

# A Survey of Organic Corn Growers in Ohio, Indiana, Michigan, and Pennsylvania

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Organic corn acreage in the United States increased by more than 55% between 2011 and 2016, driven largely by demand from organic livestock producers, particularly dairies.<sup>1</sup> However, aside from USDA census data, relatively little is known about these farms and their management practices. Additional information about organic corn farms will help guide education and research initiatives for continued growth in the region's organic corn production.

In the spring of 2018, we mailed a survey to all organic corn growers in Ohio, Indiana, Michigan, and Pennsylvania. These four states collectively represent one-third of all U.S. organic corn growers and produce about 20% of the nation's organic corn.<sup>2</sup>

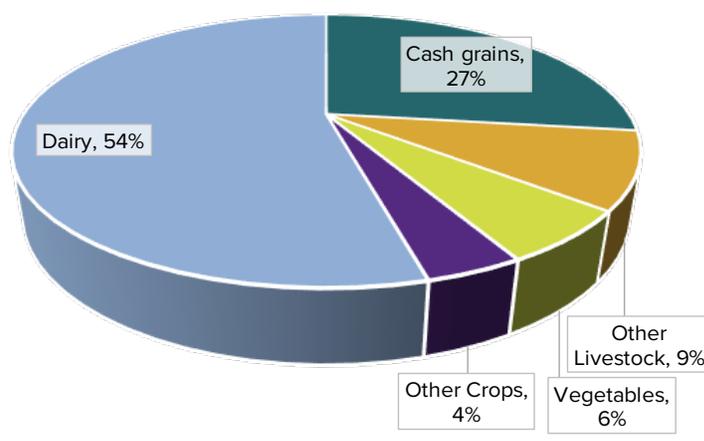
Survey questions covered overall farm operation, specific field practices, economic data, and farm management decision-making, particularly concerning soils. Of the 1,495 farms who grew corn in 2017, we received 859 usable responses (57% response rate, margin of error is 2%).

Key findings are summarized in this report. More detailed information is available at [go.osu.edu/orgcorn](http://go.osu.edu/orgcorn).

## A Profile of Organic Corn Farms

### What kinds of farms raise organic corn?

- Income from corn was usually supplemented by other agricultural commodities. Over half of organic corn growers were primarily dairy farms. Cash grain crops were the main source of income for 27% of respondents. (See Figure 1.)
- Farms typically operated between 10 and 100 acres of organic cropland, with a median size of 60 acres. Around 25% had more than 100 acres.
- Operations relying on cash grain income tended to be larger, while operations relying on vegetables tended to be smaller.
- Around 3/4 of corn growers also raised livestock (59% had dairy cows, 18% beef cattle, and 16% poultry).
- Most respondents (67%) had fewer than 10 years of experience farming organically, 7% had more than 20 years of experience.
- Nearly 2/3 of the respondents farm using horses instead of tractors and are likely members of the Plain Community (Amish, Mennonite, etc.).



**Figure 1. Primary Source of Farm Income Among Survey Respondents.**

### What types of organic corn are raised?

- Nearly all growers harvested their corn as grain (70%) and/or silage (36%).
- Roughly 60% of the corn was raised to feed on-farm livestock, rather than to sell.

## Management Practices Used

We asked each farmer to choose one typical organic corn field from their operation and provide details on the following practices.

### Tillage and Cultivation Practices

- The vast majority of organic corn farmers used moldboard plowing (84%), with 64% using complete inversion.
- Conservation tillage practices were rare overall (13%) but were more common among farmers using tractors rather than horse-drawn equipment, and more common among cash grain farmers than vegetable and dairy farmers.
- Popular tools for cultivation were row cultivators (used by 92%) and rotary hoes (used by 30%). Tine weeders were used by 9% and cultimulchers by 5%.
- On average, farmers reported 10 passes in their corn field. Typically, 3 passes were for tillage, 2 for cultivation, and other passes were used for planting, harvesting, and applying fertilizers or other amendments.

### Crop Rotations

- Most farmers (82%) incorporated a perennial forage/hay crop in their corn rotations; 69% had 2 or more years of hay in their 4-year rotation.
- Use of hay in the rotation was more common among farmers with livestock (89% vs. 59%).
- For 55% of respondents, corn was only grown once in a 4-year rotation.
- Other common crops grown in a 4-year rotation with corn were soybeans (20%), small grains (24%), and additional corn (44%).
- Farmers relying on horse-drawn equipment were less likely to have soybeans in rotation (6% vs. 44%).

### Cover Crops

- 42% of farmers planted cover crops prior to corn during the 2017 growing season.
- Grasses (rye, triticale, oats) were the most common cover crops (used on 52% of cover crop farms). Around 20% of cover crops used were legumes, with use of other forbs (buckwheat, canola, etc.) being rare (1%). Only 26% of cover crops were mixes of different plant types.
- Respondents were more likely to choose cover crops for their ability to improve the soil rather than for weed control.
- Farmers with livestock operations were more likely to grow hay, while those without livestock were more likely to use cover crops, especially legumes. In this way, both enterprise types were using soil-building crops that kept perennial roots in the soil over winter.

Type of Tillage or Cultivation Practice	TOTAL	by primary source of farm income			by type of equipment	
		Cash Grain	Veg. Crops	Dairy	Horse	Tractor
<b>Tillage</b>						
percentage of respondents						
Moldboard w/ complete inversion	63.5	59.3	60.4	66.7	66.5	58.2
Moldboard w/o complete inversion	21.7	18.2	33.3	22.0	26.6	12.9
<b>any moldboard</b>	<b>84.3</b>	<b>76.6</b>	<b>93.7</b>	<b>87.9</b>	<b>92.4</b>	<b>70.1</b>
Chisel tillage	6.7	12.6	8.3	3.2	1.1	16.4
Vertical tillage	5.7	6.9	4.2	5.4	6.1	5.1
Strip tillage	0.6	0.9	2.1	0.2	0.4	1.0
No-till	0.4	0.0	0.0	0.6	0.4	0.3
<b>any conservation tillage</b>	<b>12.8</b>	<b>19.0</b>	<b>12.5</b>	<b>9.5</b>	<b>7.9</b>	<b>21.2</b>

Common rotations	TOTAL	Cash Grain	Veg Crops	Dairy
<b>Any hay crop</b>	<b>81.9</b>	<b>61.1</b>	<b>63.6</b>	<b>95.6</b>
H-H-H-C	38.2	26.2	20.4	47.1
H-H-C-C	16.9	9.4	6.1	22.6
Sg-H-H-C	4.8	2.6	4.1	6.5
C-H-H-C	2.4	1.3	2.0	3.0
H-C-C-C	2.2	0.0	0.0	3.7
H-C-S-C	1.9	3.9	0.0	1.3
H-C-Sg-C	1.3	1.3	4.1	0.9
<b>No hay</b>	<b>18.1</b>	<b>38.9</b>	<b>36.4</b>	<b>4.4</b>
C-S-Sg-C	4.7	14.2	2.0	0.0
S-C-S-C	2.8	7.3	2.0	0.2

H=hay, C=corn, S=soybean Sg=small grain. Subtotals do not add up to totals since not all rotations are shown in this table.

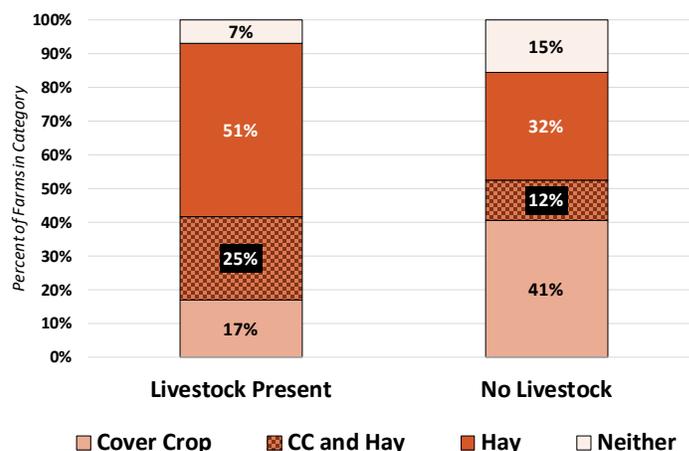


Figure 2. Use of Cover Crops or Hay in Rotation

**Use of Fertilizers and Other Soil Amendments**

- Nearly all (89%) organic corn growers applied manure prior to planting corn in 2017.
  - Beef or dairy manure was mainly used.
  - Even on farms without livestock, 82% applied manure. The most commonly purchased manure was chicken manure.
  - About 1/3 of farmers used manure as their only amendment to fields being planted to corn.
- NPK fertilizers, calcium, or micronutrients were used by 25-42% of all respondents. (See Figure 3.)
- While calcium amendments were used on 29% of corn fields in 2017, about half had applied some calcium (usually as gypsum or high-calcium lime) on these fields over the last four years.
- Micronutrient amendments were more common among dairy farms. Boron was the most commonly used micronutrient (13%).
- Vegetable farmers were more likely to use amendments in addition to manure.

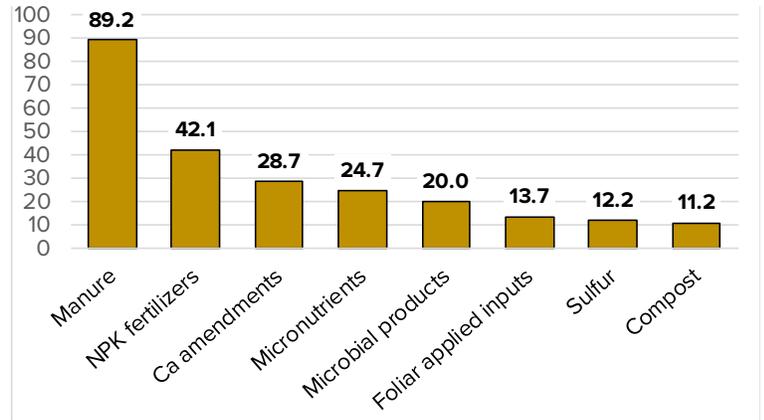


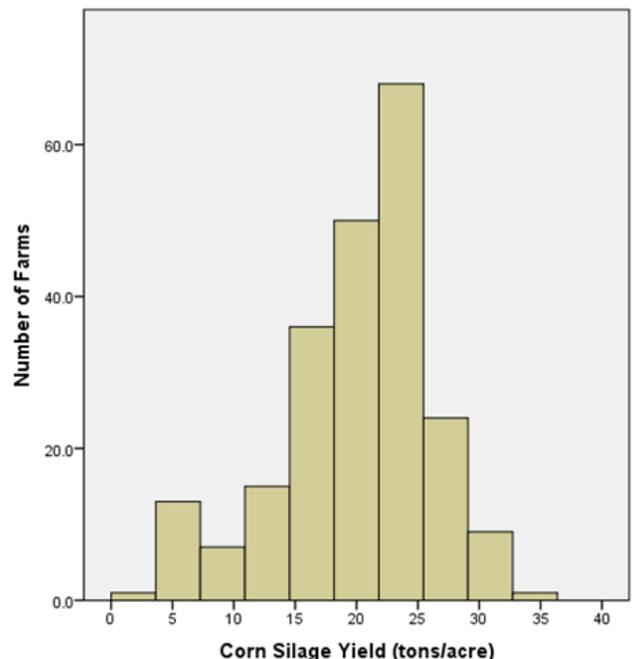
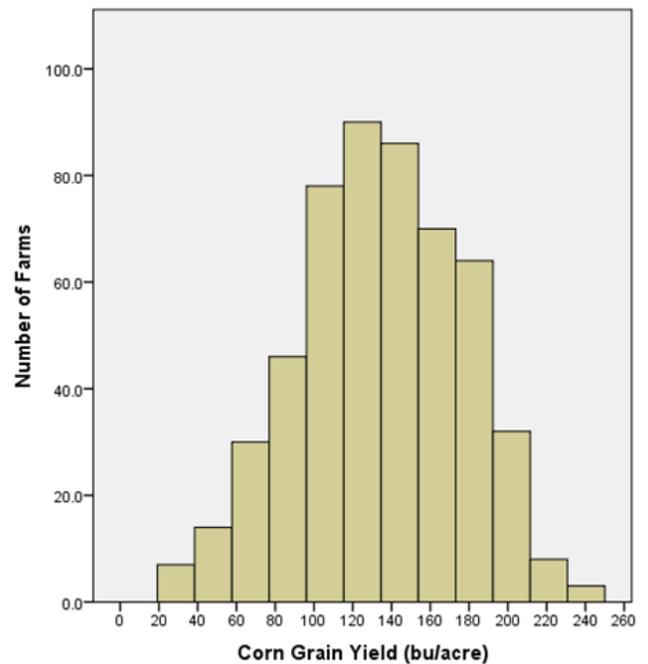
Figure 3. Percent of farmers using common soil amendments.

**Economics**

For each farmer’s selected typical corn field, we collected actual cash costs for purchased amendments and enough information to estimate costs associated with non-purchased amendments (e.g., on-farm manure), land, and fieldwork.

**Yields and Revenues**

- Survey respondents reported an average field corn yield of 133.9 bushels/acre—14.4 bushels/acre higher than the USDA 2016 estimate of 119.5 bu/acre for this region.<sup>2</sup>
- Among the 223 respondents who grew silage, the average reported yield was 20.1 tons/acre—4.7 tons/acre higher than the USDA 2016 estimate of 15.4 tons/acre for the region.<sup>2</sup>
- Average yields for individual farms varied widely, with most farms reporting between 77-190 bu/acre for grain and 11-28 tons/acre for silage.
- Average market prices for corn sold by respondents were \$9.49 per bushel for grain and \$69.99 per ton for silage.
- The average value per acre of corn harvested was \$1,266 for grain corn and \$1,405 for silage. Estimated gross revenues ranged from \$105 to \$2,640 per acre, mainly due to variation in yields.
- Not all revenues were realized since most corn was fed to livestock on the same farm where it was grown.



Figures 4 - 5 (right). Distribution of yield per acre for survey participants growing grain corn (upper figure) and silage (lower). All yields were self-reported by farmers.

### Soil Amendment Expenses

- The average reported soil amendment expense per acre (\$149.51) is comparable to a recent USDA estimate for organic corn farmers (\$136.08).<sup>1</sup>
- Manure accounted for a little over half of the total economic value of soil amendments used by our respondents.
- The economic value of soil amendments applied by farmers varied widely, with most (80%) respondents spending between \$43 and \$281 per acre.

**Table 3. Average Economic Value of Soil Amendments used on corn field in 2017\***

Soil Amendments Used	Average expenses per acre for those who reported use*
Manure & Compost	\$83.61
N-P-K Fertilizer	\$83.71
Calcium Products	\$51.61
Micronutrients	\$42.57
Microbiologicals	\$23.40
Fish Products / Foliar Applications	\$38.49
Total Soil Amendment Expenses**	\$149.51

\*Most respondents used only 1-3 of the listed amendments; therefore, average expenses reflect only those who used each amendment. See Figure 3 on page 3 for detail on frequency of use.

\*\* Also note that the average total amendment expense at the bottom is an average of all respondents who reported expenses, not a sum of the above categories.

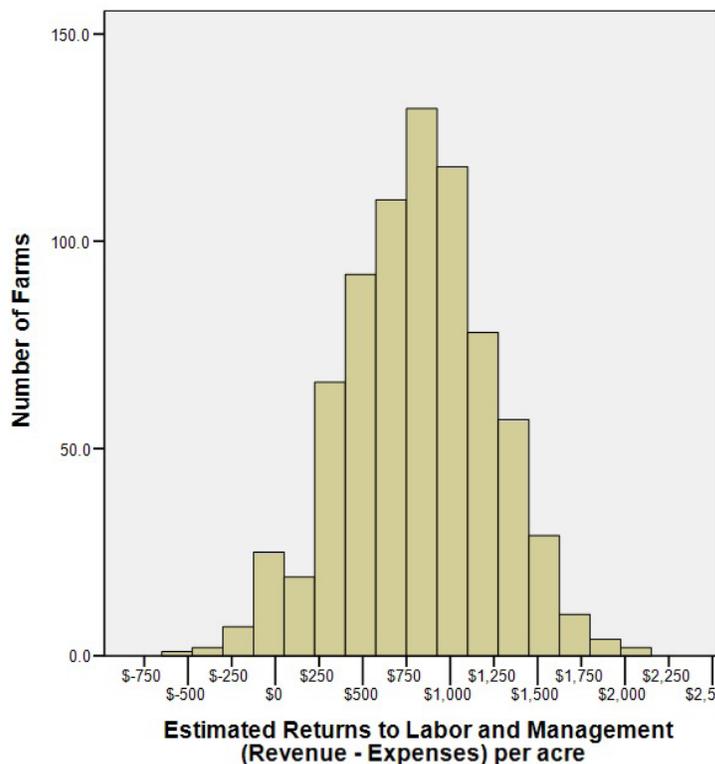
### Other Expenses

- Based on survey responses, we estimated the economic costs associated with land, machinery and equipment, fieldwork, and seeds. Together, these additional costs averaged nearly \$350 per acre in 2017.
- Total economic costs of corn production averaged \$496 per acre; most (80%) farms spent between \$335 and \$707 per acre.
- It's important to note that we did not estimate costs for other common corn production expenses such as heating and drying, transportation, insurance, and financing. For this reason, our estimated expenses may not reflect full economic costs but still allow comparisons of various strategies and farm types.

### Net Returns

By subtracting expenses (seeds, machinery, amendments, land) from total returns, we were able to estimate net returns to labor and management on these organic corn fields.

- Average net returns were \$811 per acre, but there was significant variation. (See Figure 6.)
- About half (46%) had net returns between \$500 and \$999 per acre.
- Farmers who harvested corn as silage tended to have higher net returns than those harvesting grain.



**Figure 6. The distribution of net returns to labor and management (Gains - Expenses).** Again, these numbers do not accurately reflect all production costs.

### Explaining differences in Economic Performance

- More experienced farmers had better economic returns. Total revenues and net returns were highest for farmers with 10-19 years of experience with organic farming (compared to those with less than 5 years).
- Amount spent on soil amendments tended to increase with years of experience and tended to increase yields.
- Livestock farmers earned more than those without livestock, with dairy farmers having the strongest net revenues for their organic corn fields, compared to farms that relied on vegetables or cash grains.
- Farmers using horse-drawn equipment tended to have higher net revenues compared to farms using tractors, due to lower fieldwork expenses.

## Management Philosophy

Respondents rated the importance of a series of statements concerning farm field management. The relative priority for each consideration is shown in Figure 7 below. The majority of farmers rated the first five statements below as very important.

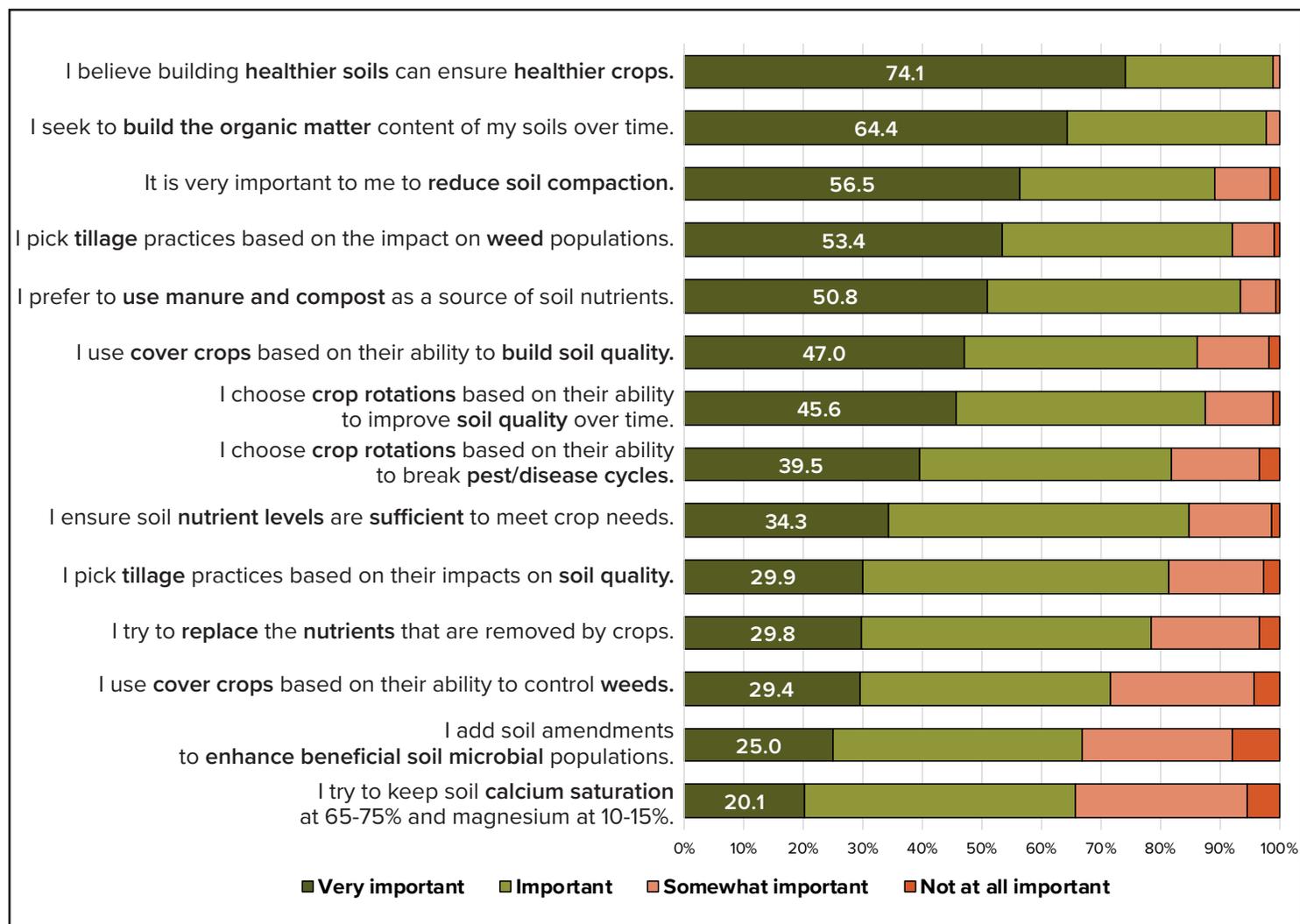


Figure 7. Respondents were asked to rate the importance of the above management considerations. The percentage of respondents who replied is shown above for each level of importance.

### Further reading

A full report of this study, including methodologies and complete results, is available online at [go.osu.edu/orgcorn](http://go.osu.edu/orgcorn). Alternatively, request a mailed copy by writing to: Dr. Doug Jackson-Smith / Ohio State OARDC / 134 Williams Hall / 1680 Madison Avenue / Wooster, Ohio 44691

### References

1. McBride, William D., Catherine Greene, Linda Foreman, and Mir Ali. 2015 July. *The profit potential of certified organic field crop production*. In ERR-188. Washington, DC: United States Department of Agriculture, Economic Research Service: [https://www.ers.usda.gov/webdocs/publications/45380/53409\\_err188.pdf?v=0](https://www.ers.usda.gov/webdocs/publications/45380/53409_err188.pdf?v=0)
2. United States Department of Agriculture, National Agricultural Statistics Service. 2017. *Certified Organic Survey 2016 Summary*. Available online at [https://www.nass.usda.gov/Surveys/Guide\\_to\\_NASS\\_Surveys/Organic\\_Production/index.php](https://www.nass.usda.gov/Surveys/Guide_to_NASS_Surveys/Organic_Production/index.php)

## Take-Home Messages

### Overview of Organic Corn Production

Organic corn in this region is typically grown on dairy, livestock, and other diversified operations. The majority of the organic corn grown is used as on-farm feed.

Organic corn growers rely mainly on manure amendments and conventional tillage to address crop fertility needs and manage weeds.

Organic farmers understand the importance of soil health and are incorporating practices such as cover crops, diverse crop rotations, and manure/compost, much more so than conventional corn farmers.<sup>1</sup>



### Profitability

Overall, organic corn production in these states was profitable in 2017, based on net returns to labor and management. Yields varied widely, but very few farms lost money on the corn enterprises examined in this study.

Farmers with more years of experience raising crops organically had higher net returns on average, suggesting that economic performance can be expected to improve over time for transitioning farms.

Use of soil amendments tended to increase with years of experience. This could partially explain higher yields, but also reflects growing knowledge. More study is needed to reliably link use of specific amendments (or other factors) to yield increases.

Livestock operations and farms using horse-drawn equipment generally had higher returns to labor and management on their corn fields due to lower fieldwork expenses.

### Possible Future Efforts

Organic farmers place a huge value on building and maintaining soil health. Future research and educational efforts should bear this in mind.

Very few organic growers use conservation tillage, especially those using horse-drawn equipment. Growers indicated they chose their tillage strategies based on weed control needs. Access to alternative weed control information, demonstrations, and equipment might help farmers reduce their reliance on tillage for weed control.

Alternative weed control tactics could include techniques farmers are already using like cover crops and crop rotations. This study showed these are primarily thought of as ways to build soil health, so they would be well received by farmers.

Communication efforts targeting organic producers should include traditional distribution methods to accommodate the large number of Plain Community farmers.

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