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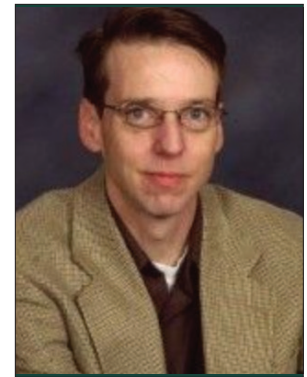
The impact of rising labor costs on Michigan's specialty crop industry



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The American labor force has experienced a decline in available laborers across the agricultural sector over the last two decades. These shortages are most sharply felt in labor-intensive specialty crop production, and many industries have come to rely on immigrant and non-citizen migrant labor, particularly from Mexico and Central America.

A sharp drop in immigration has contributed to severe labor shortages in the agricultural sector fueled by:

- rising education levels in the U.S. and abroad
- competition for workers from non-agricultural sectors
- increased difficulty in obtaining work authorization for immigrant workers
- general reduction in follow-the-crop migration

The shortage of farmworkers over the last five to 10 years is widely recognized and has prompted U.S. farmers to adjust their operations significantly. Many have adopted labor-saving technologies, employed farm labor contractors to bring workers to their farms, and adjusted the timing and intensity of agricultural practices such as pruning, weeding, and harvesting. Despite these modifications, farm labor shortages remain significant.

Higher farm wages

Labor shortages have led to a notable increase in farm wages nationwide, with Michigan experiencing a similar trend. Between 2012 and 2022, domestic crop farmworker wages in the Lake Region – Michigan, Minnesota, and Wisconsin – grew at an average annual rate of 3.7%, with some years seeing growth as high as 14%. For comparison, average wage growth across the entire U.S. economy during that same period was 3.2%, with a peak of 6.4%.

Surge in H-2A visa program

In 1952, the U.S. established the H-2 visa program to allow foreign workers to enter temporarily for low-skilled jobs. The program was divided into two parts in 1986 – the H-2A program for agricultural workers and the H-2B program for non-agricultural workers.

The H-2A program has no cap on the number of visas issued in a year. The use of the program has surged in Michigan – from approximately 1,300 in Fiscal Year 2014 to more than 15,000 by Fiscal Year 2023 (Figure 1).

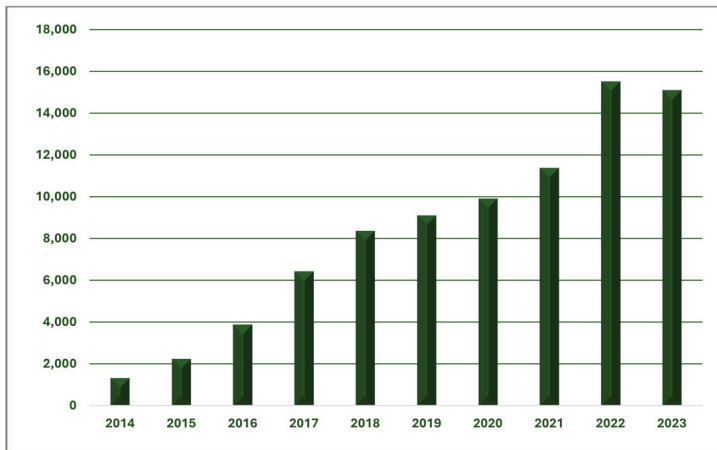


Figure 1. H-2A jobs certified in Michigan.

Source: US Department of Labor's H-2A Disclosure data processed by authors.

Under the program, employers must demonstrate they cannot find domestic workers, and workers must leave the U.S. when their visas expire. The positions are limited to seasonal work, excluding industries with year-round migrant labor needs. Employing H-2A workers can be an expensive option for employers who must:

- provide housing for H-2A workers
- pay worker transportation costs between their home country and the work site
- ensure workers are paid a special minimum wage known as the Adverse Effect Wage Rate or AEWR

The Lake Region AEWR has increased sharply in recent years, raising concerns within the agricultural industry. Higher labor costs may force employers to seek other means, like automating or reducing production of crops with high labor demand.

Higher wages, lower production

To understand the potential impacts of further wage increases, we used an equilibrium displacement model in conjunction with input-output analysis to estimate the economy-wide impacts of rising labor costs on changes in the production of specialty crops. Table 1 shows the estimated economic contribution of specialty crop farming on Michigan's economy.

Table 1. Estimated economic contribution of specialty crop farming.

| Effect | Employment | Labor Income | Value Added | Output |
|--------------|---------------|---------------------|---------------------|---------------------|
| 1. Direct | 24,064 | \$982.18 M | \$1,777.01 M | \$3,118.37 M |
| 2. Indirect | 6,974 | \$357.62 M | \$577.58 M | \$1,096.44 M |
| 3. Induced | 6,625 | \$379.22 M | \$680.83 M | \$1,205.15 M |
| Total | 37,663 | \$1,719.02 M | \$3,035.42 M | \$5,419.96 M |

Table 2 shows the expected change in economic activity from reduced specialty crop production, if specialty crop wages increased by 10%.

Table 2. Net change in estimated economic contribution of specialty crop farming resulting from a 10% wage increase.

| Effect | Employment | Labor Income | Value Added | Output |
|--------------|----------------|------------------|------------------|--------------------|
| 1. Direct | (1,612) | \$79.58 M | \$58.42 M | (\$84.2) M |
| 2. Indirect | (182) | (\$9.37) M | (\$15.17) M | (\$28.76) M |
| 3. Induced | 339 | \$19.47 M | \$34.92 M | \$61.83 M |
| Total | (1,455) | \$89.68 M | \$78.17 M | (\$51.13) M |

Our analysis suggests that while an increase in farm labor wages for specialty crop growers will increase labor income and total regional income (value added), it will also decrease specialty crop output and regional employment – effects that will be felt throughout the state's economy.

Policy changes and the economy

A reduction in output will coincide with a reduction in the number of jobs provided by specialty crop growers. This slowdown in state production will resonate with specialty crop service industries, causing a reduction in indirect employment (from reduced business to business transactions) shown in Table 2. The increase in area wages will partially offset these losses, as household spending increases with higher incomes. These partially offsetting gains are shown by induced effects in Table 2.

These findings highlight the complex effects of rising labor costs on U.S. agriculture. Wage increases can improve income for farmworkers but can also lead to reductions in employment and production, and a cascading effect on the broader economy. There is a need to carefully consider policy changes related to labor costs, immigration policy, and visa programs – as these all have far-reaching impacts on the agricultural industry and the broader state economy.

Our analysis suggests a **10% increase** in farm wages in Michigan would result in a **6.7% reduction** in farm employment and a **2.7% decrease** in specialty crop production (direct effects). Regional incomes would expand by **\$78.2 million**, mostly driven by labor income supports. However, total regional output will **decrease by \$51.1 million**, as agricultural producers pull back on production.

Taking the temperature on climate change and crop yields



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The damage inflicted on agriculture from climate change is expected to be large. An increase in production variability is likely to heighten food insecurity, endanger rural livelihoods, and increase public expenditures on agricultural policies. There is a strong presumption that much of the agricultural losses from climate change in hotter regions will be offset by increased productivity in currently colder climates. But the net effect of warmer temperatures for cold-climate agriculture remains unknown.

Cold temperatures disrupt production. While some economically important crops have developed cold-temperature adaptation (barley, wheat), plants with tropical origins (maize) remain particularly susceptible. For relatively cold growing regions, like Canada, warmer temperatures from climate change improve productivity by removing stressors and increasing beneficial temperature accumulation.

But warmer temperatures could also increase exposure to yield-reducing extreme heat, which can cause severe, disproportionate changes to many crops. To better understand the capacity of cold-climate agriculture to make up for climate-induced losses, it's important to know the extent that benefits of less cold-temperature exposure could be offset by damages from additional extreme heat from climate change.

To investigate how warmer temperatures impact agricultural productivity, we applied data-driven measures of cold-temperature exposure – along with the conventional measure of hot-temperature exposure – to data on crop yields.

Six field crops studied

Our data covers 75,451 crop-site-years for six major crops grown in the Canadian provinces of Saskatchewan and Ontario, with daily weather observations dating back to 1950. Crops included barley, canola, maize, oats, soybean, and spring wheat, representing principal field crops grown in Canada.

There is a strong presumption that much of the agricultural losses from climate change in hotter regions will be offset by increased productivity in currently colder climates.

We measured the yield impacts of cold-temperature exposure using a novel data-driven method with two metrics – chilling and freezing degree days. We considered two climate scenarios where mean surface temperature changes by 2100 are assumed to be +2°C and +4°C. Weather data from 1950 to 1990 was used to construct a baseline sample. Temperature shifts were applied to daily minimum and maximum temperatures, and all degree-day metrics were recalculated.

Yield damage from extreme heat

We looked at the yield damage from extreme heat. The extent of damage varies by crop but was severe in all cases. Replacing one day of exposure at the upper threshold temperature of 27°C with one day at 35°C, causes the following yield losses:

- 14.3% in barley
- 11.1% in canola
- 13.7% in oats
- 19.3% in wheat
- 4.0% in maize and soybean (more heat tolerant crops)

Yield boost from cold temperatures

Accounting for cold temperature exposure leads to more optimistic crop yield forecasts for all scenarios as warmer temperatures reduce cold temperature crop damage. The extent of this effect is crop dependent.

| Crop | Crop Yield Forecast (% increase) | |
|---------|----------------------------------|-------------------------|
| | +2°C temperature change | +4°C temperature change |
| Canola | 2.8% | 4.5% |
| Soybean | 1.9% | 3.1% |
| Maize | 1.8% | 2.8% |
| Wheat | 1.5% | 2.3% |
| Barley | 0.8% | 1.3% |
| Oats | 0.6% | 1.0% |

Net impact is negative

Even after accounting for cold-temperature exposure, and the small gains in yield, the net impacts of climate change are severely negative. Warmer temperatures impact yields three ways:

1. Increase yields by reducing chilling degree days (CDD) and freezing degree days (FDD).
2. Increase yields by increasing growing degree days (GDD).
3. Reduce yields by increasing harmful degree days (HDD)

It is well established that the benefits of #2 are more than offset by damages from #3, resulting in projections of severe yield losses throughout the Midwestern U.S. if adaptations are not made. The most interesting fact about this result is that the net negative impact remains true even after accounting for #1.

Adaptation is key

As with all studies, there are caveats that are first and foremost about adaptation. The results are based on current and historical seed genetics and production practices – and these will clearly need to change to adapt to warmer temperatures brought on by climate change.

- Earlier planting dates could allow canola to flower before the hottest part of the growing season.
- Carbon dioxide (CO₂) is not included in the analysis and increased CO₂ is expected to have non-trivial beneficial impacts on crop yields.
- Profit maximizing producers will respond to changes in climate and market parameters (price, demand, etc.) through crop selection that is expected to change in non-trivial ways.
- Technologies such as increased cold tolerance may also allow planting in even cooler regions where exposure to heat is less likely.

Tracking food inflation perceptions with Michigan consumers

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Mark Skidmore

After five years of economic turmoil, the U.S. economy is finally on the path to recovery. Yet, inflation remains a persistent concern for Americans, with rising food prices topping the list. Household perceptions of inflation can matter as much as the actual inflation rate, shaping people's decision-making and spending habits.

To get a clearer picture of how Michiganders feel about rising grocery and restaurant prices, we surveyed 1,000 residents through the State of the State Survey (IPPSR). Participants ranked price changes across household expenses over the past five years, from minimal to significant increases. The USDA reported a national 23.6%* increase in food prices between 2022 and 2024, and a striking 73% of our Michigan survey respondents said they've already altered their grocery shopping habits in response to price hikes.

Household perceptions of inflation can matter as much as the actual inflation rate, shaping people's decision-making and spending habits.

Price points

When asked to compare grocery prices to five years ago, perceptions varied across demographic lines.

- In **metropolitan areas**, 74% of respondents said grocery prices are “a lot higher,” compared to 83% in rural areas.
- **Gender differences** were also noticeable – 80% of women reported “a lot higher” prices, compared to 69% of men.

- **Older respondents** were more likely to perceive higher prices, with a clear positive correlation between age and inflation perception.
- **Political affiliation** added another layer, with 89% of Republicans agreeing prices are “a lot higher,” versus 60% of Democrats.

Dining decisions

Perceptions of restaurant inflation followed a similar trend to grocery prices, with a noticeable shift in reported dining habits across the state.

- Of respondents indicating a change of behavior due to price surges, 81% are eating out less or opting for cheaper restaurants.
- Residents in small towns were the most likely to report restaurant prices as “a lot higher” than five years ago, followed closely by rural residents, at 76% and 75%, respectively.
- Gender differences were less pronounced for restaurant prices – 74% of women and 68% of men agreed prices had risen significantly.
- Age continued to influence perceptions, with only 50% of respondents aged 20–24 citing major price increases, compared to 81% of those aged 65–94.
- Political divides were also smaller for restaurant inflation, with 84% of Republicans agreeing that prices are “a lot higher,” compared to 58% of Democrats.

For future research, we will contrast these perception results with the actual level of inflation in Michigan and explore which socio-demographic factors influenced inflation perception over the past five years. Our findings highlight Michiganders' perception of inflation and aim to provide valuable insights for policymakers as well as stakeholders, such as grocery stores and restaurant owners, on how inflation perceptions shape consumer behavior.

Michiganders' response to inflation for last five years

- **81%** ate out less or ate at cheaper restaurants
- **73%** changed purchases at grocery stores
- **54%** reduced entertainment such as streaming
- **49%** held off on vacations or took cheaper vacations
- **45%** held off on major purchases such as an automobile

This work is supported by MSU/MAPPR 2024 and USDA/NIFA Competitive Grant no. 2022-67023-37747.

*Source: <https://www.ers.usda.gov/data-products/ag-and-food-statistics-charting-the-essentials/food-prices-and-spending>

How fertilizer and corn prices impact phosphorus pollution in the Great Lakes



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Molly Sears

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Nutrient management is a significant concern in the Great Lakes region, an area that accounts for more than 20% of the world's freshwater and is particularly sensitive to phosphorus loads. Nutrient pollution is a difficult problem to solve, but it's important to explore options to help mitigate the negative effects.

Nutrients such as nitrogen (N) and phosphorus (P) are widespread stressors for water pollution, and excess phosphorus can cause algal blooms that affect ecological and public health.

Large soil reserves of phosphorus, intensive fertilizer applications, and increased precipitation have led to high quantities of excess phosphorus in many watersheds across the Great Lakes basin. In the Lake Erie basin, high levels of precipitation and fertilizer have significantly increased surface phosphorus runoff. Managing phosphorus inputs in agriculture – the largest anthropogenic source of phosphorus to the environment – is key to reducing phosphorus loads.

These nutrients are also key to crop development and growth and differ by crop. U.S. corn production in 2010 used approximately 43.8 lb/ac of phosphate fertilizer – cotton, soybean, and wheat production used 25.2, 14.3, and 17.4 lb/ac respectively.

Given the social benefits of clean water, we need to explore policy instruments that could have a significant impact on water quality.

Tracking fertilizer use

Incentivizing fertilizer reduction is key to managing agricultural runoff. Research shows that farmers in developed countries often apply more fertilizer than necessary for optimal crop yields, with over application of phosphorus more common than nitrogen. The fertilizer decisions farmers make in a crop year are affected by risk, weather, and input costs.

The price of fertilizer has increased by more than 100% in four years, and provides a natural setting to examine the impact of higher phosphorus prices on nutrient loads. Fertilizer costs account for 44% of corn production operating costs in 2022, compared to 32% in 1996.

Our research centers on 226 watersheds in seven states across the Great Lakes region – Michigan, Ohio, Illinois, Indiana, Pennsylvania, New York, and Wisconsin. We analyzed the total phosphorus (TP) and dissolved phosphorus (DP) trends across the watersheds. We wanted to find out elasticities of total and dissolved phosphorus – or how these levels changed based on the price of fertilizer and corn. We also wanted to find out how total and dissolved phosphorus concentrations change under different corn and fertilizer price scenarios.

Higher fertilizer prices helped reduce nutrient concentration in Great Lakes watershed.

Evaluating fertilizer pricing

Some previous studies have provided information on how phosphorus pollution changes based on phosphorus fertilizer prices – our approach differs in four key ways.

1. We used monthly data from 1990 to 2022 covering 226 Great Lakes watersheds.
2. We estimated elasticities for total and dissolved phosphorus – with total phosphorus measuring all forms of phosphorus and dissolved phosphorus measuring the fraction of total phosphorus that is soluble in water.
3. We analyzed the impact of corn prices on total and dissolved phosphorus concentrations.
4. We included an extensive set of controls – legacy total phosphorus, land use, weather, manure phosphorus, and soil phosphorus.

Across the Great Lakes basin, efforts have been made to manage phosphorus in watersheds. Recent history shows improvements in particulate phosphorus and total phosphorus loads from increased regulation and practices such as reduced tillage.

When higher prices of a fertilizer-intensive crop make production more profitable, crop acreage and fertilizer use increases. So, it's essential to understand how crop prices affect nutrient concentrations.

Key findings

- A 10% increase in fertilizer prices reduces total phosphorus by 3% and dissolved phosphorus by 6.9%.
- A 10% increase in winter corn prices raised total phosphorus by 2.1% and dissolved phosphorus by 1.7%.

When we understand more about how farmers respond to market conditions – and the impact on phosphorus runoff – we can better estimate farmer welfare and environmental outcomes.

Higher fertilizer prices helped reduce nutrient concentration in the Great Lakes watershed. On the other hand, higher corn prices after the renewable fuel standard came into effect led to higher phosphorus pollution.

The results from this study can be used in policy analysis regarding phosphorus management in the Great Lakes region, and to help with related policy changes such as subsidies and insurance structures for field crops. When we understand more about how farmers respond to market conditions – and the impact on phosphorus runoff – we can better estimate farmer welfare and environmental outcomes.

The state of Michigan agriculture

William Knudson, Michigan State University Product Center
Food Ag Bio



William Knudson

Michigan agriculture had a mixed year in 2023. Net farm income increased by about 20% to \$3.517 billion, but farm sales fell by 5.65% to \$11.554 billion. Lower prices in 2023 reduced farm sales, reflected in the lower cost of farm raised inputs such as feed which increased net farm income for livestock producers.

Michigan remains a major producer of some agricultural commodities:

- 1st in the nation for production of black beans, small red beans, asparagus, tart cherries, and squash
- 2nd for production of all dry beans, apples and cucumbers
- 4th for production of blueberries and sugar beets
- dominant producers of begonias, easter lilies, geraniums, impatiens, marigolds, petunias, and pansies

Livestock and dairy

Dairy is the largest activity in terms of sales, with dairy farming accounting for about 21% of all farm sales in Michigan. Milk sales declined by about 16.5% in 2023. The number of farms in the last 10 years has declined about 31% but the number of cows has remained fairly steady at about 440,000.

In 2023, Michigan **beef** producers sold 31.9% more beef compared to 2022, with sales increases mostly due to higher cattle prices.

Hog sales were down 6.8% from 2022. Hog output has been consistent over the past few years, and there is potential to increase production if additional workers are available at processing plants.

The value of **eggs** produced in 2023 was 15.4% less than the previous year with most of the decline due to lower prices. Avian influenza is a major source of concern.

The value of **turkeys** produced in 2023 was 11.7% less than 2022. Production was consistent but the primary cause for the reduction in sales was lower prices for turkey.

The **broiler** industry in Michigan is small but growing. While broiler sales were 19.9% lower than 2022, they were 75.2% more than 2019.

Total sales of Michigan agricultural commodities were down 5.6% in 2023 mostly due to falling agricultural commodity prices.

Major field crops

In 2023, Michigan farmers produced slightly more **corn** than in 2022, but there was a 25% decline in value due to lower crop prices.

Hay is a Michigan field crop that tends to get overlooked with 10,000 more acres grown in 2023, compared to 2022. Most of the hay produced in Michigan was used on the farm where it was produced.

Soybean acres declined in 2023 with prices down \$1.90 in 2023 to \$12.80 a bushel.

The value of **wheat** production was up in 2023, but increases in acres more than offset lower prices, with yields unchanged at 83 bushels per acre.

Michigan **potato** growers harvested 49,000 acres in 2023, with a decline in the price of potatoes by 60 cents to \$13.30 a cwt compared to the year before.

Sugar beets saw a major increase in 2023 with sales up more than \$130 million over 2022, and more than doubled since 2019.

Specialty crops

The value of **apple** production was down in 2023 due to lower prices – a decline of 4.6 cents a pound from 2022 to 26.3 cents a pound.

Michigan **blueberry** production increased in 2023 with more acres harvested and increased yields, and a price decline of 28 cents a pound from 2022 to \$1.39.

Michigan is the largest **tart cherry** producer in the country, but the industry continues to face difficulties. The value produced in 2023 dropped by 37.6% compared to 2022 due to a reduction in acreage, yields, and lower prices.

In 2023, Michigan growers harvested 28,500 acres of **cucumbers** representing a decrease in acres harvested, a slight decline in yield, and a price increase.

There was a small drop in the value of **squash** production due to a decline in yields per acre, but with a price increase.

Michigan is the nation’s largest producer of **asparagus**, but that industry is also facing difficulties as rising labor costs pressure the profitability of the industry.

The total sales of **floriculture** production – herbaceous perennials, potted flowering plants, foliage plants, and annual bedding and garden plants – dropped by 2.3% over 2022.

| Commodity | Total Sales (\$1,000s) |
|------------------------------|------------------------|
| Milk | 2,407,800 |
| Corn | 1,739,197 |
| Soybeans | 1,442,008 |
| Cattle and calves | 832,479 |
| Eggs | 707,278 |
| Hogs | 456,876 |
| Annual bedding/garden plants | 384,598 |
| Apples | 350,209 |
| Sugar beets | 333,421 |
| Wheat | 295,426 |

An updated forward-looking outlook will be published later this spring.