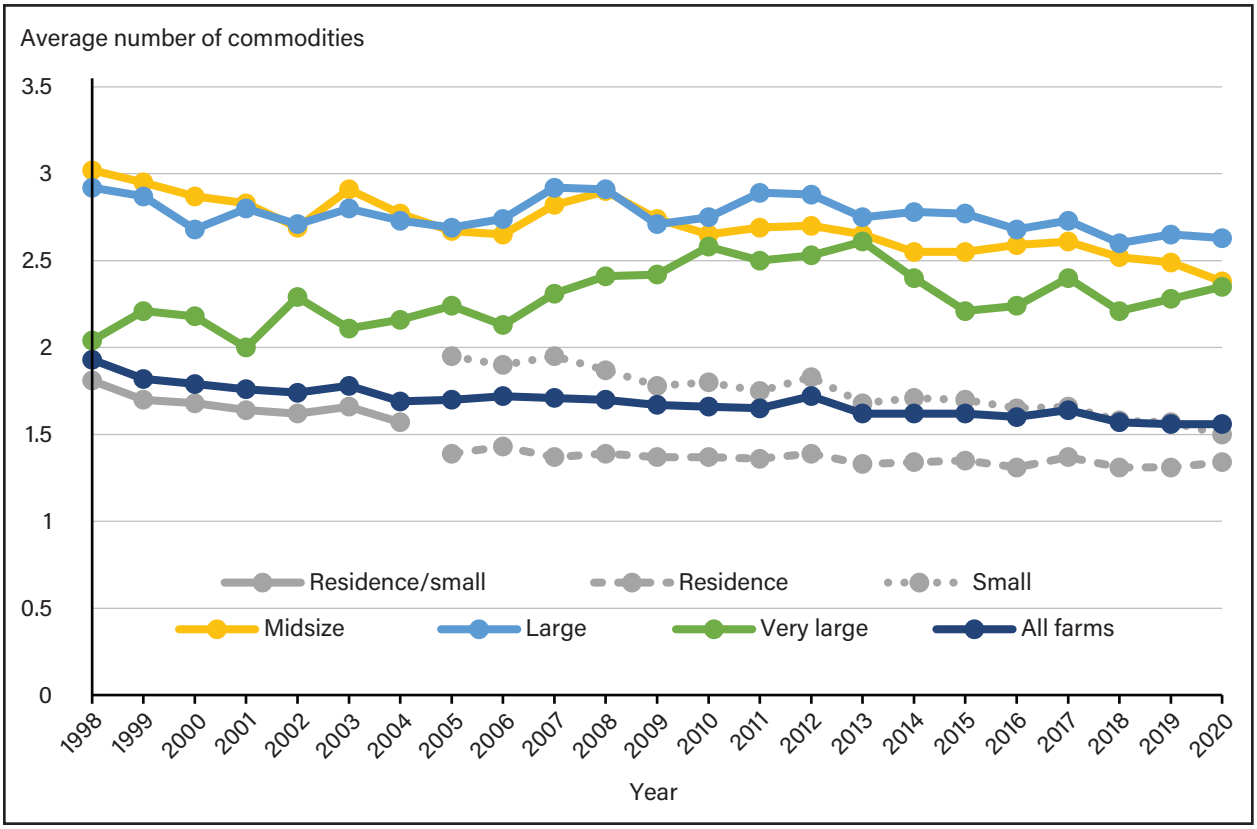
Note: The Shannon index is a measure of production diversity, where a farm that completely specializes in one commodity receives an index value of 0 and a farm that spreads production value equally across a basket of commodities receives an index value of 1.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 1998–2020 Agricultural Resource Management Survey data.

Conclusions with respect to the relationship between diversification and farm size have varied. In their 2021 analysis of risk management strategies employed by small farms in Tennessee, Adhikari & Khanal (2021) found that of the strategies they examined, production diversification was the most commonly employed. Earlier analysis from Pope & Prescott (1980) indicated that larger farms tend to be more diversified, while Mishra et al. (2004) concluded that farm size is inversely related to diversification.

Our analysis of ARMS data indicates that at the aggregate level, smaller farms have tended to produce fewer commodities than farms of other sizes (figure 2). For midsize, large, and very large farms, the average number of commodities produced has converged since the late 1990s at close to 2.5 commodities produced per farm, with midsize farms growing more specialized over the period while very large farms slightly increased the number of commodities produced.

Figure 2
Average number of commodities produced per U.S. farm, by farm size, 1998–2020



Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Residence/small = all farms with GCFI < $350,000 because residence farms are not separable from other small farms before 2005. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

Note: The number of commodities produced is calculated for all commodities for which a positive value of production is recorded. All values are in real, 2011 dollars using farm producer price index (PPI).

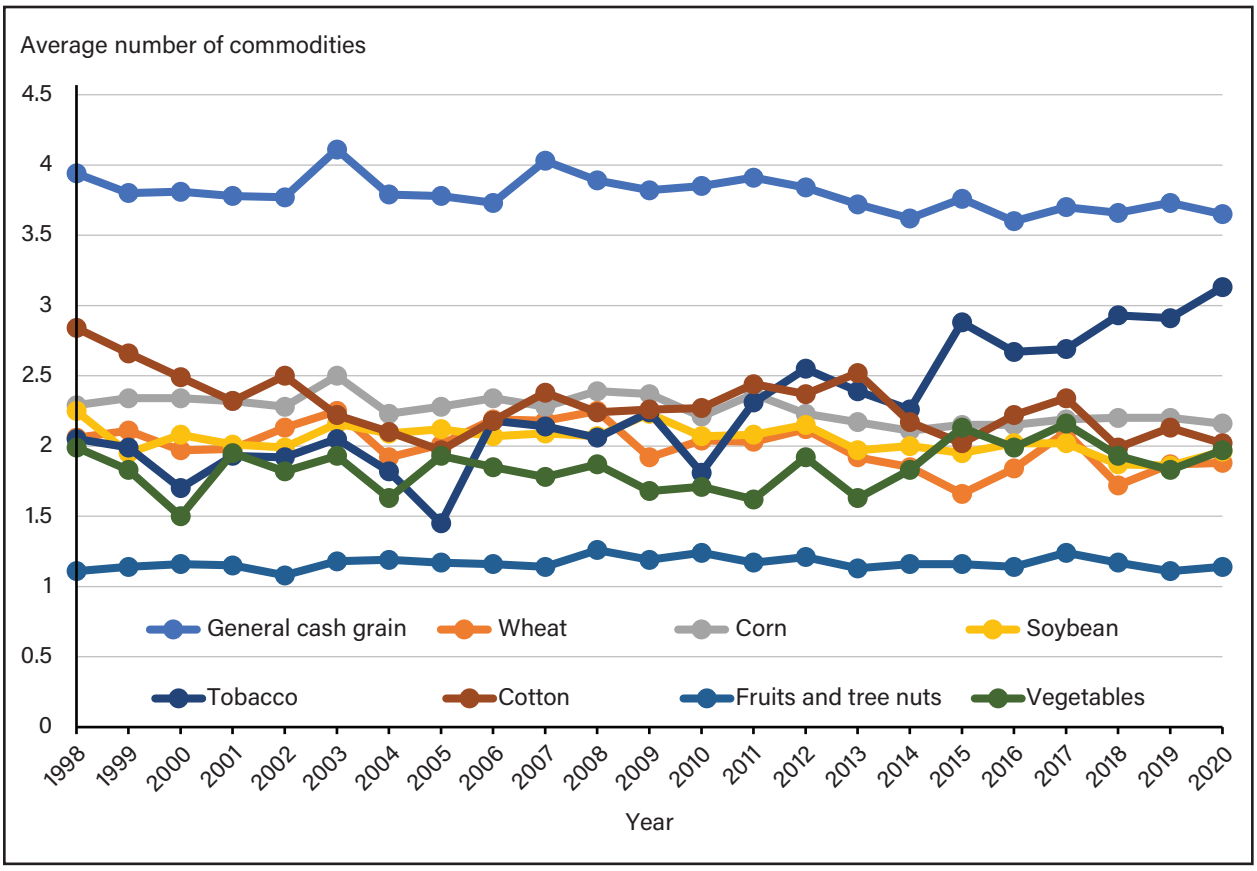
Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 1998–2020 Agricultural Resource Management Survey data.

Further differences were apparent according to farm commodity specialization (figure 3). Over the study period, most farms specializing in row crops grew around two commodities, which is consistent with the most common crop rotation patterns for major commodities (e.g. corn-soy rotations, wheat-corn rotations). In contrast, farms specializing in general cash grains (e.g., a farm for which a majority of production is cash grains, but no single grain makes up a majority of production) grew close to four commodities each year, while farms specializing in fruits/tree nuts tended to specialize in the production of only fruits and tree nuts.[4] The largest apparent shifts over time were for cotton farms (becoming more specialized) and tobacco farms (becoming more diverse). This variation was also apparent in different types of livestock farms (figure 4). Farms specializing in beef cattle, on average, produced only that commodity, but dairy farms produced greater than 2.5 commodities on average, which were likely feed sources for their dairy cattle. Hog and poultry farms fell between these two extremes.

[4] This section of ARMS does not allow producers to specify what products they are producing within the aggregated categories (here, fruits and tree nuts, and vegetables). Accordingly, these data indicate that producers of fruit and tree nuts are not producing commodities outside of that category, but does not tell us how many fruits they are growing.

Figure 3

Average number of commodities produced on U.S. farms, by crop specialization, 1998–2020

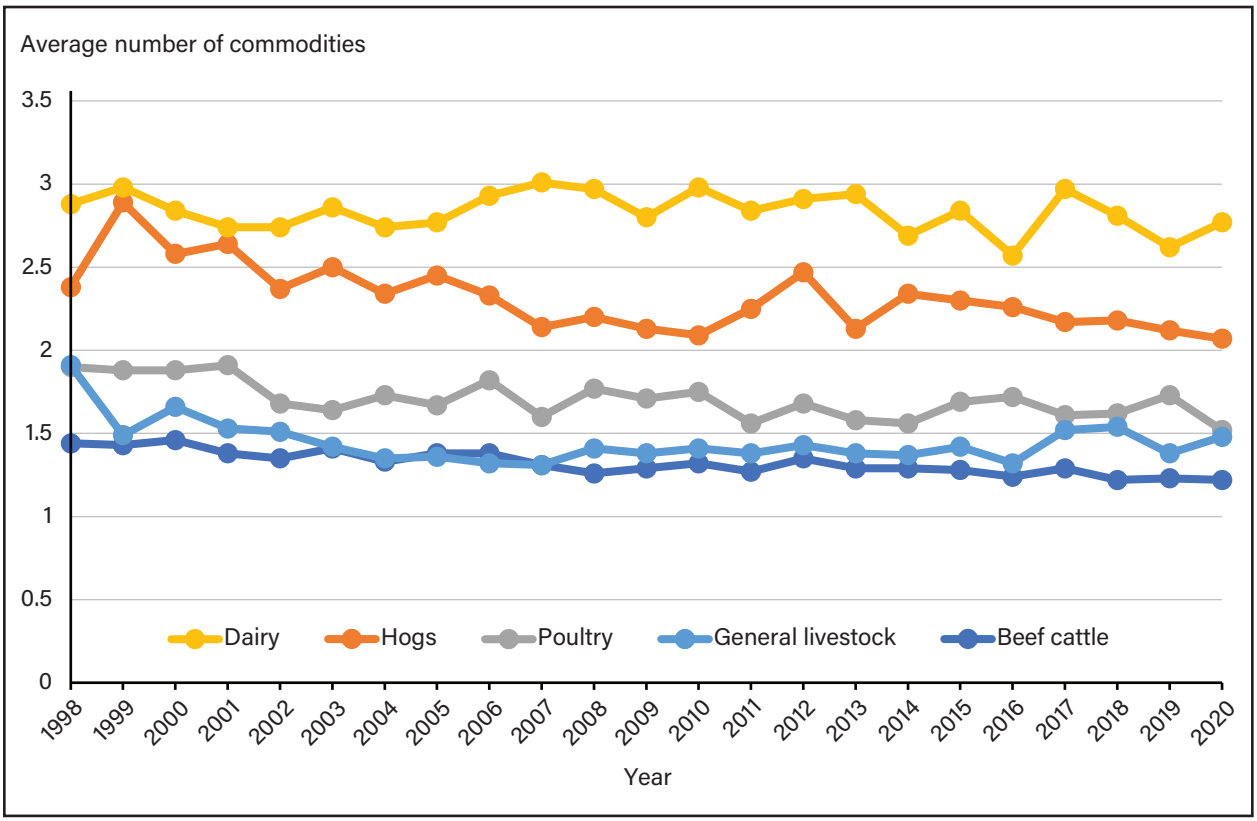


Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production. The number of commodities produced is calculated for all crops for which a positive value of production is recorded. For aggregate categories (fruits and tree nuts, vegetables), these data indicate only whether those farms are growing commodities other than those in the aggregates. The data do not account for diversification within the category.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 1998–2020 Agricultural Resource Management Survey data.

Figure 4

Average number of commodities produced on U.S. farms specializing in livestock, 1998–2020



General livestock = A majority of production is livestock, but no single animal makes up the majority of production.

Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production. The number of commodities produced is calculated for all commodities for which a positive value of production is recorded.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 1998–2020 Agricultural Resource Management Survey data.

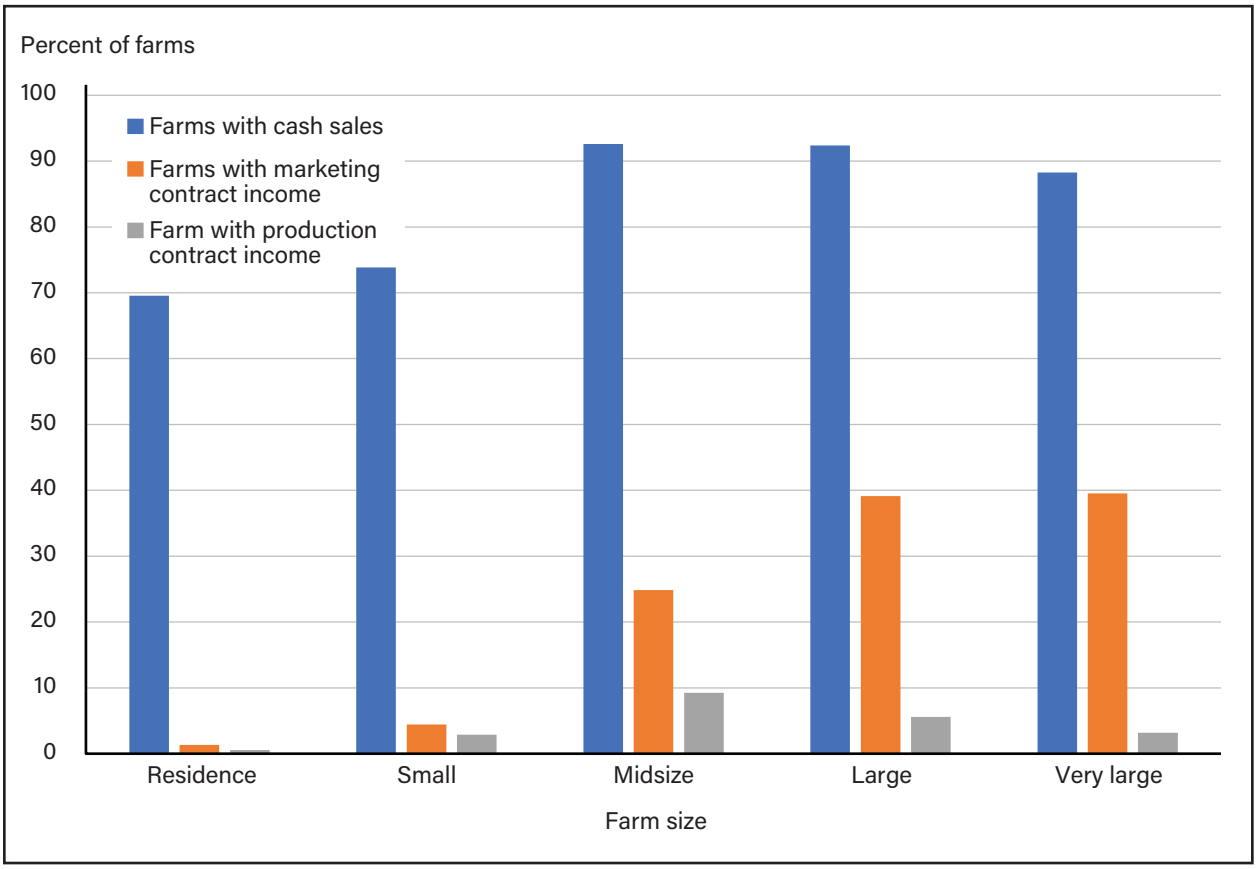
Utilizing Multiple Sales Outlets

Even for farms that focus on producing one commodity, producers can still employ diversification by selling their products into multiple outlets. Although producers have a variety of marketing options (such as through wholesale markets, contracting, retail sales, or direct-to-consumer sales), literature on sales diversification has been limited. The prominence of certain marketing channels has been investigated previously,[5] but the literature on farm-level marketing has focused almost exclusively on local foods or direct-to-consumer sales (Hunt & Matteson, 2012). For example, Martinez and Park (2021) noted that local food sales (sold directly to consumers, retailers, institutions, or intermediaries) accounted for 76 percent of the gross value of local food producers' agricultural product sales in 2015, with sales to intermediate markets and institutions predominating. Low and Vogel (2011) explored local food sales trends also by farm size class and found that small farms accounted for 80 percent of local food sales farms, but these farms overwhelmingly participated in only direct-to-consumer sales channels.

[5] See, for example, Calvin et al., 2001; Dimitri & Oberholtzer, 2009; MacDonald et al., 2004; Martinez & David, 2002.

Although ARMS does not collect data on how many individual sales outlets a grower used, it does ask about whether farms earned income from cash sales, marketing contracts, or production contracts.[6] [7] We observed a correlation between farm size and use of marketing contracts. While less than 5 percent of small farms engaged in marketing contracts, close to 40 percent of large and very large farms did so (figure 5). Engaging in production contracts is more limited, with fewer than 10 percent of farms of all sizes reporting income from production contracts.

Figure 5
Percent of U.S. farms utilizing different sales arrangements by size, 2019



Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

Note: All values are in real, 2011 dollars using farm producer price index (PPI).

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2019 Agricultural Resource Management Survey data.

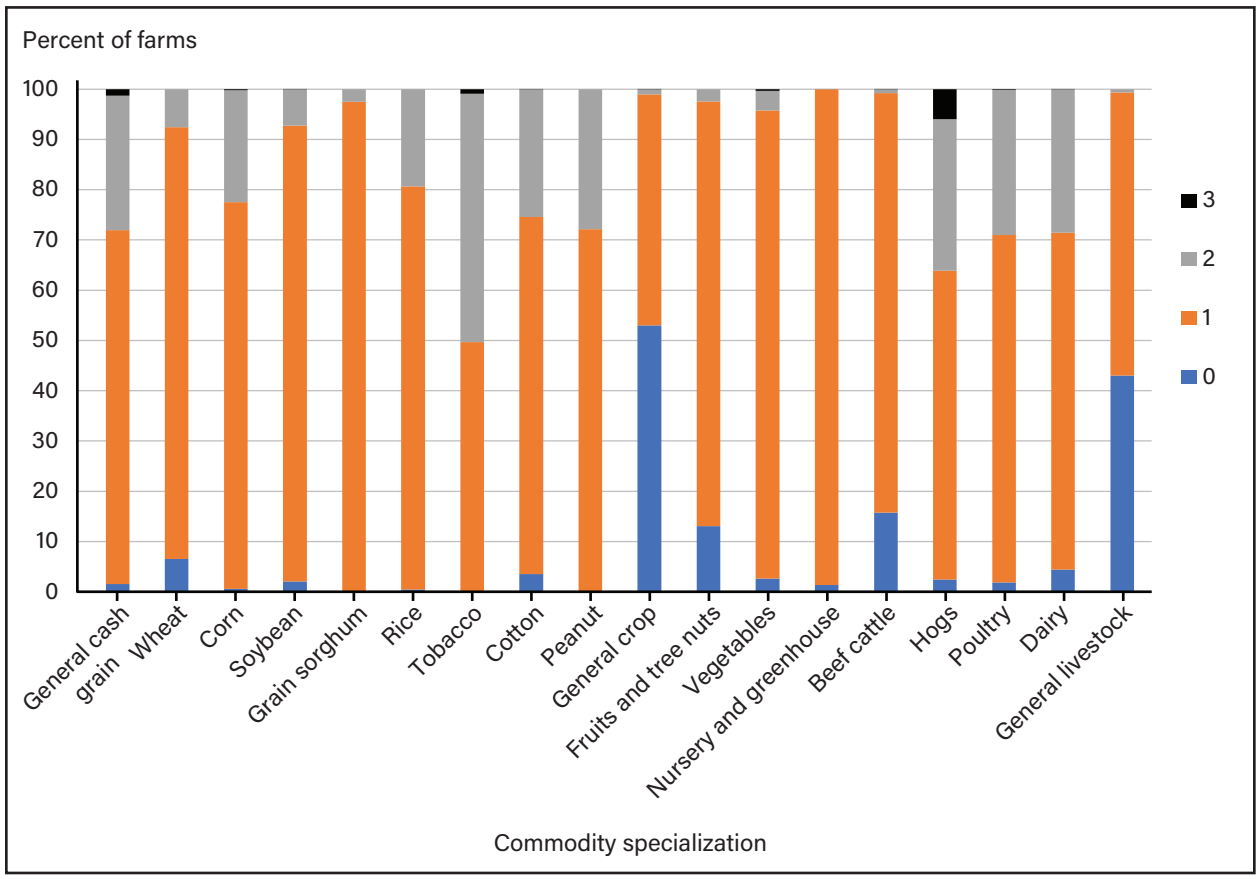
Marketing choices are often closely related to the structure of individual commodity markets. ARMS data indicate that only a minority of farmers of most commodity specializations used more than one marketing channel. For farms of nearly all commodity specializations, a majority of operations utilized

[6] Other questions look at whether or not producers are selling direct-to-consumers or to intermediate markets. However, since these sales can be either cash sales or carried out through contracts, it's not possible to separate them out as a fourth option from the three presented here.

[7] These concepts of marketing contracts and production contracts are explored further in the section on contracting. The distinction between a production contract and a marketing contract, broadly, is that producers under a production contract do not own the commodity but raise it on behalf of a contractor who provides the inputs, while a marketing contract specifies only that a producer will deliver a specified amount of production at some future date.

only one sales channel in 2019, with a higher share of farms using cash sales than any other outlet, across all specializations (figure 6).[8] Moreover, large proportions of farms for some commodities—prominently general crop and general livestock farms—used zero sales channels, indicating that none of their production was sold during the year in question.[9] Utilization of two or more channels (either marketing or production contracts in addition to cash sales) was more common among certain livestock (i.e., hogs, poultry, and dairy) and tobacco operations.[10]

Figure 6
Number of sales outlets utilized by commodity specialization, 2019



Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production. Note that these data indicate how farms of these specializations utilize different sales outlets across all commodities produced by the farm—not necessarily use of different outlets for the commodity in question.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2019 Agricultural Resource Management Survey data.

[8] One technical exception to this finding is that general crop farms were more likely to use zero channels (53.6 percent of producers) than cash sales (46.2 percent), but cash sales still predominated over the other options.

[9] These operations could also predominantly be renting out farmland or holding land under conservation contracts, such that they would not be producing commodities for sale but would still be considered farms within the context of the ARMS survey.

[10] Whether or not farms access the different marketing channels gives an incomplete picture of how producers may diversify their sales risk. For example, contracting only a small amount of production may not be sufficient to mitigate overall income volatility. Data from 2019 indicate that while income from cash sales continued to predominate, sales from marketing contracts reached at least 30 percent of the value of income from cash sales for rice, cotton, fruit and tree nuts, vegetables, and dairy operations, and even exceeded income from cash sales for tobacco and peanut operations.

Spreading Production Spatially

Producers can also diversify by spreading production across areas for which weather extremes (and thus, crop yields) are largely uncorrelated, a strategy known as geographic diversification.[11] Previous analyses found that geographic diversification could potentially be a profitable risk management strategy for Georgia peaches (Davis et al., 1997), California table grapes (Krueger et al., 2002), wheat in the Central Plains (Larsen et al., 2015), and commodities at high spoilage risk (Villa et al., 2019), but that gains for grain farmers in Central Illinois were negated by higher operational and travel costs (Nartea & Barry, 1994).

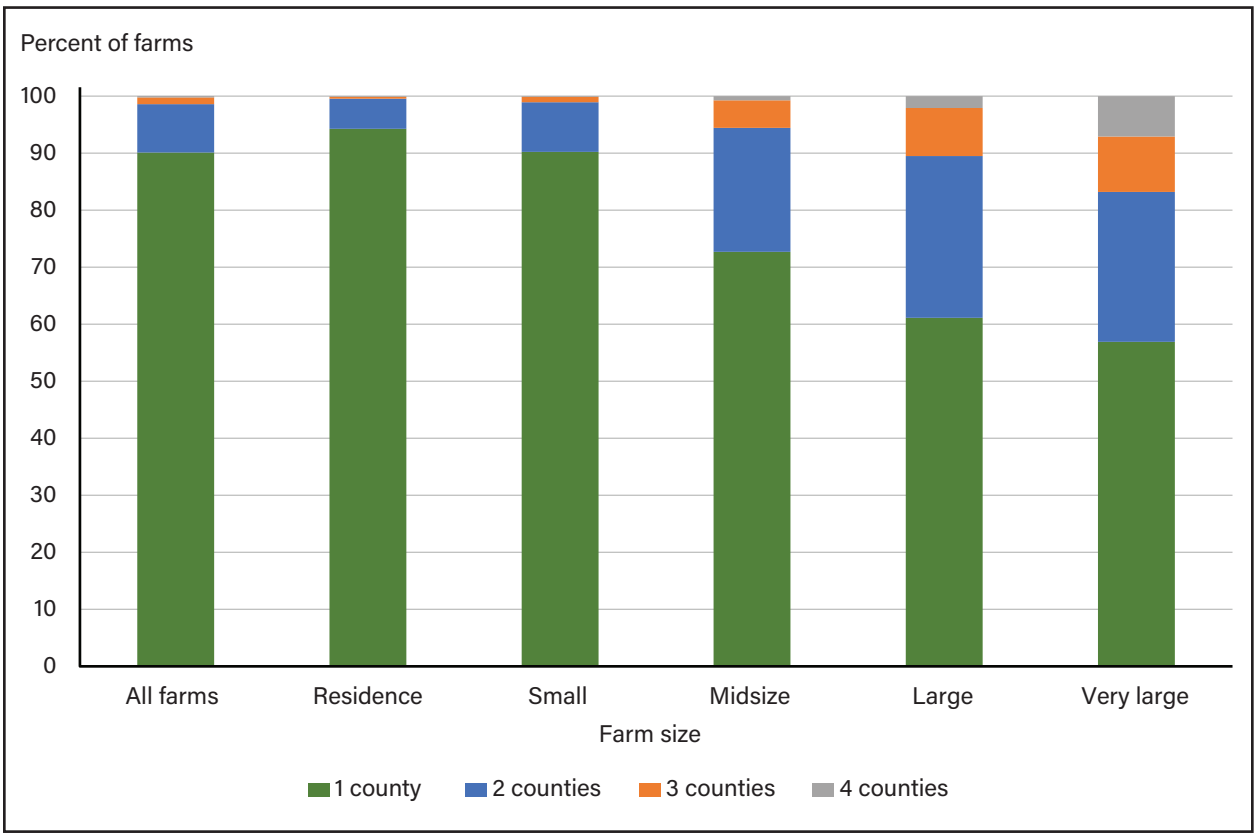
The ARMS survey does not directly query producers about use of geographic diversification specifically as a risk management strategy, but it has asked producers about farm geographic dispersion across counties every 5 years in conjunction with the Census of Agriculture. These data indicate that in 2017, only 10 percent of U.S. farms reported operations in more than one county, with most of those (8.5 percent of all farms) spread across only two counties. This suggests that most farms did not diversify geographically.[12] Furthermore, the data indicate that this geographic spread has been largely stable over the past two decades. Larger farms more frequently operated in more than one county, consistent with operations spilling across county lines as more acreage is added (figure 7).[13] While fewer than 10 percent of residence or small farms spread operations across multiple counties, around 40 percent of large and very large farms did so, with more than 15 percent of very large farms spreading operations across at least 3 counties.

[11] Firms can also pursue geographic diversification in order to overcome production seasonality and provide more consistent supplies to the market. Glaser et al. (2001) provide an example from the U.S. lettuce industry.

[12] The finding that most farms operating in multiple counties report operations in just two counties is consistent with farms being located near the county line and farming on both sides.

[13] With more income, these farms likely have larger production and thus the greater the probability that they will extend across county lines. These farms also have higher financial capacity to spread out their operation.

Figure 7
Percent of U.S. farms dispersed across multiple counties, by farm size, 2017



Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

Note: All values are in real, 2011 dollars using farm producer price index (PPI).

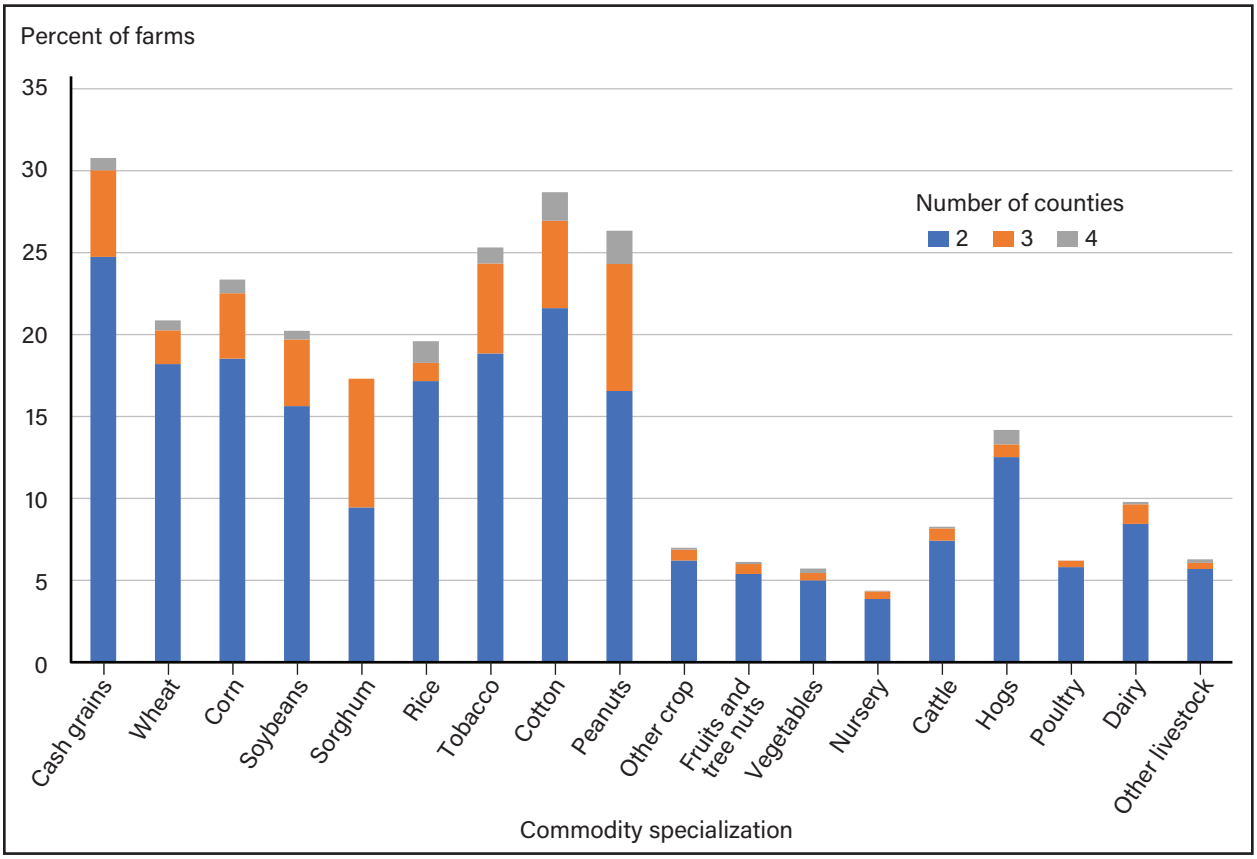
Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2017 Agricultural Resource Management Survey data.

In addition, some variation in farm geographic dispersion by commodity specialization was apparent (figure 8). A higher share of cropping operations utilized geographic diversification than livestock operations,[14] while operations specializing in highly perishable goods (fruits, vegetables, and nursery crops) were less geographically diversified than row crops, contrary to the findings from the literature. This finding likely reflects issues of scale, with row crop farms more commonly spreading their operations over larger areas to reduce per acre costs.[15]

[14] Livestock production is prominent in counties in the western United States where counties tend to be larger in size, which may also explain the lower share of those farms producing in more than one county.

[15] It could also reflect how the data are collected in ARMS, in that a single entity may own multiple operations in geographically disparate areas, but ARMS may sample each of those operations separately. It is also true that county size is not consistent across U.S. States, so this measure of geographical dispersion could understate the scale of dispersion for commodities for which production is concentrated in regions with larger counties. However, ARMS data do not have enough detail to analyze this possibility.

Figure 8
Percent of U.S. farms dispersed across multiple counties, by commodity specialization, 2017



Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2017 Agricultural Resource Management Survey data.

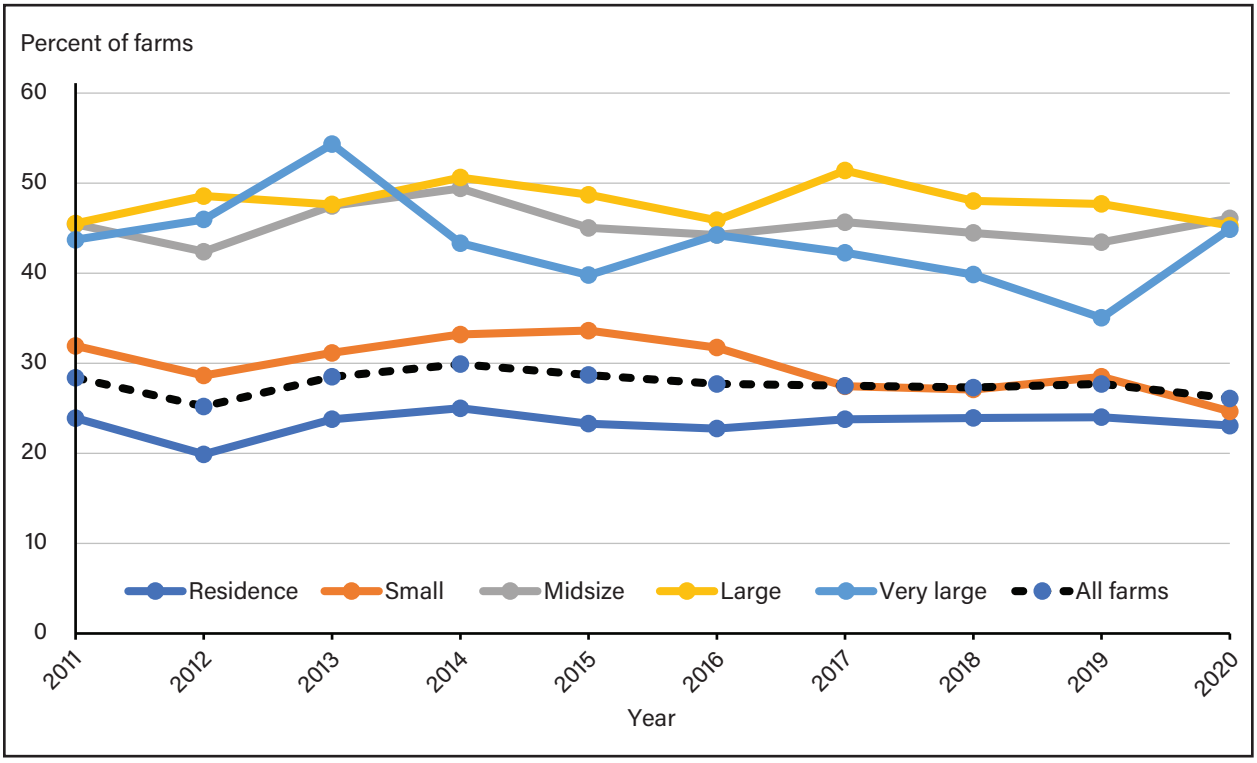
Diversifying Into Other Farm-Related Business Activities

Farm households can also diversify their income by expanding into other farm-related enterprises, whereby income is generated by utilizing farm assets for activities other than commodity production. These farm-related business activities include performing custom work with farm-owned machinery; renting out land; earning energy royalties from oil, natural gas, or wind energy on their land; processing and other value-added activities; or engaging in agritourism. Previous work has considered these activities that use farm resources to develop new ventures as on-farm diversification, which is distinct from farm households operating off-farm businesses in other sectors (Vogel, 2012). Vogel (2012) found that 13.5 percent of farms in 2007 engaged in on-farm diversification, with custom work as the most commonly reported venture. Limited literature has examined the characteristics of farms that engage in on-farm diversification in a holistic way. One analysis considered three types of on-farm diversification activities—agritourism, direct-to-consumer sales, and on-farm processing—within the context of additional production and income diversification strategies. This analysis found that an operator's decision to engage in other farm-related activities was positively correlated with their age, education level, household size, and farm size. Additionally, the decision to enter into other farm-related ventures was complementary to the decision to pursue agricultural diversification by adopting organic production (Khanal, 2020). Other literature has been devoted to the pursuit of particular farm-related ventures. For example, Winikoff and Maguire (2024) analyzed the characteristics of farms that received energy payments from natural gas, oil, and wind

production and found that 3.5 percent of farms received payments for energy production between 2011 and 2020 with the energy payment size largely determined by farm size and geography.

While ARMS has long queried producers about their income from alternative on-farm ventures, the categories reported have been inconsistent over time, which complicates time series analysis and comparability to other work. However, certain categories of alternative on-farm ventures—custom work, land rental, grazing fees, energy royalties, and forest product sales—have been consistently reported from 2011 onward.[16] Between 2011 and 2020, more than one-quarter of farms engaged in some other productive activities using farm assets, on average, and the proportion of farms pursuing these activities remained rather stable (figure 9). Midsize, large, and very large farms exhibited similar participation rates, typically 15 to 20 percentage points higher than those of small or residence farms. Among farms that engaged in these activities, they pursued only one additional venture, on average, ranging from 1.15 activities for residence farms up to 1.3 activities for large and very large farms.

Figure 9
Percent of U.S. farms engaging in other farm-related ventures by size, 2011–20



Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

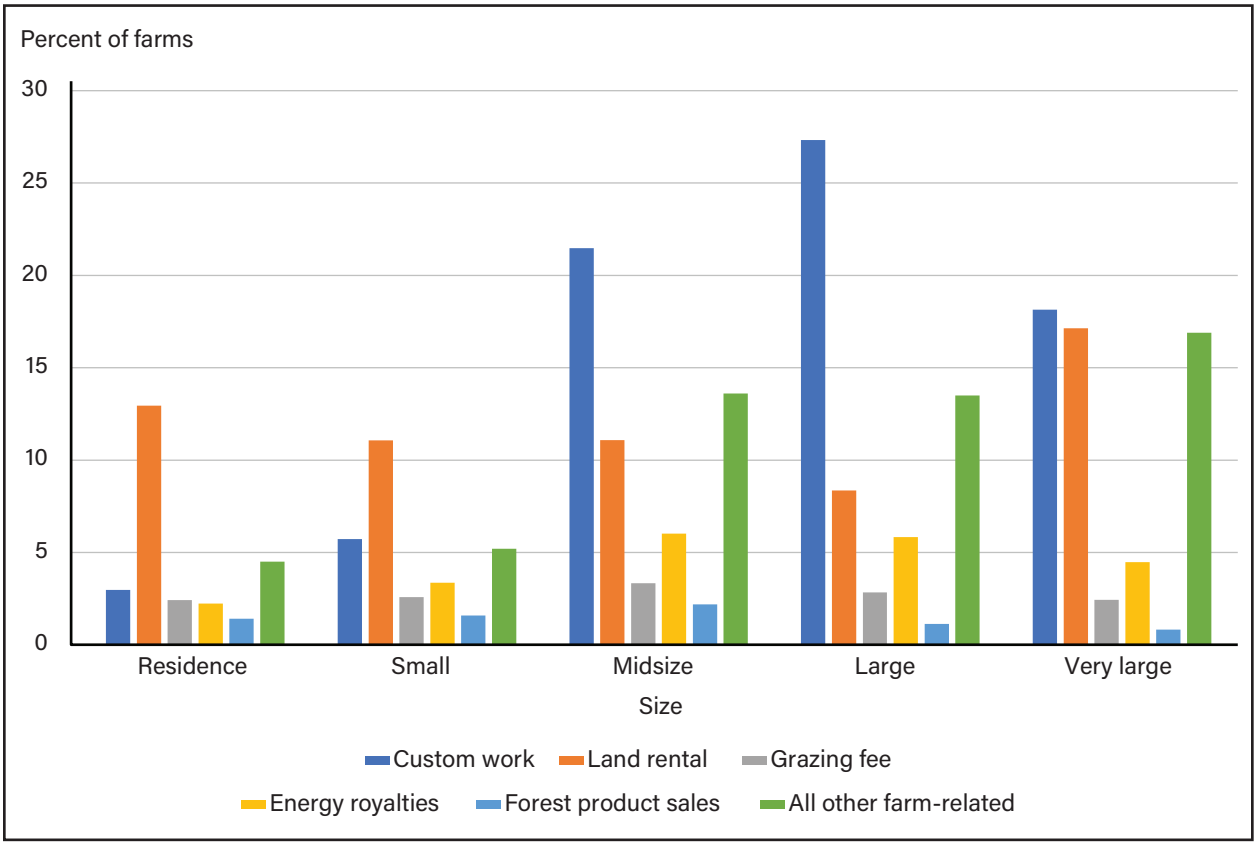
Note: All values are in real, 2011 dollars using farm producer price index (PPI).

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2011–20 Agricultural Resource Management Survey data.

[16] All other farm-related ventures are reported in the "other" aggregate. This aggregate includes allotment or quota leases; animal boarding; sales of poultry litter and manure; income from recreational activities (such as hunting, fishing, tourism, etc.); State fuel tax refunds, tax refunds, real estate tax rebates for land preservation; refunds of marketing expenses; renting or leasing of livestock or machinery; and sales of value-added goods (such as cheese, cider, jams, etc.). Because these other ventures are not distinguishable separately in the data, it is not possible to examine how farm engagement in these activities has changed over time.

The specific activities pursued by farms of different sizes seem to reflect the relative abundance of surplus farm assets. Residence and small farms predominantly engaged in land rental, whereas custom work was more prominent among midsize and large farms (figure 10). This finding suggests that some residence and small farms may own more land than they are able to operate, whereas midsize and large farms may rationalize the purchase of bigger machinery for their own operations by earning extra income from custom operations. Fewer than 5 percent of farms reported collecting grazing fees, energy royalties, and having forest product sales, but these can be a substantial source of producer household income. Energy royalties in particular averaged more than $30,000 to farm households receiving such payments from 2011–20, which exceeded government payments as a source of income (Winikoff & Maguire, 2024). Although receipt of grazing fees and forest product sales varied little by farm size, energy royalties and income from all other farm-related activities were more common among larger farms.

Figure 10
Percent of U.S. farms engaging in selected farm-related income-generating activities by farm size, 2020



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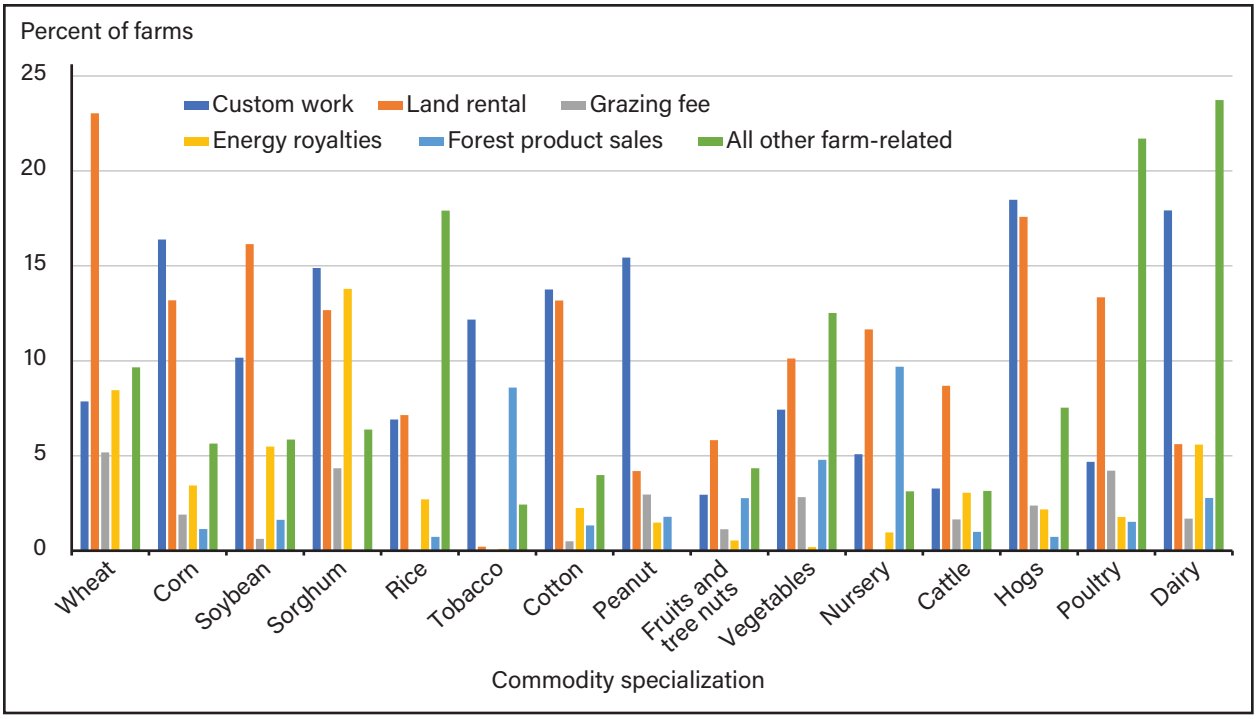
Note: All values are in real, 2011 dollars using the farm producer price index (PPI).

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2020 Agricultural Resource Management Survey data.

The most frequently pursued strategies also diverged by commodity (figure 11). Land rental and custom work remained the most common, with row crop farms pursuing both strategies at higher rates. “Other” activities were the most important enterprises for rice, vegetables, poultry, and dairy operations. For rice, the other activity may be related to agritourism activities from off season waterfowl hunting or birdwatching, while for poultry and dairy, it likely relates to sale from litter or manure.

Figure 11

Percent of U.S. farms engaging in selected farm-related income generating activities by commodity specialization, 2019



Note: Specializations indicate a commodity that comprises the majority of the farm's production.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2019 Agricultural Resource Management Survey data.

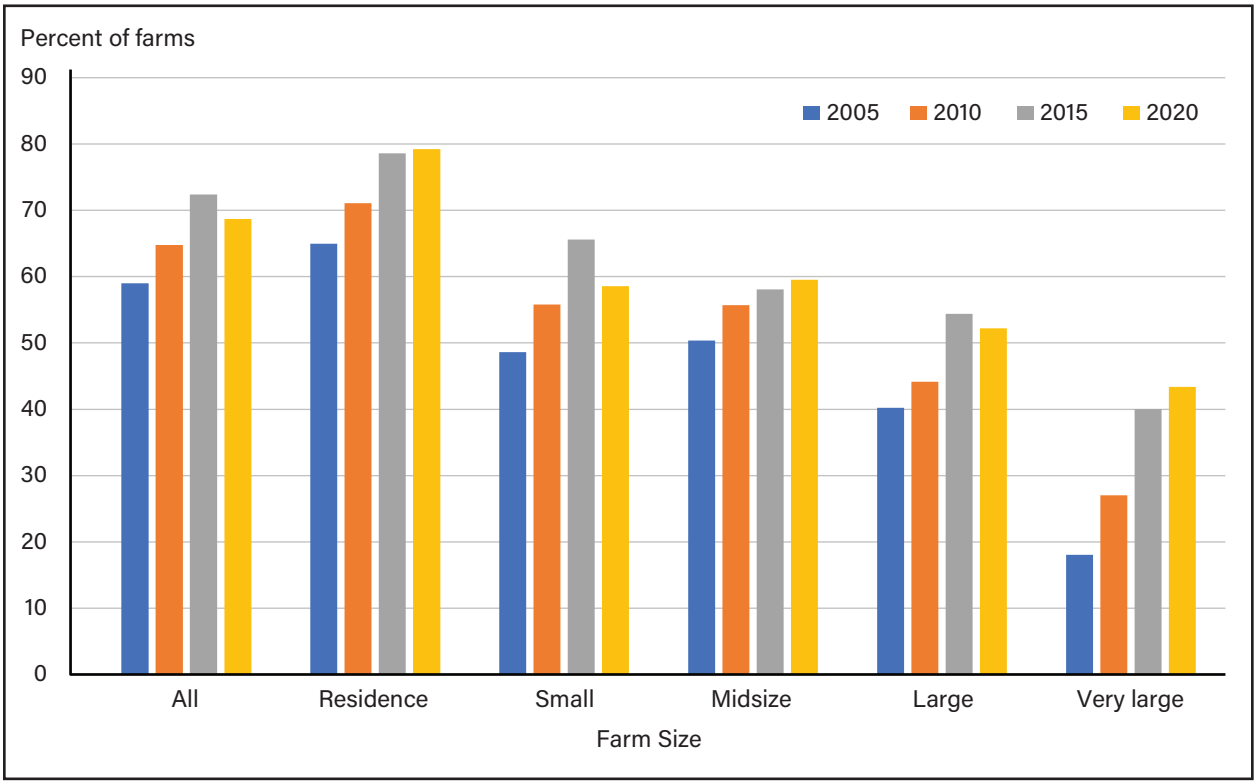
Earning Income From Off-Farm Activities

While there are various strategies for diversifying income within the farm business, the most widely practiced form of diversification has been off-farm employment. Nearly all U.S. farm households have reported some off-farm income, whether earned (such as through wages and salaries) or unearned (such as from dividends, Social Security payments, or other Government benefits) (Giri et al., 2021; Khanal, 2020). In fact, off-farm income has comprised the majority of average total farm household income for all family farms (Giri et al., 2021), which has been partly due to the importance of off-farm income to small farms (the vast majority of U.S. farms). Salary and wage earnings from off-farm work has been the largest source of off-farm income for all types of farms (Prager et al., 2018), and most farm households have reported at least one family member employed in an off-farm job (Brown & Weber, 2013). Although farm operator households have varying motivations for pursuing off-farm work (including access to health insurance or retirement benefits (Mishra & Chang, 2012)), access to a more reliable income source has been the most common justification (Whitt & Todd, 2020).

Our analysis of ARMS data has confirmed that a majority of farms engage in off-farm, wage-earning activities and that the share has increased since 2005. In 2020, nearly 70 percent of farm households reported income from off-farm wages. While residence farms reported the highest rates of off-farm wage-earning activities, the share of farm households engaging in wage-earning activities rose across all farm sizes (figure 12). In fact, these rates converged. For example, although there was a

30-percentage-point gap in the rates of off-farm wage labor participation between small and very large farms in 2005, the gap had halved to only a 15-percentage-point difference by 2020.

Figure 12
Percent of U.S. farms earning off-farm wages, selected years



Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

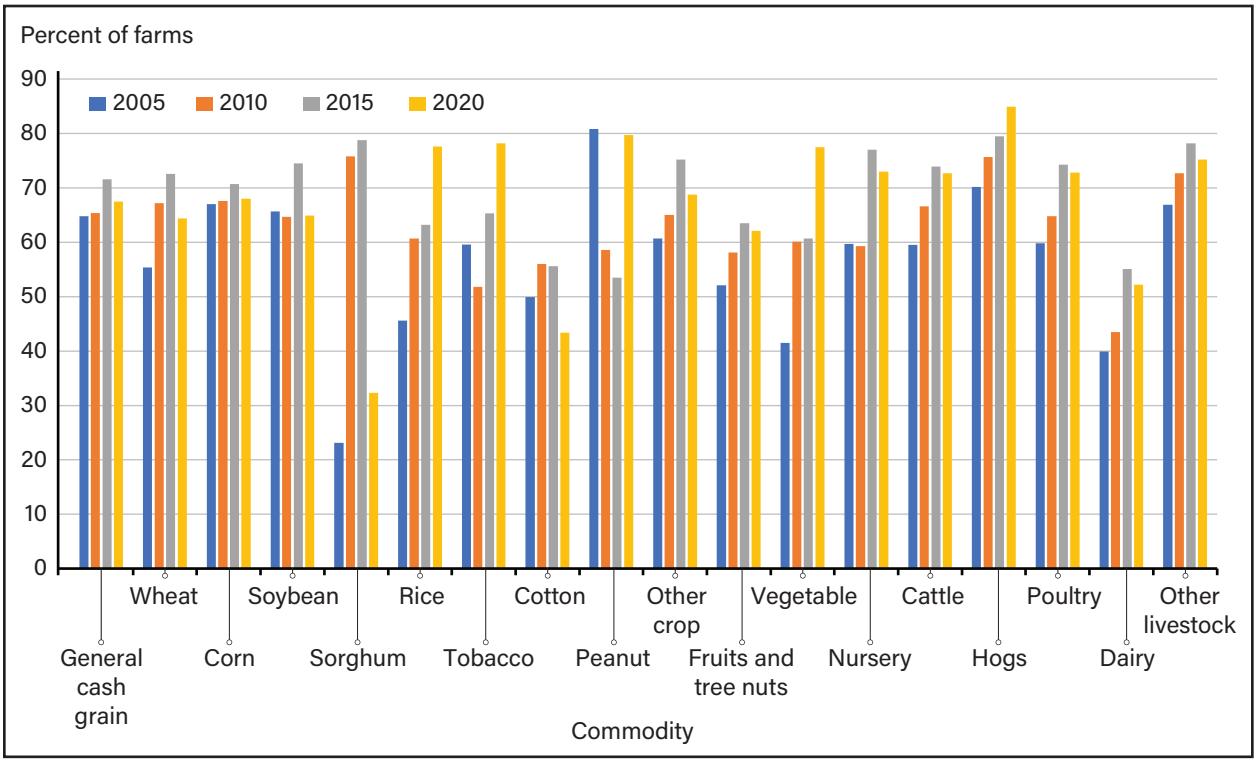
Note: All values are in real, 2011 dollars using farm producer price index (PPI).

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2005, 2010, 2015, 2020 Agricultural Resource Management Survey data.

This trend toward higher participation in off-farm wage employment over time is observed across commodity specializations with a few exceptions (e.g., soybean, cotton, and peanut) (figure 13). More than 60 percent of farm households engaged in off-farm wage-earning activity for most commodity specializations, with the share of cotton and dairy farm households edging closer to 50 percent. These two commodities are characterized by substantial economies of scale and large average farm sizes, necessitating higher farm managerial input, reducing the time available for engaging in off-farm labor.

Figure 13

Percent of U.S. farms earning off-farm wages by commodity specialization, selected years



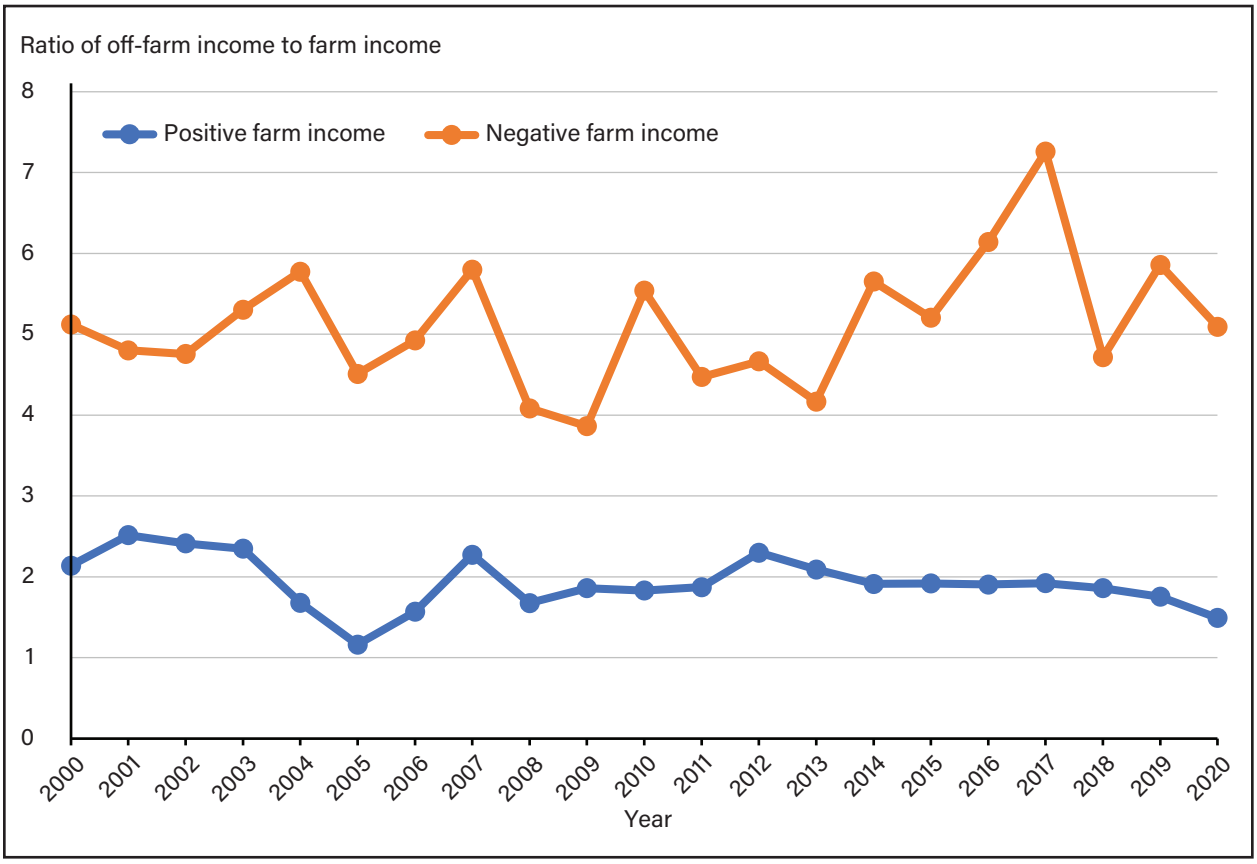
Note: Specializations indicate a commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2005, 2010, 2015, 2020 Agricultural Resource Management Survey data.

While the share of farm households engaging in off-farm work has risen, the risk mitigating potential of off-farm work (in terms of the proportion of farm income covered by off-farm earnings) has not exhibited any obvious trends. In figure 14, the ratio of off-farm wage income to the absolute value of on-farm income is graphed separately for farms with positive farm income (blue line) and negative farm income (orange line) for the median farm in each group.[17] For the median farm with positive farm income, off-farm wages have fluctuated around 2 times the value of on-farm income for the past two decades. For farms with negative farm income, off-farm wages have fluctuated around 5 times the absolute value of farm income since 2000. Accordingly, for most U.S. farms, off-farm wages more than offset farm income losses remaining after other Government payments or crop insurance indemnities are received.

[17] This analysis distinguishes between these two groups to facilitate interpretation, given that less than half of farms earn positive income from their farm operation. See Prager et al. (2018) for a further discussion on economic returns to farming for U.S. farm households.

Figure 14
Ratio of off-farm income to farm income for U.S. farms with both negative and positive farm income, 2000–20



Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2000–20 Agricultural Resource Management Survey data.

Storage

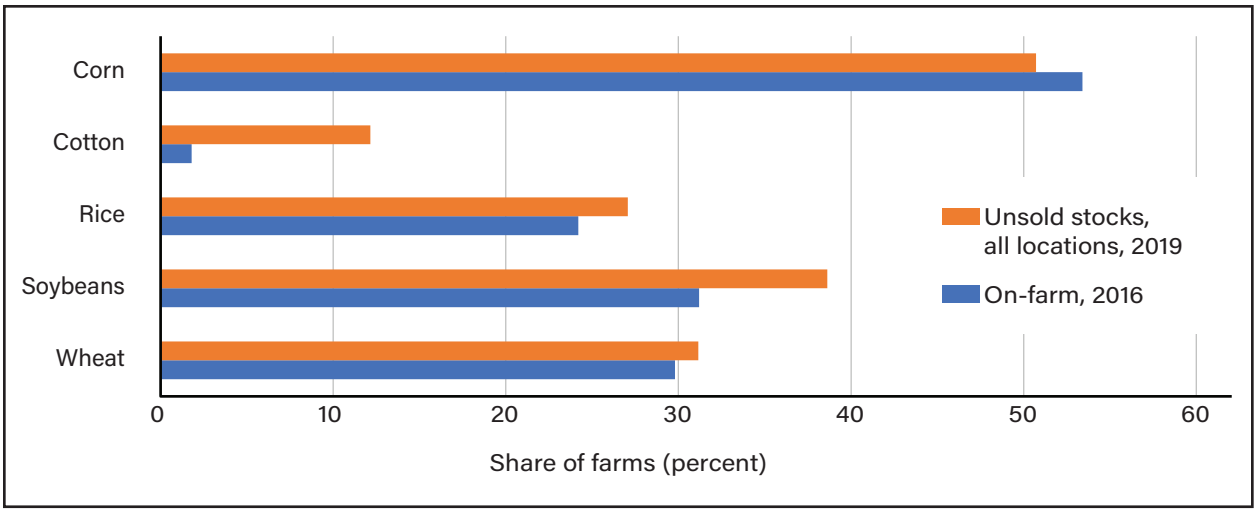
Storing commodities allows producers to mitigate temporal fluctuations in prices if they expect that prices will be higher at a future time than at harvest (net the cost of storage). The role of storage in agricultural commodity markets has been periodically investigated (Gustafson, 1958; Wright & Williams, 1982; Zulauf et al., 2006). Farmers employ various storage management strategies, including storing unpriced commodities on the farm, paying for commercial storage or pricing the stored commodities through the purchase of a forward-cash contract, which locks in a price and eliminates the downside risk of storing, but also eliminates the potential for any upside price gain.

Limited by data availability, we largely focused on the use of on-farm storage. On-farm storage use varied by commodity, related to factors such as physical product characteristics, distance of farm operations from markets or processors, and the availability and price of commercial storage. On-farm storage is common among grain farmers, who can store their commodities with minimal risk of deterioration. Specialty crop growers use on-farm storage less commonly, as many products deteriorate

rapidly between harvest and sale to the final consumer.[18] Averaged quarterly grain stocks data from the USDA, National Agricultural Statistics Service (NASS) from 2010 to 2020 indicate that on-farm storage was most common for corn (50 percent of total stocks held on farm), but also prominent for soybeans (38 percent), and less important for wheat (24 percent) and sorghum (10 percent). These shares fluctuated little from year to year.[19]

Farm-level decisions related to storage have occasionally been examined using ARMS. The 2016 ARMS survey asked farmers about their utilization of on-farm storage for corn, cotton, rice, soybeans, and wheat, while the 2019 ARMS asked farmers about their possession of certain unsold commodities regardless of their storage location. Combining information from the two years confirms that a majority of corn farms stored at least some of their production on the farm. Also, at least 20 percent of rice, soybean, and wheat operations in 2016 used on-farm storage (figure 15). Very few cotton farmers stored production onfarm, as it must be ginned before it can be stored, with bales warehoused after ginning. Additionally, the similarity in the shares of farms holding on-farm stocks and the share of farms holding unsold stocks at any location (keeping in mind that the questions were asked in different years), may indicate that most unsold stocks are held onfarm. For cotton, the off-farm storage of unsold production was more common due to bales being warehoused after ginning before being sold to a spinning mill.

Figure 15
Percent of U.S. farms producing selected commodities that reported using on-farm storage (2016) and storing unpriced commodities (2019)



Note: Unsold stocks refer to commodity inventory held by farms post-harvest 2019 (that was not priced or under any marketing contract). On-farm stocks refers to commodity inventory (priced or unpriced) held onfarm at any point in 2016. Commodity groups indicate that farms reported positive value of production for that commodity, but did not necessarily specialize in production of that commodity.

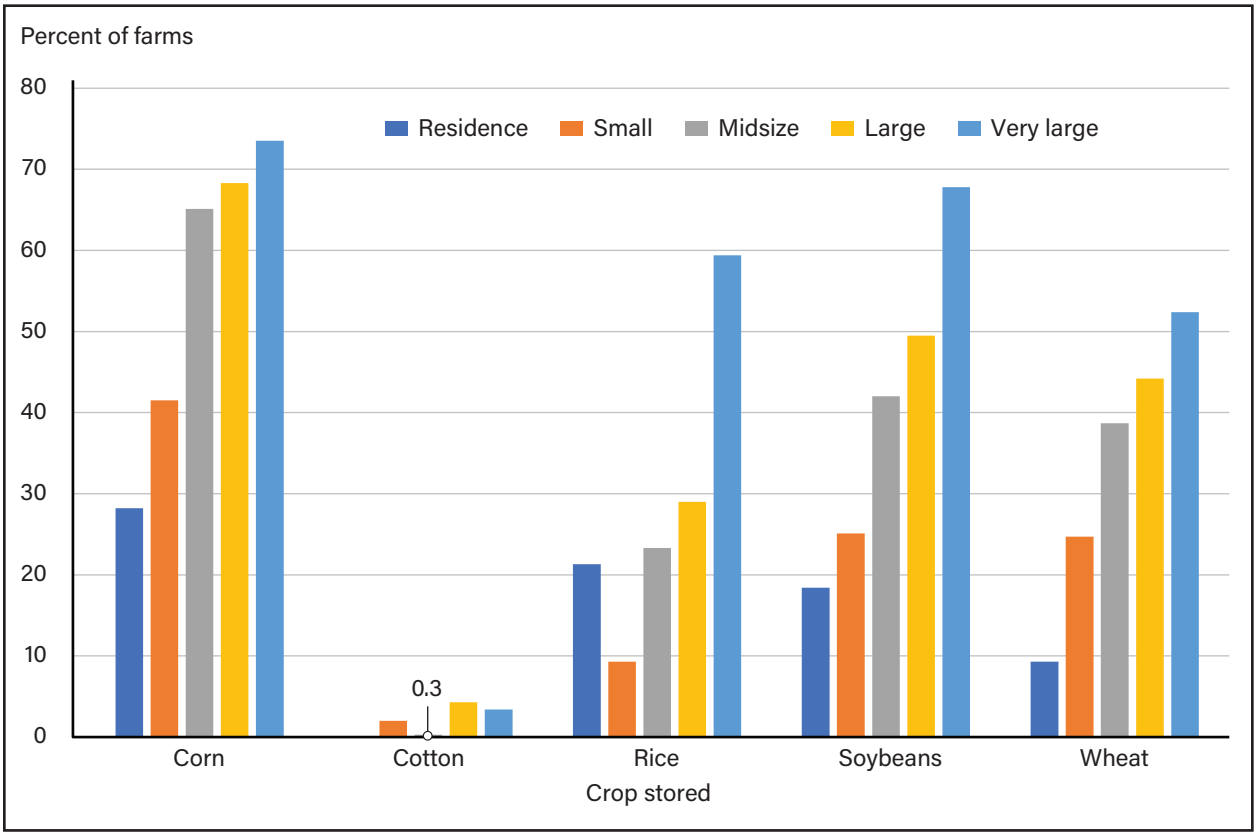
Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2016 and 2019 Agricultural Resource Management Survey data.

[18] Some produce can be stored for several months using controlled atmosphere storage systems, however. Additionally, many fruits and vegetables can be stored for long periods of time in their processed form, including as frozen or canned products. However, such storage typically takes place at the processor or retail outlet level once the commodity has undergone initial transformation, and thus is not considered in this analysis.

[19] Outside of variation in on-farm storage use by commodity, there are substantial differences in use of storage by region, with proportionally greater capacity of on-farm storage in regions further from end-users, such as the western Corn Belt and northern Great Plains (Janzen & Swearingen, 2020).

There are further nuances to on-farm commodity storage dynamics once the data are broken down by farm size (figure 16). Across specializations, larger farms more frequently utilized on-farm storage. This finding suggests that the propensity to store on-farm is related to either farms reaching sufficient scale to warrant the building of on-farm storage, and/or farms having the financial capability to construct on-farm storage. Although the general pattern holds across commodities, the distributions were not identical, giving further evidence to differing economic incentives and conditions for holding on-farm stocks by commodity. For example, more corn operations used on-farm storage than operations of any other commodity specialization at all size classes. In contrast, on-farm rice storage was heavily skewed toward very large farms,[20] while very few cotton farms used on-farm storage.

Figure 16
Percent of U.S. farms using on-farm storage, by commodity and farm size, 2016



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Note: Calculations are contingent on farms reporting positive production of the commodity, which may not be equivalent to farms specializing in production of the commodity. All values are in real, 2011 dollars using farm producer price index (PPI).

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2016 Agricultural Resource Management Survey data.

[20] Because it is common for rice to be harvested at a moisture level above the acceptable limits for grain storage, rice is usually dried before storing, a practice that is employed less frequently for other grains (Batey, 2017). This necessity of drying rice before storage raises the average costs of on-farm storage for rice relative to other crops, as bins must be equipped with aeration and running the fans raises farm-level energy costs. At the same time, producer cooperatives are very prominent in the U.S. rice industry, so most rice producers have the option to store their production at the cooperative.

Savings

Other on-farm strategies can help producers cope with the impact of negative income shocks. Most prominently, farm households can replace lost income (e.g., due to adverse weather) by either accessing household savings or by borrowing to meet household consumption needs. Although the role of precautionary savings (i.e., holding savings in the current period in anticipation of future income risk) in household consumption smoothing has been widely examined,[21] Mishra and Chang (2009) note that comparatively little empirical research has examined the role of precautionary savings in the risk management strategies of farm households. Previous authors found that certain producer or farm-level characteristics were related to farm-level savings. Focusing their analysis only on small farms, Adhikari and Khanal (2022) found lower savings use among younger operators and operators performing more off-farm work, and that more commodity diversified farms tended to save more. Using a broader sample, Mishra and Chang (2009) found that factors such as spouse age and education positively affected precautionary savings, and that farms with either operators or operator spouses engaged in part-time work were less likely to save. They also concluded that dairy producers were less likely to save, and that while operators of cash grain farms were more likely to save, their savings were the lowest among farm households who saved.

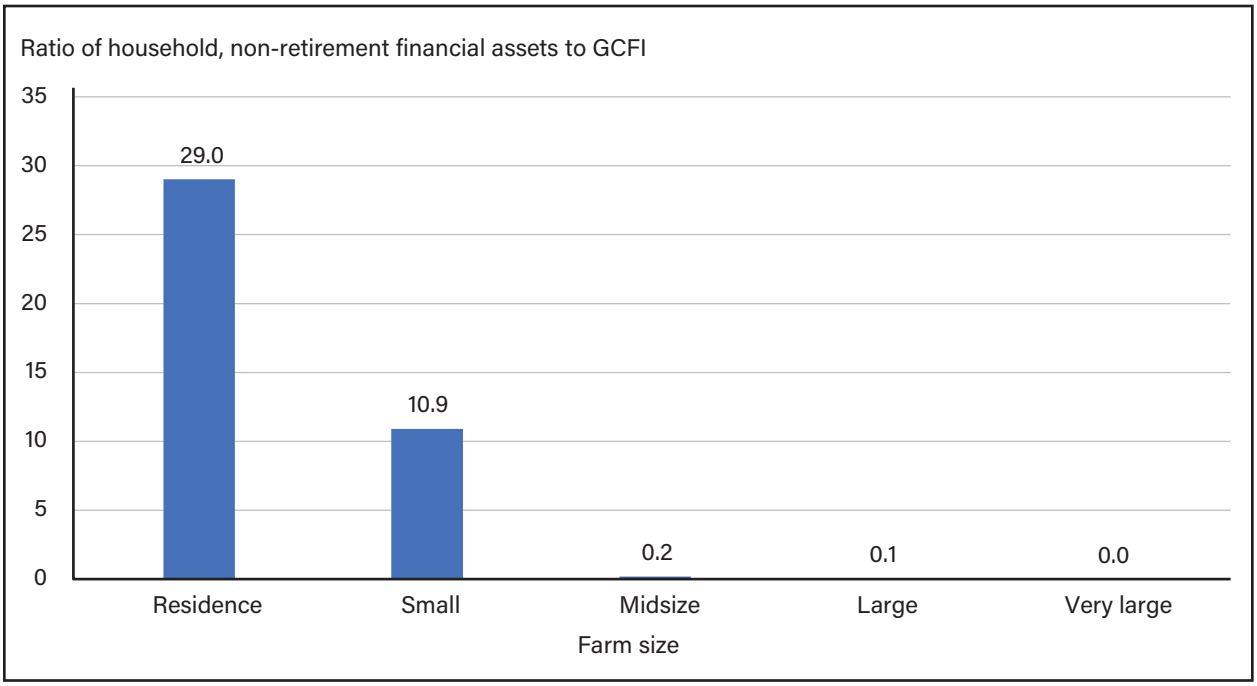
Although ARMS does not query producers directly on their use of savings, it does ask producers a series of questions about their farm finances, including detailed accounts of both farm and non-farm debts and assets. Savings can act as a risk management coping strategy if it helps farm households smooth consumption in the event of a shock. Accordingly, the key question is not whether a farm household holds liquid financial assets at all, but if the household holds enough financial assets to help cope with a negative income shock. For this reason, this analysis focused on the ratio of household financial assets held in non-retirement accounts[22] to gross cash farm income (GCFI). An examination of this indicator supports the findings of both Mishra and Chang (2009) as well as Adhikari and Khanal (2022), in that operators of different types of farms utilized savings in different ways. First, savings varied greatly by farm size (figure 17). Residence and small farm households on average held non-retirement financial assets many times larger than their operation's GCFI, which suggests that even a complete loss in income from the farm operation could be covered by other financial assets. On the other hand, the ratio of household non-retirement financial assets to GCFI of midsize, large, and very large farms were all 0.2 or less, which indicates that a complete loss in farm income could not be covered by those assets. This tendency of smaller farms to hold more precautionary savings relative to income may be related to a farm's capacity to access lines of credit to cover shortfalls in cash flow, as midsize and large farms more commonly hold an open line of credit (see the "Credit" section below).

[21] For an extensive literature review on the subject, see Browning and Lusardi (1996).

[22] These include cash, checking, savings, money market accounts, certificates of deposit, savings bonds, Government securities, outstanding personal loans due to the operator or household, corporate stock, mutual funds, cash surrender value of life insurance, and other financial assets not associated with retirement accounts.

Figure 17

Ratio of household non-retirement financial assets to GCFI by farm size for all farm sizes, 2011–20 average



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Note: All values are in real, 2011 dollars using farm producer price index (PPI).

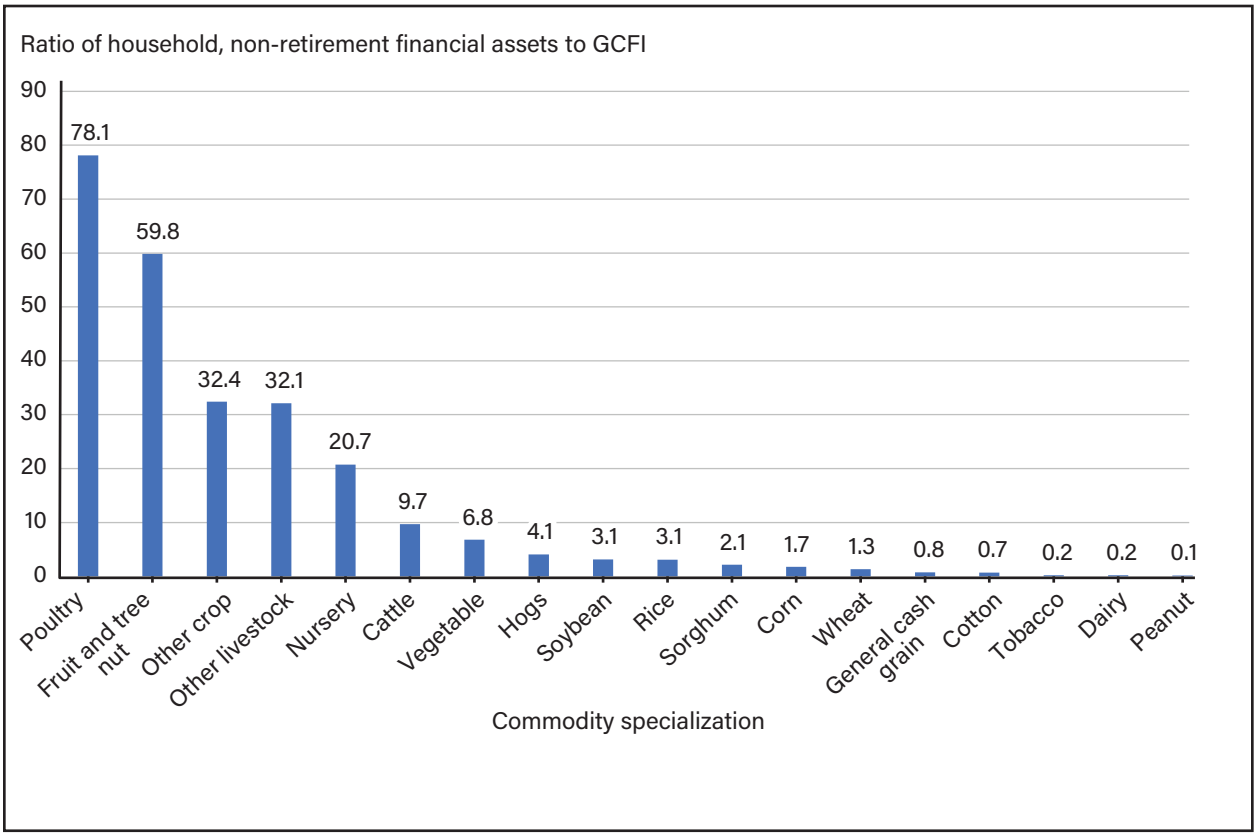
Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2011–20 Agricultural Resource Management Survey data.

We also found large heterogeneity in the share of households holding non-retirement financial assets by commodity specialization (figure 18). Operators of farms specializing in fruit and tree nuts, poultry, and other livestock held larger liquid assets relative to the size of their farm operation, while operators of most row crop farms held fewer. [23] For producers in the former group, these assets would likely cover shortfalls in farm income in a given year.

[23] It is also generally the case that more Government programs are available for protecting against income losses for the commodities toward the right side of figure 18.

Figure 18

Ratio of household non-retirement financial assets to GCFI by commodity specialization, 2011–20 average



GCFI = Gross cash farm income.

Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2011–20 Agricultural Resource Management Survey data.

Credit

While credit can be used to finance farm expansion or operations,[24] cover operating costs, or help farms to manage cash flow and provide marketing flexibility (in the case of USDA Marketing Assistance Loans), credit can also help provide a short-term lifeline to producers who experience unexpected income declines.[25] Producers can borrow from a variety of institutions, including commercial banks, the Farm Credit System, and (for producers who are unable to access credit elsewhere) the USDA, Farm Service Agency (for more information, see box "USDA, Farm Service Agency Loan Programs").

[24] In fact, recent work from Subedi and Giri (2024) indicated that 68 percent of all farm debt was real estate debt, a share that has been rising over the past decade.

[25] Using credit as a safety net also exposes the farm to higher financial risk. These tradeoffs are commonly considered in the context of the risk balancing hypothesis, which holds that farms seek to increase or decrease their financial risk in response to changes in business risk (Gabriel & Baker, 1980).

USDA, Farm Service Agency Farm Loan Programs

The USDA, Farm Service Agency (FSA) offers a variety of loans to farmers and ranchers who are unable to obtain credit elsewhere. These include:

- Farm ownership loans, which help producers to purchase or enlarge their operation. These loans can also be used to pay closing costs, construct or improve farm buildings, or conserve and protect soil and water resources
- Farm operating loans, which can be used to purchase livestock, seed, and equipment, or to pay for minor repairs or other annual operating expenses
- Microloans, which have a lower maximum amount than regular ownership or operating loans, but also fewer qualifications and less paperwork, and meet the needs of smaller, nontraditional operations
- Emergency loans, which are available to producers who suffer a qualifying loss to their farm or ranch caused by natural disasters. These loans can also be used to restore or replace property, to pay disaster year production costs, to pay essential family living expenses, to reorganize the farming operation, or to refinance certain debts.
- Conservation loans, which help producers to complete a conservation practice in an approved conservation plan

Many FSA loans are available as either Direct Loans (which are made and serviced by FSA) or as Guaranteed Loans (which are made and serviced by lenders backed by FSA). While FSA loans offer a potential financing option for producers who are otherwise unable to access credit, they account for a small share of credit used by producers. In 2021, FSA loans accounted for 3.28 percent of farm real estate loans and 2.25 percent of nonreal estate loans (Subedi & Giri, 2024).

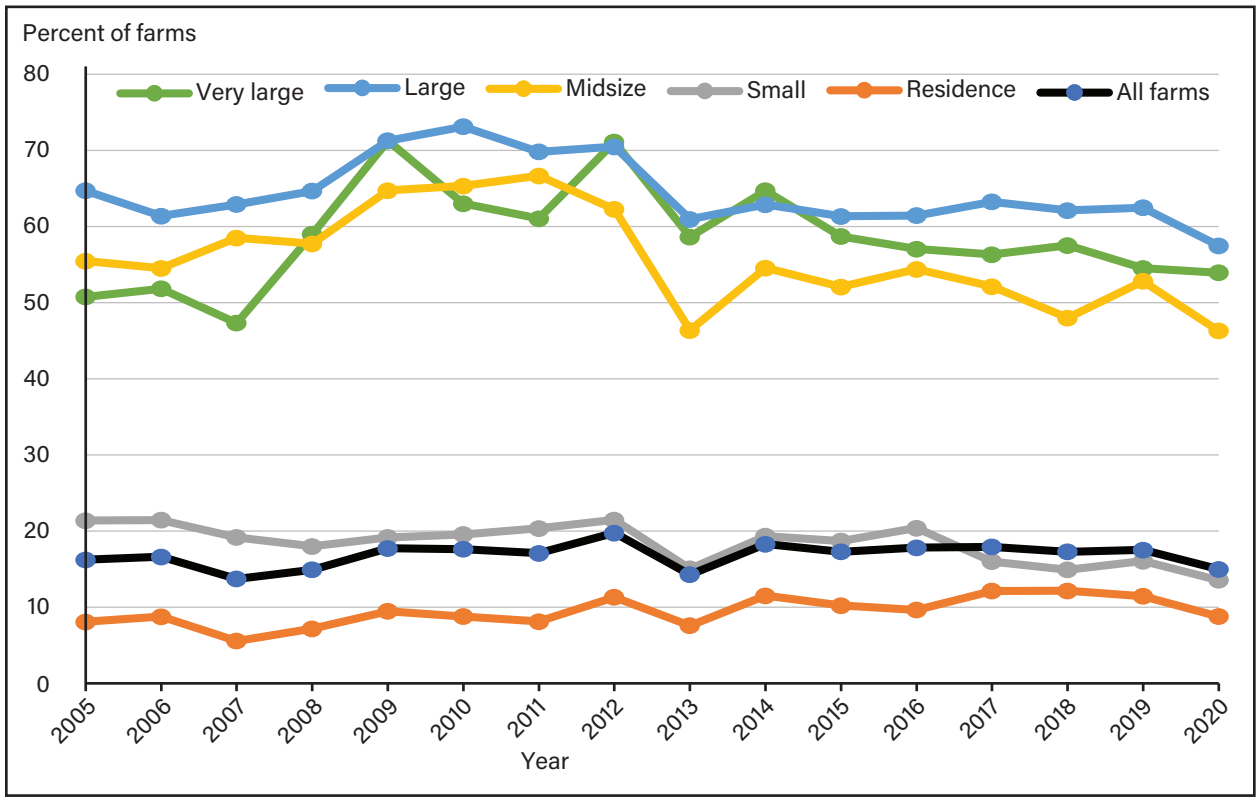
Source: USDA, Economic Research Service using USDA, Farm Service Agency, *Your Guide to FSA Farm Loans*.

Much of the research on farm access to credit either does not distinguish between short-term and long-term loans (focusing instead on overall debt load) or does not explicitly consider that short-term loans could be utilized to compensate for short-term income contractions. Nonetheless, this body of work offers some insights into the kinds of farms accessing financing. First, there has been a divide between farm businesses and residence farms in debt utilization. In 2011, 74 percent of residence farms had no debt, compared with 57 percent of commercial farms (Ifft et al., 2014). In the same vein, Subedi and Giri (2024) also found that debt utilization increases with farm size. Katchova (2005a) explored the factors associated with farm credit use in more detail and found that commercial farms with higher gross farm income were more likely to have farm debt and that farms that engaged in contracting, purchased crop insurance, or had more diversified operations, were more likely to have farm debt. Todd et al. (2024) indicates that limited resource farms utilized credit at lower rates than nonlimited resource farms. One analysis focusing on the farm credit system in particular found that credit was positively correlated with both farm income and farm output (Nadolnyak et al., 2017). Other work also considered the relationship between credit and certain risk management strategies, finding that participation in FCIP was associated with higher use of short-term debt, but not long-term debt (Ifft et al., 2015).

Although ARMS contains extensive data on producer utilization of financing, the complication in analyzing the use of credit for risk management is that producers also access short-term financing in

the normal course of farm management operations, such as to purchase inputs. While determining the intentions of a producer in accessing credit within the ARMS context is not possible, it is feasible to examine the potential for producers to access credit as a strategy to address short-term shocks to income by analyzing data on producers who maintain open lines of credit. We focused on farms that used and paid off short-term loans within the same calendar year as a proxy for producers who had established access with a financial institution, and thus the potential to easily access loans in the face of income loss. The data indicate that short-term loan utilization varied by farm size but has changed little over time (figure 19).

Figure 19
Percent of U.S. farms accessing short-term loans by farm size, 2005–20



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Note: All values are in real, 2011 dollars using farm producer price index (PPI).

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2005–20 Agricultural Resource Management Survey data.

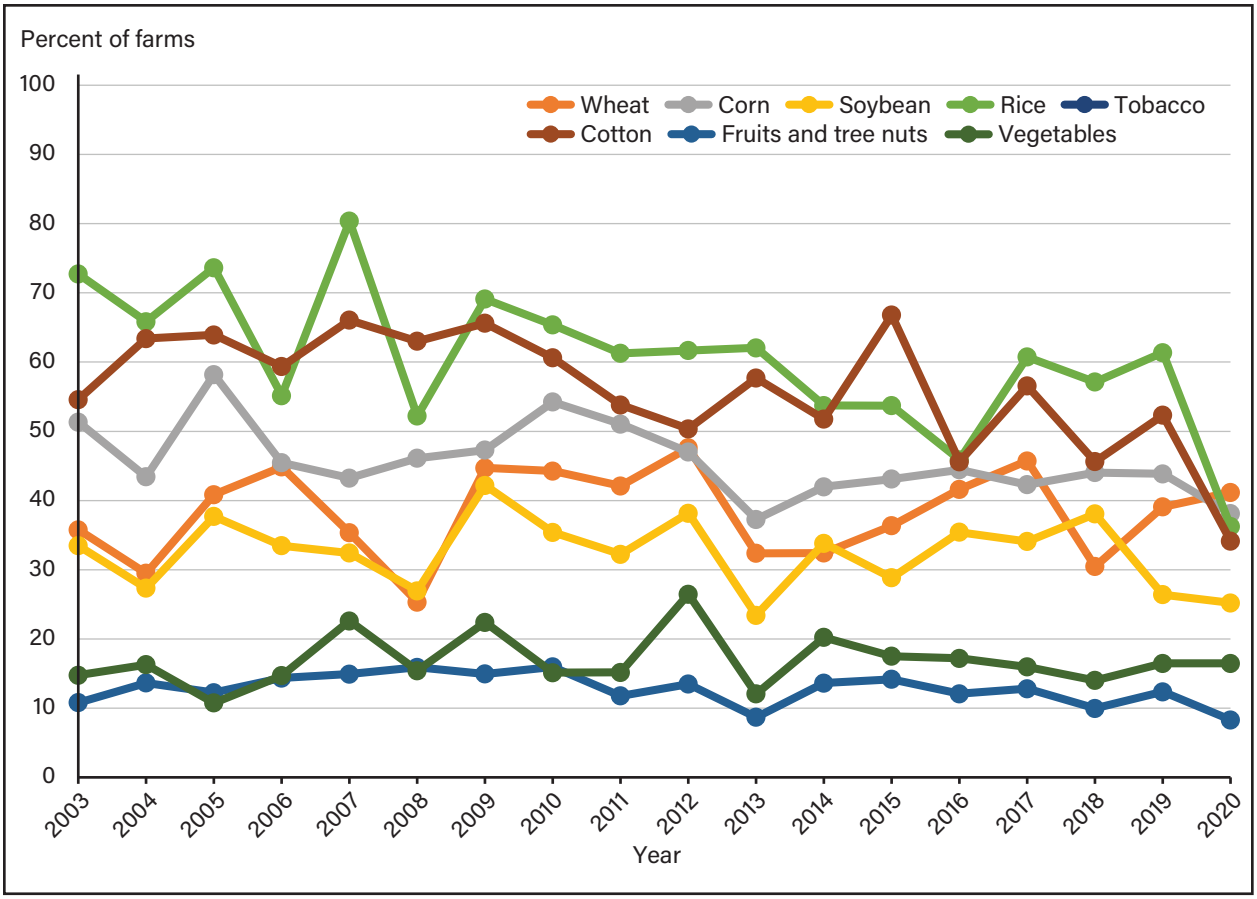
In 2020, more than 40 percent of midsize, large, and very large farms reported taking out a short-term loan, but just 14 percent of small farms and 9 percent of residence farms did so. This finding suggests that although approximately half of larger farms would likely be able to access commercial credit in response to a short-run emergency, this strategy may not be available to operators of most small farms.[26] The Federal Government offers assistance to producers in this situation, such as through

[26] Further examination of the share of farms of different sizes accessing loans by lender type may provide additional insights on how farms are using the credit system for risk management purposes. However, as the ARMS Phase III data do not differentiate operating loans by lender type, this matter is left for future research.

USDA, Farm Service Agency's (FSA) Emergency Loan Program (ELP), which offers loans of up to $500,000 to replace property damaged by a natural disaster for applicants rejected by a commercial lending institution.[27]

When trends in utilization of short-term loans are explored by commodity, divergence within crop types is also apparent, with higher utilization of loans by operations specializing in row crops compared to general crop farms and specialty crops. On average between 2018 and 2020, more than 30 percent of most row crop farms accessed short-term loans, while 15 percent or fewer of farms specializing in fruit and tree nut or vegetable production did so (figure 20).

Figure 20
Percent of U.S. farms accessing short-term loans, selected commodities, 2003–20



Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production.

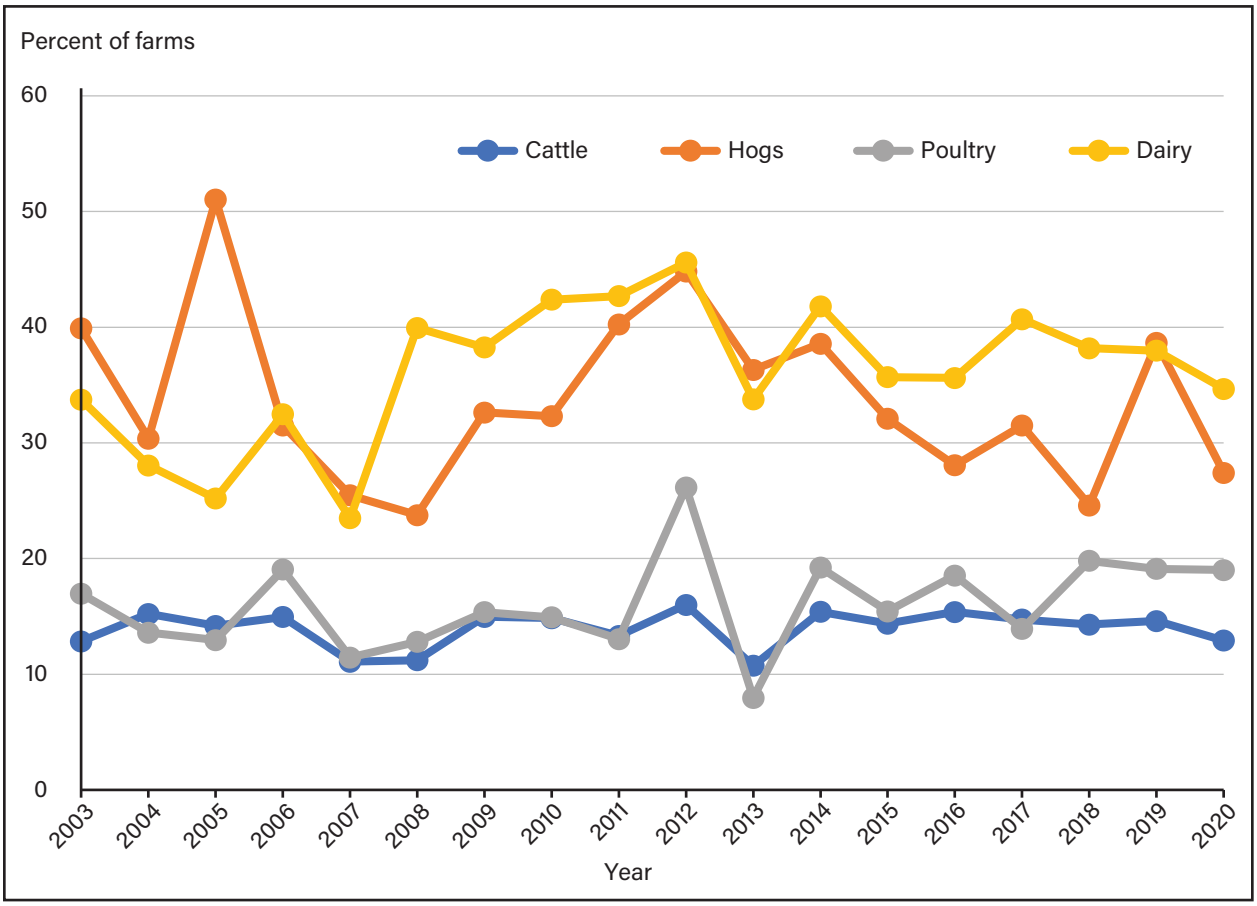
Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2003–20 Agricultural Resource Management Survey data.

Wide divergence was also apparent among livestock operations (figure 21)—fewer than 20 percent of farms specializing in poultry and cattle utilized a short-term loan over the period, while hog and dairy-specializing farms accessed short-term loans at much higher rates. For poultry, the need for short-

[27] Economic Injury Disaster Loans (EIDL) from the U.S. Small Business Administration (SBA) offer another potential source of financing for qualifying small businesses, small agricultural cooperatives, and most private nonprofit organizations in a declared disaster area that need financial resources to meet financial obligations and operating expenses that could have been met had the disaster not occurred.

term financing is limited due to integrators providing growers with most inputs. For cattle, animal breeding and marketing cycles are longer than 12 months, such that longer-term financing would typically be needed. In contrast, market pig lifecycles are less than 1 year, and dairy operations experience seasonal peaks in production and sales that would make short-term loans a more appropriate financing option.

Figure 21
Percent of U.S. farms accessing short-term loans among farms specializing in livestock, 2003–20



Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production.

Source: USDA, Economic Research Service calculations using data from USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2003–20 Agricultural Resource Management Survey

Market-based Tools

While on-farm strategies can be effective at helping producers to manage small losses, market-based tools offer producers a vehicle to manage larger losses by transferring certain risks to markets. These tools include crop or livestock insurance (such as Federal Crop Insurance Program (FCIP) products or unsubsidized single-peril products such as hail insurance), farm building or machinery insurance, futures and options contracts, and production or marketing contracts.

The Federal Crop Insurance Program

Two general types of crop and livestock insurance are available in the United States: (1) crop and livestock insurance is available through the Government-administered Federal Crop Insurance Program (FCIP) (for more information, see box "The Federal Crop Insurance Program"); and (2) named-peril insurance (such as hail or fire insurance) is available outside of FCIP.[28] FCIP operates under a public-private partnership, whereby the program is administered by the USDA, Federal Crop Insurance Corporation (FCIC), managed by the USDA, Risk Management Agency (RMA). FCIP is supported through the Federal budget, but individual policies are sold and serviced by private insurance companies known as Approved Insurance Providers (AIPs).[29]

The Federal Crop Insurance Program

The Federal Crop Insurance Program (FCIP) provides crop and livestock insurance coverage of losses due to a variety of adverse events (Turner et al., 2023). Policies are available to insure more than 130 unique agricultural commodities, including most field crops, many specialty crops, livestock, and forage crops, but coverage is not offered for all products in every county.[1] The program offers a variety of insurance products (including yield-based, revenue-based, margin protection, and index insurance such as Pasture, Rangeland, Forage or Hurricane Insurance Protection-Wind Index policies) with different indemnity triggers. Producers with individual-based policies, where indemnities are based on farm-level outcomes, can elect to insure from 50 to 85 percent of their expected yield or revenue, with coverage levels increasing in 5-percentage-point increments. Individual-based catastrophic (CAT) policies are also available, which cover 50 percent of expected yield at 55 percent of the projected or established price. Producers with group-based policies, where payments are based on outcomes of a group of individual farms, can insure 50–95 percent (also in 5-percentage-point increments) of their expected yield, revenue, or margin. The Federal Government subsidizes premiums for these policies. While the policy premium subsidy can vary by policy type and unit structure, the average subsidy rate in 2020 reached 63 percent. However, CAT policies are fully subsidized. Although FCIP is supported through the Federal budget (including by funding program administrative and operating expenditures, underwriting gains, and a share of policy premiums) the policies themselves are based on actuarial principles, meaning that the total premiums are calculated to cover anticipated indemnities. While the program's actuarial performance varies from year-to-year, from 2000 to 2020 the annual loss ratio (the ratio of total indemnities to total premiums) averaged 84.4 percent (i.e., the program is actuarially sound).

[1] Other risk management tools are available for crops that are not insurable. For further information, see the section on "Other Government programs producers use for managing risk."

Most research regarding farm utilization of insurance focuses on FCIP participation and not purchases of other types of insurance policies.[30] Larger farm size has long been associated with higher FCIP participation (Goodwin, 1993; McFadden & Hoppe, 2017; Raszap Skorbiansky et al., 2022; Sherrick et

[28] FCIP also insures against these perils, but premiums for standalone, private single-peril policies are typically lower. In addition, FCIP customers may be eligible for a premium reduction if they drop hail coverage.

[29] The tool itself is market based, but functions with Government support. We have classified it here as a market-based tool to simplify the comparison with other insurance products.

[30] There are various explanations for why most research on farm utilization of insurance analyzes the FCIP, including the analytical focus on insuring the farm's income-generating activities and not its asset base more broadly, a desire to understand the impacts of publicly-funded programs like the FCIP, and the public availability of FCIP data.

al., 2004). Smaller and more diversified farms have reported that paperwork and reporting requirements of FCIP policies deter their participation (Raszap Skorbiansky et al., 2022). Farmers with more savings were less likely to purchase crop insurance, except limited resource farmers, where those with more savings were more likely to purchase crop insurance (Farrin et al., 2016). However, operators with more debt were more likely to purchase crop insurance (Farrin et al., 2016; Ifft et al., 2015; Sherrick et al., 2004; Smith & Baquet, 1996). This relationship may be endogenous, as lenders commonly require producers to purchase crop insurance as a condition of financing. Crop insurance purchase is also commonly a requirement for the 2 crop years following receipt of assistance under temporary agricultural disaster relief programs.

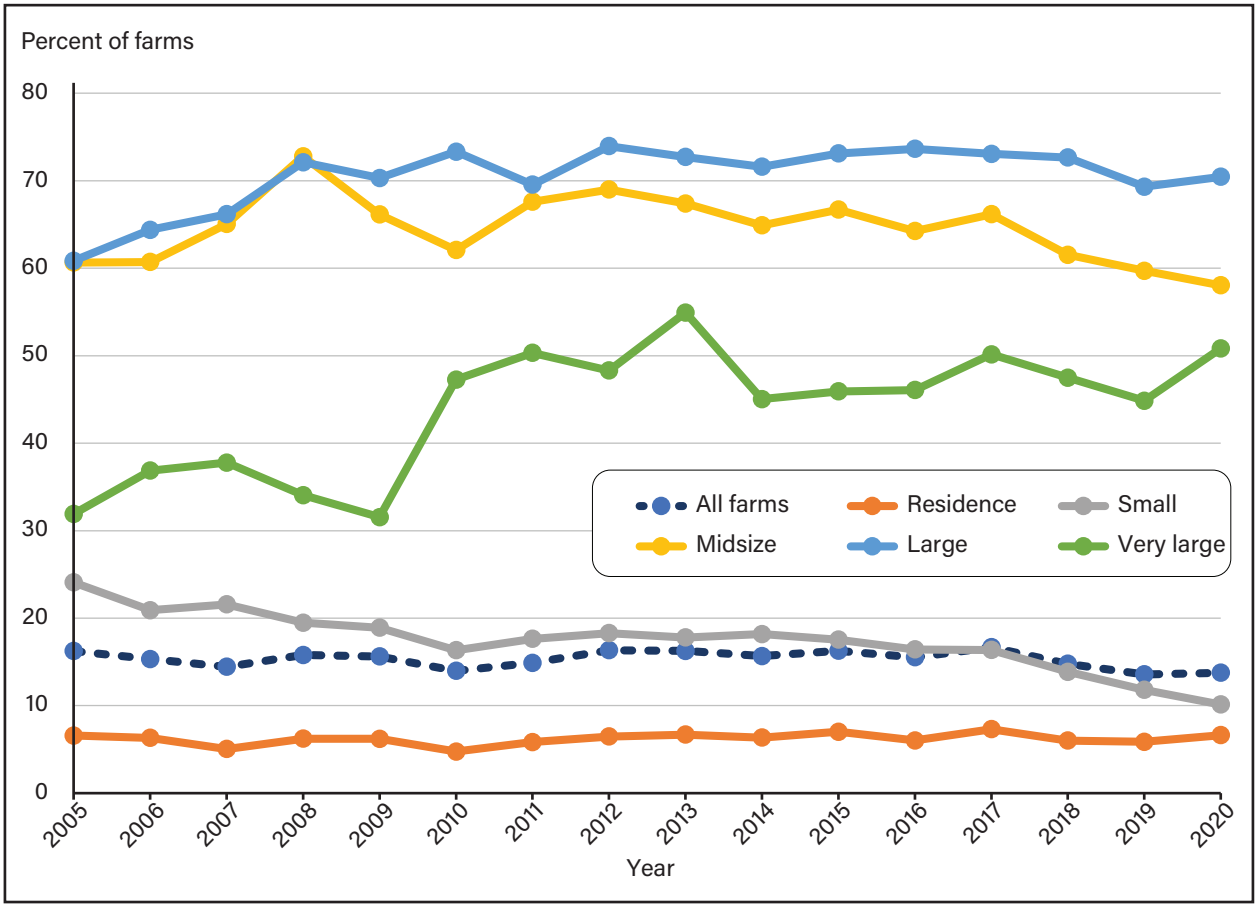
Although a range of different insurance products are available to farmers, ARMS has historically collected limited information on the specific types of insurance purchased by producers. Where included, these questions have varied over time. FCIP expenditure has been collected only since 2003; all crop insurance expenditures was collected only between 2000 and 2002; and the 2018 and 2019 surveys included sections on what types of insurance policies producers purchased. While these variations have prevented the analysis of a longer time series of insurance purchase trends, the data still offer some insights into producer behavior.

Looking at FCIP participation trends, the share of all farms purchasing FCIP has averaged 15 percent since 2005 (+/- 2 percentage points). However, this average masks divergent behavior by farm size (figure 22). For small and residence farms, 10 percent or fewer farms purchased insurance through FCIP in 2020. Participation rates were higher for other farm size classes, with a greater share of midsize and large farms purchasing insurance through FCIP than very large farms. This lower FCIP uptake by very large farms may reflect a lack of crop insurance products that meet the risk management needs of very large farms[31] or that these farms instead self-insure using tools outside of FCIP for their risk management. However, FCIP purchase by very large farms increased since 2005, which supports the possibility that more products have been developed or expanded over time that meet the insurance needs of these farms. The increase in participation by very large farms (as seen from 2009 to 2010) also coincided with increased subsidy levels for enterprise units that was a provision of the 2008 Farm Bill (Schnitkey, 2009).[32] In contrast, there was a decline in small farms' FCIP purchases, falling 14 percentage points from 2005 to 2020.

[31] This can be either due to a lack of insurance product for the commodities grown by these farms, or a lack of coverage in the specific county in which the farm is located.

[32] Enterprise units are a unit structure offered under crop insurance, whereby all insurable acreage of the same crop within a county are combined in one policy. Because production is spread across more plots, overall risk of loss is reduced, and policy premiums are lower. Very large farms were best positioned to benefit from this policy change, as they are more likely to have a larger production area.

Figure 22
U.S. farms that purchased insurance through FCIP by size, 2005–20



FCIP = Federal Crop Insurance Program. Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

Note: All values are in real, 2011 dollars using farm producer price index (PPI).

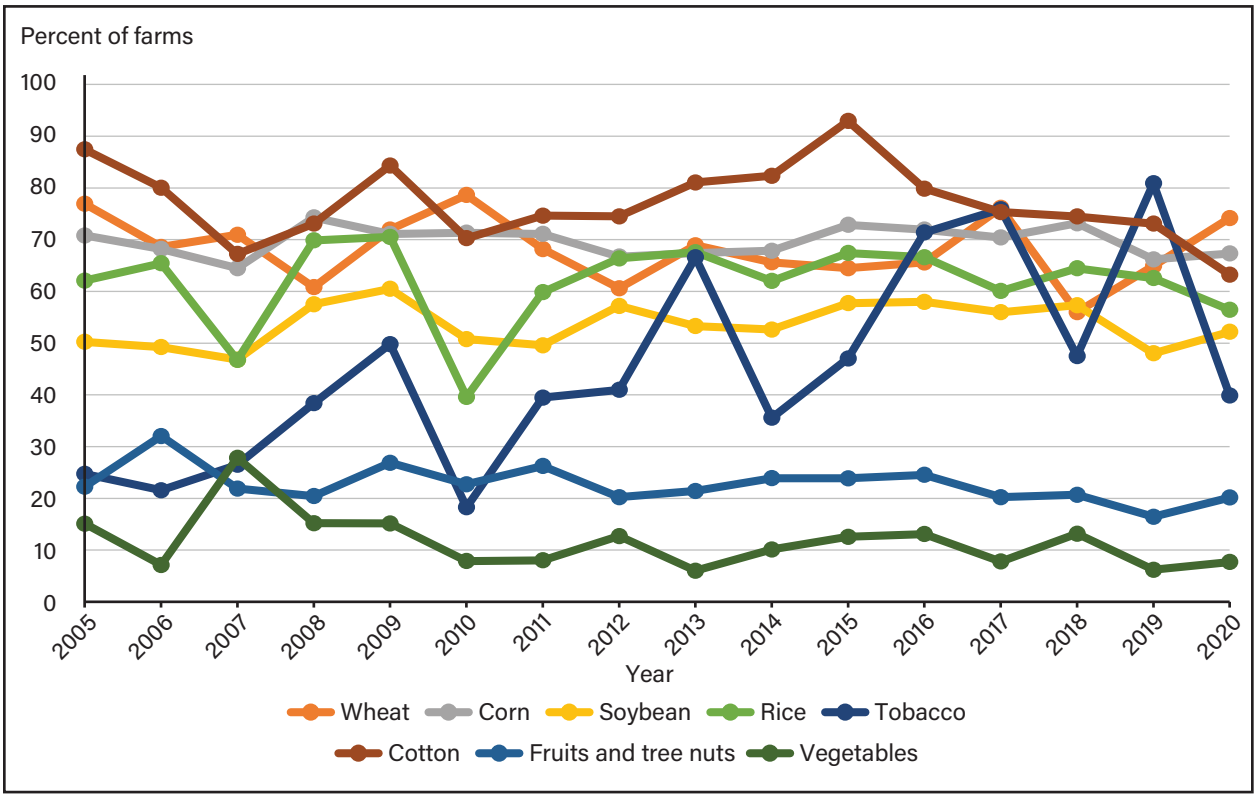
Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2005–20 Agricultural Resource Management Survey data.

With respect to FCIP purchase trends by commodity specialization, for most of the study period, FCIP options for livestock producers were limited,[33] such that we did not explore trends in FCIP participa-

[33] FCIP coverage for livestock producers was first made available in 1999 in the context of whole-farm revenue products that covered all commodities produced by the farm. A pilot program for livestock insurance was launched in 2001, but Government expenditures on the program were capped at $20 million per year, limiting overall participation by livestock producers. In 2007, a pilot program for Pasture, Rangeland, and Forage (PRF) index insurance was launched, which provides coverage for certain livestock feed sources. PRF was made available in the 48 contiguous States beginning with the 2016 crop year, and participation in the program has grown each subsequent year. FCIP participation by livestock producers increased further from 2019 after the budgetary cap on policy subsidies for livestock was removed under the Bipartisan Budget Act of 2018, the FCIC increased the subsidy percentage on livestock products, and the Agricultural Improvement Act of 2018 removed the restriction preventing producers from participating in both the Dairy Margin Coverage program and the dairy insurance program. Participation has since grown substantially. Subsidies for livestock policies grew from $4 million in 2018 to more than $400 million in 2023, while subsidies for PRF grew from $151 million in 2016 to more than $700 million in 2023. However, because the current study period ends in 2020, this recent rise in FCIP participation by livestock producers is not reflected in this study's data.

tion by farms specializing in livestock.[34] Between 40 and 80 percent of row crop farms participated in FCIP in any given year, while participation rates for fruit and tree nut and vegetable farms were much lower (figure 23). Over time, the most pronounced change in FCIP participation was for farms specializing in tobacco, which lagged participation for other commodities in the first half of the period (until roughly 2014, when payments from the tobacco quota buyout program ended) but have since risen to levels seen for other row crops.

Figure 23
U.S. farms that purchased FCIP by commodity, selected commodities, 2005–20



FCIP = Federal Crop Insurance Program.

Note: Specializations indicate the commodity that comprises the majority of the farm's production.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2005–20 Agricultural Resource Management Survey data.

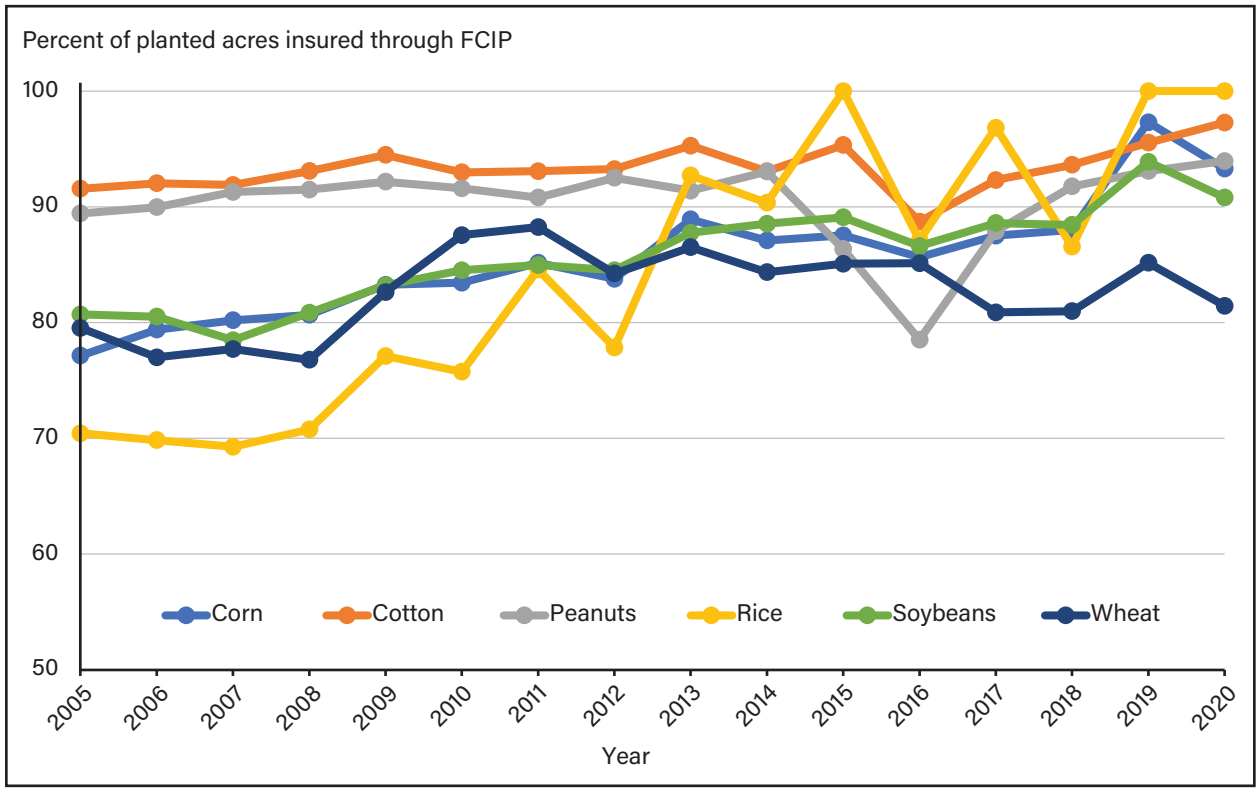
When considering relative FCIP purchase rates, farms specializing in soybeans tended to have lower participation in most years, which could reflect the farms' risk profiles (i.e., soybean yields are less risky than certain other commodities) or their reliance on other risk management strategies. In contrast, FCIP participation among farms specializing in cotton was higher than other field crops in most years.[35]

[34] Farms specializing in livestock production could still purchase FCIP for any crops they grew on their operation. Accordingly, given the lack of options for insuring livestock over much of the study period, any purchase of insurance noted in ARMS by livestock farms over the period is likely to be coverage for crops grown on the farm.

[35] Participation in FCIP among cotton producers started rising in 2010, following a period of drought in Texas (the largest cotton-producing State) from 2008-2010 that saw nearly half of the State in at least severe (D2) drought. Then in 2011, more than 70 percent of the State experienced exceptional (D4) drought, leading to then record-high FCIP indemnities for cotton that year. Widespread severe drought ameliorated beginning in 2015, with less than 10 percent of the State experiencing severe drought until 2018. For information on historic drought conditions, see the U.S. National Integrated Drought Information System's data by State. Data on historical crop insurance indemnities can be found at USDA, Risk Management Agency's Summary of Business App.

Generally, more than 50 percent of farms specializing in row crops carry crop insurance, and because more midsize, large, and very large farms are insured, most row crop acreage is insured. In 2020, more than 80 percent of acres planted to wheat were insured, while more than 90 percent of acres planted to corn, cotton, peanuts, rice, and soybeans were insured (figure 24). Growth in the share of total planted acres covered under FCIP is observed from 2005 to 2020—particularly for rice (+30 percentage points), corn (+16 percentage points), and soybeans (+10 percentage points).

Figure 24
Ratio of FCIP insured acres to total acres planted, selected commodities, 2005–20



FCIP = Federal Crop Insurance Program.

Note: Because producers can collect crop insurance indemnities on acres that were unable to be planted due to conditions at sowing but were intended to be planted with specific crops (called prevented plantings), the ratio of insured acres can reach greater than 100 percent. This is likely the case with rice acres in 2014, 2019, and 2020.

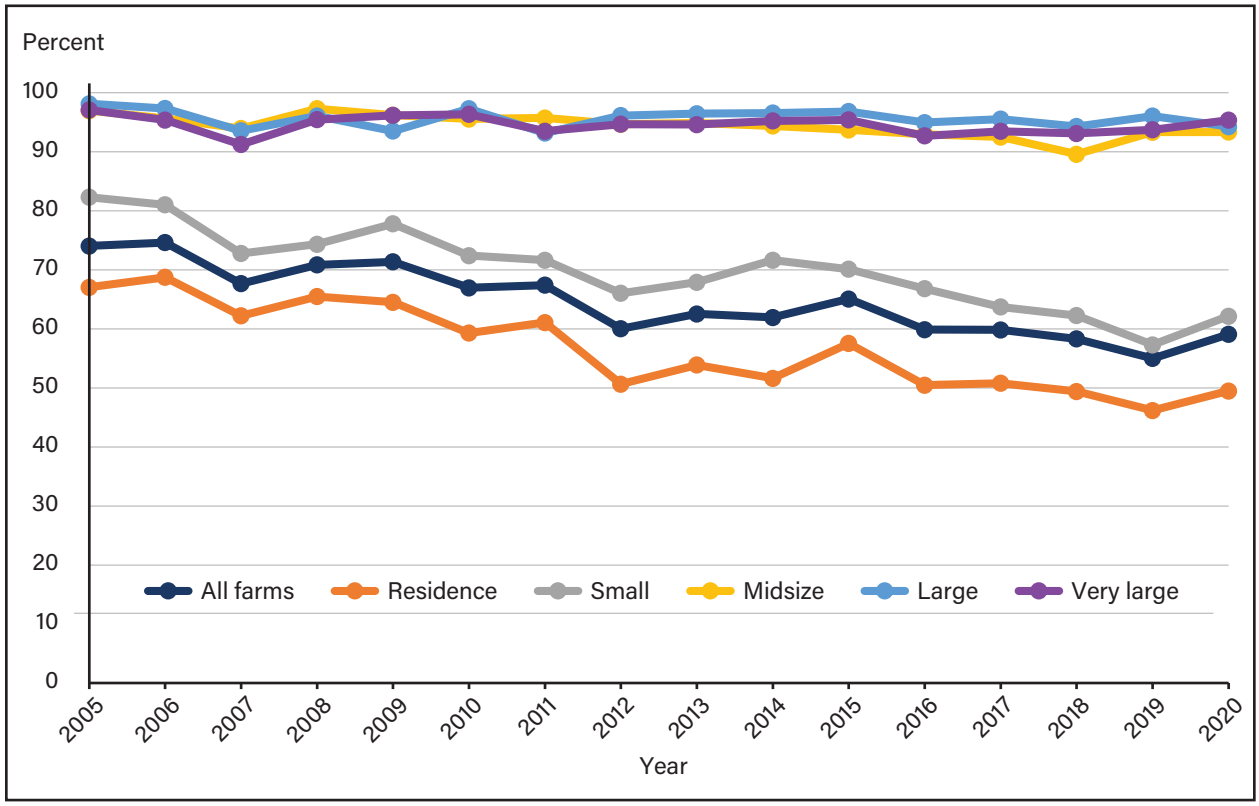
Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service Quick Stats data; and USDA, Risk Management Agency Summary of Business reports.

Other Insurance

Examining purchases of insurance other than FCIP (including private single-peril policies, umbrella policies, liability insurance, insurance for buildings and structures, and coverage for farm equipment, machinery, or commercial vehicles), we found that the gap between the largest and smallest farms grew (figure 25). Nearly all midsize, large, and very large farms carried some insurance, while only around 60 percent of small farms and about half of residence farms did so between 2005 and 2020. Insurance purchases by residence and small farms have been trending downward, falling 20 percentage points from 2005 to 2020 in the case of small farms. Data by commodity indicate that the share of farms purchasing other insurance trended down over this period for most commodity specializations, although row crop farms purchased other insurance at higher rates than livestock or

specialty crop farms.[36] Although ARMS contains little information on other insurance purchases, a short analysis of questions related to purchases of single-peril insurance products included on only the 2018 and 2019 questionnaires can be found in annex C.

Figure 25
Purchases of insurance other than FCIP by farm size, 2005–20



FCIP = Federal Crop Insurance Program. Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

Note: All values are in real, 2011 dollars using farm producer price index (PPI).

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2005–20 Agricultural Resource Management Survey data

Insurance for Stored Commodities

Insurance for stored commodities has recently garnered policy attention. In the wake of natural disasters in 2018 and 2019 (which destroyed numerous on-farm storage bins), an assistance program (the On-Farm Storage Loss Program[37]) was developed to compensate producers for losses of harvested

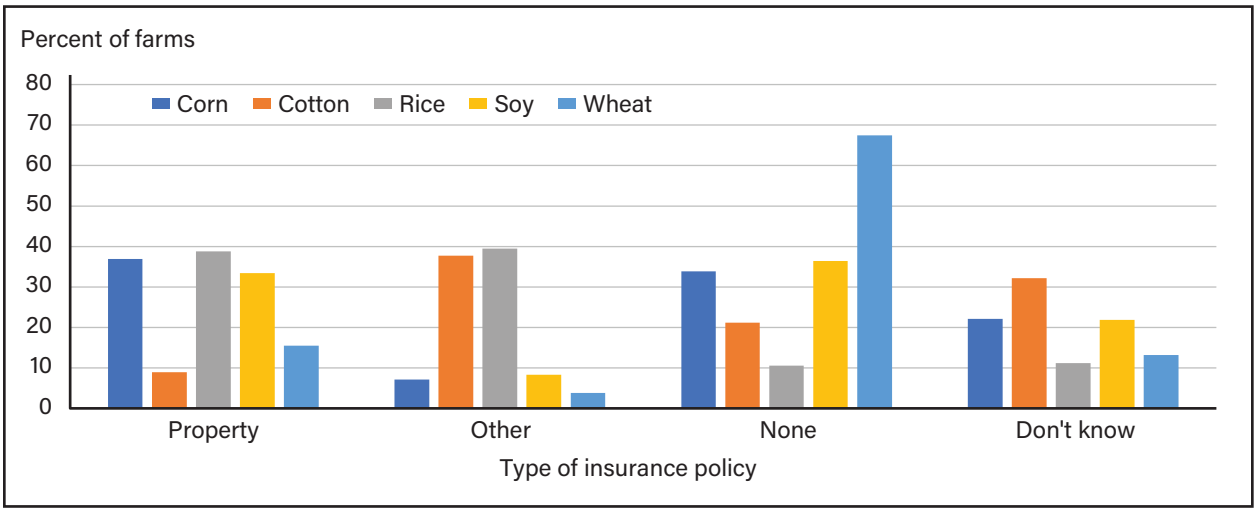
[36] The notable exception was tobacco farms, for which rates of purchasing other insurance increased 38 percentage points. The share of vegetable farms purchasing other insurance rose 1 percentage point, and the share of general cash crop, corn, soybean, and sorghum farms purchasing other insurance fell less than 10 percentage points. For all other commodities, the share of farms purchasing other insurance fell more than 10 percentage points over the period.

[37] See 84 Federal Register (FR) 48515.

commodities stored in on-farm structures. Subsequent supplemental disaster assistance appropriations have included compensation for losses of on-farm stored commodities.[38]

The data from ARMS indicate that 14 percent of all farms insured their stored commodity in 2019, a rate that is similar to the overall percentage of farms that purchased FCIP. At the same time, there were large differences in stored commodity insurance rates by commodity (figure 26) that likely reflect individual market dynamics and the prevalence of use of on-farm storage as a risk management tool in production of a given crop.

Figure 26
Stored commodity Insurance coverage for U.S. farms with unsold, stored commodities, by commodity and policy, 2019



Note: An unsold stored commodity refers to commodity inventory held post-harvest 2019 (that was unpriced and not under marketing contract). Commodity groups indicate that farms reported positive value of production for that commodity and reported storing it, but did not necessarily specialize in production of that commodity.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2019 Agricultural Resource Management Survey data.

In 2019, more than 30 percent of corn, rice, and soy producers insured their stored commodities through their property insurance policies, while nearly 40 percent of cotton and rice producers insured their commodity through other means (such as an umbrella policy). This indicates that the option to insure stored production is generally available to producers, but many choose not to do so, judging that the risk to damage of storage bins (and consequently the commodity inside) is not great enough to justify the added expense.

Futures and Options

Derivatives markets, such as futures and options contracts, allow producers to lock in an established price before harvest. Although farmers make planting decisions with some expectation of what output prices will be at harvest, that estimation has substantial uncertainty. Prager et al. (2020) noted that over a 20-year period, corn prices in Iowa rose or fell by at least 10 percent in 26 of those 240 months

[38] Including the 2021 Extending Government Funding and Delivering Emergency Assistance Act, Public Law (Pub. L.) 117–43 and the Consolidated Appropriations Act, 2023, Pub. L. 117–328. In addition, the Emergency Grain Storage Facility Assistance Program was rolled out in 2023 to address damage to commercial grain facilities (see 88 FR 16230), and the On-Farm Stored Commodity Loss Program (OFSCLP) was launched in 2025 to address damages to losses in commodities stored on-farm (see 90 FR 51956).

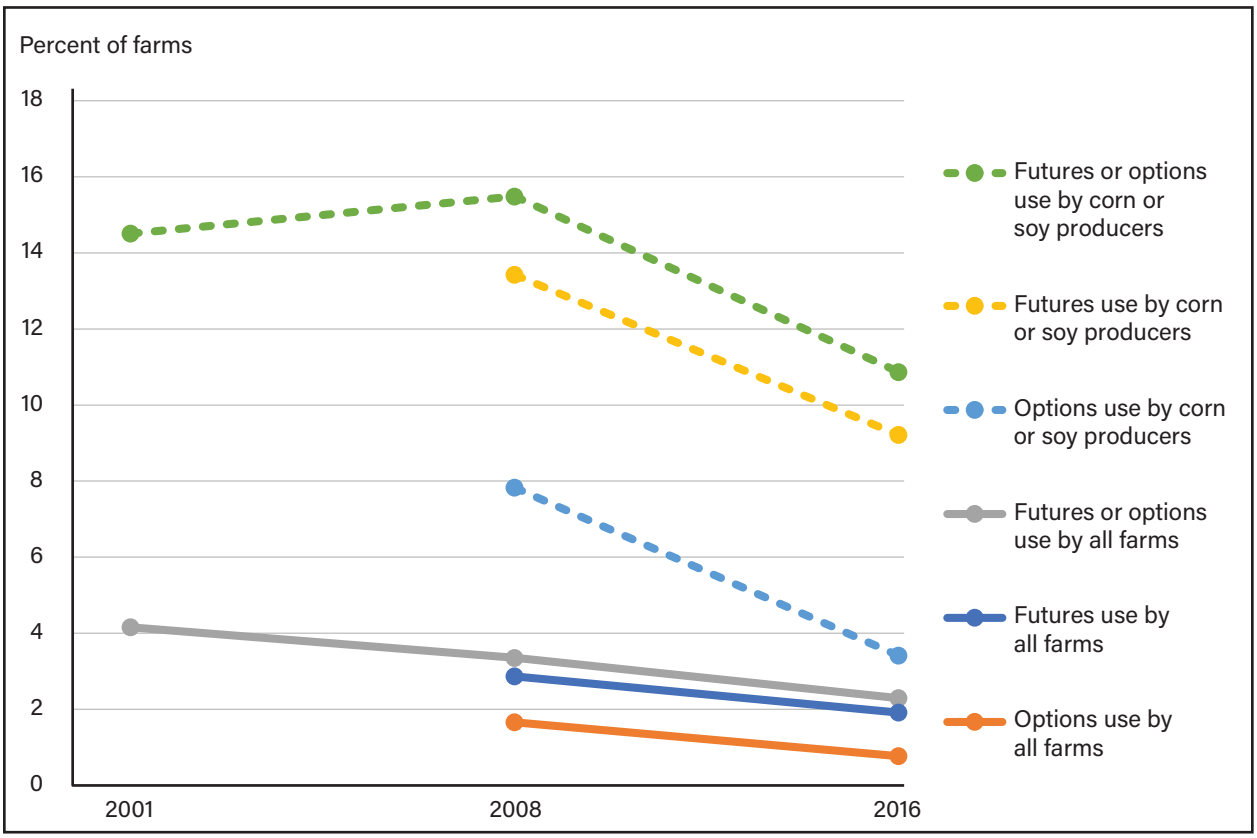
and rose or fell by 5–10 percent in another 36 months. Because crop choice decisions are locked in after planting, producers could thus experience substantial downside price risk.

Various authors have examined the characteristics of producers or farms and their use of futures and options contracts. For example, Coffey and Schroeder's (2019) analysis of risk management tools used by a sample of more than 600 Midwestern grain farmers whose operations included at least 350 acres of row crops found that approximately one-quarter of those producers used futures and options. Other work has examined operators' use of futures and options markets in conjunction with farm capital structure (Shapiro & Brorsen, 1988; Turvey & Baker, 1990); producer age or farming experience (Franken et al., 2012; Pennings et al., 2008); producer education level (Franken et al., 2012; Makus et al., 1990; Shapiro & Brorsen, 1988); farm size (Coffey & Schroeder, 2019; Franken et al., 2012; Makus et al., 1990; Pennings et al., 2008; Shapiro & Brorsen, 1988); and the relationship between hedging and insurance (Coble et al., 2000; Coffey & Schroeder, 2019; Maples et al., 2022; Walters & Preston, 2018; Wang et al., 2004).

Questions about futures and options contracts appear infrequently in ARMS, with the most recent appearance in 2016. Prager et al. (2020) analyzed use of these tools based on the 2016 data, and found that although only 2 percent of U.S. farms used these tools, users accounted for nearly 11 percent of the total value of agricultural production. This suggests that futures and options contract users were (on average) larger operations. Although producers of different commodities occasionally used futures and options contracts, more than 90 percent of the producers who used such contracts used them for corn or soybeans, with these producers hedging greater than 40 percent of their production (on average).

However, Prager et al. (2020) did not examine trends in utilization over time. We found a slight decline in the use of these tools among all farms in the years observed since 2001 (figure 27). Looking only at farms that harvested corn and soybeans, we still observed a decline in use between 2001 and 2016, but it was not clear if this was a consistent trend given the uptick in use of these tools in 2008. Further investigation of these decisions, in light of economic and farm financial conditions, may provide more concrete conclusions.

Figure 27
U.S. farm producers' use of futures and options contracts, all producers and corn and soy producers, 2001–16



Note: For corn and soybean producers, the sample is based on ARMS farms that reported positive harvested acres of corn or soybeans in 2001, 2008, and 2016.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2001, 2008, and 2016 Agricultural Resource Management Survey data.

Production and Marketing Contracts

Contracting is another strategy for managing market risks. Contracts are legal agreements between farm operators and another person or firm (known as a contractor or integrator) that specify the type, quantity, and quality of crops or livestock to be produced or marketed. Since contracts specify the terms of a commodity's production or sale, contracts can reduce the producer's risks associated with price or production volatility by shifting that risk to the holder of the contract. Although marketing contracts and futures contracts both allow producers to mitigate market risk by locking in a price, producers often prefer marketing contracts because they avoid basis risk and does not require cash holding for margin calls (Mark et al., 2008).

Producers can engage in either production or marketing contracts. With production contracts, producers agree to raise the commodity for a contractor, with the contractor providing the inputs and marketing the final product in exchange for a fee to the producer. Accordingly, producers can use production contracts to manage both input and output price risk. In contrast, marketing contracts specify only that a producer will deliver a certain amount of production at a certain price on a given future date. Marketing contracts sometimes contain formulas for final prices that consider quality

or other attributes, or they can be based on nearby futures contracts. Under forward marketing contracts, the specific price to be paid is instead specified in the contract.[39]

Operators' use of production or marketing contracts has been common in U.S. production agriculture. In their 2008 analysis of risk management strategies, Pennings et al. (2008) found that 82 percent of a sample of 1,105 crop farms located in the Midwest, Great Plains, and Southeast regions used cash forward contracts, with nearly 20 percent of producers utilizing solely cash forward contracts among forward pricing options. This comparatively high utilization of contracting among crop farmers was confirmed by Franken et al.'s (2012) analysis, using data from Illinois. Franken et al. (2012) found that 88 percent of corn growers and 83 percent of soybean growers used forward marketing contracts, while only 10 percent of corn and 25 percent of soybean growers used production contracts.

The literature has also explored the relationship between contracting behavior, farm size, and use of other risk management strategies. In their 2004 analysis of factors associated with the likelihood and scale of adopting marketing contracts, Katchova and Miranda (2004) found that highly leveraged corn farms were more likely to adopt marketing contracts and the use of futures was positively related to adoption of corn or soybean marketing contracts.[40] However, Katchova and Miranda (2008) also found that producers who have received crop insurance payments were less likely to adopt marketing contracts. In their analysis of corn and soybean farmers' risk management decisions in Illinois, Iowa, and Indiana, Velandia et al. (2009) found that while farmers who owned more acres did not tend to use forward contracting, those who operated more acres did engage in forward contracting. Results from Franken et al. (2012) were consistent with Katchova and Miranda's (2008) results regarding the positive relationship between leverage and use of contracting. Franken et al. (2012) also noted a positive relationship between farm size and use of marketing contracts. Regarding production contracts, Franken et al. (2012) found a positive correlation between the share of corn marketed through production contracts (for seed) and farm size. They also noted that soybean producers' use of production contracts was strongly correlated with the use of forward contracting.

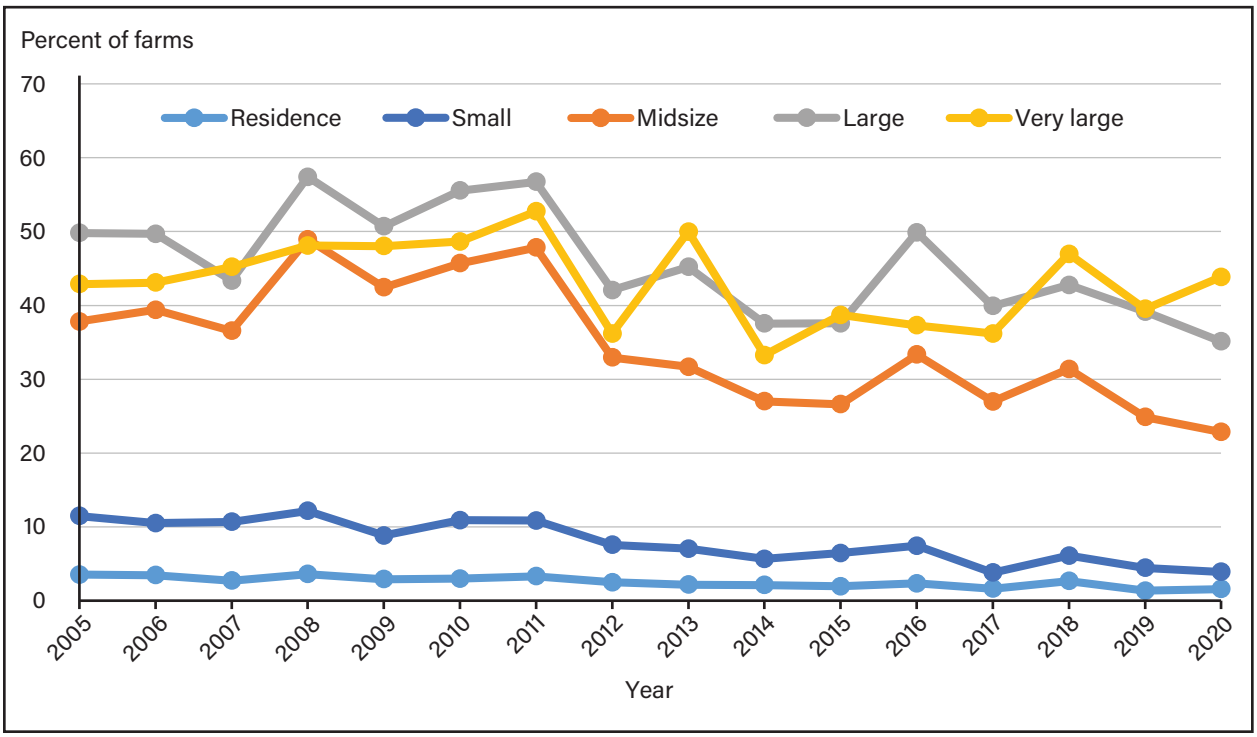
Prager et al. (2020) outlined some commodity-specific findings. They noted that marketing contract usage varied substantially by commodity, with roughly one-fifth of corn and soybean production sold through marketing contracts. Even among corn and soybean farmers who utilized this strategy, the median farmer covered less than half of their production under marketing contracts. Growers who used marketing contracts also utilized other strategies (such as on-farm storage or futures and options contracts) at a higher frequency than producers who did not use marketing contracts. The authors also noted that operators' use of marketing contracts exhibited a positive relationship with farm size.

ARMS data support the findings from the literature regarding the relationship between farm size and participation in marketing contracts, with fewer than 5 percent of residence or small farms reporting marketing contracts (figure 28). We found that higher shares of midsize, large, and very large farms used marketing contracts, but the share of midsize farms using this strategy declined. However, these data give no indication of the risk mitigation potential of marketing contracts for these farms, since the analysis did not extend to the overall share of production covered under such contracts.

[39] For further discussion on production and marketing contracts, see MacDonald et al. (2004).

[40] Additional results indicated that corn producers who used futures contracts were more likely to adopt specialty marketing contracts, not forward contracts. In other words, specialty marketing contracts were considered a complement to futures contracts, while forward marketing contracts were considered to be substitutes.

Figure 28
U.S. farms with income from marketing contracts by size, 2005–20



Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

Note: All values are in real, 2011 dollars using farm producer price index (PPI).

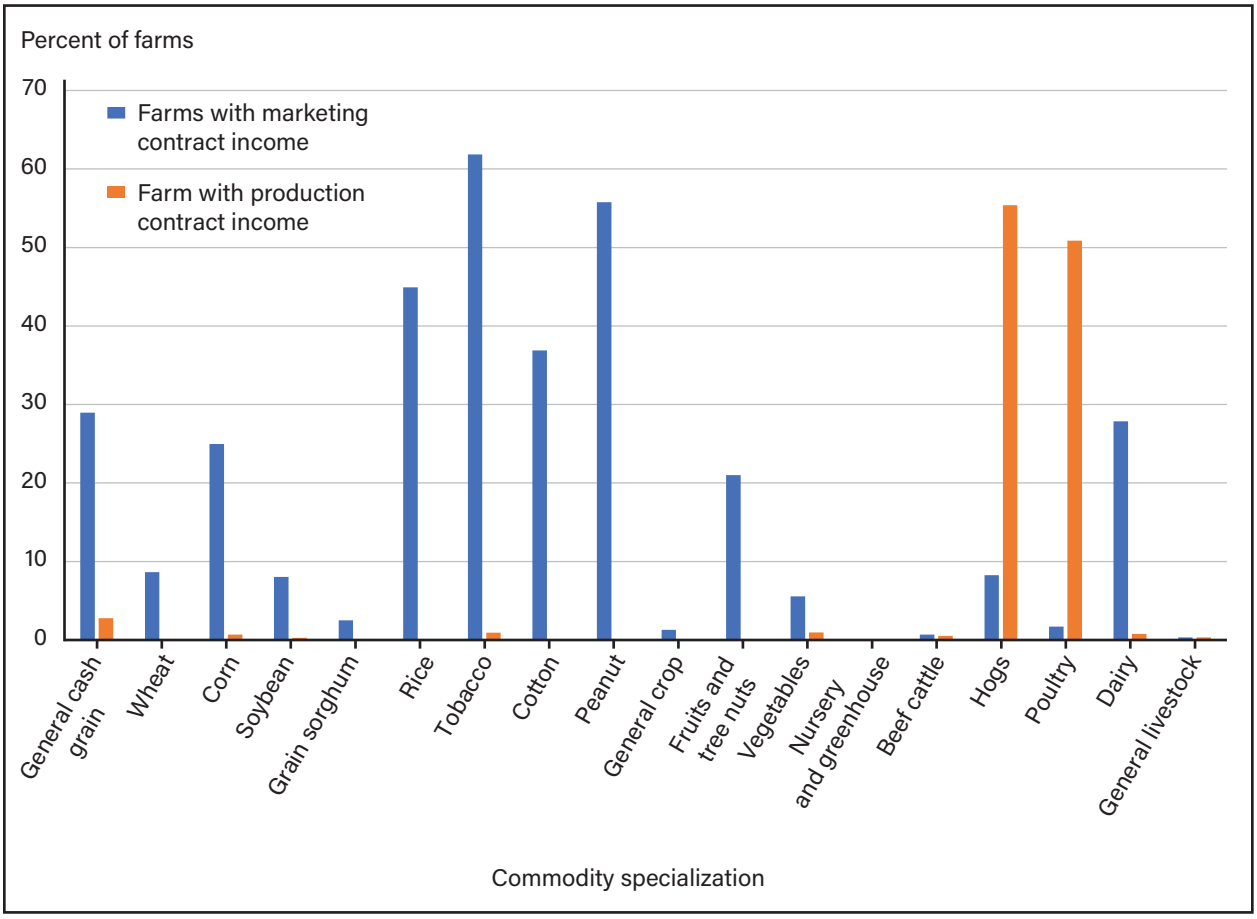
Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2005–20 Agricultural Resource Management Survey data.

The data on marketing and production contracts by commodity specialization reflect the organization of the various crop and livestock product industries (figure 29). Certain types of farms used marketing contracts as a common strategy. More than one-third of farms that specialize in cotton, peanuts, rice, and tobacco reported income from marketing contracts in 2019, and more than one-fifth of farms specializing in general cash grain, corn, fruits and tree nuts, and dairy also did. Farms specializing in hogs and poultry were the most likely to use production contracts as a risk management tool. ARMS data indicate that about half of those operations used production contracts (figure 29).[41]

[41] Although about half of these farms used production contracts, the share of production covered can be much higher depending on whether the strategy is used by a significant share of larger farms. Estimates from ARMS confirm that over 90 percent of the value of production for poultry was covered by production contracts in 2019, while over 60 percent the total value of production for hogs was covered by production contracts.

Figure 29

U.S. farms with income from marketing and production contracts, by commodity specialization, 2019



Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production. Note also that "Poultry" includes production of broilers, turkeys, and eggs.

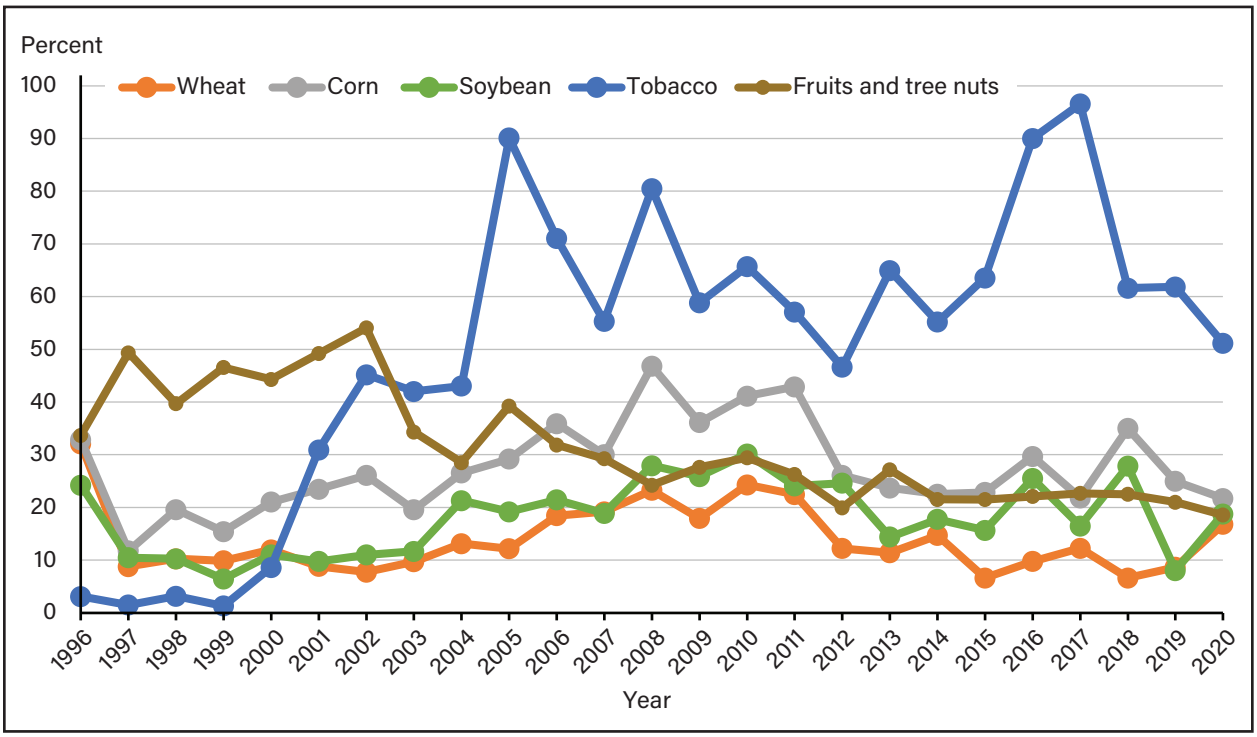
Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2019 Agricultural Resource Management Survey data.

While the shares of farms using marketing contracts can fluctuate due to market factors and individual farm production decisions in a given crop year, no long-term trends in the data were obvious for most commodity specializations (figure 30). Tobacco provided the most stark exception. Before the 2000s when tobacco quotas and the tobacco price support system were in place, few tobacco operations used marketing contracts. When quotas and the price support system ended in 2004, the share of tobacco operations using marketing contracts jumped, exceeding 90 percent in some years.[42] Farms specializing in fruit and tree nut production provide another exception as the share of those farms engaging in marketing contracts declined from around 50 percent in the early 2000s to around 20 percent in 2020. Drivers of this decline could be a topic for further investigation.[43]

[42] Further information about the rising reliance of tobacco producers on marketing contracts can be found in Foreman and McBride (2011).

[43] One complication of drawing further conclusions about changes in marketing contract utilization by fruit and tree nut farms is that the composition of this ARMS aggregate changes over time according to the value of production of different commodities that make up the category. Accordingly, this decline in use of marketing contracts by fruit and tree nut growers may be due to a declining value of production in a commodity with high reliance on marketing contracts, a rise in value of production by a commodity that uses marketing contracts relatively infrequently, or both.

Figure 30
Shares of U.S. farms using marketing contracts by commodity specialization (selected commodities), 1996–2020



Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 1996–2020 Agricultural Resource Management Survey data.

Other Government Programs Producers Use for Managing Risk

Outside of on-farm strategies and market-based tools, USDA offers assistance programs to help farmers manage different types of risks, implement conservation practices, or make investments in their operations. The share of farms receiving different types of payments from these programs has fluctuated based on various factors, including the specific programs authorized in a given Farm Bill and overall market conditions. Although all Government programs may have an indirect impact on producers' risk management by altering cost structures or providing additional income,[44] this section focused specifically on countercyclical-type programs and disaster recovery programs authorized through Title I of the Farm Bill that producers can voluntarily adopt to help manage production, income, or revenue risk.

Previous work has noted the prevalence of Government programs in the risk management portfolios of certain groups of farmers (Makus et al., 2007) and offered extensive descriptions of these programs, including what types of risks were covered, trends in program enrollment, and Government

[44] For example, the Conservation Reserve Program (CRP), authorized under Title II of the Farm Bill, offers producers a fixed rental payment in exchange for maintaining the land in a conserving use each year that the contracted land is enrolled in the program. This stream of predictable income accordingly may be important to a farm's management of income risk, particularly in areas with highly erodible land that is prioritized by the program. However, the program is not available for all producers who wish to utilize it (Rosenberg et al., 2024).

outlays for these programs (Turner et al., 2023). The policy mix of programs available to farmers changes with each Farm Bill, complicating a longer term analysis of these programs and their utilization. However, the current toolbox of programs in Title I of the Farm Bill that producers may use for protecting against income losses was largely put in place with the 2014 Farm Bill, which introduced the countercyclical-type programs Agriculture Risk Coverage (ARC) and Price Loss Coverage (PLC). ARC offers protection against revenue declines, whereas PLC offers protection against price declines. Both programs are available to producers who have historical base acres[45] of covered commodities.[46] For the years covered by this analysis, producers could enroll in either ARC or PLC on a covered commodity by covered commodity basis.[47] In addition to ARC and PLC, coverage for dairy producers is offered through the Dairy Margin Coverage (DMC) program. DMC was authorized in the 2018 Farm Bill as a replacement to the Margin Protection Program for Dairy (established in the 2014 Farm Bill) and provides coverage when dairy margins fall below a selected coverage level.[48] Analyzing farms' participation in these countercyclical-type programs indicates that relative participation patterns mirror that of FCIP. Fewer than 15 percent of all farms received any countercyclical-type payment in any given year, and receipt among midsize, large, and very large farms was higher than this overall average (figure 31). For very large farms, one potential explanation for their lower rates of payment receipt (compared to large and midsize farms) may be the average Adjusted Gross Income (AGI) limit for payment eligibility of $900,000 attached to Farm Bill programs. With GCFI of at least $5 million, many of these farms may not have been eligible for assistance.

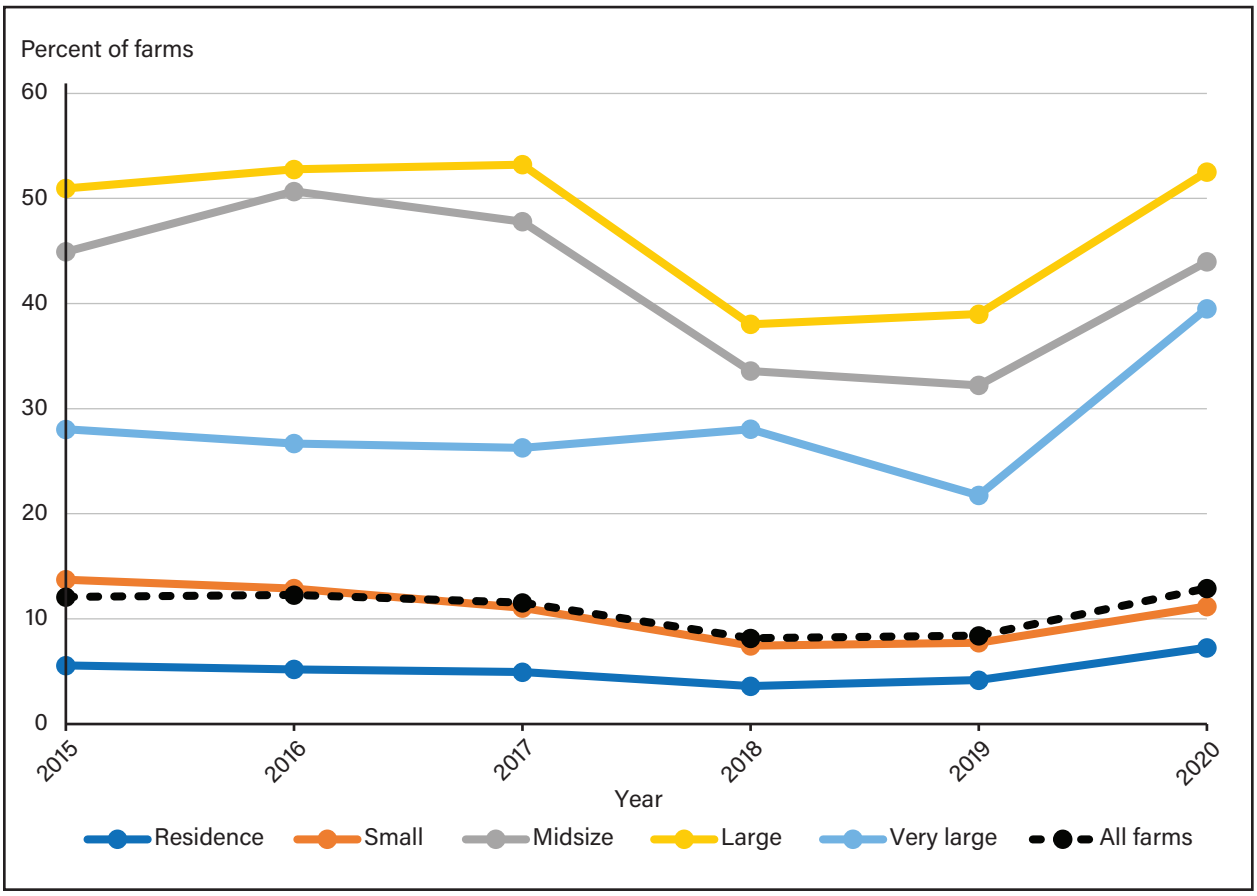
[45] Base acres are a farm's historical planted acres for specific commodities.

[46] Commodities covered under the program are wheat, oats, barley, corn, grain sorghum, rice, soybeans, seed cotton, sunflower seed, rapeseed, canola, safflower, flaxseed, mustard seed, crambe and sesame seed, dry peas, lentils, small chickpeas, large chickpeas, and peanuts.

[47] There are two types of ARC payments: (1) ARC-County (ARC-CO) and (2) ARC-Individual (ARC-IC). ARC-CO payments are triggered when the county-level crop revenue is less than the county-level revenue guarantee, while ARC-IC offers support tied to a farm's revenue from the current production of covered commodities compared with a benchmark average of that farm's production of those commodities, limited to a share of historical base acres. ARC-IC has not widely been adopted, so we focused here on ARC-CO.

[48] More information on these programs, including further details on program design features and payment calculations, can be found in Turner et al., 2023.

Figure 31
Percent of U.S. farms receiving countercyclical type payments by size, 2015–20



Residence = <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports the primary occupation is not farming; Small = GCFI < $350,000 and the operator is not retired from farming and the primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million; Large = GCFI > $1 million and < $5 million; Very large = GCFI > = $5 million.

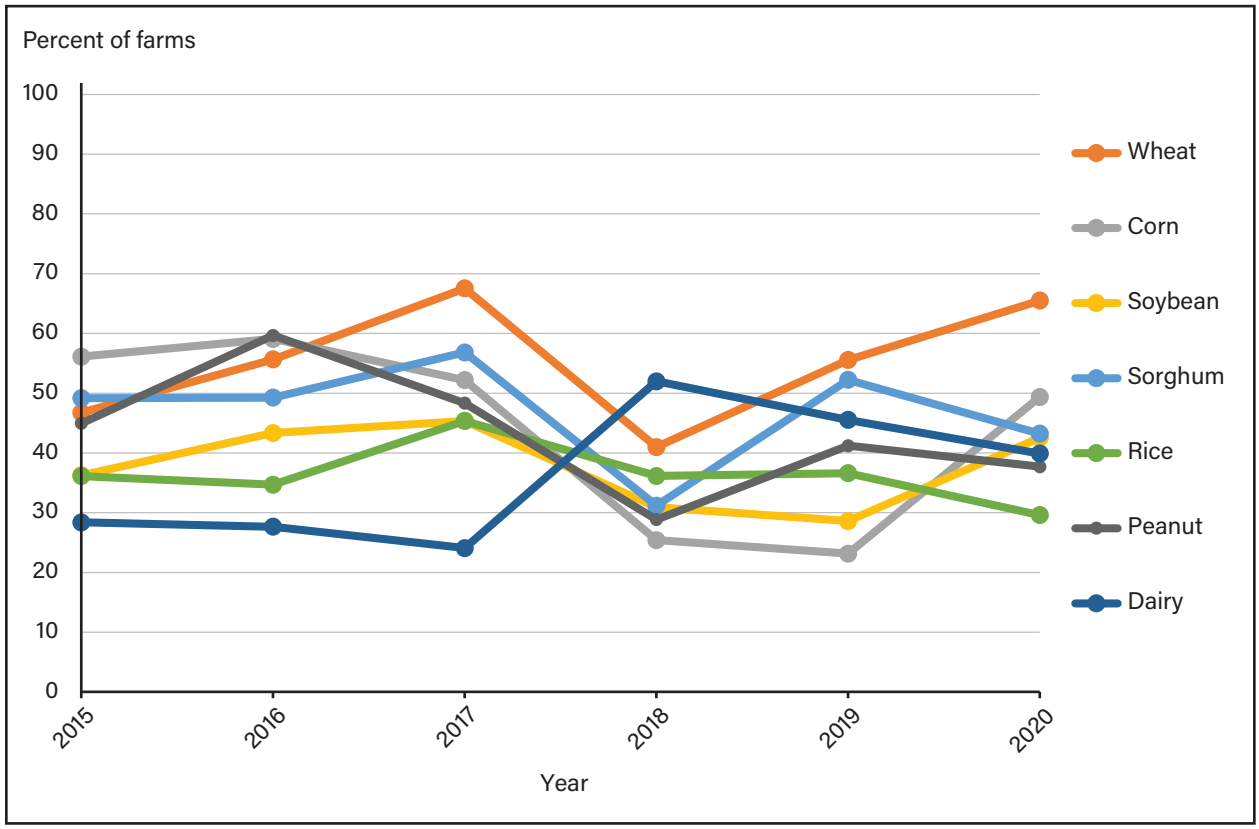
Note: All values are in real, 2011 dollars using farm producer price index (PPI). Countercyclical type programs include Agriculture Risk Coverage, Price Loss Coverage, Margin Protection Program, and Dairy Margin Coverage.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2015–20 Agricultural Resource Management Survey data.

Payments under these programs are triggered only when prices, revenue, or margins fall below established thresholds. Accordingly, the share of farms receiving payments in any given year by commodity was driven largely by market dynamics and exhibits no clear trend over time (figure 32). Over the period from 2015–20, a majority of farms specializing in wheat production received payments in most years. In contrast, less than 40 percent of farms specializing in soybeans received payments in most years. For farms specializing in dairy, the share of farms receiving payments under the Margin Protection Program was under 30 percent from 2015 to 2017 but rose to above 40 percent in 2018. Since the 2019 implementation of DMC, the share of farms specializing in dairy receiving payments has remained above 40 percent.

Figure 32

U.S. farms that received countercyclical-type payments by commodity specialization, selected commodities, 2015–20



Note: Countercyclical-type programs include Agriculture Risk Coverage, Price Loss Coverage, Margin Protection Program, and Dairy Margin Coverage.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2015–20 Agricultural Resource Management Survey data.

Outside of countercyclical-type programs, the USDA, Farm Service Agency (FSA) offers a suite of disaster programs that are authorized in the Farm Bill and complement FCIP by offering coverage when crop insurance is not available (or for damages not covered by crop insurance, including damage to farmland or infrastructure).[49] These programs fall into four broad categories: (1) livestock assistance, (2) crop loss assistance, (3) farmland damage, and (4) farm loans. Because these programs are authorized in the Farm Bill, farmers are aware ex ante that these programs will be available in the event of a qualifying loss. USDA also periodically implements supplemental ad hoc disaster assistance

[49] As of 2020, the permanently authorized disaster assistance programs included: the Livestock Forage Disaster Program (LFP); the Livestock Indemnity Program (LIP); the Emergency Assistance for Livestock, Honeybees, and Farm-Raised Fish Program (ELAP); the Noninsured Disaster Assistance Program (NAP); the Tree Assistance Program (TAP); the Emergency Loan Program; the Disaster Set-Aside Program; the Emergency Conservation Program (ECP); and the Emergency Forest Restoration Program (EFRP). For more information on Federal programs for agricultural risk management, see Turner et al. (2023) or the USDA, FSA website.

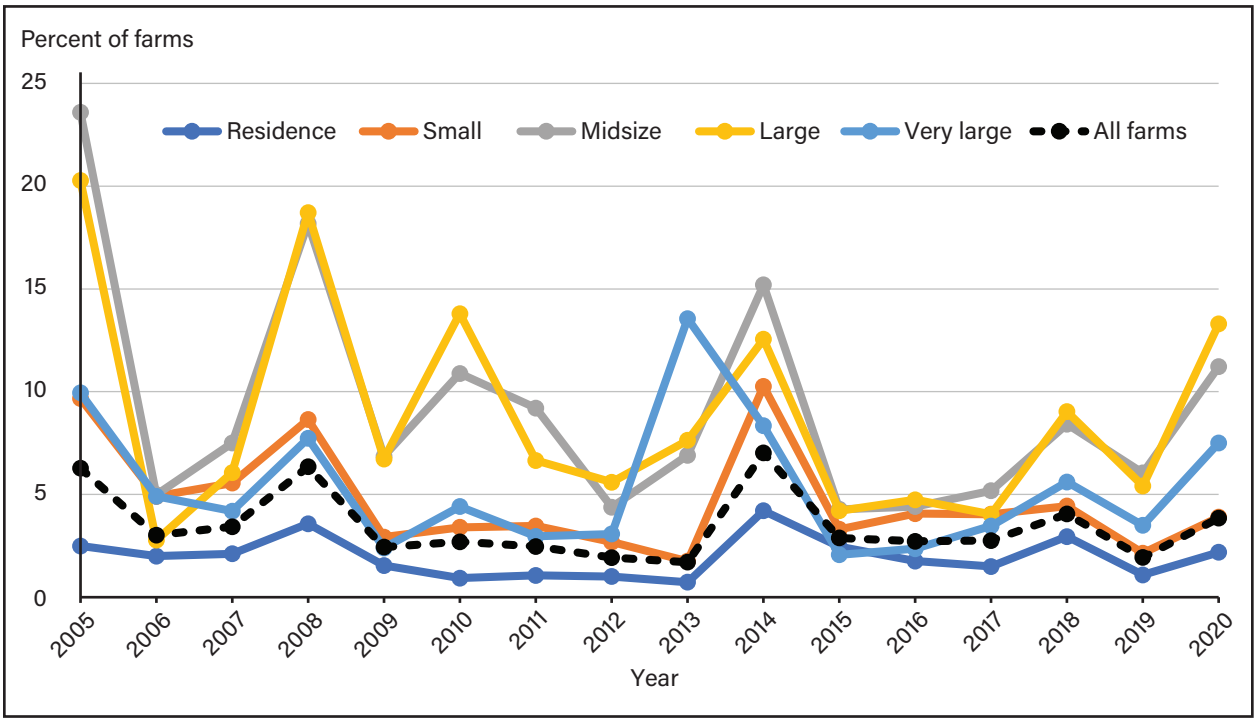
programs when Congress authorizes additional financial resources for disaster assistance in response to specific events.[50]

ARMS data make no distinction between permanently authorized and ad hoc disaster assistance programs. However, some conclusions can still be drawn about the kinds of farms receiving disaster assistance in general from the available data. In any given year, the share of farms receiving disaster payments was small, typically less than 4 percent of all farms, which was well below the percentage of farms purchasing crop insurance (figure 33). This low overall average is driven by the low shares of small and residence farms participating in these programs. By contrast, midsize and large farms more frequently receive disaster payments, with payments accruing to more than 10 percent of farms in these size classes in 2005, 2008, 2010, 2014, and 2020. Very large farms received disaster payments at lower rates than large or midsize farms. Disaster payment receipt for these farms may be limited by AGI limits for payment eligibility of $900,000 for Farm Bill programs.[51]

[50] Recent examples of these types of programs include: the 2017 Wildfire and Hurricane Indemnity Program (WHIP); the Wildfire and Hurricane Indemnity Program Plus (WHIP+); the Emergency Relief Program (ERP); the Emergency Livestock Relief Program (ELRP); ERP 2022; and ELRP 2022, which provided assistance to producers impacted by certain natural disasters in 2017, 2018, 2019, 2020, 2021, and 2022. Note that while ERP and ELRP were authorized to provide assistance for natural disaster damage incurred in 2020 and 2021, the first payments were not disbursed until 2022, such that the programs were not included in the disaster payments calculations in the 2020 ARMS survey. In addition to these recent ad hoc assistance programs, additional ad hoc assistance programs have been launched in recent years to provide assistance for lost income from trade retaliation and market disturbances—namely, the Market Facilitation Program (MFP) and the Coronavirus Food Assistance Program (CFAP). Recent ARMS surveys included separate questions about these programs, so data on these payments were not included in the disaster payment totals examined here. For more information about recent trends in ad hoc programs, see Baldwin et al. (2024).

[51] These same income limitations did not apply to certain ad hoc disaster programs, which may explain part of the reason that very large farms received disaster payments at higher rates in 2018, 2019, and 2020. For these ad hoc programs, there were typically limits on the payment amounts that a person or legal entity could receive, but there was no limitation on what sizes of farms (in terms of Adjusted Gross Income, or AGI) were eligible to receive these payments. For information on payment limitations under ad hoc disaster programs, see 83 FR 33795 (2017 WHIP) and 84 FR 48518 (WHIP+, On-Farm Storage Loss Program, and WHIP Milk Loss Program).

Figure 33
Percent of U.S. farms receiving disaster payments by size, 2005–20



Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

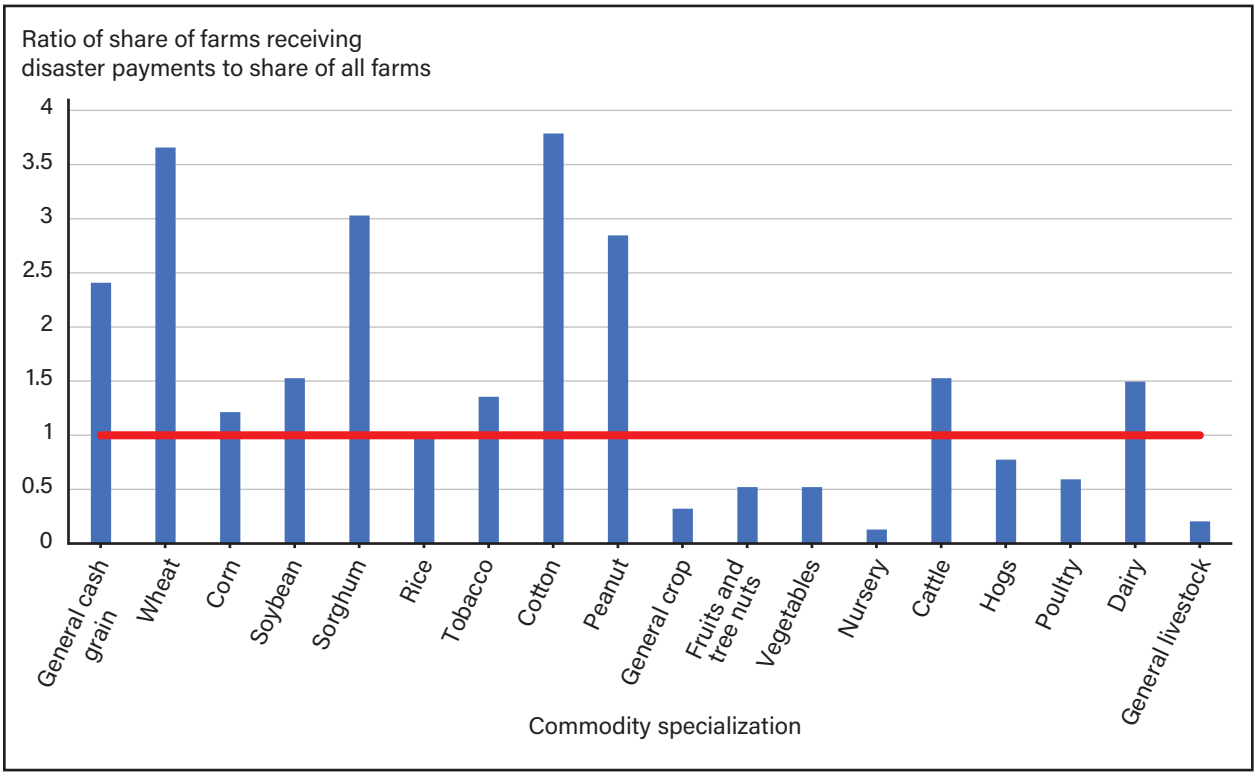
Note: All values are in real, 2011 dollars using farm producer price index (PPI).

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2008–20 Agricultural Resource Management Survey data.

Because the ARMS sample contains only a subset of producers each year, more detailed examination of producer or farm characteristics may run into disclosure issues in cases where small shares of producers adopt certain strategies, including in the case of disaster payment receipt. In addition, analyzing disaster payments over a shorter time period may bias the conclusions as payments will likely accrue to operations that grow crops that predominate in the regions that happened to be affected by natural disasters in those years. Faced with these two issues, we first pooled data from 2005–20, and then compared those farms receiving disaster payments to the full population of farms to see if certain farm commodity specializations were over-represented or under-represented compared with the overall population as a ratio. Values higher than 1 indicate farms of that commodity specialization represented a higher share of the disaster payment-receiving population than the overall farm population, while values less than 1 indicate the opposite. The data indicate that farms specializing in cotton, sorghum, and wheat represented a larger share of farms receiving disaster payments (figure 34). The aggregation of the data on receipt of disaster payments for all standing and ad hoc programs in ARMS do not allow for further analysis of the factors driving this overrepresentation. These three crops are predominantly grown in regions that are more susceptible to drought, which is the most common cause of loss in U.S. agriculture. While these operations may be specializing in wheat, sorghum, and cotton, they could be receiving payments under the Livestock Forage Program for drought-incurred forage loss. Other possibilities include that these producers received ad hoc payments over the period (which, depending on the program, either required participation in FCIP or NAP as a condition of receiving assistance or mandated FCIP or NAP coverage in the

years following payment receipt), or that producers grew these products in counties where insurance coverage was not available and received payments under NAP when they experienced losses. In contrast, fruits and tree nuts, vegetables, and nursery crop operations received disaster payments less frequently.

Figure 34
Share of U.S. farms receiving disaster payments (standing and ad hoc) relative to share of all farms in each commodity specialization, 2005–20 average



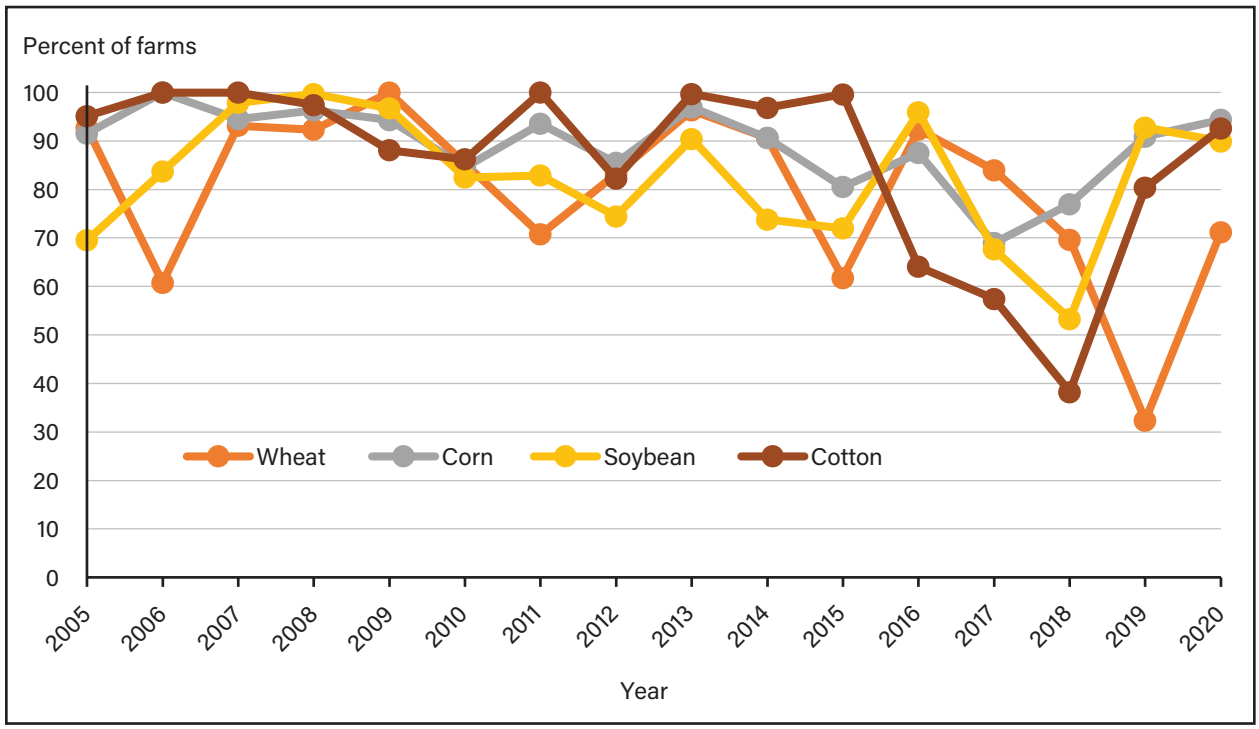
Note: Bars with a value greater than one indicate that farms specializing in that commodity represented a relatively higher share of farms receiving disaster payments than their overall share of farms. Bars with a value of less than 1 indicate that farms specializing in that commodity represented a relatively lower share of farms receiving disaster payments than their overall share of farms. Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2005–20 Agricultural Resource Management Survey data.

Further insights into the interaction between crop insurance and disaster payments can be gleaned by restricting the sample to only farms that received disaster payments and investigating the proportion of those farms that purchased crop insurance for commodities where the sample size is large enough to avoid disclosure issues. For farms specializing in corn, cotton, soybean, and wheat production that received disaster payments, the rate of insurance participation was generally high (i.e., 60–100 percent) before 2015 (figure 35). Beginning in 2016 for cotton and 2017 for wheat, the proportion of farms receiving disaster payments that also purchased crop insurance declined, falling by 60 percentage points for both crop types. These declines preceded the implementation of 2017 WHIP and WHIP+, which suggests farms may have been underinsuring before the disasters that precipitated those assistance packages. However, in the wake of 2017 WHIP and WHIP+, insurance coverage rates of farms receiving disaster payments rose from the lows seen in 2018 and 2019. This is consistent with the rules for those programs, which mandated that growers receiving benefits under both 2017 WHIP and WHIP+ purchase crop insurance (or NAP coverage, if crop insurance was unavailable) for the 2 crop years following receipt of payments. We also observed an increase in insurance rates for disaster

payment-recipient farms for some commodities between 2005 and 2007. This is consistent with crop disaster programs put in place during that time period that also required producers that had not elected to participate in crop insurance (or NAP where insurance was not available) to purchase crop insurance or NAP for the 2 subsequent crop years.[52] In contrast, the 2007 Crop Disaster Program[53] launched in December 2007 for damages incurred in 2005, 2006, and 2007 made having had crop insurance or NAP an eligibility condition for the program and did not carry the requirement to insure in subsequent years. No ad hoc crop disaster payments were observed between 2010 and 2018, when 2017 WHIP was launched. Most 2017 WHIP payments were disbursed by the end of fiscal year 2019, such that FCIP purchase requirements for most producers likely ended in 2021, while most WHIP+ payments were disbursed in fiscal year 2020, implying that the FCIP purchase requirements likely ended in 2022. Because this analysis ends in 2020, analysis of whether these coverage rates stay high once the requirement is fulfilled is left for future research.

Figure 35
Percent of disaster payment-recipient farms that also purchased crop insurance, by crop specialization, 2005–20



Note: Specializations indicate the commodity that comprises the majority of the farm's production.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2000–20 Agricultural Resource Management Survey data.

[52] Producers do not necessarily receive assistance payments for the year in which damages were incurred, or in the year in which a particular program was launched, which complicates the linking of payment receipt to certain historical programs. However, two crop disaster programs may have either generated payments for producers over that period or been the source of the requirement that increased insurance rates if a producer accepted such assistance in 2003 or 2004. The first was the Crop Disaster Program launched in June 2003, which provided assistance for losses incurred in 2001 or 2002 (see 68 FR 37936) and the second was the 2003–05 Crop Disaster Program, launched in March 2005 (see 70 FR 15725).

[53] See 72 FR 72864 for more information.

Managing Strategic Risk

The strategies examined thus far in this report (and in the risk management literature more broadly) manage intrayear production and income risk. However, other strategic risks may threaten the farm business's viability over the medium-run and long-run. These risks include policy uncertainties, macroeconomic conditions, social and natural contingencies; changes in personal circumstances such as personal injury, serious illness, or divorce; or wider industry dynamics involving input markets, product markets, and competitive and technological uncertainties (Miller et al., 2004). Although producers may not be affected by these events in the short-term, the probability increases when multiple years are considered. Managing those risks may involve taking actions in the present—such as contingency planning, decision making, and investments (Lippsmeyer & Langemeier, 2023). Farm decisions related to strategic risk management might include establishing farm goals or objectives, engaging agronomic consultants, investing in new buildings and machinery, expanding farm operations, or evaluating alternative business opportunities or strategies (Lippsmeyer et al., 2023b).

In spite of the relevance of strategic risk to long-term farm survival, the concept has only been tangentially considered within the context of ARMS. Aside from financial reserves and use of storage (explored above in the context of on-farm risk management strategies), we identified only three groups of questions in the ARMS survey related to strategic risk: (1) Investments in farm expansion or capital improvement to either increase income or reduce income volatility in the future; (2) incorporating practices to improve soil health to improve productivity or mitigate losses in case of severe weather; and (3) succession planning to reduce uncertainty in future farm management decisions.

Investing in Farm Expansion or Capital Improvements

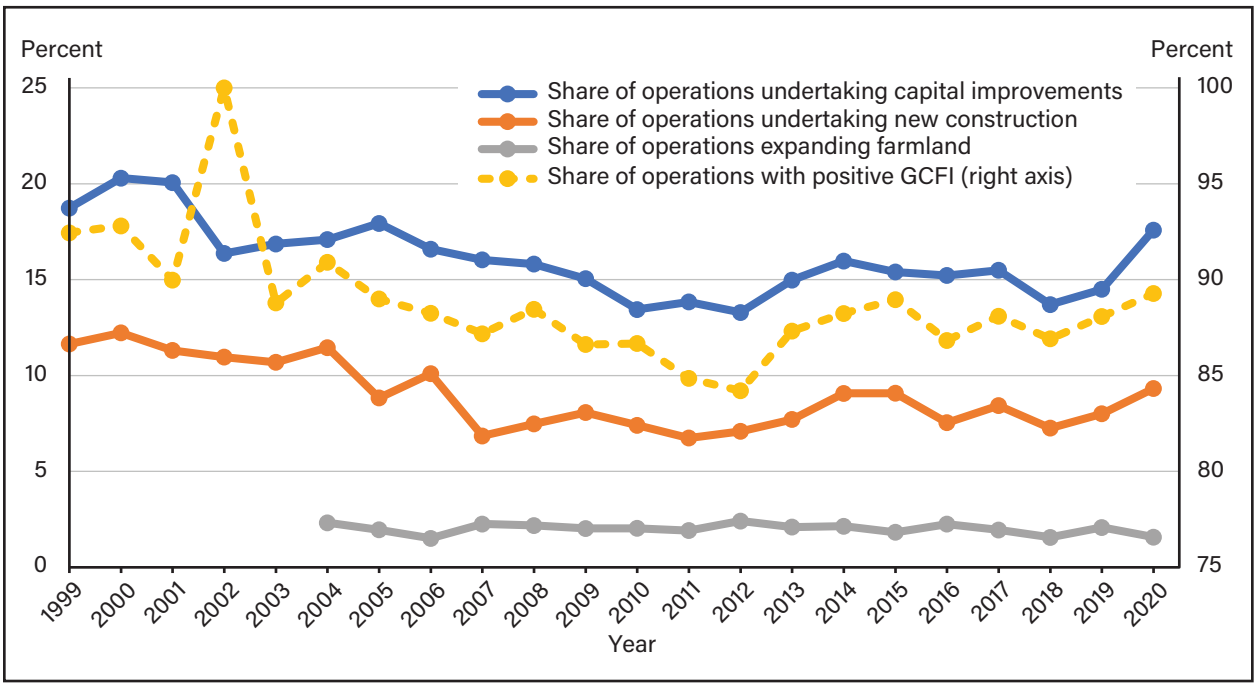
Although investing in farm expansion or capital improvements are typically considered to be normal farm financial management decisions, these choices also have implications for the management of future income or revenue risk. For example, capital improvements can be undertaken as preventative efforts to forestall more expensive repairs in the future, while farm expansion can be a means of spreading production risk. ARMS data indicate that while the level of expenditures on these types of investments[54] may fluctuate, the share of operations[55] undertaking such investments each year has changed very little over the past few decades (figure 36). Although the share of farms undertaking capital investments or new construction declined slightly from 1999 to 2010, both seem to have stabilized between 2010 and 2020 with around 15 percent of operations undertaking capital investments each year and 8 percent investing in new construction. Year-to-year fluctuations are likely the result of wider trends in farm income. In fact, interyear movements in these indicators exhibit similar dynamics to the share of farm households with positive farm income (Dubman et al., 2021).

[54] The ARMS asks how much was spent on two types of capital investments for the operation: (1) land improvements such as preparation, irrigation, well drilling, ponds, feedlots, trench silos, lagoons, new fences, etc.; and (2) new construction or remodeling of dwellings, barns, buildings, hog houses, poultry houses, milk barns, storage facilities, sheds, silos, etc.

[55] While investments on farms can be undertaken by operators, landlords, or contractors, 1999–2017 ARMS data indicate that operators undertook more than 98 percent of both capital improvements and new construction expenditures, on average, over this period. Accordingly, from 2018 forward, the question has been asked solely of operators. Thus, to allow for the longer time series, this analysis used the data of expenditures only by operators and not total capital improvement or new construction expenditures.

Figure 36

Percent of U.S. farms where the operator invested in capital improvements, new construction, and farmland expansion compared to the percent of operations with positive GCFI, 1999–2020



GCFI = Gross cash farm income.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 1999–2020 Agricultural Resource Management Survey data.

These findings on investments could have several implications for farm-level risk management, depending on the assumptions of the likelihood that the same farms continually made capital improvements. Assuming the same farms continually made improvements would indicate that the remaining 85 percent of farms either did not have the financial capacity to carry out such investments, such investments were not seen as a priority for ensuring future farm operations, or the operator was nearing retirement and no longer investing in the future of the farm business. If we instead assume that different farms undertook these improvements each year, then all farms would make some capital improvements roughly every 7 years.

While fluctuations in the shares of farms undertaking capital improvements or new construction may be correlated to farm income, the share of farms reporting farmland expansion each year does not reflect these dynamics. Farms reporting farmland expansion remained stable at around 2 percent from when these data were collected beginning in 2004 through 2020. This low share of farms expanding their operation may be a function of the thinness of farmland markets. For example, the 2014 USDA, NASS Tenure, Ownership, and Transition of Agricultural Land (TOTAL) survey indicated that anticipated farmland sales between 2015 and 2019 comprised less than 4 percent of owned U.S. farmland, with only about 2 percent of farmland expected to be sold to nonrelatives (Bigelow et al., 2016). Alternatively, producers could expand production area through land rental arrangements instead of through outright purchases, as renting does not require the same type of capital allocation as purchasing land, freeing up capital for other on-farm uses (Weber & Key, 2015; Mishra et al., 1999). This small share of farms expanding their operations each year may also reflect that land is typically a much costlier investment. As such, land expansion is a strategy available to a smaller share of producers or undertaken much less frequently because of both the cost as well as the additional investment in time and labor needed to integrate the land into the farm's operations.

Investing in Soil Health

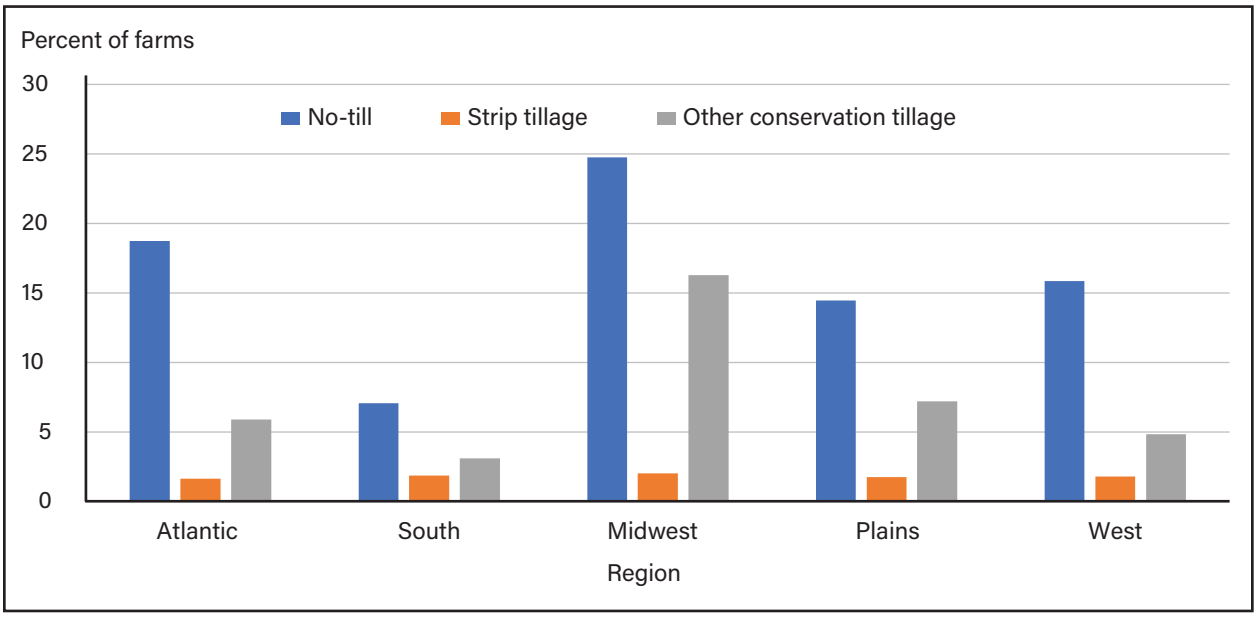
While investing in farm expansion or capital improvement both signal an interest in the longer term financial success of the farm, producers can also pursue other investments that might change the risk profile of the farm. One example is investing in soil health to improve productivity or the capacity to mitigate the impacts of extreme events, such as droughts or excess rainfall.[56] Many soil health practices require several years of sustained adoption before benefits manifest, however, which implies that these practices can be part of a strategy of mitigating the impacts of future risks.

Recent ARMS[57] data indicated that the use of practices supporting soil health (such as cover cropping and conservation tillage) grew between 2018 and 2020, although for some practices, this growth was from a very low base. For example, while the percentage of farms planting cover crops more than doubled from 2018 to 2020, it was only 10.8 percent of farms in 2020. At the same time, the nationwide average masked substantial variation in adoption by commodity and by region, which reflects the relative costs and benefits of adopting this practice between producers. For example, cover crop adoption rates in 2016 reached nearly 25 percent of corn silage acres but only around 2 percent of winter wheat acres (Wallander et al., 2021). In addition, practices like no-till or strip-till for corn, soybean, wheat, and cotton acres were adopted on more than 64 percent of farms in the Southern Seaboard region in 2010-11 versus only 19 percent of farms in the Fruitful Rim (Wade et al., 2015). Analyzing ARMS indicates that there was substantial variation in conservation tillage adoption between regions, with a large percentage of producers pursuing these practices in the Midwest, where corn and soybean production are prominent (figure 37).

[56] Studies have shown that the use of cover crops can improve soil's aggregate stability and help soils more effectively absorb water during extreme rainfall events (Basche & DeLonge, 2019; Wood & Bowman, 2021). Practices like cover cropping, conservation tillage, and installation of terraces can also improve soil moisture retention to mitigate the impacts of drought (Saco et al., 2021; Wallander et al., 2013). However, the effectiveness of these practices at improving soil health and reducing risk is not universal, as they are often dependent on production context (Cooray et al., 2024; Garba et al., 2022; Miner et al., 2020) and in some cases have been found to reduce yields (Deines et al., 2023; Nielsen et al., 2016).

[57] Questions on all of these practices have only been included in ARMS Phase III consistently since 2018. Before 2018, questions on utilization of certain conservation practices were asked only infrequently and did not consistently include the same practices identified here.

Figure 37
Adoption of conservation tillage by U.S. region, 2020



Atlantic region = Connecticut, Delaware, Kentucky, New Hampshire, New Jersey, New York, North Carolina, Maine, Maryland, Massachusetts, Pennsylvania, Rhode Island, Tennessee, Vermont, Virginia, Washington, DC, and West Virginia. South region = Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, and South Carolina. Midwest region = Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. Plains region = Kansas, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas. West region =: Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming. Alaska, Hawaii, and U.S. Territories are not covered by ARMS.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2020 Agricultural Resource Management Survey (ARMS) data.

While ARMS data indicate that there was an increase in the adoption of soil-health practices, interpreting the implications of this trend for farm-level risk management requires several caveats. Firstly, the observed shares represent only a few years of data, so they may not indicate a sustained, long-term trend toward greater adoption. In fact, adoption of soil health practices may be more closely related to wider market dynamics than indicative of a producer's commitment to investing in soil health. Second, it is not clear whether the tracts on which the practices have been adopted are exposed to the kinds of natural hazards that the practices could mitigate. Indeed, producers reported various factors that influenced their decision to incorporate new conservation practices (including practices that improve soil health) into their operations, including: information and awareness of the practice; financial incentives for adoption; social norms; macro factors; farmer demographics and attitudes; farm characteristics; and concerns about extreme weather events (Prokopy et al., 2019; Thompson et al., 2021). Accordingly, many adopting operations may not have incorporated the practices as a means to improve soil health and reduce future natural hazard risk exposure. Overall, more detailed research in this area would be needed to make more definitive statements about the adoption of these practices in a risk management context.

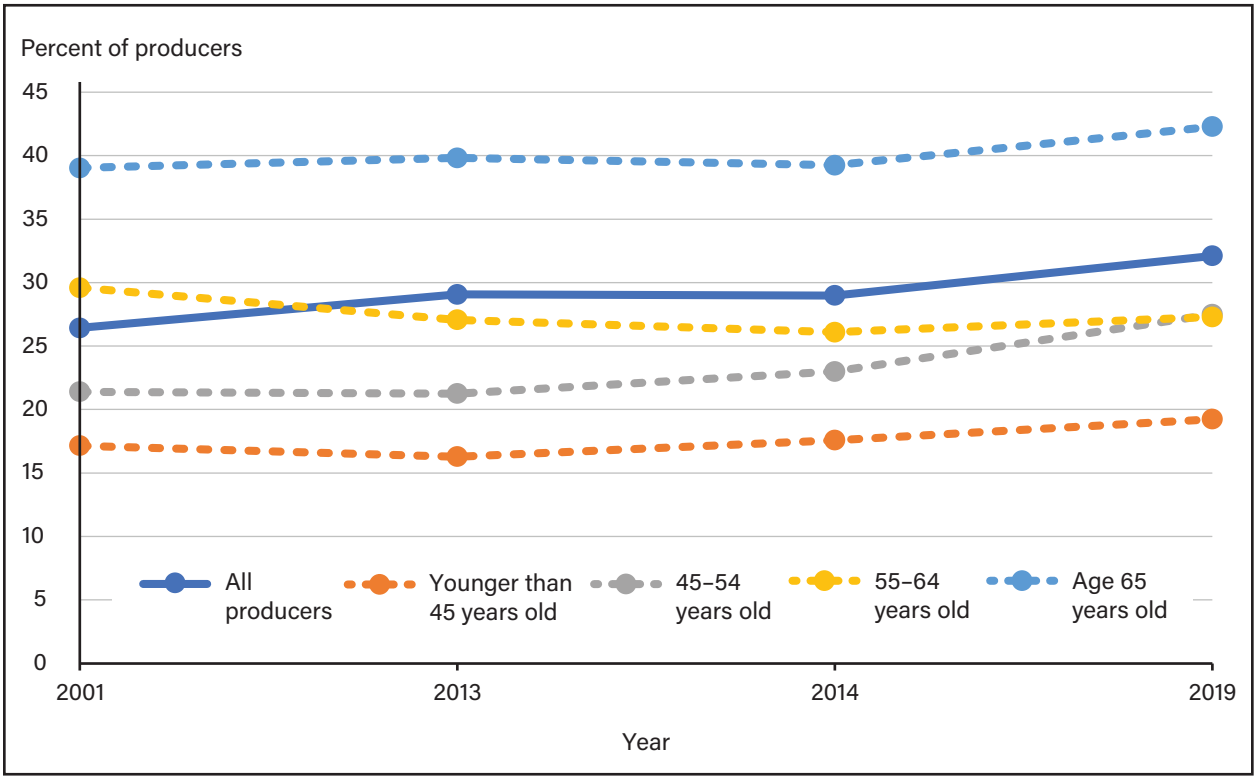
Succession Planning

While capital investments, farmland expansion, and soil health could all have implications for the management of future farm enterprise risk, one additional indicator more directly measures a producer's explicit intention to plan for future farm business continuity in the face of uncertainty—succession planning. Previous research has noted that succession planning was associated with farm charac-

teristics such as farm income, producer education level, presence of adolescent children in the farm household, and engaging in certain types of farming that required relatively larger capital outlays (e.g., dairy farming) (Mishra & El-Osta, 2007), and that farms with designated family successors have higher profit margins and returns to equity than other farms (Harris et al., 2012). More recent work based on a February 2023 survey of 403 U.S. farmers found significant positive correlations between succession planning and farm size, producer education, and farm managerial ability (Lippsmeyer et al., 2023a).

Data from the 2019 ARMS indicate that 17 percent of producers intended to retire within the next 5 years. Although more than 75 percent of producers reported engaging in succession planning in the 2017 Census of Agriculture, ARMS data indicate that fewer than one-third of producers actually have a succession plan in place[58] (figure 38). In addition, the share of producers greater than 65 years old that reported having a succession plan was more than double the share of producers under the age of 45 that did so. The share of producers with a succession plan in place rose between 2001 and 2019 among most age groups, suggesting that even younger farmers increasingly consider long-term viability. Nevertheless, the continuity of farm operations remains uncertain for a majority of producers.

Figure 38
Percent of principal operators with a succession plan in place by age group, 2011–2019



Note: Succession planning data were only collected in 2001, 2013, 2014, and 2019.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2001, 2013, 2014, and 2019 Agricultural Resource Management Survey data.

[58] ARMS questions do not specify what type of plan is in place, nor whether this implies the presence of a will or trust. Accordingly, the share of farms with formal documentation of the succession plan is at most one-third and likely to be less.

Comparing Risk Management Strategy Utilization Across Farm Types

This analysis so far has analyzed the utilization of individual risk management strategies in isolation. However, some wider conclusions can be drawn when utilization rates are compared across farm sizes and types. Below, we compare strategy utilization rates taking a 3-year average of the most recent years covered by this analysis (2018–20) where available,[59] by farm size (table 1); the comparative share of farms, value of production, and farm assets covered (table 2); and commodity specialization (table 3).

The on-farm risk management strategies that had the highest rates of utilization across most sizes of farms are savings, echoing Harwood et al., (1999), and diversification into earning off-farm wages. We found that using both of these practices generally declines as farm size increases (table 1). The high use of savings and off-farm employment support findings from the literature that the farms tend to self-insure through these mechanism in lieu of purchasing other risk management tools such as insurance (Mishra & Goodwin, 2006) or that savings and insurance act as substitutes in risk management (Farrin et al., 2016). A minority of farms pursued other forms of diversification but farms of certain sizes used savings and off-farm employment at higher rates. Geographical and sales outlet diversification have limited use by residence and small farms, while commodity diversification was common among midsize, large, and very large farms. Farm use of storage—both on-farm and unpriced storage regardless of location—increased with farm size, but declined in prominence for very large farms. Farms with an open credit line exhibited a similar concave relationship.

The most commonly utilized market-based tool was the purchase of "other" insurance, which is reported by nearly all midsize, large, and very large farms. Many farms of these sizes also reported participating in FCIP, but at lower rates than purchase of other insurance. This usage of FCIP rose from small to large-sized farms, then declined for very large farms, which is consistent with Farrin et al. (2016), who found that high-wealth farms self-insured in other ways, while low-wealth farms could not afford insurance. The percentage of farms purchasing insurance for stored commodities increased with farm size. Farm use of futures and options, and production and marketing contracting was less common—particularly by the smallest farms. We observed a greater tendency to engage in marketing contracts among larger farms.

With respect to Government payments, less than 10 percent of all farms received countercyclical-type payments during 2018-20, but a larger share of midsize and large farms received such payments. At the same time, less than 5 percent of farms received disaster payments, which is consistent with disasters being "exceptional" situations. The same relationships between farm size and payment receipt occurred for disaster payments, as more midsize and large farms reported receiving disaster payments. Given the systemic nature of disasters, economic theory would not predict that farm size should have any relation to the types of farms who experience disasters over time.[60] This difference in payment receipt rates then may reflect the determination by smaller farms that the size of the payment that they would receive under a program may not justify the transaction costs incurred in applying, or could reflect more general farm familiarity with USDA programs, as more midsize and large farms receive any type of Government payment.

[59] For questions asked only in certain years, data from the most recent year available are presented in the table—while for disaster payments, an average over 2005–20 is used.

[60] At the same time, not all farms in a given area may be affected by a particular disaster event given the timing of said event and the commodities planted on that farm. For example, if a natural disaster strikes before some commodities have been planted but not others, different farms will experience varied impacts from the same event.

Finally, mitigation of strategic risk seemed to increase with farm size. For example, the share of farms investing in capital improvements and having a succession plan in place both increased with farm size. Soil health investments also exhibited this positive tendency, with the exception of a lower adoption rate among very large farms.

Table 1

Share of U.S. farms utilizing selected risk management strategies by farm size, 2018–20 average

			Farm businesses*			
	All	Residence	Small	Midsize	Large	Very Large
1. ON-FARM STRATEGIES						
1.1 Diversification						
1.1.1 Commodity	27.4	17.1	28.5	77.4	78.3	65.4
1.1.2 Sales	5.6	1.5	4.7	27.4	34.9	36.0
1.1.3 Geography[a]	9.9	5.7	9.8	27.3	38.9	43.1
1.1.4 Enterprise	27.0	23.7	26.7	44.7	46.9	40.0
1.1.5 Off-farm	67.9	79.3	55.4	57.5	51.7	42.1
1.2 Storage						
1.2.1 Unpriced, all locations[b]	14.1	9.5	12.5	45.0	50.1	23.0
1.2.2 On-farm[c]	18.4	11.2	21.1	51.3	54.9	35.0
1.3 Savings	84.9	93.6	85.1	49.1	22.0	22.9
1.4 Credit	16.6	10.9	14.8	49.0	60.6	55.3
2. MARKET-BASED TOOLS						
2.1 FCIP	14.0	6.2	11.9	59.8	70.8	47.8
2.2 Other insurance	57.5	48.3	60.6	92.0	94.8	94.1
2.3 Insurance for stored commodities[b]	26.0	12.9	22.4	42.6	47.6	59.4
2.4 Futures and options[c]	2.3	0.6	1.1	12.6	20.7	14.9
2.5 Contracting						
2.5.1 Production	2.1	0.5	2.8	8.3	5.6	3.2
2.5.2 Marketing	5.9	1.8	4.8	26.4	38.9	43.4
3. OTHER GOVERNMENT PROGRAMS						
3.1 Any payment[d]	33.4	26.8	32.1	71.1	76.4	60.5
3.2 Countercyclical payment	9.8	5.0	8.8	36.6	43.5	30.0
3.3 Disaster payment[e]	3.3	2.1	3.5	8.6	9.4	5.6
4. STRATEGIC RISK						
4.1 Capital improvement	15.3	14.2	13.8	23.5	29.6	37.6
4.2 Soil health	21.3	15.0	20.7	54.8	60.7	38.7
4.3 Succession plans[b]	32.1	29.6	32.7	43.0	47.1	56.0

FCIP = Federal Crop Insurance Program. Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Farm businesses = GCFI >=$350,000 or GCFI < $350,000 and operator is not retired from farming and primary occupation is farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

Note: All values are in real, 2011 dollars using farm producer price index (PPI). We used the following color code: Green = Share>75 percent; Yellow= Share >50 percent; Red = Share <5 percent. 2018 through 2020 data were pooled unless otherwise noted.

a = 2017 data only.

b = 2019 data only.

c = 2016 data only.

d = any payment includes countercyclical-type payments, conservation payments, marketing loan benefits, assistance under temporary COVID-related farm assistance programs, Small Business Administration program payments, and any other assistance.

e = averaged over 2005–20.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.

Differences in risk management strategy utilization were underscored when we compared the percent of farms, value of production, and farm assets covered by selected risk management strategies (table 2). A greater share of value of production and farm assets was covered by most strategies than the share of farms. The only two exceptions to this relationship were for off-farm employment and utilization of savings, which were the two strategies utilized at the highest rates by residence farms. With respect to on-farm risk management strategies, each strategy examined in this analysis covered at least 30 percent of the value of production. When we focused on market-based tools, we found that more than 90 percent of the value of production was produced by operations that had other insurance, and about half of production was produced by operations that reported participating in FCIP or holding insurance of stored commodities. While 12 percent of production was covered by futures and options and 18 percent was covered by production contracts, these shares were still much greater than the share of farms using these tools (2 percent of farms for each tool), which is a further indication that more large farms used these tools. The share of production covered by all types of Government payments (including countercyclical-type payments, conservation payments, and disaster payments) was around double the share of farms and the share of production covered by strategic risk management through capital improvements and soil health practices was also close to double the share of farms doing so. Close to half of the value of production was covered by a succession plan compared with only around one-third of farms.

For farm assets, typically, the share using the strategies outlined here was between the share of farms and the share of value of production (regardless of direction). There are a few exceptions where the share of farm assets was slightly higher than the share of value of production, including for enterprise diversification, receipt of disaster payments, and having a succession plan. Underscoring this in-between nature of farm asset coverage, the most prominent strategy we observed was other insurance (which was found to be the most prominent strategy by value of production), but the second-most common strategy we observed was savings (the most prominent strategy by share of farms). More farm assets were also covered by a succession plan (close to half, versus around one third of farms), suggesting that the farms with the most assets to pass on likely have a succession plan in place.

These divergences in risk management strategy use according to farm size, value of production, and farm assets highlight the tradeoffs that policymakers face when designing programs. Tools that are commonly employed to protect production or assets may be less relevant for farm households.

Table 2

Percent of U.S. farms, value of production, and farm assets covered by selected risk management strategies, 2018–20 average

	Percent of all farms	Percent of total value of production	Percent of farm assets
1. ON-FARM STRATEGIES			
1.1 Diversification			
1.1.1 Commodity	27.4	67.6	45.7
1.1.2 Sales	5.6	31.7	14.3
1.1.3 Geography[a]	9.9	31.5	25.3
1.1.4 Enterprise	27.0	40.1	43.5
1.1.5 Off-farm	67.9	52.8	57.1
1.2 Storage			
1.2.1 Unpriced, all locations[b]	14.1	32.0	25.1
1.2.2 On-farm[c]	18.4	50.6	49.3
1.3 Savings	84.9	33.5	66.5
1.4 Credit	16.6	48.9	30.2
2. MARKET-BASED TOOLS			
2.1 FCIP	14.0	49.3	32.9
2.2 Other insurance	57.5	91.4	77.8
2.3 Insurance for stored commodities[b]	26.0	43.6	35.2
2.4 Futures and options[c]	2.3	11.9	6.7
2.5 Contracting			
2.5.1 Production	2.1	17.8	3.5
2.5.2 Marketing	5.9	28.9	16.1
3. OTHER GOVERNMENT PROGRAMS			
3.1 Any payment[d]	33.4	57.6	52.4
3.2 Countercyclical payment	9.8	28.5	20.3
3.3 Disaster payment[e]	3.3	6.6	7.0
4. STRATEGIC RISK			
4.1 Capital improvement	15.3	29.2	24.6
4.2 Soil health	21.3	42.9	34.0
4.3 Succession plans[b]	32.1	45.7	46.3

FCIP = Federal Crop Insurance Program.

Note: We used the following color code: Green = Share >75 percent; Yellow= Share >50 percent; Red = Share <5 percent. 2018 through 2020 data were pooled unless otherwise noted.

a = 2017 data only.

b = 2019 data only.

c = 2016 data only.

d . = any payment includes countercyclical-type payments, conservation payments, marketing loan benefits, assistance under temporary COVID-related farm assistance programs, Small Business Administration program payments, and any other assistance.

e = averaged over 2005–20.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.

When we examined the utilization of risk management strategies by farm commodity specialization, we observed some of the same dynamics as by farm size (table 3). Among on-farm risk management strategies, savings continued to be a prominent strategy for all farms except dairy, where scale econo-

mies were more important. In addition, more than half of farms of all specializations also engaged in some form of off-farm, wage-earning employment, with the exception of sorghum farms. These similarities aside, the results by commodity specialization also highlight that risk management decisions are highly influenced by the particular commodity value chain in which an operation is concentrated. For example, we found that the practice of commodity diversification (where farms produce more than one commodity) was prevalent across row crop farms, which is consistent with most common crop rotations. Dairy farms commonly practiced commodity diversification, where many operations raised at least some feed for their dairy herds on-farm. Only a minority of farms across nearly all specializations practiced sales, geographical, or enterprise diversification (although geographical diversification is relatively more common among row crop farms). Storage, regardless of location, is a strategy that was mostly limited to farms specializing in grain production (or livestock operations who store feed for their animals), as other types of commodities were less likely to be storable on the farm. Having an open line of credit was generally more common for row crop farms (sorghum and tobacco farms in particular), which may be related to the seasonality of farm operations and expenditures compared with livestock or specialty crop farms.

With respect to market-based tools, insurance was the most commonly utilized tool across specializations. We found that farms purchased "other" insurance at high rates across farm specialization types, with the highest rates for row crops. These same types of farms also purchased FCIP at the highest rates. Insurance of stored commodities was generally higher for row crop farms, with the highest levels observed for rice farms, but a majority of hog farms also reported insuring stored commodities. Hedging through futures and options was limited among all producers, but corn and soybean producers hedged most often. Use of production contracts was almost entirely limited to hog and poultry operations, while marketing contracts were used by a sizeable portion of operators across commodity types.

Table 3

Share of U.S. farms utilizing selected risk management strategies by commodity specialization, 2018–20 average

		Row Crops								Livestock				Specialty		
	All	Corn	Cotton	Peanuts	Rice	Sorghum	Soy	Tobacco	Wheat	Cattle	Dairy	Hogs	Poultry	Fruits and tree nuts	Nursery	Vegetables
1. ON-FARM STRATEGIES																
1.1 Diversification																
1.1.1 Commodity	27.4	84.3	66.2	68.3	61.1	86.3	62.5	92.9	53.7	15.0	89.7	56.4	40.2	9.4	14.9	52.3
1.1.2 Sales	5.6	22.9	22.2	24.0	15.3	6.9	15.4	50.6	9.3	1.1	24.6	30.6	25.9	2.9	0.4	6.2
1.1.3 Geography[a]	9.9	23.4	28.7	26.3	19.6	17.3	20.2	25.3	20.9	8.3	9.8	14.2	6.2	6.1	4.4	5.7
1.1.4 Enterprise	27.0	36.0	31.6	25.8	26.9	51.1	29.6	18.1	46.3	21.0	36.5	34.2	26.9	20.7	21.0	30.0
1.1.5 Off-farm	67.9	66.8	54.1	58.9	63.8	47.6	66.5	62.1	69.3	71.9	50.3	84.6	72.5	67.3	66.5	71.4
1.2 Storage																
1.2.1 Unpriced, all locations[b]	14.1	52.6	16.4	24.8	30.6	24.1	38.7	33.1	40.5	7.2	28.8	34.3	10.1	4.2	2.0	7.3
1.2.2 On-farm[c]	18.4	50.6	11.0	11.1	26.5	6.1	36.2	19.4	34.5	15.1	68.2	37.3	15.3	3.4	0.6	6.7
1.3 Savings	84.9	66.8	53.9	70.8	59.5	74.6	73.8	54.3	74.5	90.2	42.4	70.1	79.3	85.0	80.8	82.9
1.4 Credit	16.6	41.9	44.7	25.4	49.6	52.2	29.9	51.0	36.1	13.9	36.9	28.9	19.3	10.2	15.6	14.9
2. MARKET-BASED TOOLS																
2.1 FCIP	14.0	68.7	71.3	42.6	60.6	73.5	52.7	54.3	63.7	4.2	21.8	24.7	4.1	19.0	2.8	9.1
2.2 Other insurance	57.5	85.7	80.4	61.8	71.1	82.5	78.6	75.5	81.2	53.7	78.6	70.0	64.1	56.9	58.9	55.8
2.3 Insurance for stored commodities[b]	26.0	39.5	43.5	8.6	65.3	23.8	26.0	0.0	23.4	14.3	31.0	62.8	17.8	9.5	43.6	15.3
2.4 Futures and options[c]	2.3	14.1	9.8	2.7	1.7	4.3	10.3	6.9	6.5	0.5	1.5	7.4	0.9	0.0	0.0	0.9
2.5 Contracting																
2.5.1 Production	2.1	0.6	0.0	0.0	0.0	0.0	0.3	1.0	0.4	0.5	0.5	42.3	48.1	0.0	0.0	1.8
2.5.2 Marketing	5.9	26.9	34.4	48.4	38.1	6.9	18.6	59.1	10.0	0.9	24.7	7.6	2.7	20.6	0.5	6.8
3. OTHER GOVERNMENT PROGRAMS																
3.1 Any payment[d]	33.4	77.9	76.5	74.8	54.4	71.3	70.2	52.5	79.5	20.9	59.0	30.7	17.2	12.9	9.8	14.5
3.2 Countercyclical payment	9.8	32.9	39.5	35.8	33.6	42.2	34.5	22.6	52.2	4.2	45.9	9.7	3.1	0.6	0.3	4.7
3.3 Disaster payment[e]	3.3	4.7	15.2	12.3	3.0	7.2	6.2	16.4	7.7	4.4	3.8	3.8	1.3	1.1	0.3	1.0
4. STRATEGIC RISK																
4.1 Capital improvement	15.3	15.7	15.4	9.4	28.8	18.3	10.7	19.9	8.6	17.4	21.2	25.1	18.2	14.6	14.4	15.7
4.2 Soil health	21.3	64.5	48.7	64.3	36.3	55.4	59.4	66.1	46.3	10.4	52.2	26.2	16.8	28.7	15.1	32.9
4.3 Succession plans[b]	32.1	34.7	39.2	43.4	37.8	48.6	31.1	26.8	36.0	32.3	29.6	25.3	33.5	33.0	30.2	22.2

FCIP=Federal Crop Insurance Program.

Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity make up the majority of production. We used the following color code: Green = Share >75 percent; Yellow = Share >50 percent; Red = Share <5 percent. 2018 through 2020 data were pooled unless otherwise noted.

a = 2017 data only.

b = 2019 data only.

c = 2016 data only.

d = any payment includes countercyclical-type payments, conservation payments, marketing loan benefits, assistance under temporary COVID-related farm assistance programs, Small Business Administration program payments, and any other assistance.

e = averaged over 2005–20.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.

A large share of producers of certain commodities—particularly row crop and dairy producers—received Government payments from all types of programs, including countercyclical-type payments, conservation payments, marketing loan benefits, assistance under temporary COVID-related farm assistance programs, Small Business Administration program payments, and any other assistance, but receipt of payments through countercyclical-type programs or disaster programs was more limited. Countercyclical payments were reported mostly by row crop farms and dairy operations (i.e., commodities for which there are countercyclical programs in place, such as ARC, PLC, and DMC). Receipt of assistance from disaster programs was low across commodity specializations. However, despite the existence of various standing disaster programs that target livestock and specialty crop operations (notably LFP, LIP, ELAP, NAP, and TAP), the farms that received disaster payments most frequently over 2005–20 specialized in cotton, sorghum, and wheat production.

Examining strategic risk management by commodity type revealed few differences—particularly for capital improvements and succession plans—which seem to exhibit stronger correlations to farm size than commodity type. Soil health practices, however, seem to be more commonly implemented by row crop farms.

While this analysis has focused on the use of individual risk management strategies, we emphasize that producers often pursued a selection of strategies simultaneously according to a variety of factors, including their risk profiles, industry organization, and financial situation. Although most of the risk management literature has focused on the use of a single strategy, a segment of the literature has examined farms that adopt a combination of tools. For example, Pennings et al. (2008) used a choice bracketing framework to show that producers frequently implemented different types of risk management strategies in concert and that this bracketing behavior explained some choices that seemed contrary to risk management theory. Tudor et al. (2014) incorporated this concept of risk management strategy bundling into a cluster analysis of risk management tool utilization, which indicated that their sample of Illinois farmers on average reported using 11 different tools, the most frequent of which were forward contracting, Government programs, crop revenue insurance, and spreading out crop sales. Other works have also utilized this simultaneous risk management strategy adoption decision-making framework. These studies have identified factors such as proportion of owned acres, off-farm income, producer age and education level, farm size in terms of gross farm income, Government payments, smartphone use, and succession planning (Adhikari & Khanal, 2021; Khanal, 2020; Velandia et al., 2009) as strongly correlated to risk management strategy choices. Other literature has analyzed the relationships between the adoption of two risk management strategies, including crop insurance and farm debt (Ifft et al., 2015), crop insurance and hedging (Mishra & El-Osta, 2002; Walters & Preston, 2018), Government programs and hedging (Maples et al., 2022), crop insurance and diversification (O'Donoghue et al., 2009), or marketing contracts and futures/options contracts (Prager et al., 2020).

Although an econometric analysis of the relationships between different farm characteristics and risk management strategy utilization is beyond the scope of this report, cross-tabulations on the use of two strategies were calculated to examine the shares of farms jointly using two strategies where the data were collected over the same time period (in this case, only the strategies for which data were collected over 2018–20). Table 4 reports these data for midsize farms (corresponding data for all farms, residence, small, large, and very large farms are available in appendix D). The top row of each column indicates the share of farms using a single strategy, and then each subsequent row indicates the share of farms using the strategy heading that column in addition to the next row in the column. These tabulations confirm that farms often used combinations of strategies. For example, while 77 percent of midsize farms used commodity diversification, more than half of midsize farms used both commodity diversification and received any Government payment. These data also indicate that crop insurance

has not crowded out the use of other risk management strategies for most midsize operators. As one example, while nearly 60 percent of midsize operations participated in FCIP, 53 percent participated in FCIP and practiced commodity diversification, and 36 percent participated in FCIP and reported earning off-farm wage income.

Table 4

Percent of midsize U.S. farms utilizing combinations of two selected risk management strategies, 2018–20

	Commodity diversification	Sales channel diversification	Enterprise diversification	Off-farm income	Savings	Short-term loan use	FCIP	Other insurance	Production contract	Marketing contract	Any Government payment	Counter-cyclical program payment	Disaster payment	Capital improvements
Commodity diversification	77.4													
Sales channel diversification	26.1	**27.4**												
Enterprise diversification	35.6	13.2	**44.7**											
Off-farm income	44.7	16.6	25.9	**57.5**										
Savings	35.8	12.2	22.2	30.6	**49.1**									
Short-term loan use	41.2	15.0	23.8	30.0	20.8	**49.0**								
FCIP	53.4	18.8	27.2	35.8	28.9	33.6	**59.8**							
Other insurance	72.7	25.7	41.3	52.9	45.3	46.0	56.5	**92.0**						
Production contract	6.0	6.1	3.5	4.7	3.8	3.7	3.2	7.8	**8.3**					
Marketing contract	23.0	22.2	12.3	15.9	12.0	14.4	19.2	24.6	0.9	**26.4**				
Any Government payment	62.0	21.4	34.5	41.9	34.4	38.9	51.0	67.5	4.2	21.0	**71.1**			
Countercyclical program payment	34.4	12.0	18.9	21.4	16.6	20.9	28.3	34.8	1.4	12.3	36.6	**36.6**		
Disaster payment	7.1	2.3	4.5	4.6	4.3	4.9	6.0	8.0	0.4	2.3	8.6	4.6	**8.6**	
Capital improvements	17.6	6.8	11.5	12.9	11.4	12.4	13.4	22.0	1.6	6.5	16.7	8.5	2.7	**23.5**

FCIP=Federal Crop Insurance Program.

Note: We used the following color code: Green = Share >75 percent; Yellow = Share >50 percent; Red = Share <5 percent. Data for 2018 through 2020 were pooled and percents are weighted to be representative of midsize farms over the period.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.

Conclusion

This report has analyzed utilization of agricultural risk management strategies by U.S. farms since the late 1990s by tabulating summary statistics from producer responses to Phase III of the Agricultural Resource Management Survey (ARMS) on questions related to risk management. We analyzed various risk management strategies, including on-farm risk management strategies, market-based tools, other Government programs producers use for managing risk, and approaches to managing strategic risk. Data were tabulated for all farms, as well as by farm size and commodity specialization for most strategies.

Results from the analysis indicate that while some broad trends in risk management strategy utilization by farms between the late 1990s and 2020 can be identified, these overall dynamics are often associated with factors related to farm size or commodity specialization. In many cases, the underlying drivers of these differences may warrant further investigation. Other authors have advocated for the differentiation of policy based on farm size (Sant'Anna & Katchova, 2022). At the same time, we observed large differences in risk management strategy utilization when we considered the value of production or farm assets covered instead of number of farms.

This analysis also has limitations. Although the work identified trends or differences in utilization among groups of farms, this work has not explored the drivers for those differences. Future research could further examine the reasons why producers participate in certain programs or adopt certain strategies, although some literature has explored these issues.[61] In other cases, analysis using multivariate regression would be useful to further examine differences among types of farms. In some cases, ARMS may not be the most appropriate vehicle to examine these questions, as relevant populations may not be adequately sampled over time in the survey.[62] Future work could use Census of Agriculture data to track the observed behavior of the same producer over time and determine the likelihood of adopting certain risk management strategies conditional on having already adopted others. This study did not analyze the underlying dynamics driving differences in utilization by farm type, the extent to which changes in Government policy affect producer risk management decisions; or the dynamics between risk management practices and production conditions. Additionally, this work identified only a handful of questions related to strategic risk management, suggesting that this could be an area worthy of future investigation.

Overall, this work provides an updated overview of how U.S. producers utilize farm-level risk management strategies, and extends the consideration of risk to include some strategies to manage strategic risk. Some trends identified in Harwood et al. (1999) have persisted. Production for most farms remained concentrated in only one or two commodities since the 1990s, and in fact, production on the most diverse farms was increasingly concentrated into fewer products. Additionally, cash on hand in the form of non-retirement financial assets greater than or equal to gross cash farm income remained among the most common risk management strategies for farms of all sizes. Farm management practices that continued to be used more frequently by midsize and large farms include contracting, hedging using futures and options markets, and diversifying production.

[61] For example, Russell et al. (2021) analyzed Black farmers' perspectives on participating in Federal farm programs, and Roesch-McNally et al. (2018) analyzed drivers of crop diversification in the corn belt.

[62] Certain groups, however, were oversampled as part of the 2022 ARMS survey, which may shed new light on how these populations are utilizing the strategies examined in this work.

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Appendix A

All estimates in this report were calculated using the survey weights that produce estimates that are representative of all U.S. farms and total production of several commodities and for five regions.[63] We explored risk management for the farm enterprise, the unit covered by the Agricultural Resource Management Survey (ARMS), as well as the farm household of family farms (i.e., the household of the principal operator on each farm enterprise). Most U.S. farms are considered family farms,[64] where the operator most responsible for day-to-day operations (i.e., the principal operator) and their extended family own at least 51 percent of the farm's assets. Because ARMS only collects data for one household per farm, this analysis may miss information about some farm households, such as when farms are operated by a group of family members or unrelated individuals who do not share a household.

U.S. farms are diverse in terms of their scale of production, commodities produced, and whether the primary producer is focused on farming, another occupation, or is retired from farming. We compared farms across a number of these dimensions. A main categorization we explored was commodity specialization, or the commodity that comprises the majority of the farm's value of production. The ARMS data identify 18 commodity specializations: general cash grain (a majority of production is cash grains, but no single grain makes up the majority of production); general crop (a majority of production is crops, but no single crop makes up the majority of production); wheat; corn; soybean; sorghum; rice; tobacco; cotton; peanut; fruits and tree nuts; vegetables; nursery; cattle hogs; poultry; dairy; and general livestock (a majority of production is livestock, but no single animal makes up the majority of production). Between 1996 and 2020, cattle operations made up the largest share (about one-third) of all farms. Non-specialty crop-specializing farms together have comprised about 40 percent, with general crop farms making up a larger share of all farms in 2020 than in 1996.

We also separated farms by size as measured by gross cash farm income (GCFI), which is how the USDA, Economic Research Service (ERS) farm typology has measured farm size since 2011 (MacDonald & Hoppe, 2013), and the principal operator's engagement with farming. A large portion of U.S. farms meet the definition of a farm, but their operators engage very little in farming because they are retired from farming or engage in something other than farming as their primary occupation. The current USDA, ERS farm typology classifies farms with GCFI less than $350,000 whose principal operator is retired from farming as "retirement farms" and those where the principal operator's primary occupation is something other than farming as "off-farm occupation farms." Together, these farms are referred to as "residence farms." Whether the principal producer is retired from farming has only been collected in ARMS since 2005, so we were only able to separate residence farms from other farms with GCFI less than $350,000 (small farms) beginning in that year.

To ensure comparability over time, we based our farm size classification on GCFI, adjusted for inflation in producer prices using the farm Producer Price Index (PPI), with 2011 as the base year (which is the

[63] The five regions are the West, Plains, Midwest, South, and Atlantic. In addition to national and regional-level estimates, farm-level weights are designed to provide State-level estimates for 15 agriculturally important States—Arkansas, California, Florida, Georgia, Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Carolina, Texas, Washington, and Wisconsin. When estimated, variances are estimated using the delete-a-group jackknife approach with 30 replicate weights (15 replicates during 1996–2007).

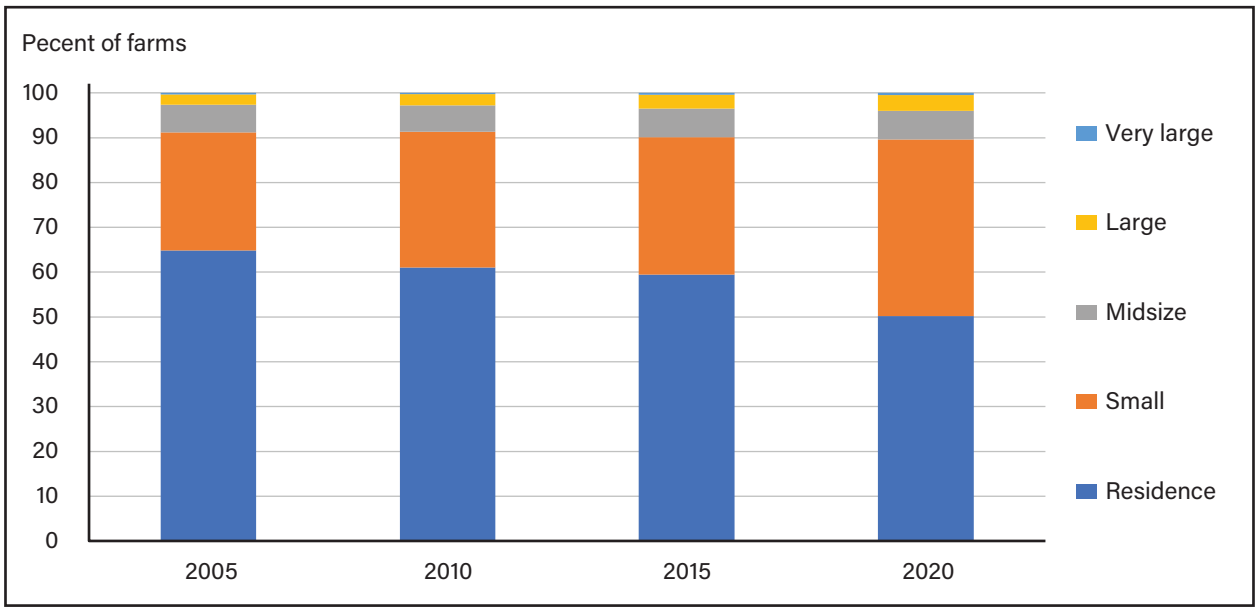
[64] About 2 percent of all U.S. farms are nonfamily farms. Lacy et al. (2025) summarizes some characteristics of these farms using 2018–22 pooled ARMS data.

year Hoppe and MacDonald (2013) used to reset farm typology categories) and identify five categories of farms based on size:

- Small/residence farms: GCFI less than $350,000 (before 2005, residence farms are not separable from other small farms)
- Residence farms: GCFI less than $350,000 and the principal operator is retired from farming or reports the primary occupation is not farming
- Small: GCFI less than $350,000 and operator is not retired from farming and the primary occupation is farming
- Midsize: GCFI of $350,000 to less than $1 million
- Large: GCFI of $1 million to less than $5 million
- Very large: GCFI of $5 million or more

Overall, the share of farms with GCFI less than $350,000 (i.e., small and residence farms) remained around 90 percent between 2005 and 2020, but the share classified as residence farms has declined while the share that were small farms increased.

Figure A.1
Share of U.S. farms in each size class, selected years, 2005–20



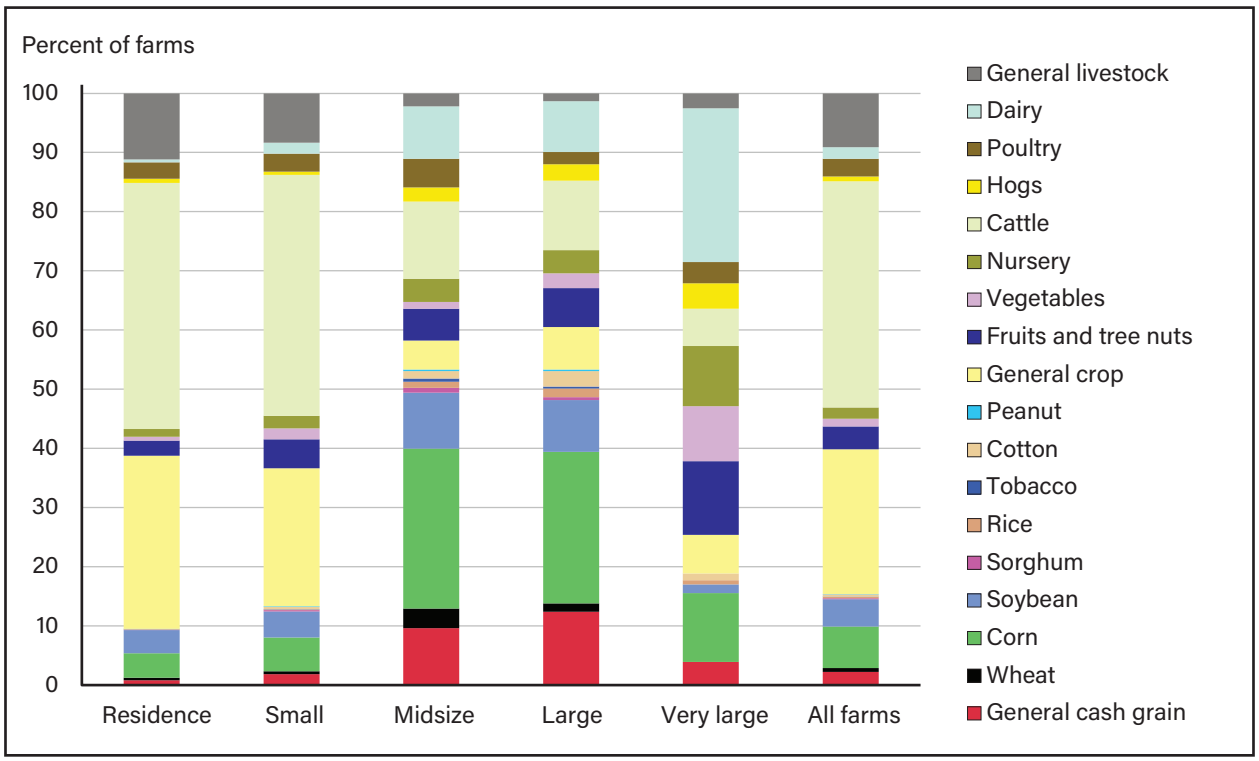
Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.

The specialization of farms varies by farm size, with residence and small farms more likely to specialize in general crops, general livestock, and cattle, while midsize and large farms are more likely to specialize in cash grains. The specializations of very large farms are more evenly distributed, with about one-third specializing in fruits and tree nuts, vegetables, and nursery crops.

Figure A.2

Share of U.S. farms specializing in each commodity by farm size, 2020



Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.

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Appendix B

The Shannon index (Shannon, 1948) is a widely used measure of diversity that has been used in the agricultural economics literature to measure diversification of crop production (Aguilar et al., 2015; Ang et al., 2018; Sipilainen & Huhtala, 2013) and income of rural households (Leng et al., 2020). For illustrative purposes, consider the production diversification of a farm operation, where the variables of interest are crop-specific value of production and total (across all crop categories) value of production measures. The normalized Shannon index, for farm *i* is, $S_i = \frac{-\sum_{n=1}^{N}(v_n * \ln[v_n])}{-\sum_{n=1}^{N}(v_e * \ln[v_e])}$, where *N* is total crop categories, v_n is the proportion of the value of production of crop *n* to the total value of production for all *N* crops, and v_e is the proportion of the value of production of crop *n* to the total value of production if production is evenly allotted across all crops (i.e., total diversity). The normalized index is bounded by 0 and 1, with larger values indicating a greater degree of diversification.

References

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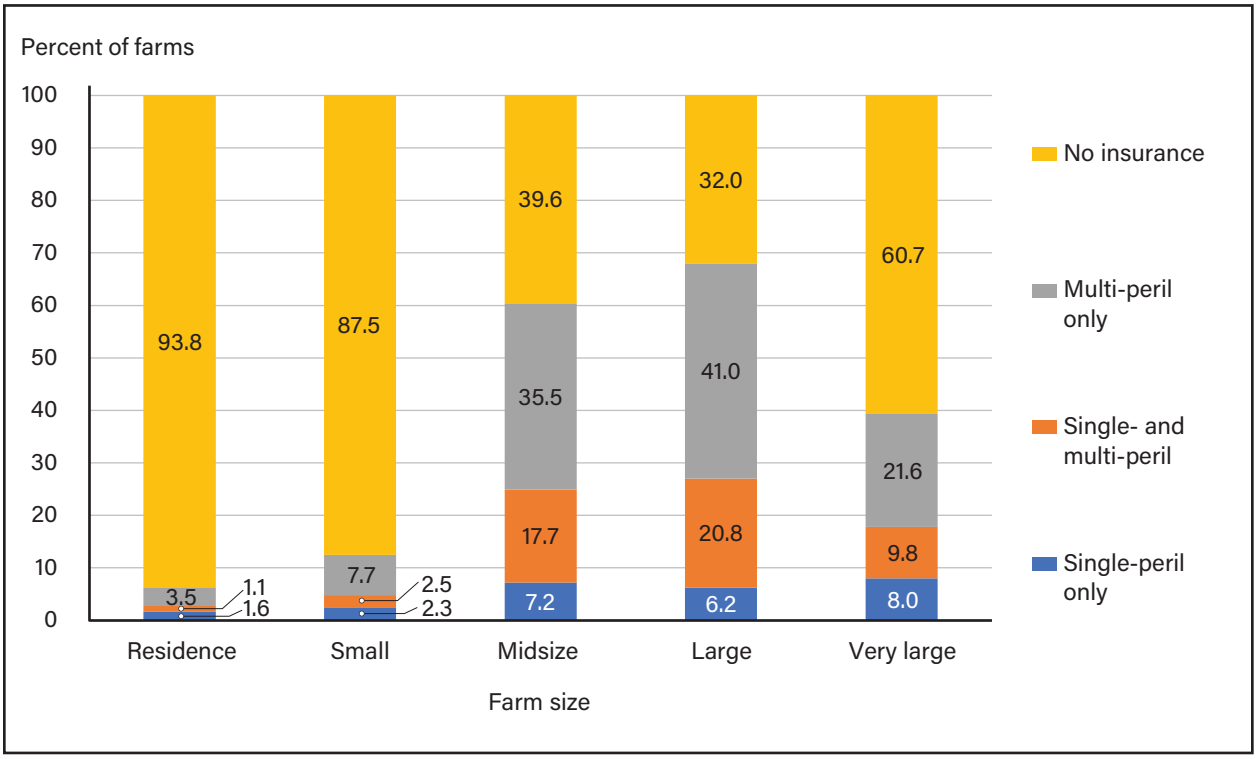
Appendix C

While the Agricultural Resource Management Survey (ARMS) contains little additional information on producer purchases of other insurance, the 2018 and 2019 surveys included questions in a different part of the survey distinguishing purchases of single-peril and named-peril policies from multi-peril policies. Although the question did not specify whether the policy was purchased under FCIP, because there were no FCIP single-peril policies during those years[65] (with the exception of Pasture, Rainfall, Forage insurance, for which uptake was still limited in 2018 and 2019[66]), this question effectively allowed an examination of the kinds of farms purchasing private,[67] single-peril crop insurance.[68] Similar to FCIP participation patterns, residence and small farms purchased single-peril insurance at much lower rates (figure C.1). The data indicate a large crop insurance gap between midsize and small farms, with close to a 50-percentage-point difference between the two size classes in the share of farms carrying crop insurance.

Figure C.1
Type of crop insurance coverage by farm size, 2018–19



Residence = Farm with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming. Small = GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming. Midsize = GCFI > $350,000 and <$1 million. Large = GCFI > $1 million and < $5 million. Very large = GCFI > = $5 million.

Note: All values are in real, 2011 dollars using the farm Producer Price Index (PPI).

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2018–19 Agricultural Resource Management Survey data.

[65] FCIP now offers a variety of single-peril policies, including the Hurricane Insurance Protection—Wind Index (HIP-WI) and HIP-WI Tropical Storm Option; Pasture, Rangeland and Forage (PRF); Controlled Environment, Livestock Revenue Protection; and Livestock Gross Margin policies.

[66] PRF launched as a pilot program in 2007 but was first made available in the 48 Contiguous States in 2016.

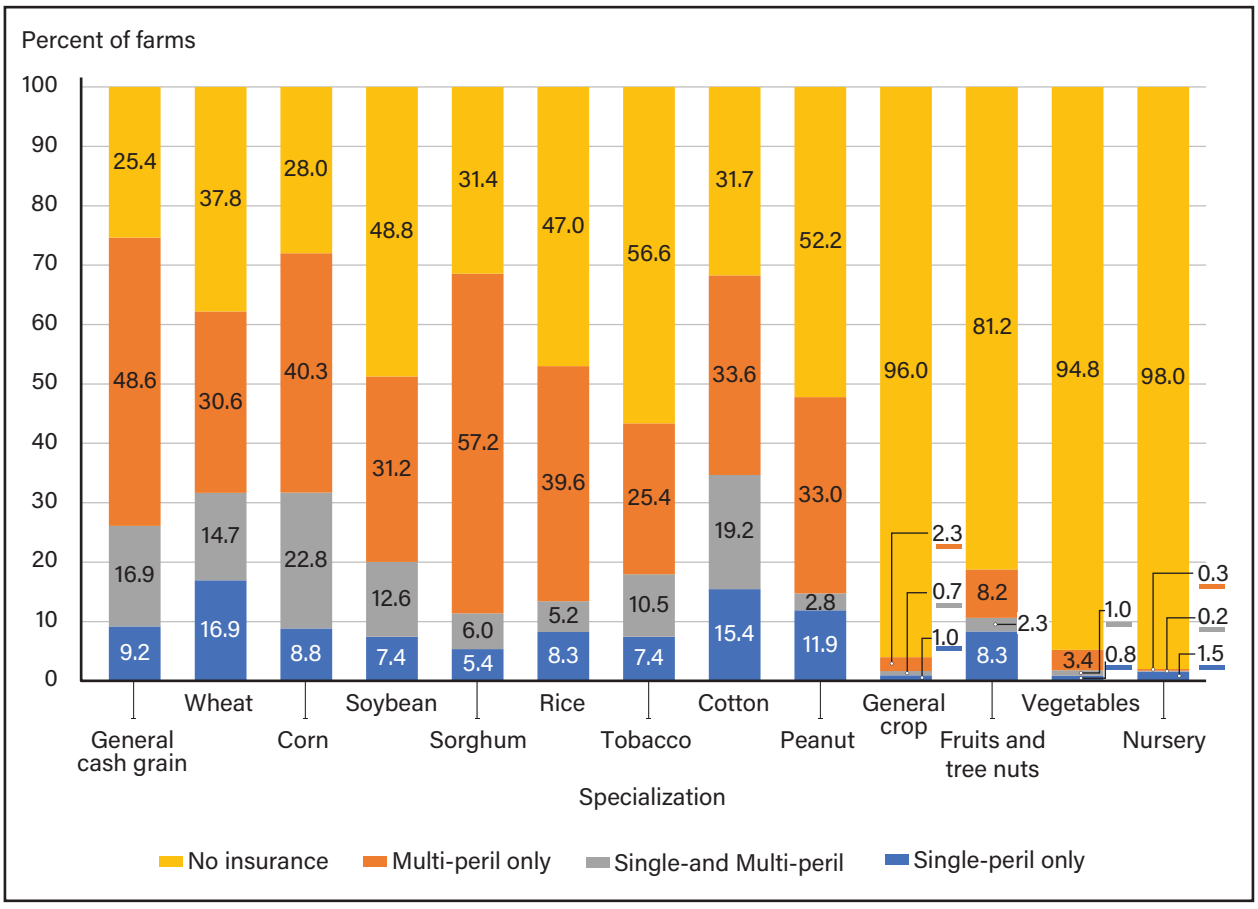
[67] Producers typically purchase both MPCI and single-peril policies from the same private insurance broker. While the insurance premium for the MPCI is subsidized, premiums for the single-peril policies are not.

[68] Because these questions are asked in a different part of ARMS than the previous insurance data examined (which came from the expenditure survey), the data between these two measures varies for some crops—particularly where fewer producers are surveyed.

Because similar shares of midsize, large, and very large farms reported purchasing single-peril policies, the insurance gap between large and very large farms was driven by differences in purchases of multi-peril policies. There may be various explanations for this tendency of very large farms to purchase multi-peril policies less frequently, including that the farms are managing their risks by other means, multi-peril policies may not be available for the commodity they produce, or they have other eligibility concerns that prevent them from participating in FCIP.[69]

Regarding crop insurance purchases by commodity specialization, the share of producers who purchased only single-peril coverage exceeded 15 percent only for farms specializing in cotton and wheat (figure C.2). Substantial acreage for these two crops was reported in States that experience high numbers of hail events (Texas and Kansas, respectively) (National Weather Service, 2023), which could be one explanation for this finding. Few farms specializing in specialty crops utilized single-peril insurance. Among these operations, crop insurance coverage was most prominent among fruit and tree nut growers who can experience substantial economic losses from even small hail events due to fruit bruising.

Figure C.2
Type of crop insurance coverage by commodity specialization, 2018–19



Note: Specializations indicate the commodity that comprises the majority of the farm's production. "General" specializations indicate no single commodity makes up the majority of production.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, 2018–19 Agricultural Resource Management Survey data.

[69] For example, while there is no income limit on participating in FCIP as there is with participating in Title I programs such as ARC and PLC, in order to be eligible for the premium subsidy on FCIP policies, farms must still comply with Highly Erodible Land Conservation and Wetland Conservation provisions and keep certification on file with the USDA, Farm Service Agency.

Reference

National Weather Service. (2023). *Annual severe weather report summary 2022*. National Weather Service Storm Prediction Center, U.S. National Oceanic and Atmospheric Administration.

Appendix D

We include here the corresponding cross-tabulations on utilization of two risk management strategies by farms of different sizes (note the figure on midsize farms is located in the main text in "Comparing Risk Management Strategy Utilization Across Farm Types"). For each cross-tabulation, the share of farms using a single strategy is reported in bold at the top row of each column, and then each subsequent row indicates the share of farms using the strategy heading that column in addition to the next row in the column (table D.1). These tabulations indicate that residence and small farms are using few strategies aside from off-farm income and savings, while large and very large farms more frequently use combinations of various strategies.

Table D.1

Percent of all U.S. farms utilizing combinations of two selected risk management strategies, 2018–20 average

	Commodity diversification	Sales channel diversification	Enterprise diversification	Off-farm income	Savings	Short-term loan use	FCIP	Other insurance	Production contract	Marketing contract	Any Government payment	Counter-cyclical program payment	Disaster payment	Capital improvements
Commodity diversification	**27.4**													
Sales channel diversification	5.1	**5.6**												
Enterprise diversification	9.6	2.4	**27.0**											
Off-farm income	17.9	3.5	17.5	**67.9**										
Savings	18.8	2.8	21.4	60.2	**84.9**									
Short-term loan use	9.2	3.0	6.4	11.5	11.0	**16.6**								
FCIP	10.7	3.3	5.8	8.7	8.3	6.6	**14.0**							
Other insurance	21.4	5.0	19.0	37.4	45.8	13.6	12.5	**57.5**						
Production contract	1.3	1.2	0.8	1.3	1.2	0.7	0.5	1.8	**2.1**					
Marketing contract	4.5	4.5	2.3	3.7	3.2	3.0	3.8	5.3	0.1	**5.9**				
Any Government payment	14.7	4.1	13.5	21.8	25.3	9.3	11.1	24.8	0.7	4.3	**33.4**			
Countercyclical program payment	7.2	2.2	4.3	6.1	6.2	4.2	5.7	8.5	0.3	2.3	9.8	**9.8**		
Disaster payment	1.6	0.4	1.4	2.1	2.3	1.2	1.3	2.7	0.1	0.4	3.3	1.0	**3.3**	
Capital improvements	5.7	1.3	4.9	10.7	12.4	4.0	2.7	10.9	0.3	1.3	5.4	1.8	0.8	**15.3**

FCIP=Federal Crop Insurance Program.

Note: We used the following color scheme: Green = Share >75 percent; Yellow = Share >50 percent; Red = Share <5 percent. Data for 2018 through 2020 are pooled and percents are weighted to be representative of all farms over the period.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.

Table D.2

Percent of residence U.S. farms utilizing combinations of two selected risk management strategies, 2018–20 average

	Commodity diversification	Sales channel diversification	Enterprise diversification	Off-farm income	Savings	Short-term loan use	FCIP	Other insurance	Production contract	Marketing contract	Any Government payment	Counter-cyclical program payment	Disaster payment	Capital improvements
Commodity diversification	**17.1**													
Sales channel diversification	1.2	**1.5**												
Enterprise diversification	4.5	0.4	**23.7**											
Off-farm income	14.7	1.3	17.6	**79.3**										
Savings	15.0	1.2	21.9	75.2	**93.6**									
Short-term loan use	3.4	0.8	3.3	9.6	9.9	**10.9**								
FCIP	3.6	0.8	2.2	5.0	5.2	2.1	**6.2**							
Other insurance	11.0	1.2	14.3	37.9	44.6	7.6	4.9	**48.3**						
Production contract	0.2	0.2	0.1	0.5	0.4	0.1	0.1	0.5	**0.5**					
Marketing contract	1.1	1.3	0.4	1.6	1.6	0.9	1.0	1.5	0.0	**1.8**				
Any Government payment	6.0	1.1	10.2	20.2	24.7	4.4	4.4	16.3	0.1	1.3	**26.8**			
Countercyclical program payment	2.3	0.4	1.6	4.1	4.5	1.3	2.0	3.4	0.0	0.5	5.0	**5.0**		
Disaster payment	0.5	0.1	0.7	1.7	1.8	0.6	0.5	1.6	0.0	0.1	2.1	0.4	**2.1**	
Capital improvements	3.6	0.2	3.5	12.1	13.4	2.4	0.8	9.0	0.1	0.3	3.1	0.7	0.4	**14.2**

FCIP=Federal Crop Insurance Program. Residence farms are farms with <$350,000 in gross cash farm income (GCFI) and the principal operator is retired from farming or reports their primary occupation is not farming.

Note: We used the following color scheme: Green = Share >75 percent; Yellow = Share >50 percent; Red = Share <5 percent. Data for 2018 through 2020 are pooled and percents are weighted to be representative of all farms over the period.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.

Table D.3

Percent of small U.S. farms utilizing combinations of two selected risk management strategies, 2018–20 average

	Commodity diversification	Sales channel diversification	Enterprise diversification	Off-farm income	Savings	Short-term loan use	FCIP	Other insurance	Production contract	Marketing contract	Any Government payment	Counter-cyclical program payment	Disaster payment	Capital improvements
Commodity diversification	**28.5**													
Sales channel diversification	4.2	**4.7**												
Enterprise diversification	9.5	1.6	**26.7**											
Off-farm income	15.6	2.7	15.3	**55.4**										
Savings	21.5	3.1	21.5	49.7	**85.1**									
Short-term loan use	7.7	1.9	5.5	9.1	10.8	**14.8**								
FCIP	8.6	1.9	4.4	6.5	8.5	4.4	**11.9**							
Other insurance	22.0	4.0	19.2	33.1	50.0	12.1	10.4	**60.6**						
Production contract	1.5	1.5	1.0	1.7	1.9	0.8	0.3	2.3	**2.8**					
Marketing contract	3.2	3.3	1.5	2.8	3.5	1.8	2.4	4.1	0.1	**4.8**				
Any Government payment	13.8	2.8	12.1	19.0	25.6	7.1	8.9	24.8	0.7	3.0	**32.1**			
Countercyclical program payment	6.1	1.3	3.8	4.8	6.7	2.8	4.2	7.9	0.2	1.4	8.8	**8.8**		
Disaster payment	1.5	0.2	1.4	1.9	2.8	0.9	1.1	2.6	0.1	0.2	3.5	0.9	**3.5**	
Capital improvements	5.0	0.8	4.8	7.9	11.7	3.2	1.8	10.0	0.4	0.8	4.9	1.2	0.7	**13.8**

FCIP=Federal Crop Insurance Program. Small farms are farms with GCFI < $350,000 and the operator is not retired from farming and their primary occupation is farming.

Note: We used the following color scheme: Green = Share >75 percent; Yellow = Share >50 percent; Red = Share <5 percent. Data for 2018 through 2020 are pooled and percents are weighted to be representative of all farms over the period.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.

Table D.4

Percent of large U.S. farms utilizing combinations of two selected risk management strategies, 2018–20

	Commodity diversification	Sales channel diversification	Enterprise diversification	Off-farm income	Savings	Short-term loan use	FCIP	Other insurance	Production contract	Marketing contract	Any Government payment	Counter-cyclical program payment	Disaster payment	Capital improvements
Commodity diversification	**78.3**													
Sales channel diversification	33.5	**34.9**												
Enterprise diversification	39.6	19.2	**46.9**											
Off-farm income	41.9	18.4	24.6	**51.7**										
Savings	14.9	6.7	9.9	7.2	**22.0**									
Short-term loan use	51.3	23.9	31.5	31.2	11.7	**60.6**								
FCIP	62.2	28.7	35.5	37.9	14.8	46.3	**70.8**							
Other insurance	75.1	33.8	45.0	49.4	20.8	58.0	67.9	**94.8**						
Production contract	5.0	5.1	3.2	2.8	1.2	3.5	4.2	5.3	**5.6**					
Marketing contract	33.5	31.5	19.7	20.2	8.0	25.0	31.5	37.5	1.6	**38.9**				
Any Government payment	67.9	31.0	38.8	39.9	15.8	50.7	60.6	73.5	4.4	32.5	**76.4**			
Countercyclical program payment	41.6	19.3	24.5	22.8	8.2	29.9	36.7	41.9	2.0	20.1	43.5	**43.5**		
Disaster payment	8.2	3.4	4.8	5.3	1.4	6.4	7.1	9.0	0.5	3.6	9.4	5.5	**9.4**	
Capital improvements	22.3	10.2	15.1	15.2	6.0	18.9	21.0	28.3	1.4	11.9	22.3	13.7	3.4	**29.6**

FCIP=Federal Crop Insurance Program. Large farms are farms with gross cash farm income > $1 million and < $5 million.

Note: We used the following color scheme: Green = Share >75 percent; Yellow = Share >50 percent; Red = Share <5 percent. Data for 2018 through 2020 are pooled and percents are weighted to be representative of all farms over the period.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.

Table D.5

Percent of very large U.S. farms utilizing combinations of two selected risk management strategies, 2018–20 average

	Commodity diversification	Sales channel diversification	Enterprise diversification	Off-farm income	Savings	Short-term loan use	FCIP	Other insurance	Production contract	Marketing contract	Any Government payment	Counter-cyclical program payment	Disaster payment	Capital improvements
Commodity diversification	**65.4**													
Sales channel diversification	33.5	**36.0**												
Enterprise diversification	29.1	16.7	**40.0**											
Off-farm income	26.3	15.9	16.7	**42.1**										
Savings	12.5	5.7	10.0	0.5	**22.9**									
Short-term loan use	39.9	22.3	27.0	23.5	9.5	**55.3**								
FCIP	36.0	20.1	23.1	20.2	9.9	30.1	**47.8**							
Other insurance	62.7	35.0	38.4	39.4	20.9	52.7	45.8	**94.1**						
Production contract	2.4	2.7	1.8	1.7	0.9	1.8	1.8	3.2	**3.2**					
Marketing contract	35.2	34.3	18.5	18.1	8.3	25.2	25.0	41.8	1.0	**43.4**				
Any Government payment	49.7	28.8	30.5	24.9	11.1	40.1	36.4	58.5	2.4	32.1	**60.5**			
Countercyclical program payment	28.4	16.7	15.6	11.2	4.9	21.3	19.8	29.2	1.2	16.7	30.0	**30.0**		
Disaster payment	4.9	3.9	3.9	2.6	0.6	4.2	4.5	5.5	0.2	4.0	5.6	3.3	**5.6**	
Capital improvements	25.4	13.5	17.4	14.2	9.7	22.4	20.2	35.8	0.7	17.3	24.9	10.8	2.4	**37.6**

FCIP=Federal Crop Insurance Program. Very large farms are farms with gross cash farm income > = $5 million.

Note: We used the following color scheme: Green = Share >75 percent; Yellow = Share >50 percent; Red = Share <5 percent. Data for 2018 through 2020 are pooled and percents are weighted to be representative of all farms over the period.

Source: USDA, Economic Research Service calculations using USDA, National Agricultural Statistics Service and USDA, Economic Research Service, Agricultural Resource Management Survey data.