

Economic Contribution of Maine's Potato Industry: March 2024

Economic Contribution of Maine's Potato Industry

Todd Gabe (todd.gabe@maine.edu)¹

School of Economics

College of Earth, Life, and Health Sciences

University of Maine

EDA UMaine Staff Paper 2024-112: Technical Report²

March 2024³

Results of the study show that:

- ⇒ Maine ranks 6th nationally for acres of potatoes planted and harvested in 2022.
- ⇒ Maine ranks 9th nationally for the value of potato sales in 2022.
- ⇒ Over the past 30 years or so, potato production in Maine has been relatively stable at between about 15 million and 20 million cwt of spuds grown annually.
- ⇒ In 2022, the Maine potato industry had a total economic contribution of an estimated \$1.3 billion in output, 6,571 full and part-time jobs, and \$237 million in labor income.
- ⇒ The economic contribution of the Maine potato industry's supply chain is split into 31 percent from potato production and agribusiness services, 58 percent from potato processing and wholesale, and 11 percent from retail and food services.

¹ Todd Gabe is a Professor in the School of Economics and author of the book *Pursuit of Economic Development: Growing Good Jobs in U.S. Cities and States*. This project was funded by the Maine Potato Board. Gabe's research is also supported, in part, by the USDA National Institute of Food and Agriculture, Hatch Project Number ME0-22307 through the Maine Agricultural and Forest Experiment Station.

² EDA UMaine Staff Papers disseminate research and analysis conducted by members of the EDA Center at the University of Maine. The author acknowledges the helpful information provided by the Maine Potato Board.

³ A future version of this report could be released to clarify any errors or omissions, or to incorporate new data. For example, results of the 2022 U.S. Census of Agriculture will be released in early 2024.

Economic Contribution of Maine's Potato Industry

1. Introduction

Potatoes are an iconic part of the American diet. Consumed as chips with a tasty dip, as an ingredient in lots of delicious dishes (e.g., shepherd's pie, potato salad, gnocchi), or alone as a piping hot baked potato or crispy French fries, the potato is a versatile food staple that is enjoyed year-round in all parts of the United States and many countries around the globe. The United States is also a major agricultural producer and food processor of potatoes. Data from the U.S. Department of Agriculture (USDA) show that U.S. farms produced 399 million cwt of potatoes in 2022, with an aggregate value of \$4.8 billion in farm sales.⁴ Of the 399 million cwt of potatoes grown in the United States in 2022, about 279 million cwt (70 percent) were processed—e.g., frozen French fries (157 million cwt), chips and shoestrings (62 million cwt) and dehydrated products (38 million cwt). A 2023 study found that the U.S. potato industry generates an annual economic contribution, including multiplier effects and counting activity along the entire supply chain, of an estimated \$101 billion in output, 714,504 jobs, and \$34.1 billion in labor income (Knudson and Miller 2023).

The USDA tracks potato production data in 13 states, with the five largest states for production in 2022 being Idaho (121 million cwt), Washington (95 million cwt), Wisconsin (27 million cwt), Oregon (26 million cwt) and North Dakota (22 million cwt). Of the 13 states with

⁴ These figures are from a publication titled "Potatoes: 2022 Summary," National Agricultural Statistics Service of the United States Department of Agriculture. For more details, see: <https://downloads.usda.library.cornell.edu/usda-esmis/files/fx719m44h/cr56pj02j/4q77h840g/pots0923.pdf>.

Economic Contribution of Maine's Potato Industry: March 2024

large potato crops, Maine ranks 9th nationally with 18.4 million cwt in production in 2022. By this measure, Maine's potato industry accounts for about 4.6 percent of U.S. production. In Maine, potato crops occupy a relatively high percentage of the state's land devoted to vegetable crops. According to the 2017 U.S. Census of Agriculture, Maine had 50,211 acres of land devoted to growing potatoes, which is 81 percent of the 62,239 acres of land used for "vegetables harvested for sale" in Maine.⁵

The purpose of this study is to examine the size and growth of Maine's potato industry, with comparisons to other areas, and assess the statewide economic contribution of potatoes in Maine. Economic contribution is defined as the output, employment and labor income that are directly related to the production of spuds and potato products, as well as the economic activity that is supported by the spending of businesses and workers that are connected to potato production. In addition, the study traces the supply chain of potatoes in Maine to track and measure economic activity spanning from the sales of potatoes in grocery stores and restaurants all the way to the businesses that supply goods and services used by Maine's potato growers. The analysis uses data from the U.S. Department of Agriculture and the methodology for calculating the Maine potato industry's economic contribution closely follows the approach and assumptions made in the Knudson and Miller (2023) study about the economic significance of the U.S. potato industry. Industry multiplier effects and supply chain linkages are estimated using an input-output model (IMPLAN) of the Maine economy.

⁵ These figures are from Maine's historical highlights of the 2017 U.S. Census of Agriculture, National Agricultural Statistics Service of the United States Department of Agriculture. For more details, see: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_State_Level/Maine/st23_1_0001_0001.pdf.

Economic Contribution of Maine's Potato Industry: March 2024

Table 1. Potato Production in Maine, 2022

	Acres Planted (1,000s)	Acres Harvested (1,000s)	Production (1,000 cwt)	Amount Sold (1,000 cwt)	Value of Production (\$1,000)	Value of Sales (\$1,000)
Maine	52.0	51.9	18,425	17,374	246,895	232,240
Maine, rank	6	6	9	9	8	9
<u>Other States:</u>						
California	21.0	20.9	8,465	8,296	237,020	232,699
Colorado	53.0	52.9	21,425	19,046	379,223	337,982
Florida	20.0	19.7	5,024	4,989	111,030	110,348
Idaho	295.0	294.5	120,745	112,897	1,509,313	1,405,828
Michigan	46.0	45.5	18,883	17,769	262,474	246,183
Minnesota	47.0	46.7	19,147	18,132	237,423	225,166
Nebraska	20.0	19.9	9,652	8,783	123,546	112,391
North Dakota	74.0	72.5	21,750	20,445	280,575	263,558
Oregon	43.0	43.0	25,800	23,709	265,740	244,738
Texas	13.0	12.9	7,418	7,135	116,463	112,072
Washington	165.0	164.5	95,410	89,399	942,651	883,176
Wisconsin	67.0	66.5	26,600	25,297	414,960	394,471
United States	916.0	911.4	398,744	373,271	5,127,313	4,800,852
Maine share of U.S.	5.7%	5.7%	4.6%	4.7%	4.8%	4.8%

Source: National Agricultural Statistics Service, United States Department of Agriculture.

2. Potato Production and Processing in Maine

Table 1 shows potato production data for Maine in 2022, along with the same statistics for the 12 other potato growing states tracked by the USDA and the United States as a whole. These numbers indicate that Maine ranks between 6th and 9th nationally—of the 13 states with data—for the various aspects of potato production. Maine ranks 6th nationally in terms of acres planted (52,000) and acres harvested (51,900) in 2022, 9th for production (18.4 million cwt) and the amount sold (17.4 million cwt), 8th for the value of production (\$247 million) and 9th for the value of potato farm sales (\$232 million).⁶ Along with the land used to grow potatoes that are sold to consumers or processors, 9,711 acres of Maine farmland were certified by the Maine Seed Potato program to grow seed potatoes in 2022.⁷ Assuming a yield of 290 cwt per acre and a price of \$15 per cwt of seed potatoes, this amounts to \$42.2 million in revenue to potato growers from the sales of seed potatoes.⁸ Overall, potato farmers in Maine receive an estimated \$259 million in revenue from the sales of potatoes to consumers or processors and the sales of seed potatoes.⁹

As noted above, about 70 percent of the potatoes produced in the United States in 2022 were processed—i.e., 279 million cwt processed out of the 399 million cwt in production.¹⁰ In

⁶ The difference between production and sales is attributed to “seed used on farms where grown,” “household use and used for feed on farms where grown,” and “shrinkage and loss.” For more details, see:

<https://downloads.usda.library.cornell.edu/usda-esmis/files/fx719m44h/cr56pj02j/4q77h840g/pots0923.pdf>.

⁷ For more details, see: https://www.maine.gov/dacf/php/seed_potato/documents/2023SeedPotatoCert.pdf.

⁸ The yield and price figures for seed potatoes are from the Maine Potato Board.

⁹ This revenue figure of \$259 million is higher than the USDA numbers for Maine in 2022 (e.g., \$232 million in potato sales and \$247 million in potato production), with the difference—at least in part—due to how seed sales are counted. The USDA report (see footnote 4) shows 1.1 million cwt of potatoes that are sold for seed in Maine, whereas data from the Maine Potato Board (e.g., 9,711 acres and a yield of 290 cwt per acre) suggest 2.8 million cwt of potatoes that are sold for seed in Maine. Using a total revenue of \$259 million instead of the USDA estimates (\$232 million or \$247 million) has a very small impact on the overall economic contribution numbers presented in this report.

¹⁰ The 279 million cwt of processed potatoes comes from page 13 of the USDA report titled “Potatoes 2022 Summary.” For more details, see: <https://downloads.usda.library.cornell.edu/usda-esmis/files/fx719m44h/cr56pj02j/4q77h840g/pots0923.pdf>.

Economic Contribution of Maine's Potato Industry: March 2024

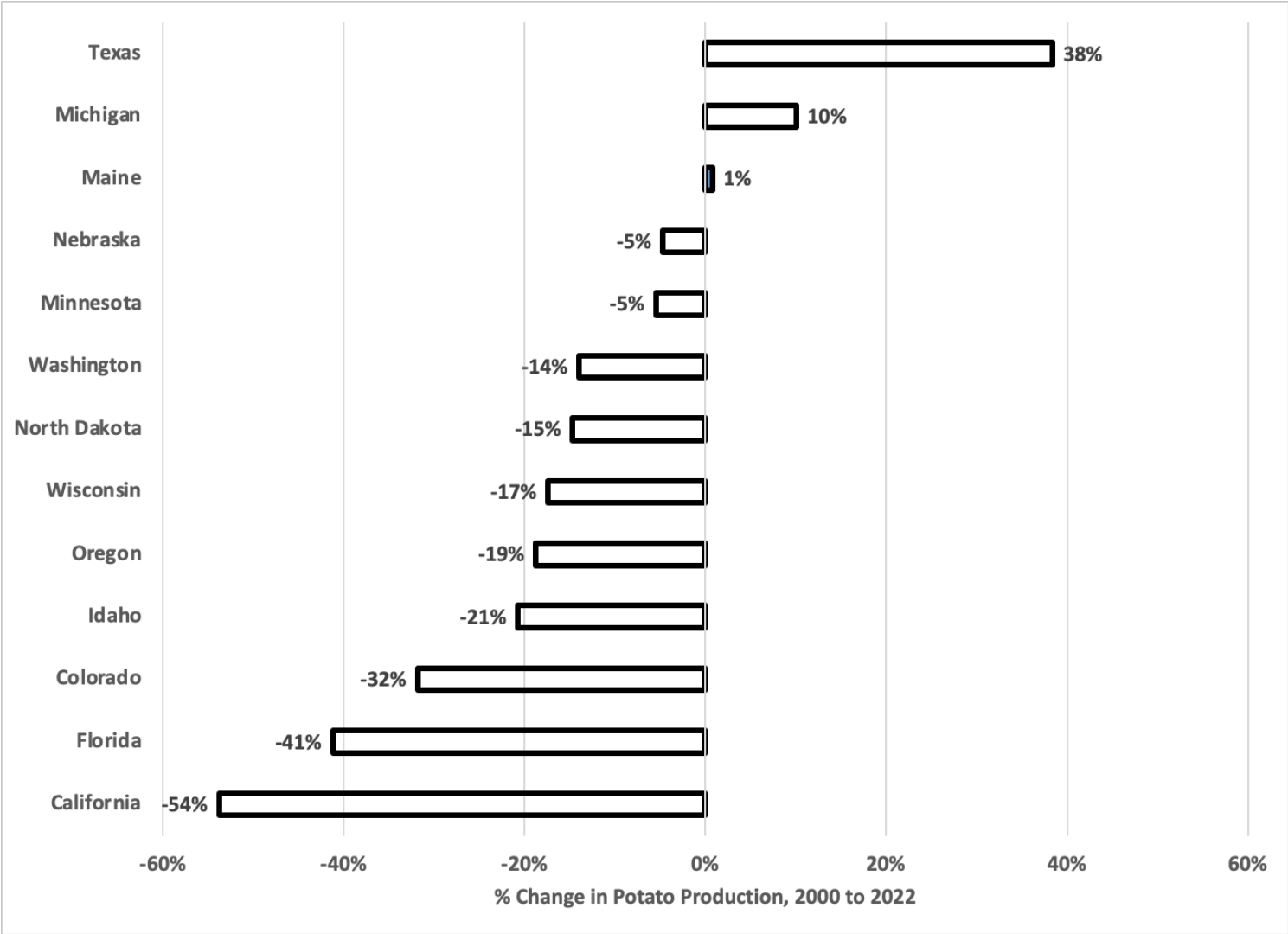
Maine, potato processing facilities “received and used” 5.4 million cwt in potatoes in 2022 (from the 2021 crop), which is equivalent to about 30 percent of the potatoes produced in Maine in 2021.¹¹ Given that the processing figures are the “total quantity received and used for processing regardless of the state in which the potatoes were produced,” the processing figures for Maine could include potatoes grown elsewhere. Likewise, the 5.4 million cwt of potatoes processed in Maine in 2022 does not count Maine-grown potatoes that were processed in Canada or other states. The Maine Potato Board estimates that about 65 percent of the potatoes grown in Maine are processed.

Potato production in Maine has fluctuated between about 15 million and 20 million cwt of spuds grown annually from 1990 to the present. Over most of this period, Maine accounted for roughly 4 percent of the potatoes produced nationally. As noted above, Maine ranked 9th nationally for potato production in 2022, behind states such as Idaho, Washington, Wisconsin, and Oregon. Of the 13 states tracked by the USDA, Texas had the largest growth in potato production between 2000 and 2022, with a 38 percent growth rate of production (see Figure 1). On the flip side, California had the largest decline with a 54-percent reduction in potato production since 2000. Of the 13 regions shown in Table 1, Maine is one of three states, along with Texas and Michigan, that experienced growth in potato production from 2000 to 2022; although the growth rate of potato production in Maine was only one percent.

¹¹ The processing figures for Maine count potatoes that were processed in 2022 from the 2021 crop, whereas the U.S. numbers count potatoes that were processed in 2023 from the 2022 crop. This is because the 2023 processing numbers for Maine (based on the 2022 crop) are “withheld [in the USDA report] to avoid disclosing data for individual operations.”

Economic Contribution of Maine's Potato Industry: March 2024

Figure 1. Potato production in Maine grew by 1 percent between 2000 and 2022.



Notes. Potato production figures are from the U.S. Department of Agriculture.

Economic Contribution of Maine's Potato Industry: March 2024

Potato cropland in Maine is highly concentrated in Aroostook County, which has 45,823 of the state's 50,211 acres of land used to harvest potatoes (see Figure 2).¹² Put another way, Aroostook County has 91 percent of the land in the state that is used to harvest potatoes, followed by Penobscot (4.5 percent) and Oxford (3.4 percent) counties. The 45,823 acres of land harvested for potatoes in Aroostook County is equivalent to 87 percent of this county's total farmland devoted to vegetables.¹³ As noted above, 81 percent of the land devoted to vegetable crops in Maine is used for potatoes.

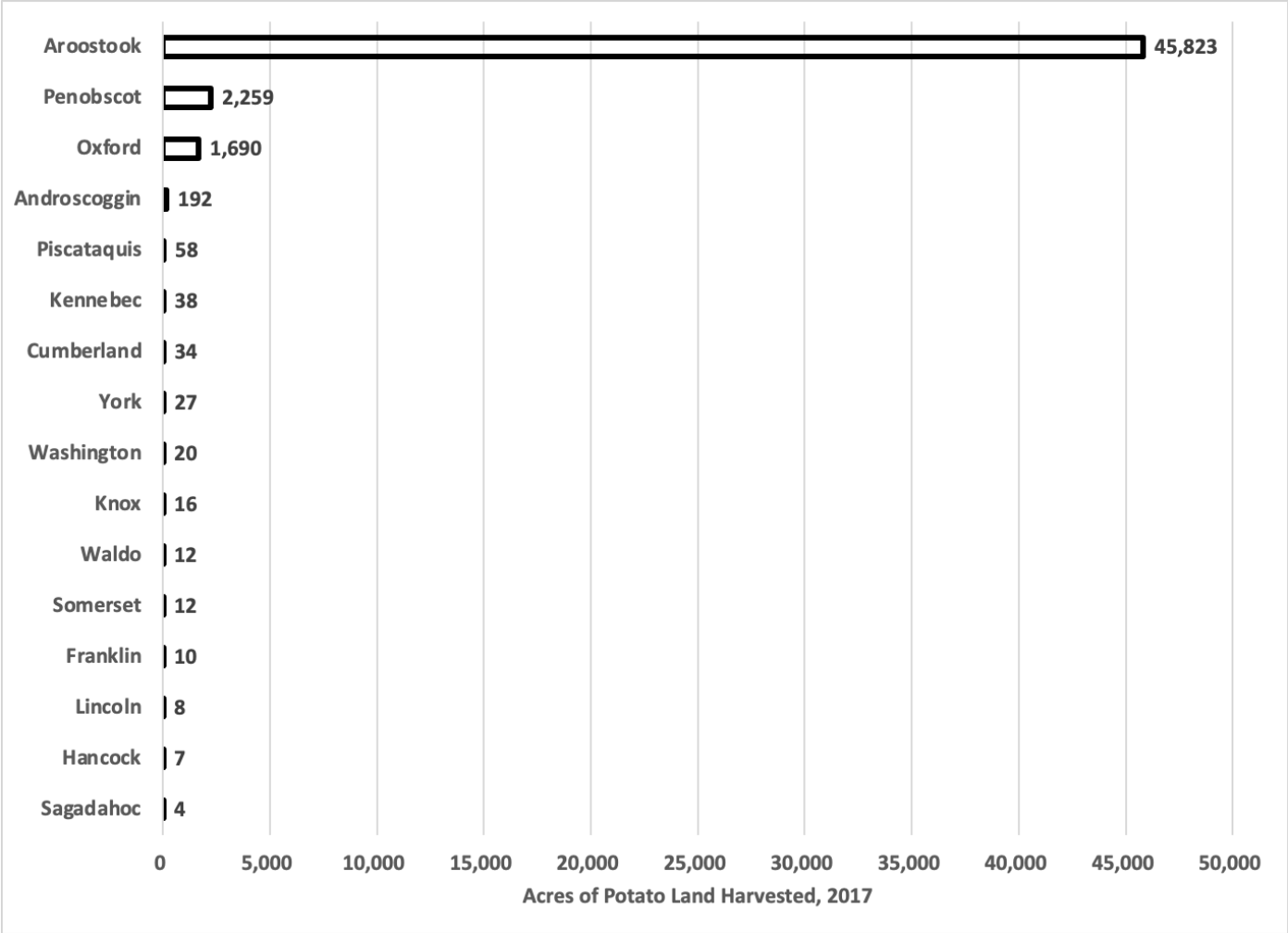
Figure 3 shows the top 35 U.S. counties by acres of farmland harvested for potatoes in 2017. All of these counties account for at least 0.5 percent of the total U.S. farmland harvested for potatoes, and collectively they make up 64 percent of the 1.1 million acres of U.S. farmland used to harvest potatoes. Aroostook County has the third highest number of harvested acres for potatoes and is one of five U.S. counties with more than 40,000 harvested acres of potatoes. Of the top 10 U.S. counties by this measure, Idaho accounts for five, Washington has three, and Maine and Wisconsin are home to the remaining two counties in the top 10 for acres of harvested potatoes. Looking at the entire top 35 counties, Idaho makes up 11, Washington accounts for six, and Wisconsin chips in with four.

¹² These figures are from the 2017 U.S. Census of Agriculture, National Agricultural Statistics Service of the United States Department of Agriculture.

¹³ These figures are from the 2017 U.S. Census of Agriculture, National Agricultural Statistics Service of the United States Department of Agriculture. See:

https://www.nass.usda.gov/Publications/AgCensus/2017/Online_Resources/County_Profiles/Maine/cp23003.pdf.

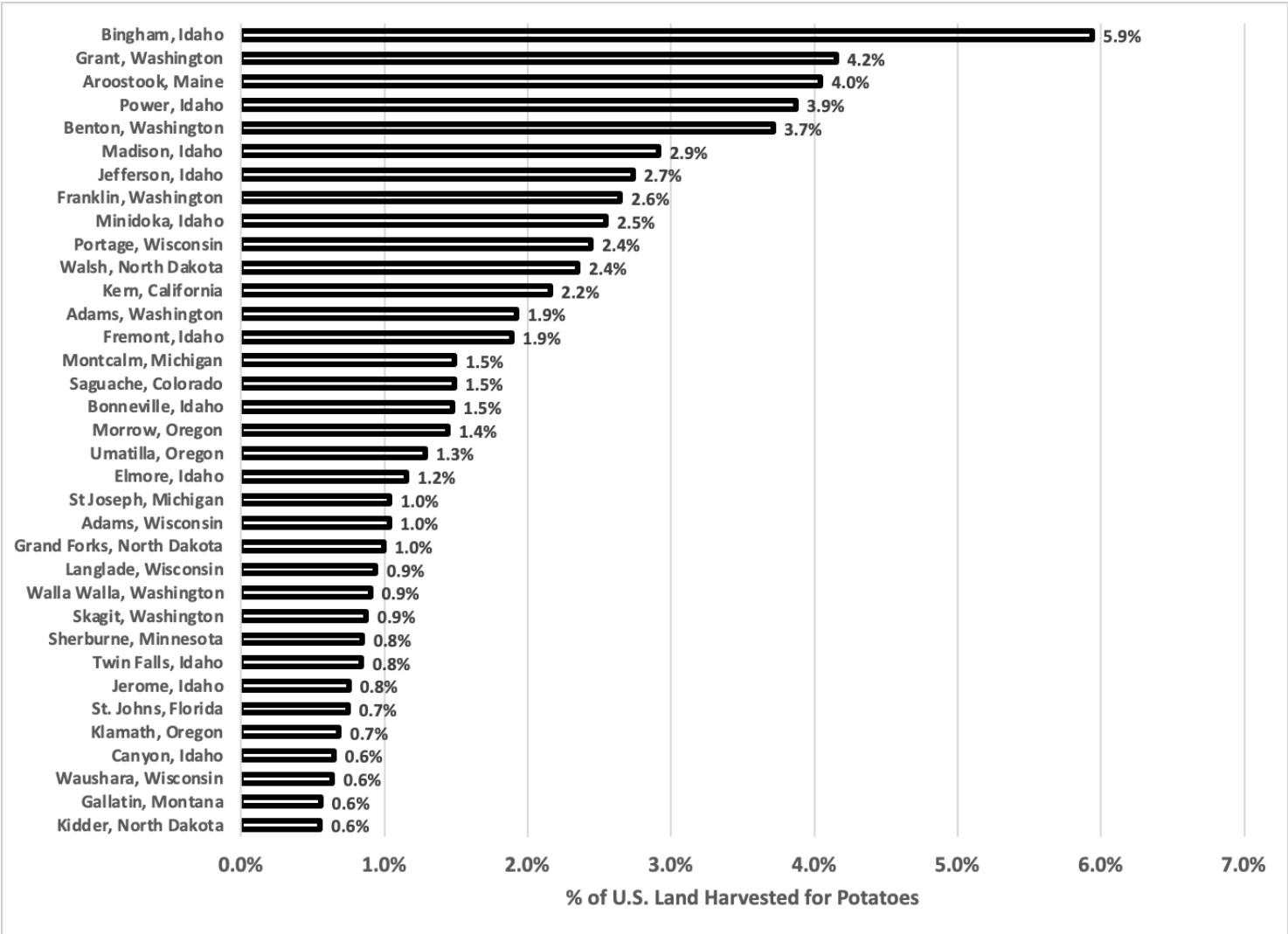
Figure 2. Aroostook County has, by far, the most land harvested for potatoes in Maine.



Note. Data are from the 2017 U.S. Census of Agriculture.

Economic Contribution of Maine’s Potato Industry: March 2024

Figure 3. Aroostook County has the 3rd highest amount of land harvested for potatoes nationally, and it accounts for 4% of the U.S. total.

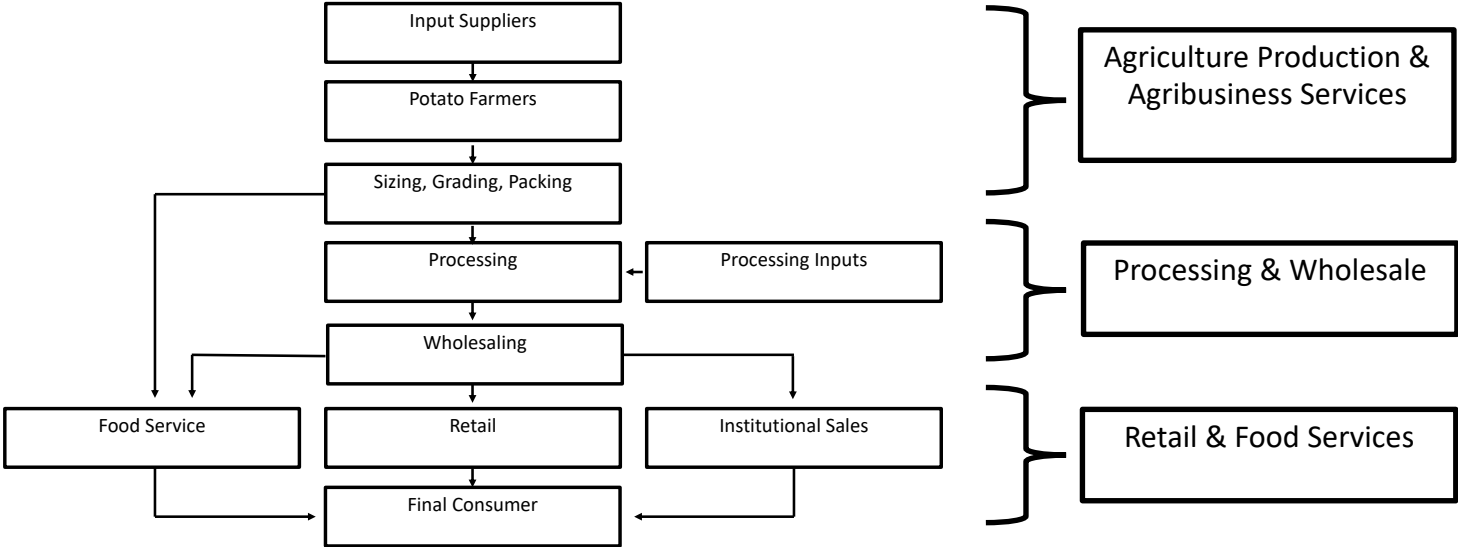


Note. Data are from the 2017 U.S. Census of Agriculture.

3. Potato Supply Chain

The potato supply chain tracks a spud from when it is enjoyed by a consumer (e.g., as a bag of chips out of a vending machine, or a baked potato in a fancy restaurant) all the way back to the goods and services used by farmers to grow potatoes. Figure 4, which was developed by Knudson and Miller (2023) in an analysis of the U.S. potato industry, shows the main activities that bring a potato from the ground to the table. Potato farmers are positioned along the supply chain between businesses and individuals that provide inputs used in the production of potatoes and the activities of handling potatoes to determine their size and grade (and to package for processing or to sell directly to consumers). As noted above, U.S. potato farmers generated \$4.8 billion in sales, and potato farmers in Maine had an estimated \$259 million in revenue from the sales of potatoes to consumers or processors and the sales of seed potatoes. The fact that additional economic activity happens when potatoes are processed by food manufacturing companies and sold to consumers at food retail stores and restaurants means that the overall economic contribution of the U.S. potato industry (\$101 billion) is considerably larger than the value of sales by U.S. potato farmers (\$4.8 billion).

Figure 4. Potato supply chain.



Notes. This figure was developed by Knudson and Miller (2023) in an analysis of the U.S. potato industry.

Economic Contribution of Maine's Potato Industry: March 2024

For the purposes of calculating and reporting the economic contribution of the businesses and activities along the U.S. supply chain for potatoes, Knudson and Miller (2023) further refine the supply chain (Figure 4) into the major components of (1) agricultural production and agribusiness services, (2) processing and wholesale, and (3) retail and food services. To put the relative sizes of these components into perspective, agricultural production and agribusiness services account for 11.2 percent of the total U.S. economic contribution of the potato supply chain, processing and wholesale account for 35 percent, and retail and food services chip in 53.8 percent of the U.S. potato supply chain's overall economic contribution (Knudson and Miller 2023).

When interpreting the economic contribution of the U.S. potato industry overall, it is important to consider "where" the different activities happen along the potato supply chain. The impacts related to agricultural production and agribusiness services are geographically concentrated in the states where potatoes are grown. Likewise, the 35 percent of the potato industry's economic contribution that is related to processing and wholesale is concentrated in the regions where potatoes are processed. The largest component of the potato industry's economic contribution—retail and food services—is widely dispersed across regions of the United States in rough proportion to where people reside, and tourists visit. That's because the purchase and consumption of potatoes—and all sorts of food items, for that matter—generally happen in retail stores and restaurants where people are located.

4. Economic Contribution of Maine's Potato Industry

To assess the economic contribution of Maine's potato industry, we use the same general approach developed by Knudson and Miller (2023) in their analysis of the U.S. potato industry. That is, we examine the economic contribution of the separate components of production and agribusiness services, processing and wholesale, and food services and retail; and then sum these components to arrive at totals. Given that Maine has a lot of potato production and a relatively small population, we expect the overall economic contribution of Maine's potato supply chain to have a larger emphasis—compared with the United States as a whole—on the production and agribusiness component, and a smaller share related to food services and retail. On the other hand, a state such as California with a large population and a relatively low percentage of its farmland devoted to the production of potatoes (3.5 percent) would have a potato supply chain economic contribution that is heavily skewed toward food services and retail.¹⁴

In the analysis of the economic contribution of Maine's potato sector, linkages along the supply chain and industry multiplier effects are estimated using an input-output model (IMPLAN) for the state of Maine. The Maine IMPLAN model has an input-output framework (based on U.S. input-output tables) that traces the flows of expenditures and income through the Maine economy with a complex system of accounts that are uniquely tailored to the region. Underlying these accounts is information regarding transactions among businesses located in Maine, the

¹⁴ This figure is from California's historical highlights of the 2017 U.S. Census of Agriculture, National Agricultural Statistics Service of the United States Department of Agriculture. For more details, see: https://www.nass.usda.gov/Publications/AgCensus/2017/Full_Report/Volume_1,_Chapter_1_State_Level/California/st06_1_0001_0001.pdf.

spending patterns of households, and transactions between Maine businesses and households and the rest of the world.

As noted above, the multiplier effects estimated by the IMPLAN model represent the additional economic activity that is supported by the purchases of businesses (indirect impacts) and workers (induced impacts). This means, for example, that the multiplier effects estimated for the food services and retail component of the potato supply chain capture, in part, the purchases of potatoes (by restaurants and food retailers) from wholesalers and, in some cases, directly from farmers. As such, at least part of the direct economic activity of potato processors and growers is captured in the multiplier effects of food services and food retail. Likewise, the multiplier effects related to potato processing (which capture their purchases of inputs from farmers) represent part of the direct economic activity of potato farmers. Given that an analysis of the separate components of an industry supply chain (e.g., retail and food services, potato processors and growers) inherently capture direct economic impacts in the multiplier effects of upstream activities (e.g., the multiplier effects of food retail capture part of the direct activity of processors), adjustments to the downstream activities are needed to avoid double counting. For example, the direct economic activity of potato processing is interpreted as the output, employment and labor income of processors that is not already accounted for in the multiplier effects related to the sales of potatoes by Maine retailers and restaurants.

Economic Contribution of Maine's Potato Industry: March 2024

Table 2. Estimated Economic Contribution of Maine's Potato Industry, 2022

		Employment	Labor Income	Output
Production & Agribusiness Services	Direct Impact	1,575	16,347,114	202,433,947
	Multiplier Effects	1,331	51,683,331	189,037,144
	Total	2,906	68,030,446	391,471,091
		Employment	Labor Income	Output
Processing & Wholesale	Direct Impact	650	35,269,992	380,100,919
	Multiplier Effects	1,769	85,702,718	344,032,437
	Total	2,420	120,972,710	724,133,357
		Employment	Labor Income	Output
Retail & Food Services	Direct Impact	881	29,536,266	78,431,297
	Multiplier Effects	364	18,312,032	65,283,994
	Total	1,245	47,848,297	143,715,291
		Employment	Labor Income	Output
All Activities	Direct Impact	3,107	81,153,373	660,966,163
	Multiplier Effects	3,464	155,698,081	598,353,575
	Total	6,571	236,851,453	1,259,319,738

Notes. Figures are based on data from the USDA, Knudson and Miller (2023) and the Maine Potato Board, and multiplier effects and supply chain linkages are estimated using an input-output (IMPLAN) model of the Maine economy. The employment and labor income figures are estimated by the IMPLAN model. A future version of this report could update the employment and/or labor income figures with data from the 2022 U.S. Census of Agriculture, when it is released in early 2024.

Table 2 summarizes the estimates of the economic contribution of Maine's potato industry. As noted above, the impacts related to food services and retail represent the economic activity supported by the sales of potatoes in, for example, food retail businesses and restaurants. Given that potatoes make up a relatively small part of the food items sold in food stores and restaurants, this economic activity constitutes a small percentage of overall employment in Maine's food stores and restaurants. At the other end of the supply chain, the economic contribution of potato producers and agribusiness represent the economic activity of Maine's

potato farmers and the service providers that they support that is not accounted for in the multiplier effects of the upstream potato supply chain.

Overall, the analysis shows that the Maine potato industry has a total economic contribution of an estimated \$1.3 billion in output, 6,571 full and part-time jobs, and \$237 million in labor income. The estimated \$259 million in revenue received by Maine potato farmers is spread throughout the figures shown in Table 2. First, a small percentage of the potato sales by Maine farmers is captured as part of the multiplier effects associated with the retail and food services activities of the potato supply chain. This is because Maine restaurants and retail stores sell potatoes and some of them (as estimated by an input-output model of the Maine economy) are processed and/or grown in Maine. Second, a larger percentage of the potato sales by Maine farmers is captured in the multiplier effects associated with the activities of potato processing and wholesaling. This is because potato processors in Maine purchase spuds from Maine farmers. Finally, the largest part of the revenue earned by Maine potato farmers is captured in the direct output associated with the activities of potato production and agribusiness services. This is because most of the potatoes grown in Maine are not processed or consumed in the state.

Looking at the three main components of the potato industry's supply chain in Maine, the production and agribusiness component accounts for 31 percent (in terms of output) of the total economic contribution, processing and wholesale make up 58 percent, and food services and retail chip in 11 percent. The food services and retail part of the potato industry account for a smaller percentage of the overall economic contribution in Maine (11 percent) as compared with the overall United States (54 percent) because Maine has a relatively large amount of potato production and processing whereas, for the United States as a whole, there's a relatively higher

percentage of potato consumers (who buy potatoes in retail stores and restaurants) relative to potato farmers.

5. Summary

This report examined the size and growth of Maine's potato industry, with an analysis of its statewide economic contribution. In 2022, Maine farmers produced and sold 18.4 million and 17.4 million cwt in potatoes, respectively.¹⁵ Maine ranks 9th nationally for both of these indicators of potato production. Over the past 30 years or so, potato production in Maine has been relatively stable at between about 15 million and 20 million cwt of spuds grown annually. Within Maine, Aroostook County is the largest producer of potatoes. The County had about 46,000 acres of land harvested for potatoes in 2017, which accounts for 4 percent of all land in the United States that was harvested for potatoes. The only other Maine counties with over 1,000 acres of land harvested for potatoes in 2017 were Penobscot County (2,259 acres) and Oxford County (1,690 acres), but these areas are well behind Aroostook County for potato production.

In 2022, the Maine potato industry had a total economic contribution of an estimated \$1.3 billion in output, 6,571 full and part-time jobs, and \$237 million in labor income. The economic contribution of the Maine potato industry's supply chain (based on output numbers) is split into 31 percent from potato production and agribusiness services, 58 percent from potato processing and wholesale, and 11 percent from retail and food services.

¹⁵ The difference between production and sales is attributed to "seed used on farms where grown," "household use and used for feed on farms where grown," and "shrinkage and loss." For more details, see: <https://downloads.usda.library.cornell.edu/usda-esmis/files/fx719m44h/cr56pi02j/4q77h840g/pots0923.pdf>.

Study Limitations

Although the economic contribution figures capture activities along the entire supply chain, they do not reflect all of the impacts related to the production, processing, and sales of potatoes in Maine. Thus, the results presented in this report should be considered as part of the overall impacts of Maine's potato industry. The analysis presented in this report is based on data from 2022 and numbers from the 2017 U.S. Census of Agriculture. Results from the 2022 Census of Agriculture are scheduled to be released in 2024. Given the year-to-year fluctuations in potato production and prices, the figures presented in this report may not represent the economic contribution of Maine's potato industry in the future.

References:

Knudson, William, and Steven R. Miller. "Measuring the Economic Significance of the US Potato Industry." (2023).