Staff Paper

Cost of Asparagus Production in Western Michigan

by

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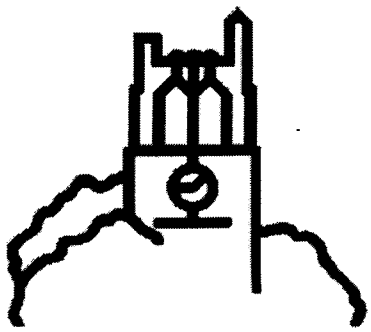
Staff Paper 2002-42 November, 2002



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Cost of Asparagus Production in Western Michigan

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Abstract

This bulletin was developed to help producers as well as educators and agribusinesses working with producers to estimate costs of production and expected profit based on "typical" asparagus management strategies found in northwestern Michigan. The budget included in this bulletin will allow users to revise inputs based on their management strategies and calculate their expected cost and profit. This flexibility provides a decision aid to search for systems that generate higher net returns to the farm's resource base.

The brief outline of cultural and pest management practices included in this publication should be supplemented with publications from Michigan State University or from other Universities. See the References section for resources. Many are available on-line.

15 pages

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Barbara Dartt, Norm Myers, Roy Black, John Bakker[1]

This bulletin was developed to help producers as well as educators and agribusinesses working with producers to estimate costs of production and expected profit based on "typical" asparagus management strategies found in northwestern Michigan. The budget included in this bulletin will allow users to revise inputs based on their management strategies and calculate their expected cost and profit. This flexibility provides a decision aid to search for systems that generate higher net returns to the farm's resource base.

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Asparagus Production

About 85% of Michigan's asparagus is currently sold for processing (2). Asparagus is a perennial with a life cycle of up to 15 years of harvest from the initial planting. The varieties most frequently planted in Michigan are male hybrids, especially Jersey Giant and Jersey Knight, which have high yields and disease tolerance. The quality of the harvest is dependant on good crown establishment and on-going management. Pest control and cultural management of asparagus requires good judgment and careful crop monitoring. Management decisions not only affect crop harvest for the current year, but for subsequent harvest seasons.

Proper soil preparation can extend the asparagus harvest, maximize the longevity of the plant production and reduce the rate of disease and insect problems. In addition, selecting healthy crowns of an appropriate variety for the soil type and location is important to assure good yields. In recent years, all-male hybrid varieties, especially Jersey Giant and Jersey Knight, have replaced open pollinated varieties in Michigan. The crop is typically harvested from April through the end of June. Following harvest, there is minimal management of the crop as it continues to grow and produce new roots and branches.

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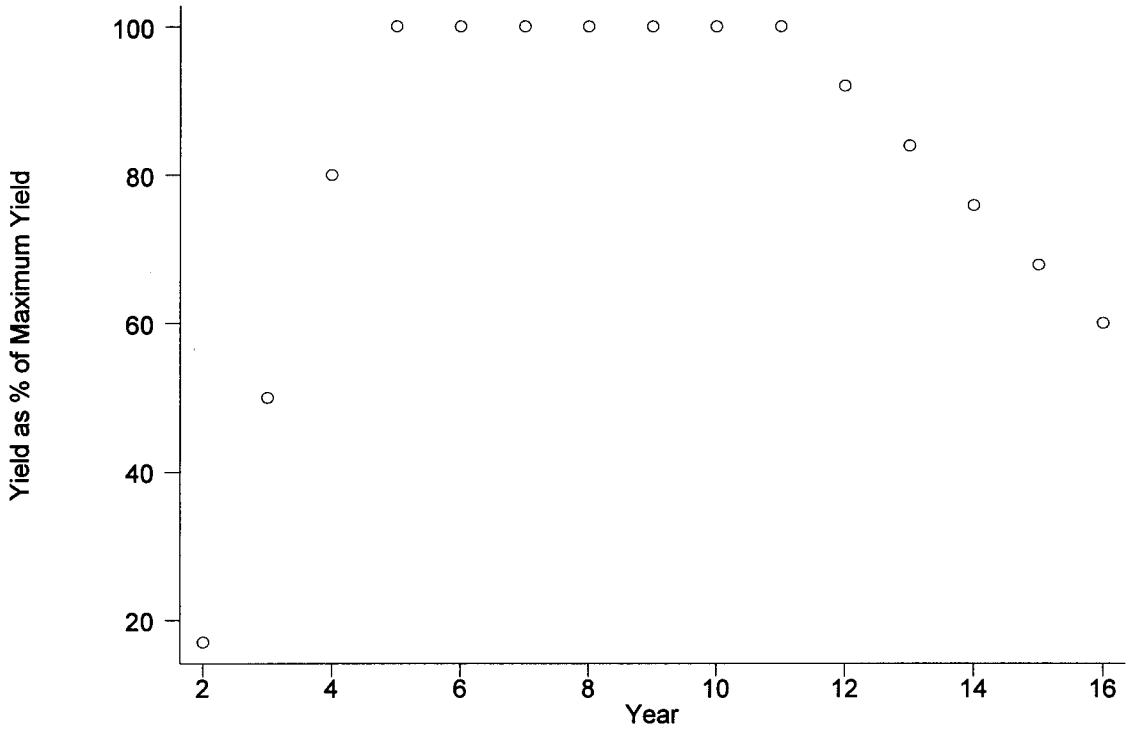
Approach To Calculating Cost

The information on asparagus cost structure and yields was developed with a focus group of Michigan growers with a good knowledge of the industry and good field, enterprise, and financial records. The process was initiated by defining an asparagus production system and strategic planning context representative of production northwestern Michigan. Subsequently, both the sequence of decisions and the information necessary to make these key decisions was collected. Decisions covered the course of the multiyear production cycle as well as individual years within this production cycle. This process resulted in a list of inputs and input prices that were then translated into costs, which were verified against grower records.

Yield trajectories across the multiyear asparagus production cycle were drawn largely from experimental data at the Michigan State University research station located in Oceana County. The lifespan of asparagus depends upon a number of economic and biological factors; however, 15 years is a good approximation. Thus, the economic life was broken into four periods for purposes of component budgeting: (1) site preparation and establishment; (2) years one though three as production increases; (3) mature production during peak years; and (4) declining years of 11 to 15. Budgets were developed for each of these phases and are included in the section on budgets. Figure 1 depicts yields, relative to the peak production years, across the asparagus life cycle used in the life-cycle economic analysis.



The lifecycle economic analysis converts all revenues and costs into an *annual equivalent average* to facilitate comparisons with other enterprises on an annual basis. Thus, data collection had to facilitate estimation of cash requirements and net cash flow at any point in the production cycle as well as a method for standardizing the results to an annual equivalent basis. The concept is analogous to a loan with equal annual payments; in both instances, we are converting irregular cash flows into an annual average.

Annual Costs of Capital Services (Buildings, Machinery, and Equipment)

Estimating the annual cost of using buildings, machinery, equipment and other assets is a challenge in cost of production studies. In previous Michigan studies of horticultural crops, focus groups constructed a representative farm with fixed acreage and then constructed the buildings, machinery, and equipment needed to operate this farm. They also generated associated labor needs and the repair and operating costs. This approach has the advantage of being very tangible but also makes it difficult to interpret results for alternative farm sizes.

In this study, an alternative approach was taken. Buildings, machinery and services were priced to the enterprise on a "custom" basis. That is, we assumed the farm business priced these services to the crop enterprise. Further, services such as land preparation were priced to the enterprise as a "bundled" service/task reflecting both the machinery and labor components of the service.

This approach requires some judgment because costs such as buildings to house machinery and equipment, the farm shop, and labor used in maintenance of machinery and equipment must be included in the "custom charge" as well as the depreciation and interest on the machinery and equipment. The fact that this custom charge approach was used does not imply that custom operators did all the tasks. The services may well have been provided by the "machinery services enterprise" of the farm. As a double check, members of the focus group attempted to compare the aggregate custom fee costs to those based on their accounting records which included labor, custom fees, and depreciation and interest on buildings, machinery, and equipment. Custom charges were double-checked against survey information when available.

Site Selection & Planting

Choosing an appropriate and well-prepared site to plant asparagus is important as the plants may grow up to 15 years in this location. Soil type should be a sandy to sandy-loam containing residual organic matter. Composted manure may be added to amend the site prior to planting. Overall, the soil should be prepared a year prior to planting the crowns by growing a green manure such as wheat, oats, Sudan grass or clover. In this paper, this pre-planting year of preparation is designated as Year 0. See Table 1 for a description of the years of asparagus stand life. In the fall of Year 0, the cover crop should be cut and incorporated into the soil.

In Year 1, prior to planting asparagus crowns, soil should be amended with adequate fertilizer or manure. A soil test should be conducted to prevent over-fertilization. The ideal soil pH is 7.0. Asparagus will not thrive if soil pH is lower than 6.0 or higher than 7.5. Soil pH below 6.0 increases the risk of *Fusarium* crown rot. Over the years, soil pH may become more acidic due to continual addition of nitrogen, so lime should be added to maintain a soil pH near 7.0.

Following soil preparation, plant 12,000-14,000 crowns per acre at a depth of 8 inches to avoid winter frost injury.

Table 1. Asparagus lifecycle used in the accompanying budgets.

Year	Definition	Number of Pickings	Harvest Percent of Typical Full Bearing Year
0	Build-up soil before planting*	0	0
1	Planting year*	0	0
2	Year after planting*	3	17%
3	Increasing production	8-12	50%
4	Increasing production	15-20	80%
5-11	Full bearing years*	20-30	100%
12-15	Declining production	15-20	60-90%
16	Last year of stand	8-12	60%

* These years are represented in accompanying budgets.

Pest Management

When seeking advice on use of labeled pesticides (including herbicides), please refer to the most current versions of Michigan State University Extension Bulletins titled "Insect, Disease and Nematode Control for Commercial Vegetables" (Extension Bulletin E-312) and "Weed Control Guide for Vegetable Crops" (Extension Bulletin E-433). They are available on-line at http://www.msue.msu.edu/pestpubs/E312/ and http://www.msue.msu.edu/vegetable/weeds.htm *respectively. Specific herbicide and pesticide names have been used in this publication to facilitate accurate budgeting. Michigan State University does not endorse any of the brand name products listed and does not direct producers to limit management systems to these products.*

Sources provided at the end of this introduction could be used to help identify common asparagus pests.

Weed control is essential for successful crown production. This can be achieved by using a combined system of crop rotation, pre- and post- harvest cultivations, herbicides, and straw mulch.

Insect pests of asparagus include cutworms, common asparagus beetles, spotted asparagus beetles, tarnished plant bug, and asparagus aphid. A selection of insecticides is indicated in the budget to control these insects. Always check that pesticides are currently registered for asparagus.

Diseases of asparagus include Rust, Purple Spot, and Crown Rot. Having a good crop rotation system, selecting soil with good water and air drainage and using disease resistant varieties can reduce disease pressure. There are registered pesticides that provide adequate control of Rust and Purple spot. Crown rot is controlled primarily through selection of healthy crowns. If Fusarium Crown Rot (*Fusarium monilinform)* infects asparagus, corn should not follow in rotation due to its susceptibility to *F. monilinform* (1).

Harvest, Storage and Marketing

To maximize stand longevity, harvest should not begin until Year 2 and include only 2-3 pickings. Years 3-4 provide between 8 and 20 pickings. Maximum harvest of asparagus is typically achieved by Year 5 and continues through Year 11. Spears should be harvested at 7.5 inches in height and a diameter of 5/16 of an inch. Once the spears are harvested, they should be kept in the shade or chilled to remove field heat as soon as possible. Cooling extends shelf life and maintains appearance. Asparagus intended for use in processing is dumped into bulk boxes directly in the field and hauled to a receiving station or processing plant at the end of the day's harvest where it is chilled to maintain freshness.

The price for processing asparagus for each season is decided by the Michigan Agricultural Cooperative Marketing Association (MACMA). On behalf of asparagus growers, they collectively bargain with processors for a price each season. Following negotiation the price is typically set for the season. Some fresh market asparagus is grown in Michigan and sold as wholesale, retail and u-pick.

Cost of Production Budgets:

Budgets are presented for the build-up year, the establishment year, the year following planting, and years 5 through 11. A portion of harvest costs is treated as proportional to yield. This may understate costs when yields per harvest are low.

The Life Cycle economics section builds upon these results to calculate the asparagus price that would be required to cover all costs over the life cycle of the investment. Special treatment is required because the net cash flow stream varies in each year over the course of the life cycle, starting out significantly negative in the early years, becoming positive as the crop approach the peak production years, and then tapering off again.

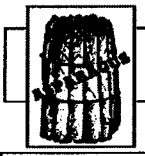
Table 1. Costs for Build-Up Year

Asparagus, Processing Spears Build-up Year (Year 0)	Quantity	Unit	Price per Unit	Amount	Your farm
EXPENSES					
Seed[1]	1.25	lb	$435.00	$543.75	
Limestone	2	ton	$20.00	$40.00	
Spring Cover Crop					
Soil prep				$15.00	
Sorghum seed				$10.00	
Drilling cost				$5.00	
Nitrogen	80	lb	$0.30	$24.00	
Flail chopping				$10.00	
Plowing under				$17.00	
Discing	2	times	$10.00	$20.00	
Fall Cover Crop					
Rye seed				$6.00	
Drilling cost				$5.00	
Herbicide[2]				$10.00	
Herbicide application				$6.00	
Land Rent				$30.00	
Interest on Operating Costs for the Year			8%	$61.34	
Management & Supervision Labor				$25.00	
TOTAL EXPENSE				**$828.09**	

1 Assumes that 1.5 lb of seed per acre of Jersey Giant sent to custom grower for crown rearing.

2 Includes 1 fall application of Round-up to burn down rye.

Table 2. Costs for Planting Year (Year 1)



Asparagus, Processing Spears

Planting Year (Year 1)

	Quantity	Unit	Price per Unit	Amount	Your Farm
EXPENSES					
Furrowing				$40.00	
Fertilizer					
Nitrogen	61	lb	$0.30	$18.23	
Phosphorus	69	lb	$0.29	$20.01	
Potassium	150	lb	$0.13	$19.50	
Fertilizer delivery and application				$6.00	
Crowns	15	1,000 crowns	$37.00	$555.00	
Box rental & storage	15	1,000 crowns	$3.00	$45.00	
Planting Labor[1]				$120.00	
Planting Charge - Machinery[2]				$40.00	
Covering crowns	2	times	$7.50	$15.00	
Herbicide					
Materials[3]	3	times	$14.00	$42.00	
Application	3	times	$10.00	$30.00	
Insecticide & Fungicide					
Materials[4]	5	times	$11.00	$55.00	
Application	5	times	$10.00	$50.00	
Cultivation	2	times	$7.50	$15.00	
Hand Weeding Labor[5]	1.5	times	$48.00	$72.00	
Fall Cover Crop					
Oat seed				$6.00	
Spreading cost				$5.00	
Cultivation				$7.50	
Scouting Fee				$15.00	
Land Rent				$125.00	
Interest on Operating Costs for the Year			8%	$112.10	
Management & Supervision Labor[6]				$100.00	
TOTAL EXPENSE				**$1,513.33**	

1 Includes migrant labor and benefits.

2 Includes crown delivery, forklift for unloading crowns, and tractor and wagons to take crowns to field.

3 Includes applications of Lorox, Roundup and Post

4 Includes applications of Sevin XLR, Ambush, Dithane and Bravo.

5 Assumes approximately 8 hours total of hoeing.

6 Assumes approximately 5 hours of labor at $20 per hour.

Table 3. Costs for Year After Planting (Year 2)

Asparagus, Processing Spears
Year After Planting (Year 2)

	Quantity	Unit	Price per Unit	Amount	Your farm
REVENUES					
Asparagus spears[1]	_____	lb	$_____	$_____	
TOTAL REVENUE				$_____	
EXPENSES					
Discing	1	time	$10.00	$10.00	
Leveling	1.5	times	$7.50	$11.25	
Fertilizer					
Nitrogen	38	lb	$0.30	$11.48	
Potassium	72	lb	$0.13	$9.36	
Boron	0.7	lb	$2.25	$1.58	
Sulfur	5	lb	$0.17	$0.85	
Fertilizer blending, delivery & application				$6.00	
Herbicide					
Materials[2]	1	time	$51.55	$51.55	
Application	1	time	$10.00	$10.00	
Insecticide & Fungicide					
Materials[3]	6	times	$13.72	$82.33	
Application	6	times	$10.00	$60.00	
Harvest					
Cart Investment & Maintenance				$50.00	
Fuel	3	times	$0.32	$0.96	
Labor[4]	700	lb	$0.25	$175.00	
Fern Chop				$5.00	
Fall Cover Crop					
Rye seed				$6.00	
Drilling cost				$10.00	
Scouting Fee				$15.00	
Land Rent				$50.00	
Interest on Operating Costs for 4 Months			8%	$16.52	
Management & Supervision Labor[5]				$53.00	
TOTAL EXPENSE				**$635.87**	
RETURN OVER TOTAL EXPENSE					

1 Price received is net of Michigan Agricultural Commodity Marketing Association (MACMA) dues (2% of asparagus revenue) and promotion and research funds paid as required by MI PA 232 ($0.0125 per pound).

2 Includes applications of Solicam, Roundup and Karmex.

3 Includes applications of Lorsban, Sevin XLR, Ambush, Bravo and Dithane.

4 Includes charges for wages, social security, worker's compensation, unemployment, housing and delivery to receiving station.

5 Assumes approximately 100 hours per week for 8 weeks (spread over 300 acres) at $20 per hour.

Table 4. Costs or Years 5 - 11

Asparagus, Processing Spears

Full Bearing Year (Years 5 - 11)

	Quantity	Unit	Price per Unit	Amount	Your Farm
REVENUES					
Asparagus spears[1]	$ _____	lb	$ _____	$ _____	
TOTAL REVENUE				**$1,250.00**	
EXPENSES					
Fern Chop				$5.00	
Fertilizer					
Nitrogen	36	lb	$0.30	$10.80	
Potassium	108	lb	$0.13	$14.04	
Boron	0.7	lb	$2.25	$1.58	
Lime[2]	0.25	ton	$20.00	$5.00	
Fertilizer blending, delivery & application				$12.00	
Herbicide					
Materials[3]	2	times	$24.88	$49.75	
Application	2	times	$10.00	$20.00	
Insecticide & Fungicide					
Materials[4]	6	times	$10.73	$64.36	
Application	6	times	$10.00	$60.00	
Harvest					
Cart Investment & Maintenance				$50.00	
Fuel	24	times	$0.32	$7.68	
Labor[5]	2,500	lb	$0.25	$625.00	
Fern Chop				$5.00	
Scouting Fee				$15.00	
Land Rent				$125.00	
Interest on Operating Costs for 4 Months			8%	$32.54	
Management & Supervision Labor[6]				$150.00	
TOTAL EXPENSE				**$1,252.75**	
RETURN OVER TOTAL EXPENSE					

1 Price received is net of Michigan Agricultural Commodity Marketing Association (MACMA) dues (2% of asparagus revenue) and promotion and research funds paid as required by MI PA 232 ($0.0125 per pound).

2 Assumes 2,000 lbs applied every fourth year.

3 Includes applications of Roundup, Sencor, Karmex, Gramoxone and 2, 4-D.

4 Includes applications of Lorsban, Sevin 80S, Sevin XLR, Ambush, Bravo and Dithane.

5 Includes charges for wages, social security, worker's compensation, unemployment, housing and delivery to receiving station.

6 Assumes approximately 7.5 hours per acre for the season @ $20 per hour.

Life Cycle Costing

Procedures to budget the economics of perennial crops, like asparagus, are more complicated than those used for annual crops like corn. For perennials, life-cycle economic analysis procedures are needed to transform the uneven streams of net cash flows over the life cycle of a stand to an "annualized" basis so we have a common reference point for comparison. This permits information relative to a number of questions. Examples include:

1) What is the expected average net return per year to investment in a stand?
2) What is the expected average annual net return under alternative management strategies (many strategies have different stand life and/or different patterns of net cash flow over the life of the stand)?
3) When should I replace a stand if stand replacement is appropriate?
4) Comparison to other crops that could be planted?

The steps in the life cycle cost analysis are as follows:

1) What is a dollar received in the future worth today? Take the net cash flows (NCF) in each year and "discount" them back to the present. For example, a dollar received 10 years from now is worth 1/(1 + discount rate)^10. If the discount rate were 8%, that would be $0.463.
2) Sum the discounted NCF's to get the cumulative earnings in today's dollars over the asparagus life cycle (cumulative NCF).
3) Convert the cumulative sum to an average annual equivalent. This is equivalent to calculating the payment on an equal annual payment loan. A zero value means all costs have been paid; the price received is just large enough to cover all costs over the entire life cycle.

Table 5 gives an example based upon the cost budget information provided in tables 1 – 4, 2,500 lbs peak production, and an 8% annual discount rate. The life-cycle break-even price is $0.66/lb.

Table 5. Annualized Average Net Cash Flow Over Asparagus Life Cycle for 2,500 lb peak yield

Yield during years 5 to 10	2,500 lbs/acre
Price	$0.66 /lb
Cost (exclusive of harvest labor):	
Year of build-up	$828.09 /acre
Year 1	$1,513.33 /acre
Years 2-5, 11-16	$460.87 /acre
Years 5 to 10	$627.75 /acre
Harvest labor	$0.25 /lb
Discount rate	0.08

Year	Relative yield	Yield	Revenue	Cash outflow	NCF	Discounted NCF	Cumulative discounted NCF
0	0	0	$0.00	$828.09	-$828.09	-$828.09	-$828.09 /acre
1	0	0	$0.00	$1,513.33	-$1,513.33	-$1,401.23	-$2,229.32 /acre
2	17	425	$280.84	$567.12	-$286.28	-$245.44	-$2,474.76 /acre
3	50	1,250	$826.00	$773.37	$52.63	$41.78	-$2,432.98 /acre
4	80	2,000	$1,321.60	$960.87	$360.73	$265.15	-$2,167.83 /acre
5	100	2,500	$1,652.00	$1,252.75	$399.25	$271.72	-$1,896.11 /acre
6	100	2,500	$1,652.00	$1,252.75	$399.25	$251.60	-$1,644.52 /acre
7	100	2,500	$1,652.00	$1,252.75	$399.25	$232.96	-$1,411.56 /acre
8	100	2,500	$1,652.00	$1,252.75	$399.25	$215.70	-$1,195.85 /acre
9	100	2,500	$1,652.00	$1,252.75	$399.25	$199.72	-$996.13 /acre
10	100	2,500	$1,652.00	$1,252.75	$399.25	$184.93	-$811.20 /acre
11	100	2,500	$1,652.00	$1,085.87	$566.13	$242.80	-$568.40 /acre
12	92	2,300	$1,519.84	$1,035.87	$483.97	$192.19	-$376.21 /acre
13	84	2,100	$1,387.68	$985.87	$401.81	$147.74	-$228.46 /acre
14	76	1,900	$1,255.52	$935.87	$319.65	$108.83	-$119.63 /acre
15	68	1,700	$1,123.36	$885.87	$237.49	$74.87	-$44.77 /acre
16	60	1,500	$991.20	$835.87	$155.33	$45.34	$0.57 /acre
					Annualized average NCF		**$0.06** /acre

In Table 6, annual peak production is set at 4,100 lbs. The other assumptions remain unchanged. The life-cycle break-even price is $0.50 / lb.

Table 6. Annualized Average Net Cash Flow Over Asparagus Life Cycle for 4,100 lb peak yield

Yield during years 5 to 10	4,110	lbs/acre
Price	$0.50	/lb
Cost (exclusive of harvest labor):		
Year of build-up	$828.09	/acre
Year 1	$1,513.33	/acre
Years 2-5, 11-16	$460.87	/acre
Years 5 to 10	$627.75	/acre
Harvest labor	$0.25	/lb
Discount rate	0.08	

Year	Relative yield	Yield	Revenue	Cash outflow	NCF	Discounted NCF	Cumulative discounted NCF
0	0	0	$0.00	$828.09	-$828.09	-$828.09	-$828.09 /acre
1	0	0	$0.00	$1,513.33	-$1,513.33	-$1,401.23	-$2,229.32 /acre
2	17	699	$349.35	$635.55	-$286.20	-$245.37	-$2,474.69 /acre
3	50	2,055	$1,027.50	$974.62	$52.88	$41.98	-$2,432.71 /acre
4	80	3,288	$1,644.00	$1,282.87	$361.13	$265.44	-$2,167.27 /acre
5	100	4,110	$2,055.00	$1,655.25	$399.75	$272.06	-$1,895.21 /acre
6	100	4,110	$2,055.00	$1,655.25	$399.75	$251.91	-$1,643.29 /acre
7	100	4,110	$2,055.00	$1,655.25	$399.75	$233.25	-$1,410.04 /acre
8	100	4,110	$2,055.00	$1,655.25	$399.75	$215.97	-$1,194.07 /acre
9	100	4,110	$2,055.00	$1,655.25	$399.75	$199.97	-$994.10 /acre
10	100	4,110	$2,055.00	$1,655.25	$399.75	$185.16	-$808.94 /acre
11	100	4,110	$2,055.00	$1,488.37	$566.63	$243.02	-$565.92 /acre
12	92	3,781	$1,890.60	$1,406.17	$484.43	$192.37	-$373.54 /acre
13	84	3,452	$1,726.20	$1,323.97	$402.23	$147.90	-$225.65 /acre
14	76	3,124	$1,561.80	$1,241.77	$320.03	$108.96	-$116.69 /acre
15	68	2,795	$1,397.40	$1,159.57	$237.83	$74.97	-$41.71 /acre
16	60	2,466	$1,233.00	$1,077.37	$155.63	$45.43	$3.71 /acre
					Annualized average NCF		**$0.42** /acre

Table 7 gives the life-cycle break-even price for alternative levels of peak asparagus production. The assumptions are the same as those used in Tables 5 and 6. Note, these are *full cost* budgets including land rent.

Table 7. Life cycle break-even price For Alternative Levels of Peak Production

Peak yield (lbs/acre)	Life-cycle break-even price ($/lb)
2500	$0.660
3000	$0.592
3500	$0.543
4000	$0.507

If a grower cannot cover life-cycle break-even costs that does not mean that the grower should get out of the asparagus enterprise. If the enterprise has been established, they should continue to produce as long as they are making a net contribution to whatever resources are fixed (NRTF) to the asparagus production and marketing system (e.g., land). That is, if the grower is covering the variable costs outlined in Table 4 (or, Table 3 as production begins to fall) they should continue to produce as long as NRTF exceeds the comparable earnings for an alternative use of the resources. However, if a grower is considering investing in asparagus production, these are the life-cycle break-even prices required to cover the *system outlined* under the *cost of production estimates* developed by the focus group.

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