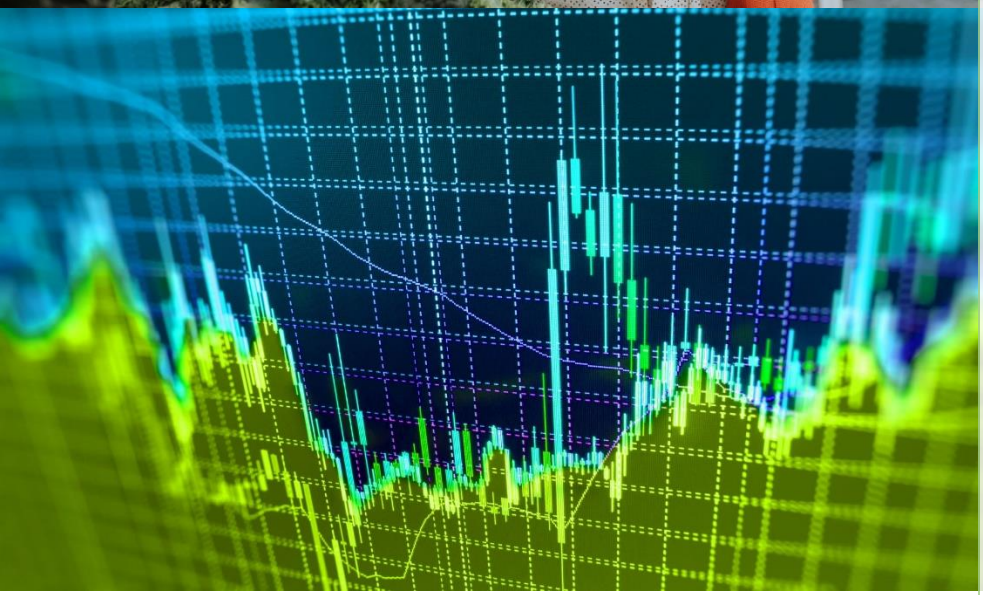

# Economic Changes & Small Farmers: An Analysis on the America's Hidden Lifeline

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**AEASP ECOG 181**

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## Abstract

Small farmers are the largest source of our country's food. However, they constantly struggle to make ends meet with their yearly median income falling well below that of the average Americans. This paper sets out to analyze the scale of differences that shocks in the economy have on family farms. We will be doing this by measuring the correlation of the economic indicators on the farms profit margins and median income for the farmers.

## Background

In this paper, family farms are considered small farms. Small farms can provide up to 88% of food in America during any given year (1). Small farms are important to our food sourcing as they generally produce healthier foods that are better quality and sold at lower prices than non-family farms. Buying local also keeps those funds within that community. Small farmers have a direct impact on food deserts and the sustainability of the profession, so it is important to keep support systems in place. There is a plethora of barriers to entry for small farmers, the largest of which is income. Others include ordinances, space and resources requirements for cultivation, and the unstable income of being a farmer. Farmers also operate in economies of scale so there are less returns for smaller farmers as their income is dependent on crops produced and sold. These long periods can also lead to instability for farmers who must endure long periods without an alternative non-farm income sources.

The recent farm bill in 2018 has left a positive impact on small farms. For example, it instituted additional protections and insurance programs that strengthen small and urban farmers. It also assists farmers by setting a base price for their crops, providing funds during fallow periods, and making loans available for equipment and destitute times. However, even with those changes, the farming industry still must navigate the issue of "right to repair" regulations in addition to needing clarification of rights as they are not applied equally to all workers.

Farmers must make the initial investment by purchasing supplies needed for the season, equipment, and other general business needs or living expenses. As they wait and care for the crops that they grow, the farmers are reliant on either previous season's profits or government subsidies to live if farming is their primary source of income. Farmers receive a set wage for each crop that is sold to marketplaces. The marketplaces then sell the crops at a markup to consumers in order to realize a profit. There are some exceptions to this process including

farmers who sell in secondary markets like side-of-the-road vendors. We examined a few different common crops including apples, oranges, and bread to compare the average profit of the farmer vs the marketplace.

Like most Americans, farmers have set monthly expenses. In contrast however they often lack a steady income, sometimes going on sometimes as long as seven months receiving any form of farm income or revenue. This long stretch of being unwaged makes farmers more vulnerable to economic changes. According to the USDA ERS, the average off-farm income for all farm households was $104,460. With over half of that income coming from another job held by either the operator, spouses, or others. A quarter of their income is funded by government subsidies, and the rest from either interest earned or non-farm incomes ***(C1)***. Compared to the median household income of Americans who are self-employed, the average median income for farmers after operating costs is significantly less ***(C2)***.

In addition, the USDA ERS compared the income and wealth levels for farm households within the US and found that the highest distribution of farmers had both high incomes and high wealth. The second highest distribution comprised of farmers who had low income and high wealth. This indicates that farmers who do well either make enough income from their farms to cover them throughout the year or have income sources outside of farming so that they are not reliant on income from the farm. The other distributions are farmers who have low income and low wealth, and farmers who have high income and low wealth. This suggests that those who use the income from farming as their primary source make significantly less money than those whose primary income comes from non-farming related jobs (C3). This paper sets out to measure the strength of the correlation between economic variables such as stock indexes, manufacturing, and local markets and farmer income.

## Data

The base idea is to compare the economy and see how well it correlates with the farmer income data.

## Economic Indicators

Stock indicators are used to illustrate the health of firms in that particular index. This meaning that if those long list of firms are performing particularly well, the country as a whole shall be benefiting and vice versa. In order to have a general idea about how well the economy

has done over recent years, the Wilshire 5000, which tracks the performance of virtually all publicly traded companies in the United States, the NASDAQ 100, which focuses on the largest 100 non-financial companies, the S&P 500, which a market-capitalization-weighted index of 500 leading publicly traded companies in the U.S., and the DJIA ,which tracks 30 U.S. blue-chip stocks were used. According to data on those four stock indexes by FRED St. Louis, there seems to be an upward trend from 2013 to 2020 for each (T1-T4). Wilshire5000 and NASDAQ are very closely figured. This made interpreting results for either individually difficult.

Manufacturing data collected from ESMIS included Info, NDM, DM, PTS, Retail, WS, and Food; however, it did not show any significant changes in profit throughout the years from 2013 to 2022 (T9, T13). Sales data from manufacturing will be used to represent the output of the data by sector as a comparison to the farmer income data. Different sectors include Wholesale, retail, food, durable goods, and non-durable goods products. This will show which sectors have the strongest relation to agriculture.

## Farmer Income indicators

The crops used to determine profit are potatoes, tomatoes, milk, bread, oranges, and apples. According to data collected by BLS and NSAC, the average retail price for these crops far outstrips the price that farmers received for these particular crops with farmers only receiving about 24% of the profit on average (T5/T8). The exception to this would be milk crops with farmers receiving nearly half of those profits (T6). We had to leave out the data related to eggs as this was considered meat.

Each crop has a sale of ¢/lb ranging from 1-3 of that particular crop. The more robust crops have a lower average profit price. It does seem as though tomatoes and bread are robust through the years despite any major economic changes.

## Future Literature & Data Limitations

Additional Data sources also include CPI and inflation data. Due to time constraints, additional analysis to compare CPI and inflation data was not able to be completed. In addition, the coding packages used when trying to conduct analysis became corrupted partially through the analysis. Further details would conduct not only relativity to CPI, inflation, but also time series comparison as agriculture is a seasonal field. This also resulted in having to recalculate many of the results of regressions.

The time period that existed between the different datasets overlapped best between 2000 and 2020. The specific period that seemed to match all data was 2013-2017. It was during this period that the comparisons over time were able to be conducted in change between years.

## Analysis

Upon initial literature review, clean data sources for farmer income after expenses were difficult to obtain. Average profit for farmers was estimated by subtracting average expenses from average revenue from the USDA and BLS datasets. It is important to note that because the data for median income was not clearly defined, median farmer income also included large, non-family farms. Therefore, it can be assumed that the median income for family farms is even less than what the available data shows. Our data shows that on average, 1.5% of farms are considered non-family farms. The results were close to that of the BLS data chart provided (***C2***).

Using economic variables as the X axis, and farmer income variables as the Y axis, we find that the Dow Jones and S&P 500 are closely related, and the Wilshire 5000 and the Nasdaq are also very closely related. The only difference lies in the companies themselves. When the stock indexes are compared to median income, stocks are a poor indicator when attempting to represent farming sectors, profits, or income as it increases on average regardless of changes to income, profit percentages, or sales that the farmers are experiencing.

We also found that weather resistant crops appear to be sold at a lower price, as such, bread and potatoes are the more robust crops while milk and tomatoes are the most profitable.

Unsurprisingly, food manufacturing by year is strongly correlated with farmer median income. However, manufacturing sectors as a whole are not very closely related and therefore are a poor indicator. The specific sector that corresponds to the median income of civilians is the non-durable manufacturing (NDM) having the strongest correlation upon our initial analysis. Regarding CPI and inflation data, initial analysis revealed that the CPI is a stronger indicator of the farmers income data variables (***T10***) but further analysis need to be conducted to further prove this correlation.

## Conclusions

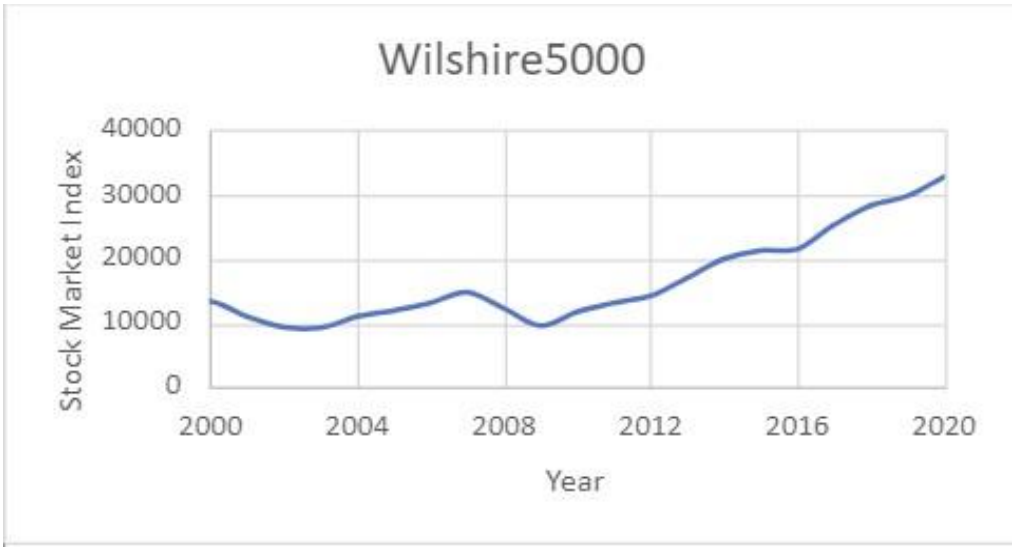
While it may seem that all economic indicators are equal, some do a poor job at showing how certain sectors of the economy are doing. This initial look into the strength of the ties

between the economy and the farmers shows that non-durable manufacturing, food manufacturing, and CPI are the strongest indicators of how farmers are doing at a particular time. Stock indexes, certain manufacturing sectors, and inflation do not necessarily do a great job telling the status of farmers by year. Although many future studies need to be conducted, this is a look into how we can measure small and urban farmers to strengthen the supportive infrastructure of America's hidden lifeline.

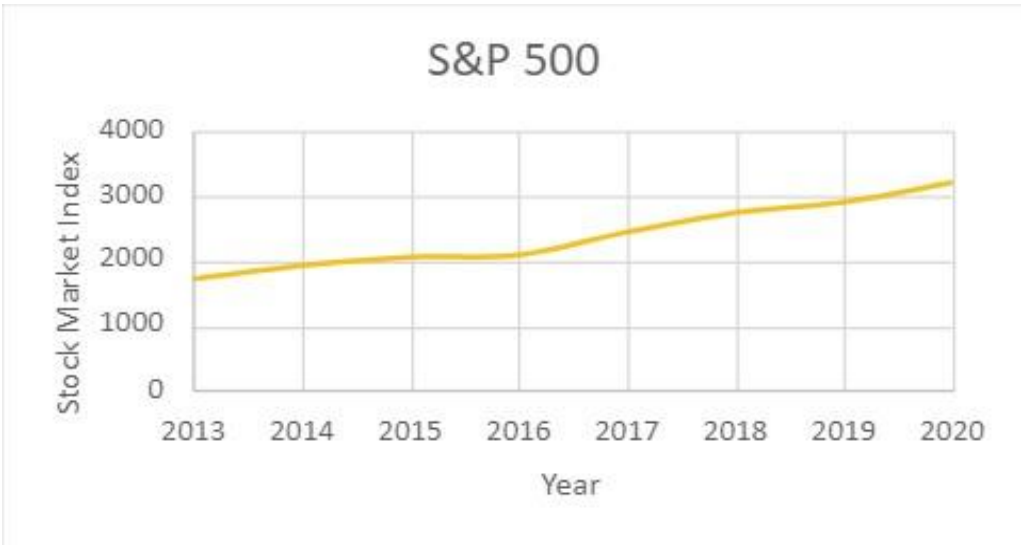
References

Figures

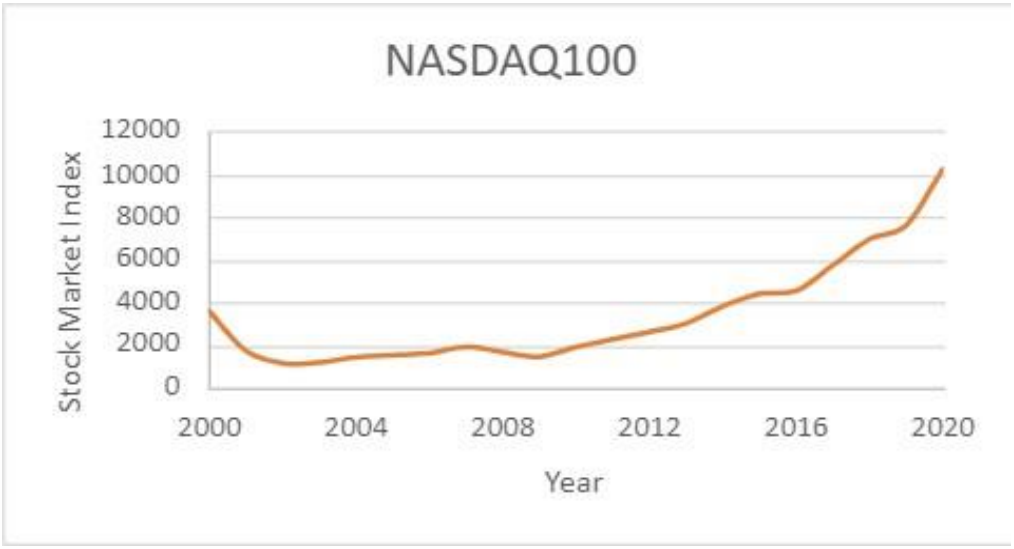
Tables




- T1

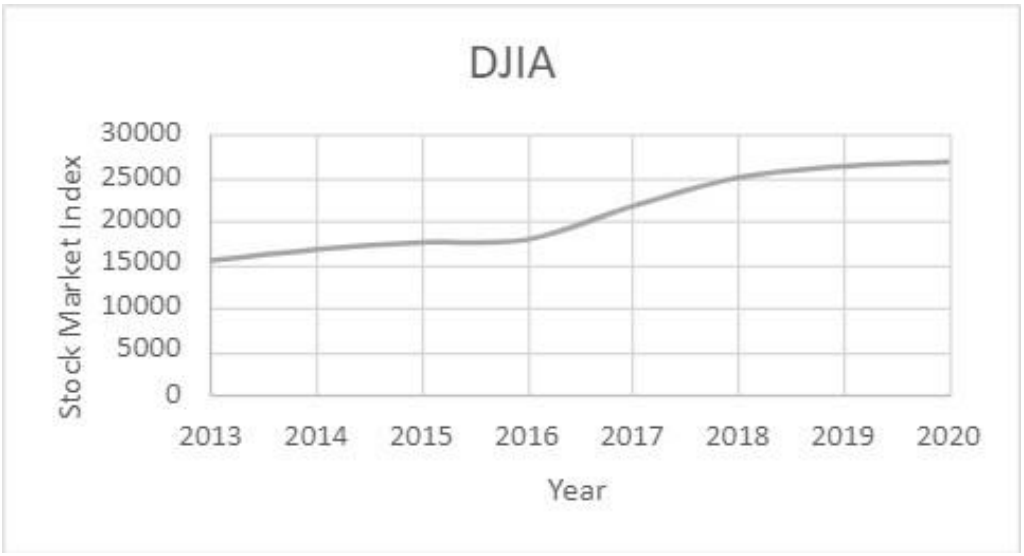



- T2

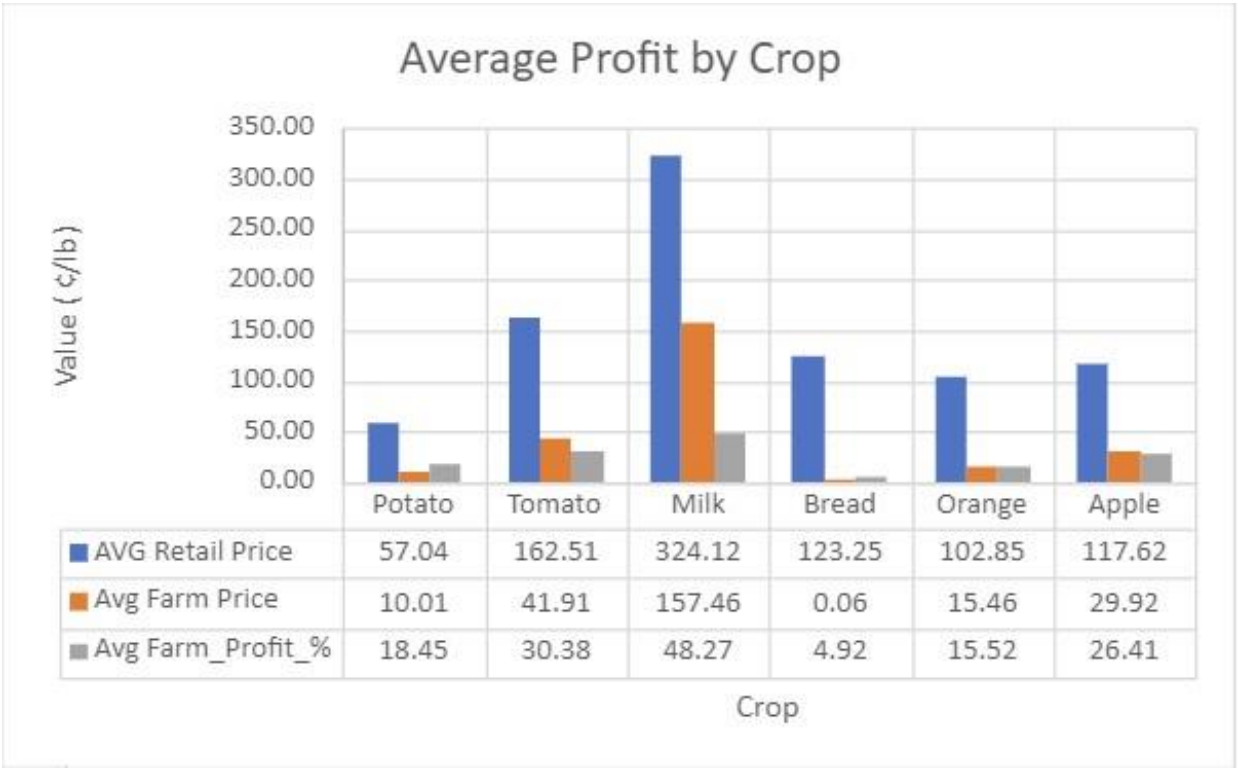



- T3

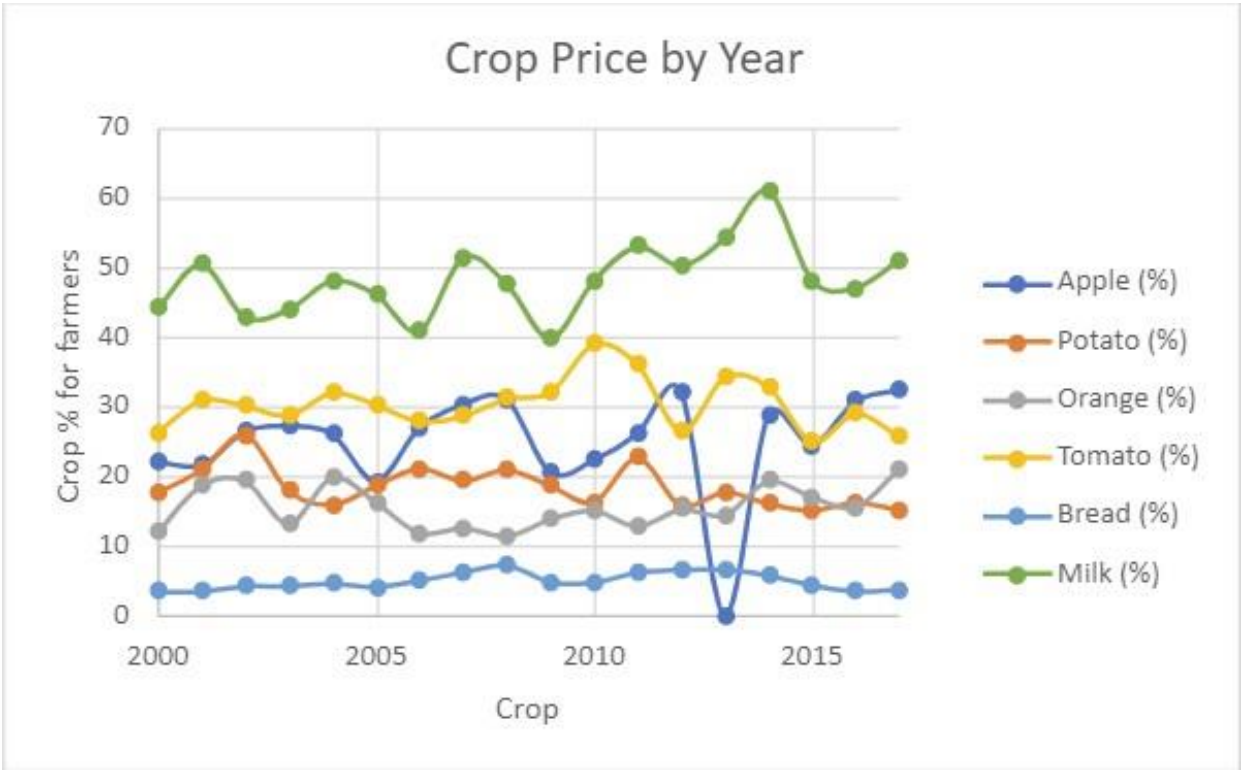
- T4


DJIA
Stock Market Index
30000
25000
20000
15000
10000
5000
0
2013
2014
2015
2016
2017
2018
2019
2020
Year

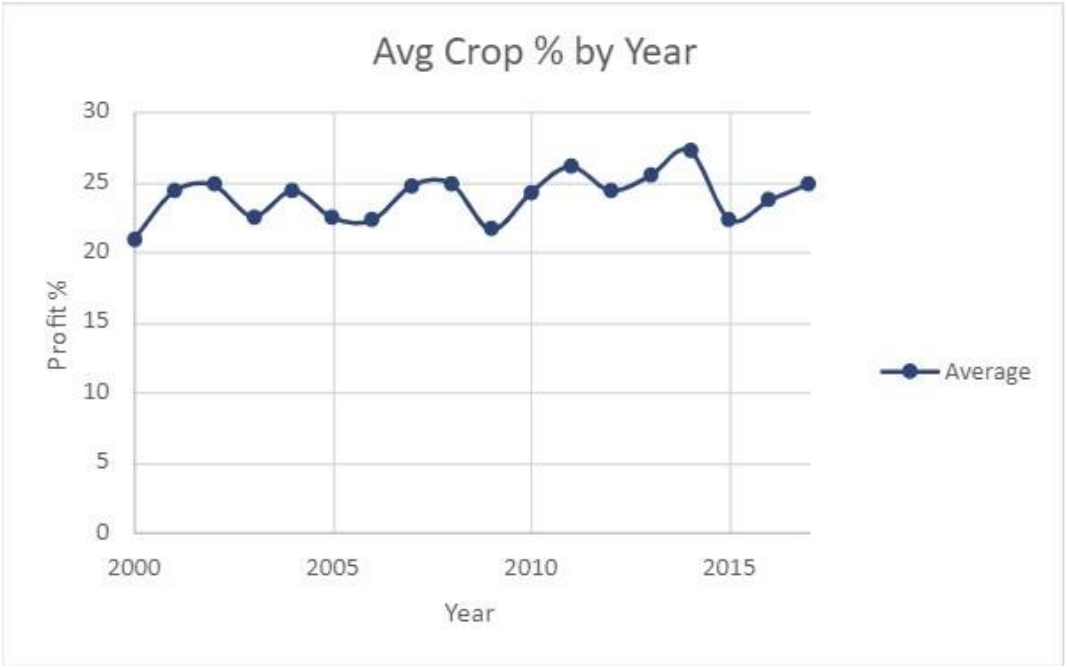
- T5


Average Profit by Crop
Value ( ¢/lb )
350.00
300.00
250.00
200.00
150.00
100.00
50.00
0.00
Potato
Tomato
Milk
Bread
Orange
Apple
AVG Retail Price 57.04 162.51 324.12 123.25 102.85 117.62
Avg Farm Price 10.01 41.91 157.46 0.06 15.46 29.92
Avg Farm_Profit_% 18.45 30.38 48.27 4.92 15.52 26.41
Crop

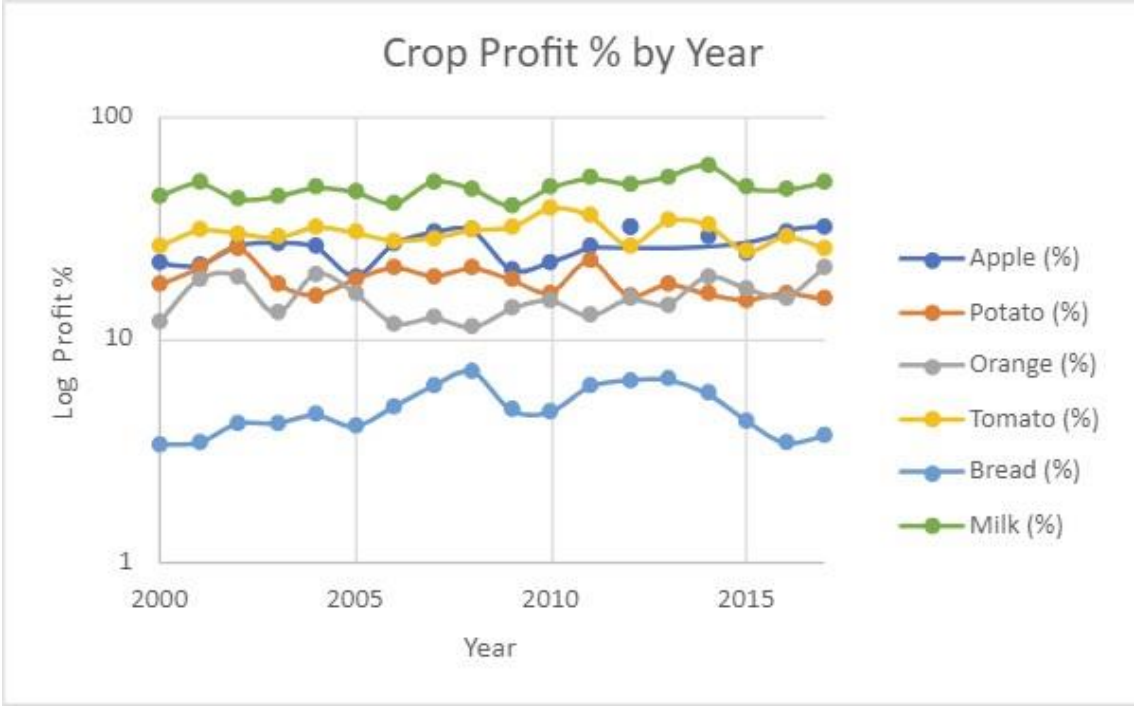
- T6


Crop Price by Year
Crop % for farmers
70
60
50
40
30
20
10
0
2000
2005
2010
2015
Crop
Apple (%)
Potato (%)
Orange (%)
Tomato (%)
Bread (%)
Milk (%)

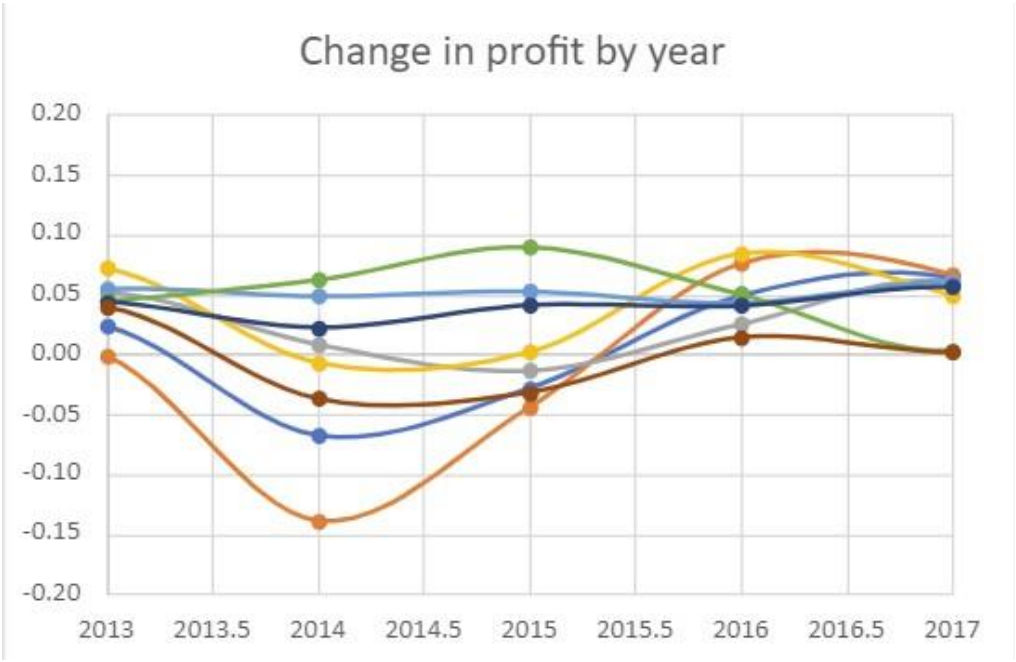
- T7

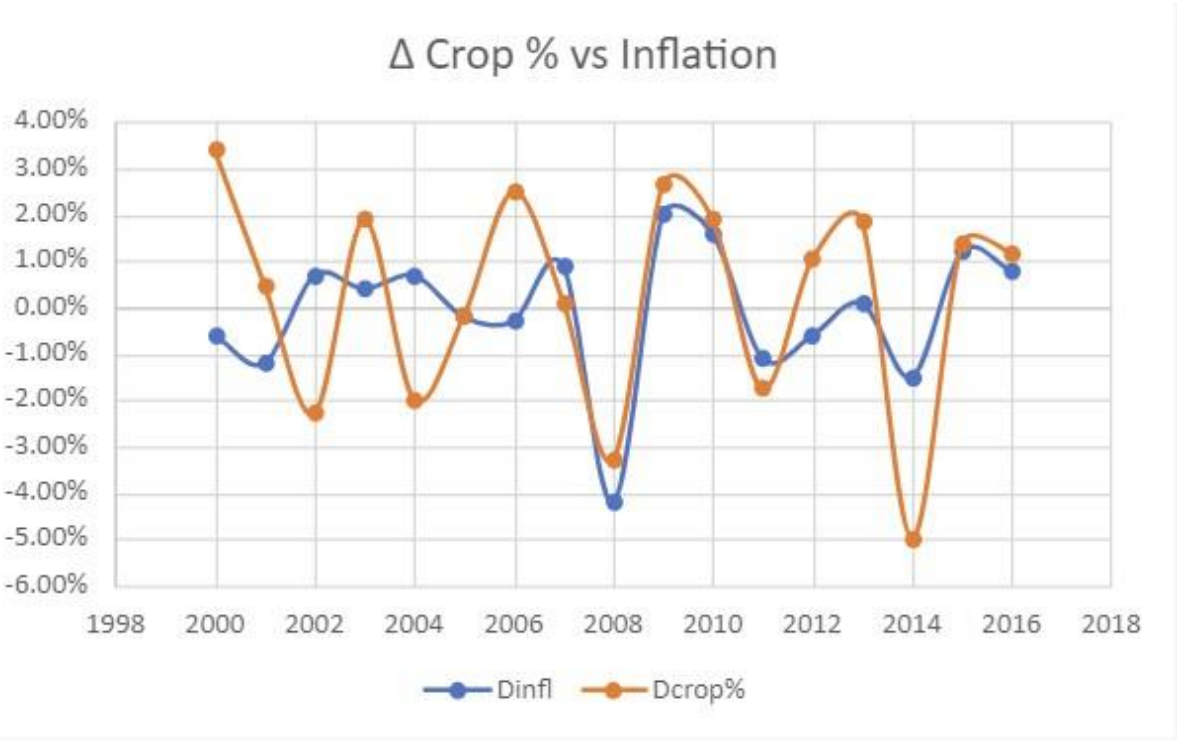

Avg Crop % by Year
Profit %
30
25
20
15
10
5
0
2000
2005
2010
2015
Year
Average

- **T8**

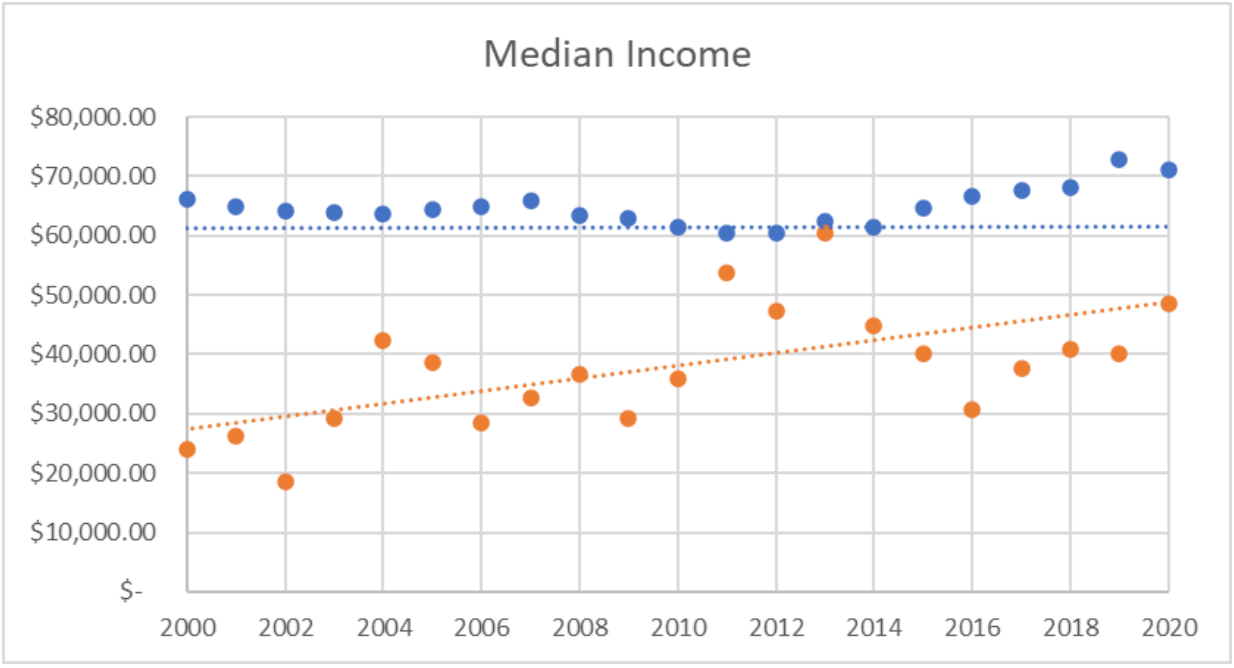

Crop Profit % by Year
100
10
1
Log Profit %
2000
2005
2010
2015
Year
Apple (%)
Potato (%)
Orange (%)
Tomato (%)
Bread (%)
Milk (%)

- T9


Change in profit by year
0.20
0.15
0.10
0.05
0.00
-0.05
-0.10
-0.15
-0.20
2013
2013.5
2014
2014.5
2015
2015.5
2016
2016.5
2017

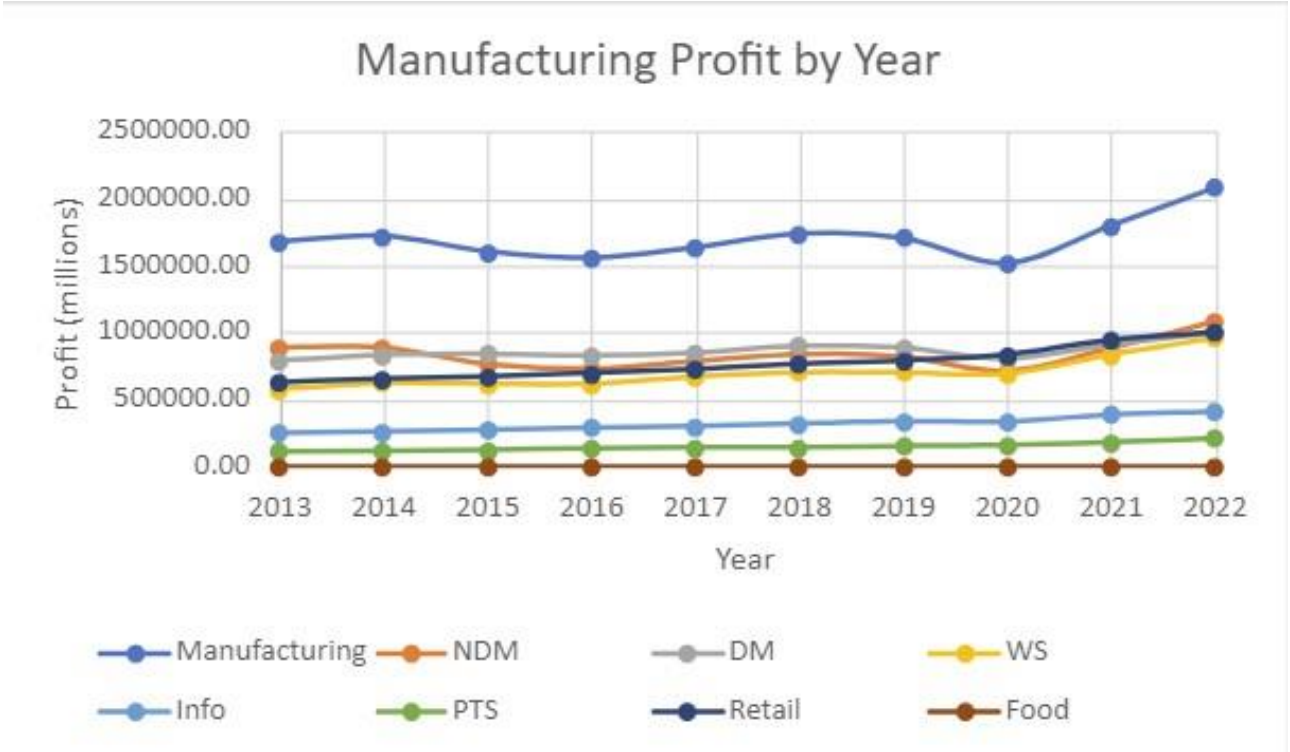

Δ Crop % vs Inflation
4.00%
3.00%
2.00%
1.00%
0.00%
-1.00%
-2.00%
-3.00%
-4.00%
-5.00%
-6.00%
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
Dinfl
Dcrop%

- **T10**


Median Income
$80,000.00
$70,000.00
$60,000.00
$50,000.00
$40,000.00
$30,000.00
$20,000.00
$10,000.00
$-
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018
2020

- T11

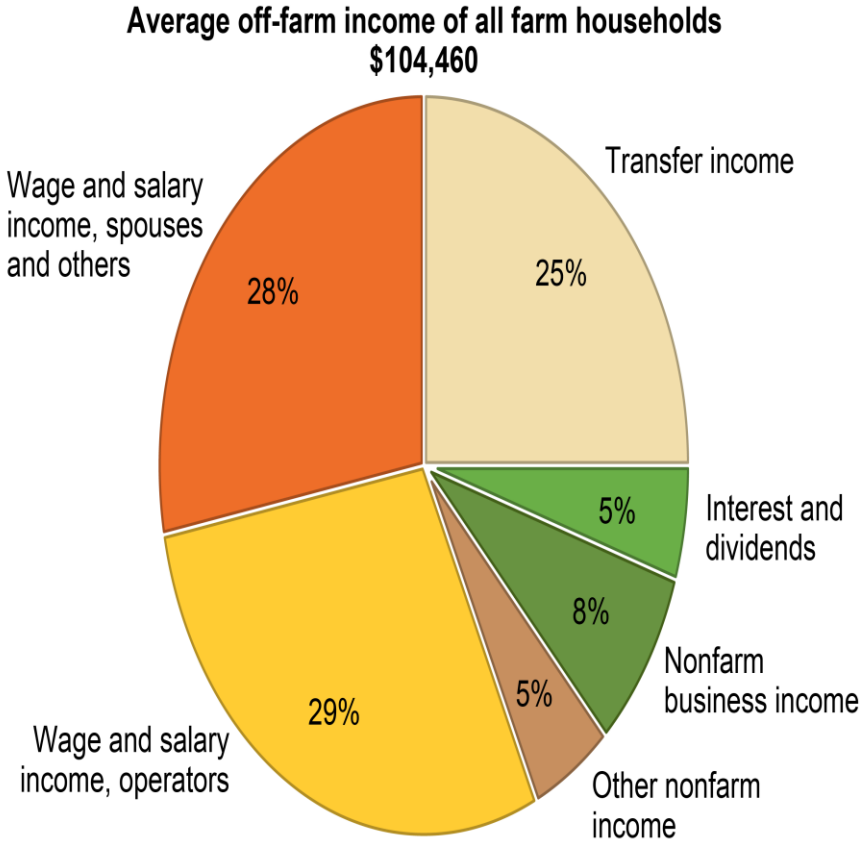
- T12


Manufacturing Profit by Year
Profit (millions)
2500000.00
2000000.00
1500000.00
1000000.00
500000.00
0.00
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
Year
Manufacturing
NDM
DM
WS
Info
PTS
Retail
Food

## Charts

- C1

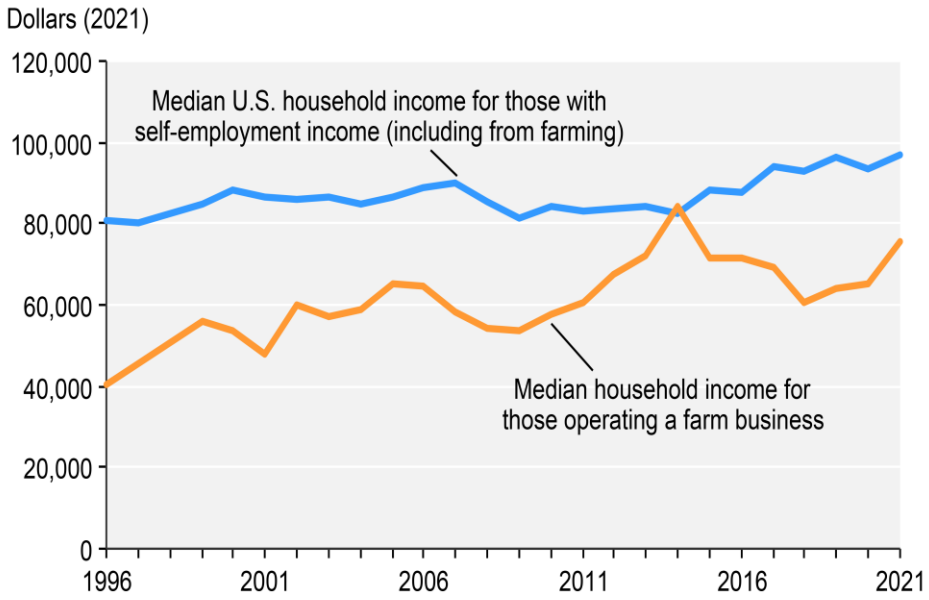
### Farm household sources of off-farm income, 2021




Note: Other nonfarm income includes gifts, payment for nonbusiness services, or miscellaneous income such as gambling winnings, financial payments, rebates, etc. Components may not sum to 100 percent because of rounding.
Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service, Agricultural Resource Management Survey. Data as of December 1, 2022.

- C2

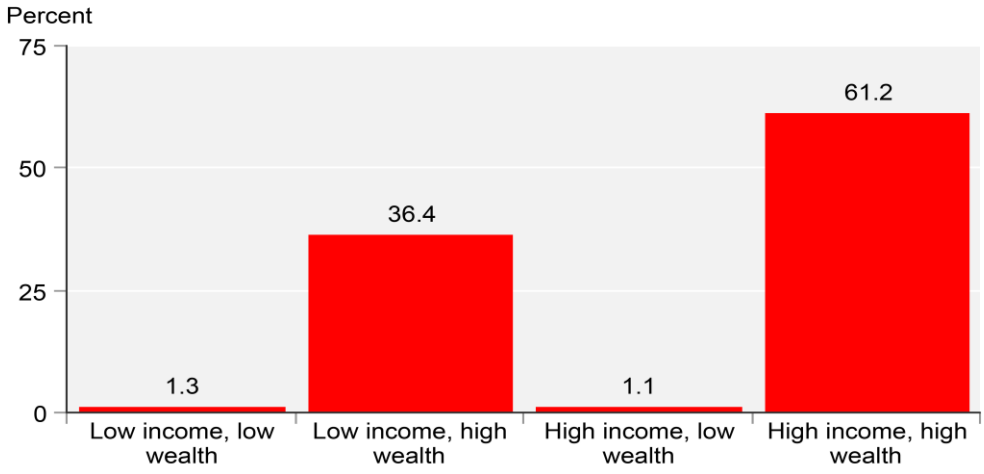
**Median household income of farm business households and U.S. households with self-employment income, 1996–2021**




Note: Farm businesses are defined as farms with gross cash farm income over $350,000 in 2021 dollars, or farms where the principal operator lists farming as the primary occupation. Household income is estimated only for households operating family farms. Changes to U.S. median income among households with self-employment income from 2013 and forward reflect changes in data collection and processing of the March supplement of the Current Population Survey as well as changes in actual household income.
Sources: USDA, Economic Research Service and USDA, National Agricultural Statistics Service, Agricultural Resource Management Survey, and U.S. Department of Commerce, Bureau of the Census, Current Population Survey. Values are adjusted for inflation using the U.S. Bureau of Economic Analysis Gross Domestic Product Price Index (BEA API series code: A191RG), 2021=1. Data as of December 1, 2022.

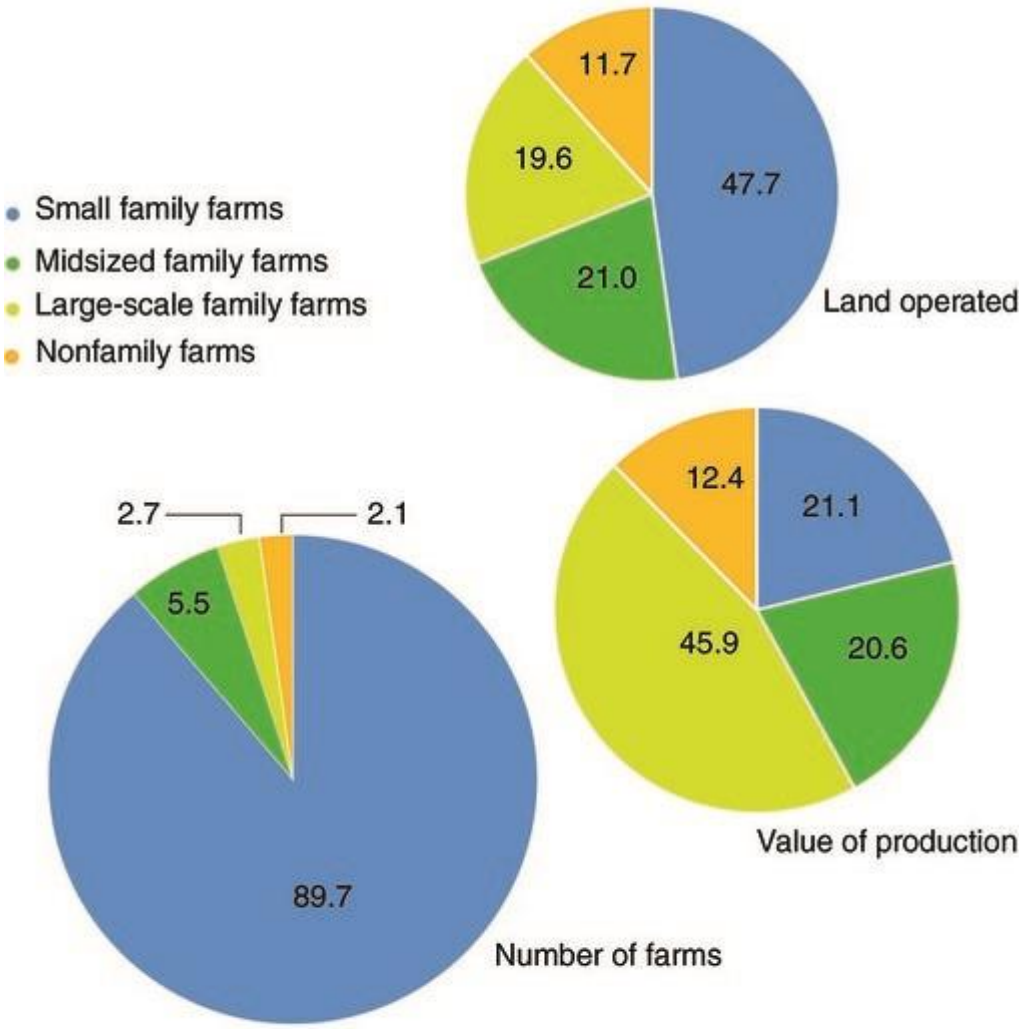
- C3

**Distribution of farm households by measures of economic well-being, 2021**




Note: Income and wealth levels for farm households are compared to the median levels of income and wealth of all U.S. households. The median income level used for comparison purposes is $70,784 and median wealth is $132,037 for all U.S. households in 2021.
Sources: USDA, Economic Research Service and USDA, National Agricultural Statistics Service, Agricultural Resource Management Survey; U.S. Department of Commerce, Bureau of the Census, Current Population Survey; and the Federal Reserve Board, Survey of Consumer Finances. Data as of December 1, 2022.

**Distribution of farms, land operated and value of production by farm type, 2018**




Source: USDA, Economic Research Service and USDA, National Agricultural Statistics Service, 2018 Agricultural Resource Management Survey.

- C4

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