

# MICHIGAN ASPARAGUS COST OF PRODUCTION STUDY 2022-23

This bulletin *Michigan Asparagus Cost of Production Study 2022/23* (E3483) provides updated cost and revenue information for the industry. The last full cost study was conducted in 2015/16, *Cost and Returns for Producing Michigan Asparagus* (E3315) (August 2016) by Curtis Talley and Ben Werling.

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## KEY POINTS

- ◆ We conducted one-on-one interviews and an industry focus group to collect detailed cost information.
- ◆ Establishment costs for new fields were estimated to be \$5,723 per acre.
- ◆ The market continues to be balanced between cuts and tips (27%), spears (13%), and fresh-market asparagus (60%).
- ◆ Peak yields are higher and longer than reported in 2015, and stand longevity has also increased.
- ◆ Harvest labor costs have increased 52% since 2015, while housing costs have decreased 50%.
- ◆ Net cash flows for full-bearing years are estimated to be \$1,072 per acre, which is down from 2015 due to higher costs.
- ◆ At 5,500 pounds per acre, the break-even price is \$0.73 per pound.



# INTRODUCTION

Michigan, home to the National Asparagus Festival, is now the top asparagus-producing state in the United States, ranking No. 1 in terms of volume, acreage, and value (U.S. Department of Agriculture [USDA], National Agricultural Statistics Service [NASS], 2023). About 100 growers produce over 20 million pounds of asparagus each year (Michigan Asparagus, 2023), reaching over 26 million pounds in 2022 (USDA, NASS, 2023). Most of Michigan's production occurs in the relatively sandy soils of the western-central Lower Peninsula, near Lake Michigan.

Asparagus is grown by planting crowns that have been started from seed into trenches or furrows. Because the planting depth affects the thickness of the harvested asparagus spears, growers are careful to plant at a range of about 8 to 10 inches to get the premium spear diameter. On their third year, these perennial plants shoot up enough spears in the spring and early summer to begin harvesting. In a full-bearing field, crews can pick asparagus up to twice daily during a 6-week season spanning early May through the third week of June. Crews harvest riding on carts just above the spears. They snap the asparagus at a length to match the desired market — about 10 inches to 12 inches for fresh spears and 7.5 inches for those sent to processing.

Michigan's dual market streams are unique in the United States. Growers produce asparagus for both fresh and processed markets. A majority of Michigan's asparagus is sold to the fresh market, which has continued in strength

since the last study in 2015. However, processing remains an important part of the Michigan asparagus industry. Processors utilize about 40% of production and provide a steady market and return that growers can count on year by year. Processed products include canned spears, frozen cuts and tips, as well as frozen spears.

The Michigan asparagus industry has conducted a cost of production study approximately every seven years since 1995. The study enables growers to assess and compare their current costs to industry averages. It also provides a way to see changes in the industry over time. Key changes since the last study by Werling and Talley (2016) include:

- ◆ The Millennium variety covers most acres and is used for about 95% of new plantings. This variety is higher yielding, with longer lived stands compared to older varieties.
- ◆ Gross revenue is up due to increased stand yields and stand life, but because of higher overall costs, net revenue during peak bearing years is 25% lower.
- ◆ Labor costs for hand-harvesting and packing are up substantially, a major issue for this already labor-intensive crop.
- ◆ Many input prices such as fertilizer and fuel are relatively high.
- ◆ Spray and crop protectant costs are up overall.
- ◆ Housing costs have come down.



Looking past 2023, input prices have tempered some from their high about a year ago. They may continue to fall as supply chains come back on board. However, labor prices, already very high in 2022, will rise substantially due to a nearly \$2 rise in H2A-mandated minimum wages, a number that is unlikely to drop given inflation and a still-hot labor market.

## METHODS & ASSUMPTIONS

We took a three-fold approach to data collection. We first met individually with three commercial growers late in 2022, taking a detailed look at their financial and spray records. This information was used to develop a baseline for current costs and revenues. We then held a focus group in January 2023 that included growers, Michigan State University (MSU) Extension personnel, and industry supporters. At this event, the baseline numbers were discussed, elaborated on, and amended where necessary. Other production and marketing issues were brought to light. Finally, we had numerous one-on-one conversations and communications with packers, processors, crown growers, and other experts. Input suppliers were contacted for current prices as of winter 2023.

The basic methods of analysis used for this study were to:

- ◆ Identify current practices of the growers involved in the study.
- ◆ Use the *custom rate* approach for tasks involving machinery.
- ◆ Utilize current input prices.

- ◆ Identify recent yield averages of the growers involved.
- ◆ Look at recent and historical prices to develop revenue averages.
- ◆ Use *tailgate* returns (revenue received for each pound delivered) for calculations.

Data were put into spreadsheet form following the basic format used by past Michigan asparagus cost of production studies (2002, 2009, and 2015). The tables and information from the spreadsheet are included throughout this report and within the appendix.

## STAND LIFE, YIELD, & MARKETS

Asparagus stands last longer and yield more. The average stand length, from planting year to final harvest year, is currently 14 years, up from 13 years in 2015. Peak yields rose from an estimated 4,000 pounds per acre in 2015 to 5,500 pounds per acre in 2022. In addition, peak yields are being achieved for a longer period (eight years currently, up from five years).

Due to the high cost of labor, growers are not harvesting the relatively small amount of production in Year 2. Harvest generally begins in Year 3, and by Year 5 is at peak. In years 13 and 14, the yield tapers off (Figure 1). About 60% of production goes to the fresh market, 27% to cuts and tips, and 13% to spears.

Some of these substantial increases in stand life and yield can be attributable to widespread usage of the Millennium



variety. This variety has been used where older varieties have been taken out and now accounts for up to 95% of production by acreage.

On average, stands are taken out after Year 14. As a field ages, it takes more time to harvest a set number of pounds. Picking becomes more inefficient as rows widen; this results in higher minimum-wage makeups (see section “Labor,” which follows further in this report). Also, larger variations in spear diameter occur in the later years. Together, this makes the cost of harvesting greater than the returns at a certain point in a stand’s life. Current labor

prices will pressure growers to take out fields earlier than they might have before 2023.

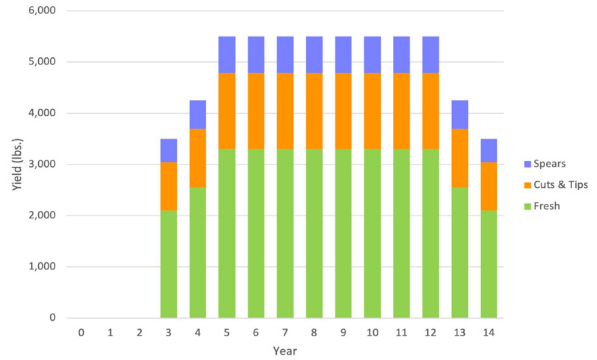


Figure 1. Average asparagus yields over the life of an average stand.

## PRODUCTION

Production costs vary across a stand’s life. A few major costs are noted in Table 1 to illustrate some of the major changes since the last study.

Table 1. Major Items of Change in Production Costs From 2015

Item	2015/16	2022/23	Change
Housing costs	3 cents/lb	1.5 cents/lb	-50%
Harvest labor	23 cents/lb	35 cents/lb	+52%
Asparagus seed	\$800 per 20,000	\$1,040 per 20,000	+30%
Crown growing	\$54.67 per 1,000	\$63 per 1,000	+15%
Turkey litter	\$57/ton	\$45/ton	-21%
Fumigation	\$627.25/acre	\$900/acre	+43%
Potash	\$0.17/lb	\$0.382/lb	+125%
Urea	\$0.17/lb	\$0.388/lb	+128%
Rate of return for growers	12%	8.10%	-32.50%
Operating interest rate	5%	9%	+80%



The pie chart in Figure 2 illustrates the level of expenses for major cost categories. We can see that over the life of a stand, labor makes up about half of total costs.

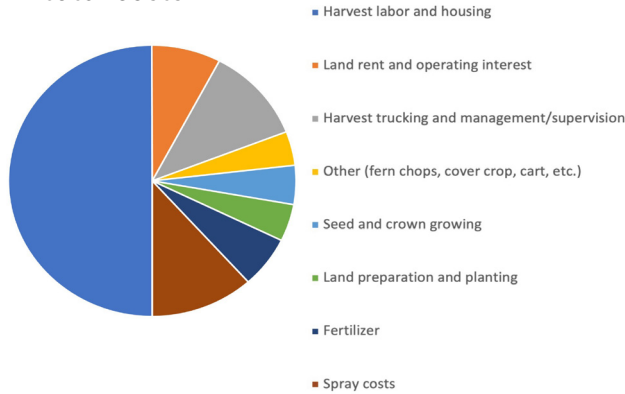


Figure 2. Pie chart showing the different percentages of major cost categories.

## ESTABLISHMENT, YEARS 0-2

The pre-plant (Year 0), planting year, and the year after planting are considered to be the establishment years. Added together, the expenses related to establishment years currently total \$5,723 per acre, up 40% from 2015 (\$4,082). Higher labor and input prices make up the bulk of the increase.

Year 0 costs include seed purchase, fumigation, and cover crop establishment. Land rent is not considered as a cost under the assumption that the rent was covered by a cash crop in Year 0 (fumigation and cover cropping occur after the cash crop has been harvested). Fumigation costs are currently much higher than 2015 (\$900 per acre versus \$627), but growers continue to find benefit in fumigating replant acres. However, growers generally don't fumigate virgin soils that have not previously had asparagus.

Seed and crown prices have increased. Crown planting density has increased somewhat to 15,500 crowns per acre, up from 15,000 in 2015. Together these increases have helped push establishment costs noticeably higher (Table 2).

Table 2. Crown Growing Costs

Item	Price	Units	Total
Crown growing	\$63/1,000	15.5	\$976.50
Soaks	\$10/box	5	\$50.00
Box rental	\$6/box	5	\$30.00
Box storage	\$6/box	5	\$30.00
<b>Total/acre</b>			<b>\$1,086.50</b>

Year 1 expenses include fees for custom crown growing, along with trenching, planting labor, and furrow closing. On average, growers send a weeding crew in once, and row cultivate twice. However, some growers only use hand-weeding during the planting year. The fertilizer program for Year 1 includes an application of turkey litter at 3 tons per acre, and an application of liquid 10-34-0, averaging 10 gallons per acre, at planting.

The main costs for Year 2 include spraying ferns, applying fertilizer, and establishing cover crops. Little to no yield is harvested in Year 2; a small but viable yield usually exists, but given current



labor costs, the volumes are too light to offset harvest costs. Corn rental prices are generally used during years 1 and 2 as plantings don't generate revenue.

For more details on establishment costs, see tables 14, 15, and 16 in the appendix.

### PRODUCTION, YEARS 3-14

Growers pay substantial labor and housing costs in the production years in addition to expensive spray and fertilizer programs, A discussion of costs by category follows.

#### Soil tests and fertilizer program

Soil tests are conducted every three years on average, with most growers doing standard soil tests (one test for every 10 acres). However, some growers are testing more intensively, at a level of one test per acre to generate maps for variable rate (VR) spreading of potash and lime. For purposes of this study, we assume that the higher costs of testing are made up for by the benefits of the more accurate VR spreading.

The fertilizer program used in this study is largely the same as 2015, with minor adjustments (Table 3). Note, however, that some growers are starting to turn to sophisticated custom mixes that incorporate micronutrients, the costs of which vary by farm.

#### Spray program

Growers are applying an average of one more fungicide application per year due to warmer Septembers. However, the actual products used are largely similar to those in 2015 (Table 4).

Table 4. Spray Application Frequency

	Year 1 (Planting)	Year 2	Year 3-14
Post-plant herbicide	1		
Pre-harvest herbicide		1	1
Beetle			1
Post-harvest herbicide			1
Fern	5	6	5

Pre-harvest herbicides are used to kill emerged winter annuals and perennials as well as provide residual control to hold back during harvest. Compared to 2015, growers are including more pre-emergent herbicides in pre-harvest applications in an attempt to control pigweed.

Growers apply insecticides during harvest to prevent egg laying by the asparagus beetle. In 2022, some growers were able to skip the beetle spray in some blocks, but in most years, this is considered to be a cost.

Fern sprays mainly manage disease, but insecticides often provide pest protection as well. Note that in Year 2, there is an additional fern spray compared to other years. This is because the spears are not being harvested (or are only harvested for a short period), giving them a chance

Table 3. Fertilizer Program, Production Years

Fertilizer	Rates	Cost	Total/acre
Borate	10 lbs/acre	\$.682/lb	\$6.82
21-0-0-24S	50 lbs/acre	\$.314/lb	\$15.70
0-0-60	240 lbs/acre	\$.382/lb	\$91.68
46-0-0	125 lbs/acre	\$.388/lb	\$48.50
Limestone	.5 ton/acre	\$38/ton	\$19.00



to grow out earlier in the year. We also note that some growers are including foliar fertilizers in their fern sprays (see the appendix for a sample spray program).

Custom work and trucking

Most equipment costs were determined on a custom, per acre basis. In other words, how much does one grower or custom operator charge another grower for a particular practice such as disking? This custom work approach has the advantage

of not having to develop complicated equipment formulas based on average tractors and implements used, and it may in fact be more accurate where growers have a decent idea of custom costs, as is the case with the Michigan asparagus industry. Growers were asked about custom rates and frequencies of practices (Table 5). Costs have gone up slightly for custom work, but practice frequency largely remains the same.

Table 5. Custom Job or Service Prices and Frequency

Custom job or service	Cost/acre	Frequency
Leveling/field cultivator	\$15	Once, Year 2 (year after planting)
Disking	\$16	2 times before fumigation Year 0, once after turkey litter Year 1, once spring of Year 2
Fern chopping	\$15	Once Year 2, 3 times Year 3 and after
Trenching	\$125	Planting year (Year 1), once (note range was \$60 to \$140)
Row cultivating	\$16	Planting year (Year 1), 2 times
Crown covering	\$22	Planting year (Year 1), once
Limestone application	\$12	\$8 per ton, once every 3 years at 1.5 tons/acre
Spray application	\$11	See application Table 4
Fertilizer application	\$8	Once Year 1, once Year 2, 2 times a year after
Turkey litter spreading	\$30	\$10/ton, 3 tons/acre
Fumigation	\$900	Once, Year 0 (before planting)
Trucking	\$103	2.5 trips per acre per year at \$41/trip (see trucking table below for cost breakdown)
Porta-pottie	\$4	\$120 GAP compliant per 32 acres
Soil testing	\$20	Once every 3 years, 1 test per 10 acres; \$20 each



Trucking costs have increased since 2015, due in part to changes in equipment carrying capacity. It is now more common to use a pickup and trailer, but these hold less than the old flatbed stake trucks (many of which are still in operation). More miles per trip are included in our cost breakdown. This is to reflect that many growers take loads back to their farm to consolidate before taking to the receiver, though this practice varies with the farm's proximity to the receiver.

Because some pickings are lighter than others, it was determined that on average 2.5 trips are needed per acre per year. Also, we found that the trucking time is often a mix between management hours and straight trucking labor (as performed by employees). This is because growers will deliver loads while checking and supervising their field operations. Therefore, while more time is spent per trip, only one hour of employee time is included in our breakdown. The other time is captured in the management and supervision labor allocation. These can be seen in the yearly cost tables in the appendix (tables 14 through 21).

Table 6. Trucking Costs Breakdown Per Trip

Category:	Units	Cost/unit	Total
Labor	1 hour	\$24	\$24
Mileage	26 miles	\$0.655/mile	\$17.03
<b>Total/trip:</b>			<b>\$41.03</b>
x 2.5 trips/acre			
<b>Total/acre:</b>			<b>\$102.58</b>

### Harvest carts

Most growers are still using Joreson harvest carts, which have a relatively high salvage value due to their longevity. While not always easy to find since they are no longer produced, these carts do become available from time to time. In talking to growers, we've determined that the carts likely have a 25- or 30-year (or longer) life, provided they are well-maintained. Maintenance will include wheel bearings and at least one engine over the life of the cart. Due to higher purchase, interest, and maintenance costs, these carts are allocated a higher cost than in the 2015 study (Table 7). A single cart can comfortably cover 25 acres.

Table 7. Joreson Harvest Cart Cost Breakdown

Purchase price of new cart <sup>1</sup> (\$)	<b>\$15,000</b>
Useful life (yr)	<b>30</b>
Salvage value (% of original)	<b>47%</b>
Salvage value (\$)	<b>\$7,000</b>
Purchase price minus salvage value	<b>\$8,000</b>
Depreciation (per year for 30 years)	<b>\$267</b>
Interest (per year)	<b>\$770</b>
Total repairs and maintenance	<b>\$300</b>
Acres per 5-man cart	<b>25</b>
Total cost/acre	<b>\$53.47</b>

<sup>1</sup> \$15,000 was assumed as an initial cost for purposes of analysis. These carts are no longer manufactured but can be purchased on the used market.

### Land rental

After Year 3, land rental costs increase from corn-level rents. The formula most often used is 200 lbs/acre x the Michigan Agricultural Cooperative Marketing Association (MACMA) price (81 cents for 2022), leading to a total of \$162/acre per year.





### Housing

Housing costs have dropped from an estimated 3 cents per pound in 2015 to 1.5 cents per pound for 2022, despite substantially higher interest rates and construction costs. The primary driver is the increased use of the H2A program that allows growers to fill housing units closer to maximum capacity. The

2015 study considered a 40% worker occupancy rate, which now edges closer to 100%. Additionally, housing design for bunk-style quarters is substantially more efficient than previous designs, offsetting rises in construction material costs (Table 8). Note, we assume that 40% of the housing cost is allocated to asparagus, and the other 60% is allocated to labor used for other crops.

**Table 8.** Modern Bunk-Style Housing for 42 Workers

Construction cost new	1 unit for 42 people: 4480 sq ft x \$90/sq ft = \$403,200
Economic depreciation	$\$403,200 - \$201,600 \text{ salvage value} \div 30 \text{ yr. useful life} = \$6,720/\text{yr}$
Interest	$\text{Interest on average investment value} = (\$403,200 + \$201,600)/2 \times 7.0\% = \$21,168/\text{yr}$
Repairs	Repairs likely = \$2,000/yr
Taxes and insurance	1.5% of construction cost = \$6,048/yr
Inspection fees	$\$5/100 \text{ square ft: } (4,480 \text{ sq ft} \div 100) \times 5 = \$224/\text{yr}$
Total annual cost	$\$6,720 + \$21,168 + \$2,000 + \$6,048 + \$224 = \$36,160/\text{yr}$
Cost assigned to asparagus	40% of \$36,160 = \$14,464/yr
Cost per acre*	$\$14,464 \div 210 \text{ acres} = \$69/\text{acre}/\text{yr}$
Cost per lb**	Average yield/acre during bearing years = 5,000 lbs: $\$69/\text{acre} \div 5,000 \text{ lb/acre} = \$0.014/\text{lb}$

\* One worker can harvest 5 acres a year, down from 6.5 acres, due to substantial yield increases. 42 x 5 = 210 acres

\*\* Due to usual challenges keeping 100% working occupancy (illness, appointments, etc.) we assume an overall cost of **\$0.015/lb**.

**NOTE** that the older, family-style mode of housing still exists and is still utilizable/being used. However, when built the assumption was a 40% occupancy rate. When adjusting the old family-style housing for a 100% occupancy rate due to the increased use of the H2A program, it has a similar cost to the newer type housing calculations above. While the cost of construction has gone up substantially, the newer style housing makes more efficient use of space.



Labor

The increasingly high cost of labor is the single biggest issue for Michigan asparagus growers. Picking labor is by far the largest cost item, and at the levels growers are facing in 2023, it will account for nearly 50% of aggregate expenses over a stand’s life. Most growers are working with the H2A seasonal labor program. This is often through farm labor contractors (FLCs), who provide the labor services of H2A workers in exchange for a management fee. Generally, growers must provide housing for the workers, but those without housing can work with an FLC to source housing for an extra cost.

On average, each worker can harvest 5 acres during a year. A 5-person crew can typically cover 20 or 25 acres a day throughout the multiple pickings of the season. Harvest labor is generally paid by piece rate. However, when pickings are light, growers must assure that wages don’t fall below the Adverse Effect Wage Rate (AEWR)<sup>2</sup> for the H2A program. The AEWR is set by the U.S. Department of Labor to ensure that the employment of H2A workers does not adversely affect the wages paid to domestic workers doing the same work. Already high at \$15.37 per hour in 2022, the AEWR will be increased to \$17.34 an hour for 2023. This will cause more situations where growers need to “makeup” piece rate wages to achieve the H2A minimum wage.

During the first three weeks of harvest, the strong volumes of product ensure that workers beat the AEWR using the piece rate. Most minimum-wage makeup situations occur during the last three weeks of harvest in June. Also, makeup is

more likely when workers pick cuts and tips, where a greater number of spears need to be picked to make up a pound.

Crew training is also a cost factor. Picking the right spears at the correct height is a skill that takes experience. Crews used to one type of picking might be challenged when moving to another type. For example, if a crew is trained in cuts and tips harvesting, then the cuts and tips harvest will usually be faster than fresh market picking. However, when crews used to fresh market picking are moved to cuts and tips, they can be 15% slower at that type of harvest because they are less used to it.

Many growers now utilize a single piece rate for each of the harvesting modes (fresh market, cut and tips, and processing spears market), a change from 2015 when each category had a different piece rate. Between the base AEWR rate, the FLC’s fee, and makeup needs, growers estimate that ultimately, their picking labor will average 35 cents per pound in 2023. This is a 50% increase over 2015 levels, when the piece rate was approximately 23 cents.

Table 9. Labor Rates and Units by Category

Category	Units/acre	Price	Total \$/acre
Planting/hour	16	\$24	\$384
Hand-weeding/hour	5	\$24	\$120
Truck driving/hour	2.5	\$24	\$60
<b>Piece Rate/lb*</b>	(varies by yield)	<b>\$0.35</b>	(varies)

\* Note that this piece rate includes estimated makeup amounts.

<sup>2</sup>See the U.S. Department of Labor website on AEWR at <https://www.dol.gov/agencies/eta/foreign-labor/wages/adverse-effect-wage-rates>



Table 9 details the different rates by job type. Planting is done earlier in the season when there are plenty of laborers arriving and looking for work. However, truck driving does, and weeding can, coincide with harvest season, a time when labor is tight. This can push the rates shown upward.

Management and supervision time were determined to be \$40 per hour including benefits. This is money that either the grower or their employee-manager receives for ensuring the different tasks are completed throughout the year. Management times for bearing years have been dropped slightly to 7 hours per acre, from 7.5 hours per acre in 2015. This reflects the fact that in some cases, FLCs are providing hands-on supervision during harvest time.

Note that labor costs related to equipment driving (for example, tillage, fertilizer spreading, spraying) are captured in the custom rates, discussed in the previous “Custom Work and Trucking” section.

## REVENUE

Revenue was calculated using current and historical price data. Price per pound is provided in our tables on a *tailgate* basis, meaning payout (cents per pound) for every pound brought into the receiver (adjusted for pack out).

For the fresh market, average, annual returns since 2016 were obtained for a subset of growers and used to calculate average prices. An average of the past seven harvest years was used excluding 2020 since COVID-19 restrictions kept imports out and prices were uniquely

high that year. We used an average to account for fluctuations due to year-to-year changes in domestic and imported volumes. For example, 2022 was a high-volume and relatively lower price. Using the method previously stated, the average fresh price was calculated to be 82.9 cents per pound before assessments.

For the processing market, we used the prices determined by the Michigan Agricultural Cooperative Marketing Association (MACMA) as a basis. MACMA is an organization that negotiates with processors on behalf of growers. For 2022, the price for cuts and tips was 81 cents per pound, and on average, our respondent processors experienced 95% pack outs. This yields an average cuts and tips price of 76.95 cents per pound before assessments.

Processors pay a higher premium for processing spears due to the higher costs of picking and orienting the spears in the field. After adjusting for approximate 96% pack out rates, the average 2022 price from our responding processors was 88.62 cents per pound before assessments.

**Table 10.** Price and Return Calculations

Processing returns	Total returns/lb*
Cuts & tips	\$0.7545 **
Spears	\$0.8712 ***
Packing returns	
Fresh	\$0.8140

\* 7-Year average (excluding 2020), after assessments of \$0.015 cents/lb. MACMA is not deducted, as participation is voluntary.

\*\* Returns based on price of \$ 0.81/lb after 95% pack out

\*\*\* Average of two processor prices after 96% pack out



Table 11. Yields, Revenues, and Net Returns

Year	Fresh (60%)	Cuts & Tips (27%)	Spears (13%)	TOTAL YIELD	FRESH returns, \$0.8140 /lb	Cuts & Tips returns, \$0.7545/lb	SPEARS returns, \$0.8712 /lb	TOTAL REVENUES	TOTAL EXPENSES from spreadsheets	NET ANNUAL RETURN
0	0	0	0	0					\$2,192	-\$2,192
1	0	0	0	0					\$2,762	-\$2,762
2	0	0	0	0					\$769	-\$769
3	2,100	945	455	3,500	\$1,709	\$713	\$396	\$2,819	\$2,516	\$303
4	2,550	1,148	552	4,250	\$2,076	\$866	\$481	\$3,423	\$2,888	\$535
5	3,300	1,485	715	5,500	\$2,686	\$1,120	\$623	\$4,430	\$3,357	\$1,072
6	3,300	1,485	715	5,500	\$2,686	\$1,120	\$623	\$4,430	\$3,357	\$1,072
7	3,300	1,485	715	5,500	\$2,686	\$1,120	\$623	\$4,430	\$3,357	\$1,072
8	3,300	1,485	715	5,500	\$2,686	\$1,120	\$623	\$4,430	\$3,357	\$1,072
9	3,300	1,485	715	5,500	\$2,686	\$1,120	\$623	\$4,430	\$3,357	\$1,072
10	3,300	1,485	715	5,500	\$2,686	\$1,120	\$623	\$4,430	\$3,357	\$1,072
11	3,300	1,485	715	5,500	\$2,686	\$1,120	\$623	\$4,430	\$3,357	\$1,072
12	3,300	1,485	715	5,500	\$2,686	\$1,120	\$623	\$4,430	\$3,357	\$1,072
13	2,550	1,148	552	4,250	\$2,076	\$866	\$481	\$3,423	\$2,888	\$535
14	2,100	945	455	3,500	\$1,709	\$713	\$396	\$2,819	\$2,606	\$213
									<b>Grand total</b>	<b>\$4,441</b>

\* Note that these numbers are *not* adjusted for present value.



# COSTS, RETURNS, & CASH FLOW

## Costs and returns

Expenses have gone up substantially and are currently about 76% higher than in 2015 after adjusting for stand life. Labor and input prices are much higher, but much of this large increase in cost is also due to higher yields needing to be picked by laborers. As a result of the higher yields, gross revenues are currently 54% higher than in 2015 after adjusting for stand life.

On a per acre per year basis, the 2015 study revenues exceeded costs by an average of \$467 per acre for the life of the stand, and our current study numbers show revenues exceeding costs by an average of \$317 per acre. These calculations reflect a 32% drop in per acre returns in comparison to 2015 (Table 11 & 12).<sup>3</sup>

## Net cash flow

Using our price, cost, and yield information, we developed a net cash flow graph (Figure 3). Revenues cover cash costs starting in year 9, after which positive returns continue to accrue.

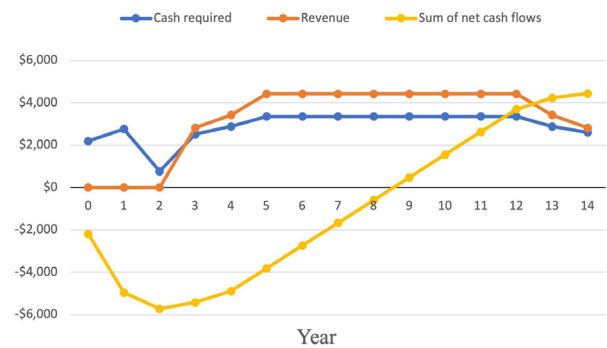


Figure 3. Cash expenses, gross revenues, and cumulative net cash flow over the life of a planting.

## Rate of return and break-even prices

Using the current cost levels, we are able to calculate the yield levels needed to attain different rates of return at different prices. These are illustrated in Table 13. A zero-percent rate of return is considered to be a break-even price. Note that the cost of operating capital is included in these calculations.

Table 13 is a good planning tool, as it can illustrate whether growers are meeting return goals for different fields. Fields that are not consistently meeting those goals could be considered for replant or alternative crops.

At current prices and a 5,500-pound peak yield, growers are experiencing an 8.1% rate of return.

Table 12. Net Profit/Acre/Year

Total REVENUE/acre over life of planting	\$47,919
Total COSTS/acre over life	\$43,478
Net profit over life (returns minus costs)	\$4,441
Average annual net profit/acre/year (14 years)	<b>\$317.23</b>

<sup>3</sup> These calculations and Tables 11 and 12 are not adjusted for a net present value calculation. It is reasonable to assume that most asparagus growers have enough acreage that they will have a spread of stands which justifies looking at these returns as all current.



Table 13. Prices Required to Achieve Different Rates of Return Based on Different Yields

% Return	3,000 lbs	3,500 lbs	4,000 lbs	4,500 lbs	5,000 lbs	5,500 lbs	6,000 lbs	6,500 lbs.
0	\$1.34	\$1.15	\$1.00	\$0.89	\$0.80	\$0.73	\$0.67	\$0.62
3	\$1.38	\$1.19	\$1.04	\$0.92	\$0.83	\$0.75	\$0.69	\$0.64
5	\$1.42	\$1.22	\$1.06	\$0.95	\$0.85	\$0.77	\$0.71	\$0.65
7	\$1.46	\$1.25	\$1.09	\$0.97	\$0.87	\$0.79	\$0.73	\$0.67
9	\$1.50	\$1.28	\$1.12	\$1.00	\$0.90	\$0.82	\$0.75	\$0.69
11	\$1.54	\$1.32	\$1.16	\$1.03	\$0.92	\$0.84	\$0.77	\$0.71
13	\$1.59	\$1.36	\$1.19	\$1.06	\$0.95	\$0.87	\$0.79	\$0.73



## APPLICATION TO FARM

The results of this study should be viewed as averages and benchmarks. Every farm has its own unique circumstances that need to be adjusted for. Assumptions about land rent, housing costs, cart costs, and fertilizer and spray programs need to be fine-tuned to a particular farm.

For example, let's consider a farm that has paid off its harvest carts and land. In this example, the only cart cost the grower needs to consider is ongoing maintenance, about \$12 per year, which would drop the annual cart cost calculation about \$41 per year (\$53 minus \$12 = \$41). On the land side, since the land used for production is owned by the farmer and is paid off, only the tax rate needs to be considered. Assuming a tax rate of about \$40 per acre, this would drop the rent/land cost calculation \$122 (\$162 minus \$40 = \$122). Adding the cart savings (\$41) and the land savings (\$122) yields a cost that is about \$163 per acre lower than the assumptions in this study, a substantial difference.

## CONCLUSIONS

Asparagus is an industry dependent on hand labor. In 2023, Michigan's growers are experiencing a nearly \$2 per hour increase in AEW rates, which were already a challenge for production. This creates a margin squeeze from two sides for growers: the production side and the packing side.

While yields are substantially higher than those in the last study, those yield and any efficiency gains since 2015 have been more than offset by higher labor and input prices.

In such an environment, best management practices may be key, in addition to cost cutting where it can be done without sacrificing yield. Growers will need to consider removal of poor performing stands given high labor costs.

## ACKNOWLEDGMENTS

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# APPENDIX

## COSTS & RETURNS BY YEAR

Table 14. Year 0 (Pre-Plant) Costs

### ASPARAGUS SPEARS, CUTS & TIPS, AND FRESH MARKET-YEAR BEFORE PLANTING

	Quantity	Unit	\$/Unit	\$/Acre
<b>REVENUES</b>				\$0
<b>TOTAL</b>				\$0
<b>CASH EXPENSES</b>				
Asparagus seed <sup>1</sup>	18,000	seeds	\$0.052	\$936.00
Fertilizer				
Soil test <sup>2</sup>	0.1	sample	\$20.00	\$2.00
Limestone	1.5	ton	\$38.00	\$57.00
Limestone application	1.5	ton	\$8.00	\$12.00
Fumigation				
Disking	2	times	\$16.00	\$32.00
Custom fumigation			\$900.00	\$900.00
Fall cover crop				
Rye seed	2	bu	\$9.00	\$18.00
Rye spreading	1	time	\$8.00	\$8.00
Land rent <sup>3</sup>				
Interest on operating costs for one year <sup>4</sup>				\$176.85
Management & supervision	1.25	hours	\$40.00	\$50.00
<b>TOTAL EXPENSES</b>				<b>\$2,191.85</b>

<sup>1</sup> Cost of Millennium variety (at a rate of \$1,040 for 20,000)

<sup>2</sup> Assume 1 test per 10 acres (if VR is used, testing cost is much higher, but benefits accrue)

<sup>3</sup> Assumes land rents are charged to a cash crop grown before asparagus

<sup>4</sup> Assumes 9.0% interest rate on operating loan



**Table 15.** Year 1 (Planting Year) Costs

<b>ASPARAGUS SPEARS, CUTS AND TIPS, AND FRESH MARKET: PLANTING YEAR</b>				
	<b>Quantity</b>	<b>Unit</b>	<b>\$/Unit</b>	<b>\$/Acre</b>
<b>REVENUES</b>				\$0
<b>TOTAL</b>				\$0
<b>CASH EXPENSES</b>				
Asparagus crowns				
Crowns	15.5	1,000 crowns	\$63.00	\$976.50
Crown soaks <sup>1</sup>	5	boxes	\$10.00	\$50.00
Box rental <sup>1</sup>	5	boxes	\$6.00	\$30.00
Box storage <sup>1</sup>	5	boxes	\$6.00	\$30.00
Soil prep				
Turkey litter material	3	ton	\$45.00	\$135.00
Turkey litter application	3	ton	\$10.00	\$30.00
Disking	1	time	\$16.00	\$16.00
Trenching	1	time	\$125.00	\$125.00
10-34-0 (material cost)	100	lb	\$0.35	\$35.00
Planting				
Planting labor <sup>2</sup>	16	hours	\$24.00	\$384.00
Trucking crowns	1.5	trips/acre	\$41.03	\$61.55
Crown covering			\$20.00	\$20.00
Post-planting herbicides				
Materials			\$32.78	\$32.78
Application	1	time	\$11.00	\$11.00
Cultivate & weed				
Hoeing	5	hours	\$24.00	\$120.00
Row cultivate	2	times	\$16.00	\$32.00
Fern sprays				
Materials, for all 5 sprays			\$109.58	\$109.58
Application	5	times	\$11.00	\$55.00



Table 15, continued

Fall cover crop				
Oat seed	2.5	bu	\$5.50	\$13.75
Spreading cost	1	time	\$8.00	\$8.00
Land rent <sup>3</sup>				\$75.00
Interest on operating costs for one year <sup>4</sup>				\$211.51
Management & supervision	5	hours	\$40.00	\$200.00
<b>TOTAL EXPENSES</b>				<b>\$2,761.67</b>

- <sup>1</sup> Assumes about 3,000 crowns per box
- <sup>2</sup> Assumes a wage of \$24 per hour
- <sup>3</sup> Assumes corn-level rent for first three years
- <sup>4</sup> Assumes 9.0% interest rate on operating loan



**Table 16.** Year 2 (Year After Planting) Costs

**ASPARAGUS SPEARS, CUTS AND TIPS, AND FRESH MARKET:  
YEAR AFTER PLANTING**

	Quantity	Unit	\$/Unit	\$/Acre
<b>REVENUES</b>				\$0
<b>TOTAL</b>				\$0
<b>CASH EXPENSES</b>				
Disking	1	time	\$16.00	\$16.00
Leveling (field cultivator)	1	time	\$15.00	\$15.00
Fertilizer				
Urea 46-0-0	125	lb	\$0.39	\$48.50
Potash 0-0-60	240	lb	\$0.38	\$91.68
Am. Sulfate 21-0-0-24S	50	lb	\$0.31	\$15.70
Borate (1# actual boron)	10	lb	\$0.68	\$6.82
Application	1	time	\$8.00	\$8.00
Herbicide				
Materials			\$68.35	\$68.35
Application	1	time	\$11.00	\$11.00
Fern sprays				
Materials, for all 6 sprays			\$128.72	\$128.72
Application	6	times	\$11.00	\$66.00
Fall cover crop				
Rye seed	2	bu	\$9.00	\$18.00
Rye spreading	1	time	\$8.00	\$8.00
Fern chop	2	times	\$15.00	\$30.00
Land rent <sup>1</sup>				\$75.00
Interest on operating costs for one year <sup>2</sup>				\$54.61
Management & supervision	2.7	hours	\$40.00	\$108.00
<b>TOTAL EXPENSES</b>				<b>\$769.37</b>

<sup>1</sup> Assumes corn-level rent first three years

<sup>2</sup> Assumes 9.0% interest rate on operating loan



**Table 17. Year 3 Costs and Returns**

<b>ASPARAGUS SPEARS, CUTS AND TIPS, AND FRESH MARKET: YEAR 3</b>				
	<b>Quantity</b>	<b>Unit</b>	<b>\$/Unit</b>	<b>\$/Acre</b>
<b>REVENUES</b>				
Spears <sup>1</sup>	455	lb	\$0.871	\$396.40
Cuts & tips <sup>1</sup>	945	lb	\$0.755	\$713.00
Fresh market <sup>2</sup>	2,100	lb	\$0.814	\$1,709.40
<b>TOTAL REVENUE</b>				<b>\$2,818.80</b>
<b>CASH EXPENSES</b>				
Fertilizer				
Soil test	0.033	samples	\$20.00	\$0.66
Limestone	0.5	ton	\$38.00	\$19.00
Limestone application	0.333	times	\$12.00	\$4.00
Urea 46-0-0	125	lb	\$0.388	\$48.50
Potash 0-0-60	240	lb	\$0.382	\$91.68
Am. Sulfate 21-0-0-24S	50	lb	\$0.314	\$15.70
Borate (1# actual boron)	10	lb	\$0.682	\$6.82
Application	2	times	\$8.00	\$16.00
Pre-harvest sprays, burndown, and pre-emergence				
Materials, for both sprays			\$74.45	\$74.45
Application	2	times	\$11.00	\$22.00
Spring fern chop	1	time	\$15.00	\$15.00
Harvest				
Cart investment & maintenance, annual			\$53.47	\$53.47
Cart fuel	2.82	gal	\$3.40	\$9.59
Trucking to receiver <sup>3</sup>	2.5	trips	\$41.03	\$102.58
Picking labor <sup>4</sup>	3,500	lb	\$0.35	\$1,225.00
Worker housing	3,500	lb	\$0.015	\$52.50
Porta-potties <sup>5</sup>				\$3.75
Beetle spray - materials			\$19.24	\$19.24
Beetle sprays -application	1	time	\$11.00	\$11.00



Table 17, continued

Post-harvest chopping and spray				
Fern chop	1	time	\$15.00	\$15.00
Materials - post-harvest spray			\$68.24	\$68.24
Spray application	1	time	\$11.00	\$11.00
Fern sprays				
Materials, for all 5 sprays			\$120.23	\$120.23
Application	5	times	\$11.00	\$55.00
Fall cover crop				
Rye seed	2	bu	\$9.00	\$18.00
Rye spreading	1	time	\$8.00	\$8.00
Fall fern chop	1	time	\$15.00	\$15.00
Land rent <sup>6</sup>				\$75.00
Interest on operating costs for four months <sup>7</sup>				\$59.67
Management & supervision	7.0	hr	\$40.00	\$280.00
<b>TOTAL EXPENSES</b>				<b>\$2,516.06</b>

<sup>1</sup> Tailgate (Net of revenue minus \$0.015/lb MAAB assessment)  
<sup>2</sup> Tailgate (Net of revenue minus \$0.015/lb MAAB assessment)  
<sup>3</sup> Includes some allocation for trips to home farm to consolidate loads, etc.  
<sup>4</sup> Piece rate plus estimated makeup needed  
<sup>5</sup> Assumes one GAP compliant porta-pottie per 32 acres for two months  
<sup>6</sup> Assumes corn-level rent first 3 years  
<sup>7</sup> Assumes 9.0% interest rate on operating loan; housing & cart costs backed out



**Table 18. Year 4 Costs and Returns**

**ASPARAGUS SPEARS, CUTS AND TIPS, AND FRESH MARKET:  
YEAR 4**

	Quantity	Unit	\$/Unit	\$/Acre
<b>REVENUES</b>				
Spears <sup>1</sup>	552	lb	\$0.871	\$480.90
Cuts & tips <sup>1</sup>	1,148	lb	\$0.755	\$866.17
Fresh market <sup>2</sup>	2,550	lb	\$0.814	\$2,075.70
<b>TOTAL REVENUE</b>				<b>\$3,422.77</b>
<b>CASH EXPENSES</b>				
Fertilizer				
Soil test	0.033	samples	\$20.00	\$0.66
Limestone	0.5	ton	\$38.00	\$19.00
Limestone application	0.333	times	\$12.00	\$4.00
Urea 46-0-0	125	lb	\$0.388	\$48.50
Potash 0-0-60	240	lb	\$0.382	\$91.68
Am. Sulfate 21-0-0-24S	50	lb	\$0.314	\$15.70
Borate (1# actual boron)	10	lb	\$0.682	\$6.82
Application	2	times	\$8.00	\$16.00
Pre-harvest sprays, burndown, and pre-emergence				
Materials, for both sprays			\$74.45	\$74.45
Application	2	times	\$11.00	\$22.00
Spring fern chop	1	time	\$15.00	\$15.00
Harvest				
Cart investment & maintenance, annual			\$53.47	\$53.47
Cart fuel	2.82	gal	\$3.40	\$9.59
Trucking to receiver <sup>3</sup>	2.5	trips	\$41.03	\$102.58
Picking labor <sup>4</sup>	4,250	lb	\$0.35	\$1,487.50
Worker housing	4,250	lb	\$0.015	\$63.75
Porta-potties <sup>5</sup>				\$3.75
Beetle spray - materials			\$19.24	\$19.24
Beetle sprays-application	1	time	\$11.00	\$11.00



Table 18, continued

Post-harvest chopping and spray				
Fern chop	1	time	\$15.00	\$15.00
Materials - post-harvest spray			\$68.24	\$68.24
Spray application	1	time	\$11.00	\$11.00
Fern sprays				
Materials, for all 5 sprays			\$120.23	\$120.23
Application	5	times	\$11.00	\$55.00
Fall cover crop				
Rye seed	2	bu	\$9.00	\$18.00
Rye spreading	1	time	\$8.00	\$8.00
Fall fern chop	1	time	\$15.00	\$15.00
Land rent <sup>6</sup>				\$162.00
Interest on operating costs for four months <sup>7</sup>				\$70.38
Management & supervision	7.0	hr	\$40.00	\$280.00
<b>TOTAL EXPENSES</b>				<b>\$2,887.53</b>

<sup>1</sup> Tailgate (Net of revenue minus \$0.015/lb MAAB assessment)  
<sup>2</sup> Tailgate (Net of revenue minus \$0.015/lb MAAB assessment)  
<sup>3</sup> Includes some allocation for trips to home farm to consolidate loads, etc.  
<sup>4</sup> Piece rate plus estimated makeup needed  
<sup>5</sup> Assumes one GAP compliant porta-pottie per 32 acres for two months  
<sup>6</sup> MACMA price (\$0.81) x 200 lbs  
<sup>7</sup> Assumes 9.0% interest rate on operating loan; housing & cart costs backed out





Table 19. Years 5 Through 12 Costs and Returns (Per Year)

ASPARAGUS SPEARS, CUTS AND TIPS, AND FRESH MARKET: YEARS 5 TO 12

	Quantity	Unit	\$/Unit	\$/Acre
<b>REVENUES</b>				
Spears <sup>1</sup>	715	lb	\$0.871	\$622.91
Cuts & tips <sup>1</sup>	1,485	lb	\$0.755	\$1,120.43
Fresh market <sup>2</sup>	3,300	lb	\$0.814	\$2,686.20
<b>TOTAL REVENUE</b>				\$4,429.54
<b>CASH EXPENSES</b>				
Fertilizer				
Soil test	0.033	samples	\$20.00	\$0.66
Limestone	0.5	ton	\$38.00	\$19.00
Limestone application	0.333	times	\$12.00	\$4.00
Urea 46-0-0	125	lb	\$0.388	\$48.50
Potash 0-0-60	240	lb	\$0.382	\$91.68
Am. Sulfate 21-0-0-24S	50	lb	\$0.314	\$15.70
Borate (1# actual boron)	10	lb	\$0.682	\$6.82
Application	2	times	\$8.00	\$16.00
Pre-harvest sprays, burndown, and pre-emergence				
Materials, for both sprays			\$74.45	\$74.45
Application	2	times	\$11.00	\$22.00
Spring fern chop	1	time	\$15.00	\$15.00
Harvest				
Cart investment & maintenance, annual			\$53.47	\$53.47
Cart fuel	2.82	gal	\$3.40	\$9.59
Trucking to receiver <sup>3</sup>	2.5	trips	\$41.03	\$102.58
Picking labor <sup>4</sup>	5,500	lb	\$0.35	\$1,925.00
Worker housing	5,500	lb	\$0.015	\$82.50
Porta-potties <sup>5</sup>				\$3.75
Beetle spray - materials			\$19.24	\$19.24
Beetle sprays - application	1	time	\$11.00	\$11.00



Table 19, continued

Post-harvest chopping and spray				
Fern chop	1	time	\$15.00	\$15.00
Materials - post-harvest spray			\$68.24	\$68.24
Spray application	1	time	\$11.00	\$11.00
Fern sprays				
Materials, for all 5 sprays			\$120.23	\$120.23
Application	5	times	\$11.00	\$55.00
Fall cover crop				
Rye seed	2	bu	\$9.00	\$18.00
Rye spreading	1	time	\$8.00	\$8.00
Fall fern chop	1	time	\$15.00	\$15.00
Land rent <sup>6</sup>				\$162.00
Interest on operating costs for four months <sup>7</sup>				\$83.93
Management & supervision	7.0	hr	\$40.00	\$280.00
<b>TOTAL EXPENSES</b>				<b>\$3,357.33</b>

<sup>1</sup> Tailgate (Net of revenue minus \$0.015/lb MAAB assessment)  
<sup>2</sup> Tailgate (Net of revenue minus \$0.015/lb MAAB assessment)  
<sup>3</sup> Includes some allocation for trips to home farm to consolidate loads, etc.  
<sup>4</sup> Piece rate plus estimated makeup needed  
<sup>5</sup> Assumes one GAP compliant porta-pottie per 32 acres for two months  
<sup>6</sup> MACMA price (\$0.81) x 200 lbs  
<sup>7</sup> Assumes 9.0% interest rate on operating loan; housing & cart costs backed out

**Table 20.** Year 13 Costs and Returns**ASPARAGUS SPEARS, CUTS AND TIPS, AND FRESH MARKET:  
YEAR 13**

	<b>Quantity</b>	<b>Unit</b>	<b>\$/Unit</b>	<b>\$/Acre</b>
<b>REVENUES</b>				
Spears <sup>1</sup>	552	lb	\$0.871	\$480.90
Cuts & tips <sup>1</sup>	1,148	lb	\$0.755	\$866.17
Fresh market <sup>2</sup>	2,550	lb	\$0.814	\$2,075.70
<b>TOTAL REVENUE</b>				<b>\$3,422.77</b>
<b>CASH EXPENSES</b>				
Fertilizer				
Soil test	0.033	samples	\$20.00	\$0.66
Limestone	0.5	ton	\$38.00	\$19.00
Limestone application	0.333	times	\$12.00	\$4.00
Urea 46-0-0	125	lb	\$0.388	\$48.50
Potash 0-0-60	240	lb	\$0.382	\$91.68
Am. Sulfate 21-0-0-24S	50	lb	\$0.314	\$15.70
Borate (1# actual boron)	10	lb	\$0.682	\$6.82
Application	2	times	\$8.00	\$16.00
Pre-harvest sprays, burndown, and pre-emergence				
Materials, for both sprays			\$74.45	\$74.45
Application	2	times	\$11.00	\$22.00
Spring fern chop	1	time	\$15.00	\$15.00
Harvest				
Cart investment & maintenance, annual			\$53.47	\$53.47
Cart fuel	2.82	gal	\$3.40	\$9.59
Trucking to receiver <sup>3</sup>	2.5	trips	\$41.03	\$102.58
Picking labor <sup>4</sup>	4,250	lb	\$0.35	\$1,487.50
Worker housing	4,250	lb	\$0.015	\$63.75
Porta-potties <sup>5</sup>				\$3.75
Beetle spray - materials			\$19.24	\$19.24
Beetle sprays - application	1	time	\$11.00	\$11.00



Table 20, continued

Post-harvest chopping and spray				
Fern chop	1	time	\$15.00	\$15.00
Materials - post-harvest spray			\$68.24	\$68.24
Spray application	1	time	\$11.00	\$11.00
Fern sprays				
Materials, for all 5 sprays			\$120.23	\$120.23
Application	5	times	\$11.00	\$55.00
Fall cover crop				
Rye seed	2	bu	\$9.00	\$18.00
Rye spreading	1	time	\$8.00	\$8.00
Fall fern chop	1	time	\$15.00	\$15.00
Land rent <sup>6</sup>				\$162.00
Interest on operating costs for four months <sup>7</sup>				\$70.38
Management & supervision	7.0	hr	\$40.00	\$280.00
<b>TOTAL EXPENSES</b>				<b>\$2,887.53</b>

<sup>1</sup> Tailgate (Net of revenue minus \$0.015/lb MAAB assessment)  
<sup>2</sup> Tailgate (Net of revenue minus \$0.015/lb MAAB assessment)  
<sup>3</sup> Includes some allocation for trips to home farm to consolidate loads, etc.  
<sup>4</sup> Piece rate plus estimated makeup needed  
<sup>5</sup> Assumes one GAP compliant porta-pottie per 32 acres for two months  
<sup>6</sup> MACMA price (\$0.81) x 200 lbs  
<sup>7</sup> Assumes 9.0% interest rate on operating loan; housing & cart costs backed out



**Table 21. Year 14 Costs and Returns**

**ASPARAGUS SPEARS, CUTS AND TIPS, AND FRESH MARKET:  
YEAR 14**

	Quantity	Unit	\$/Unit	\$/Acre
<b>REVENUES</b>				
Spears <sup>1</sup>	455	lb	\$0.871	\$396.40
Cuts & tips <sup>1</sup>	945	lb	\$0.755	\$713.00
Fresh market <sup>2</sup>	2,100	lb	\$0.814	\$1,709.40
<b>TOTAL REVENUE</b>				<b>\$2,818.80</b>
<b>CASH EXPENSES</b>				
Fertilizer				
Soil test	0.033	samples	\$20.00	\$0.66
Limestone	0.5	ton	\$38.00	\$19.00
Limestone application	0.333	times	\$12.00	\$4.00
Urea 46-0-0	125	lb	\$0.388	\$48.50
Potash 0-0-60	240	lb	\$0.382	\$91.68
Am. Sulfate 21-0-0-24S	50	lb	\$0.314	\$15.70
Borate (1# actual boron)	10	lb	\$0.682	\$6.82
Application	2	times	\$8.00	\$16.00
Pre-harvest sprays, burndown, and pre-emergence				
Materials, for both sprays			\$74.45	\$74.45
Application	2	times	\$11.00	\$22.00
Spring fern chop	1	time	\$15.00	\$15.00
Harvest				
Cart investment & maintenance, annual			\$53.47	\$53.47
Cart fuel	2.82	gal	\$3.40	\$9.59
Trucking to receiver <sup>3</sup>	2.5	trips	\$41.03	\$102.58
Picking labor <sup>4</sup>	3,500	lb	\$0.35	\$1,225.00
Worker housing	3,500	lb	\$0.015	\$52.50
Porta-potties <sup>5</sup>				\$3.75
Beetle spray - materials			\$19.24	\$19.24
Beetle sprays - application	1	time	\$11.00	\$11.00



Table 21, continued

Post-harvest chopping and spray				
Fern chop	1	time	\$15.00	\$15.00
Materials - post-harvest spray			\$68.24	\$68.24
Spray application	1	time	\$11.00	\$11.00
Fern sprays				
Materials, for all 5 sprays			\$120.23	\$120.23
Application	5	times	\$11.00	\$55.00
Fall cover crop				
Rye seed	2	bu	\$9.00	\$18.00
Rye spreading	1	time	\$8.00	\$8.00
Fall fern chop	1	time	\$15.00	\$15.00
Land rent <sup>6</sup>				\$162.00
Interest on operating costs for four months <sup>7</sup>				\$62.25
Management & supervision	7.0	hr	\$40.00	\$280.00
<b>TOTAL EXPENSES</b>				<b>\$2,605.64</b>

<sup>1</sup> Tailgate (Net of revenue minus \$0.015/lb MAAB assessment)  
<sup>2</sup> Tailgate (Net of revenue minus \$0.015/lb MAAB assessment)  
<sup>3</sup> Includes some allocation for trips to home farm to consolidate loads, etc.  
<sup>4</sup> Piece rate plus estimated makeup needed  
<sup>5</sup> Assumes one GAP compliant porta-pottie per 32 acres for two months  
<sup>6</sup> MACMA price (\$0.81) x 200 lbs  
<sup>7</sup> Assumes 9.0% interest rate on operating loan; housing & cart costs backed out



Table 22. Year 1 Spray Program

Year 1 Spray Program		
Spray type	Material, Rate/acre	Cost/acre
Post-planting herbicide 1	Lorax, 1 lb	\$32.78
	<b>TOTAL post-planting herbicides</b>	
		<b>\$32.78</b>
Fern sprays 1,3, & 5**	Bravo, 1 qt	\$8.48
	Carbaryl, 1 qt	\$19.24
	<b>Per spray subtotal</b>	
	<b>\$27.72</b>	
Fern sprays 2 & 4	Bravo, 1 qt	\$8.48
	Onset, 6 oz	\$4.72
	<b>Per spray subtotal</b>	
	<b>\$13.21</b>	
<b>TOTAL Fern spays (all five)</b>		<b>\$109.58</b>

Table 23. Year 2 Spray Program

Year 2 Spray Program		
Spray type	Material, Rate/acre	Cost/acre
Herbicide	Prowl, 3 qt	\$38.51
	Dual Magnum, 24 oz	\$14.85
	Karmex, 1 lb	\$6.06
	Glyphosphate, 1 qt	\$8.93
	<b>TOTAL Herbicide</b>	
		<b>\$68.35</b>
Fern sprays 1,3, & 5**	Bravo, 1 qt	\$8.48
	Carbaryl, 1 qt	\$19.24
	Permethrin, 4 oz	\$2.13
	<b>Per spray subtotal</b>	
	<b>\$29.85</b>	
Fern sprays 2 & 4	Bravo, 1 qt	\$8.48
	Onset, 6 oz	\$4.72
	Permethrin, 4 oz	\$2.13
	<b>Per spray subtotal</b>	
	<b>\$15.34</b>	
Fern spray 6	Bravo, 1 qt	\$8.48
	<b>Per spray subtotal</b>	
		<b>\$8.48</b>
<b>TOTAL Fern spays (all six)</b>		<b>\$128.72</b>



**Table 24. Years 3 to 14 Spray Program**

<b>Years 3-14 Spray Program</b>		
<b>Spray type</b>	<b>Material, Rate/acre</b>	<b>Cost/acre</b>
Pre-harvest rye burn down		
	Glyphosphate, 1 qt	\$8.93
	2,4 D, 1.5 qt	\$12.23
	Brimstone, 1qt/100 gal*	\$5.83
	Crosshair, 4 oz/acre	\$1.81
Pre-harvest hold down		
	Prowl, 2 qt	\$25.68
	Tricor, 1 lb	\$15.97
	Efficax, 8 oz	\$4.00
<b>TOTAL Pre-harvest sprays</b>		<b>\$74.45</b>
Beetle spray, harvest time		
	Carbaryl, 1 qt	\$19.24
<b>TOTAL Beetle sprays</b>		<b>\$19.24</b>
Post-harvest shutdown		
	Karmex, 2 lb	\$12.11
	Tricor, .67 lb	\$10.64
	Dual Magnum, 30 oz	\$18.56
	Glyphosphate, 1 qt	\$8.93
	2,4 D, 1 qt	\$8.16
	Efficax, 8 oz	\$4.00
	Brimstone, 1qt/100 gal*	\$5.83
<b>TOTAL Shutdown spray</b>		<b>\$68.24</b>
Fern sprays 1,3, & 5**		
	Bravo, 1 qt	\$8.48
	Carbaryl, 1 qt	\$19.24
	Permethrin, 4 oz	\$2.13
	<b>Per spray subtotal</b>	<b>\$29.85</b>
Fern sprays 2 & 4		
	Bravo, 1 qt	\$8.48
	Onset, 6 oz	\$4.72
	Permethrin, 4 oz	\$2.13
	<b>Per spray subtotal</b>	<b>\$15.34</b>
<b>TOTAL Fern sprays (all five)</b>		<b>\$120.23</b>
* Figured using 15 gal/acre		
** An alternative program being recommended is azoxystrobin, tebuconazole, permethrin, and carbaryl for sprays 1,3, and 5, and Bravo, carbaryl, and permethrin for sprays 2 and 4. Depending on rate and manufacturer of azoxystrobin used, this would add about \$50 to the fern spray program for the year (Hausbeck & Spafford, 2022).		