

Evaluating the Profitability of Blueberry Production

By

Charles D. Safley¹

William O. Cline²

Charles M. Mainland³

¹ Professor, Department of Agricultural and Resource Economics, North Carolina State University, Raleigh, NC 27695-8109

² Researcher/Extension Specialist, Department of Plant Pathology, Horticultural Crops Research Station, North Carolina State University, 3800 Castle Hayne Rd. Castle Hayne, NC 28429

³ Emeritus Professor, Department of Horticultural Science, Horticultural Crops Research Station, North Carolina State University, 3800 Castle Hayne Rd. Castle Hayne, NC 28429

Current and potential blueberry growers need production, marketing, and financial information to make informed decisions about starting, expanding, or leaving their existing operations. Like all business owners, their main objective should be to make a profit so their farms will be financially successful. Ideally, growers should keep detailed records that would serve as a reference when estimating their production, harvest, and marketing costs, but this typically does not happen. Therefore, the purpose of this chapter is to provide information about the costs and returns of growing, harvesting, and marketing blueberries for the fresh and process markets. The data and investment analysis are intended to serve as guides to either assist individuals who are considering entering the blueberry industry, or help those who are currently growing blueberries make more informed business management decisions.

Throughout this discussion, a 100-acre blueberry planting will be used as the model. Production practices were defined based on above average management practices recommended by North Carolina State Extension and research specialists, tempered with information from growers about the practices used on real farms. For purposes of this analysis, it was assumed that all the machinery and equipment were purchased new at 2004 purchase prices. A detailed breakdown of the costs associated with owning and operating this machinery and equipment is shown in Appendix Table 1. Input prices were obtained from local dealers who regularly supply blueberry growers and labor was compensated at a rate of \$8.00 per hour. A rental rate of \$40 per acre was charged which reflects the average rental rate for land in southeastern North Carolina. However, since land values vary throughout the county, growers should use a land charge that is representative of current land values in their region.

The harvest season was assumed to last 11 weeks, starting the last week of May and continuing through the first week of August. Marketing obviously bears a cost that varies considerably depending on the marketing system growers decide to use. The revenues and marketing costs presented here were calculated assuming that farmers will try to sell as much as possible in the fresh market, however fresh market opportunities are somewhat limited. It was assumed therefore that 80 percent of berries were sold fresh at \$14.11 per flat⁴ (156.8 cents per pound⁵), 18 percent of the berries were sold for processing at 60 cents per pound and 2 percent of the projected yield was an economic loss.

⁴ Fresh and process prices are the average prices received by growers in 2004 as reported by the North Carolina Agricultural Statistical Service.

Based on grower records, 60 percent of the blueberries intended for the fresh market were harvested by hand at a cost of \$8.29 per flat and 20 percent was harvested by machine at a rate of \$5.67 per flat. These costs included harvest and packing labor; packing charges for sorting, packing and supplies; marketing charges and assessments, and when appropriate, the cost of operating the self-propelled harvester. Berries sold for processing that were harvested by machine accounted for 16.2 percent of the total harvest and cost \$0.39 per pound, while an estimated 1.8 percent of the processed fruit were “fresh rejects” harvested at a cost of \$0.83 per pound. Fresh rejects are hand-harvested fruit that was rejected for fresh sales but is still acceptable for processing. These harvest costs included the cost of labor, marketing charges and assessment, and the cost of operating the harvester as appropriate. The remaining 2 percent of the total harvest that was classified as an economic loss, represents the estimated 10 percent of the machine-harvested fruit that was culled because the berries were either soft, under-ripe, or green,

Blueberry Profitability

When judging the profitability of an enterprise, it is important not only to see how many dollars the enterprise yields but also when the dollars come in and the returns available in other enterprises. There are two principles to consider. First, the sooner a dollar of revenue comes in the sooner it can be used to earn more revenue. Secondly, for any two enterprises of equal risk, the one yielding the higher rate of return is usually preferable. We will look at the flow of funds in the blueberry business to show both profitability and cash position (solvency).

Table 1 shows capital investments, excluding land, by years for establishment and operation of the 100-acre blueberry planting. Purchase of most of the equipment, land preparation and planting occur in the first year. The 220 gallon airblast sprayer and four farm trailers can be delayed until the second year while the truck, two mowers, the packing shed and the equipment for the first packing line can be delayed until the first harvest year. The purchase of the blueberry harvester can be postponed until the fourth year while four additional trailers and the second packing line, the color sorter and pneumatic pruners can be delayed until the fifth and sixth years, respectively. The machinery that is projected to have a useful life less than 20 years (see Appendix Table 1) will require replacement in the thirteenth, fourteenth, sixteenth,

⁵ One flat contains 9 pounds of blueberries.

seventeenth and eighteenth years. Irrigation equipment has an expected useful life of 15 years, requiring replacement in year 16.

Table 2 shows the expected yield pattern over the 20-year life of the planting for various assumptions of soil quality and irrigation. The irrigated planting on good blueberry soil reaches a peak production of 8,000 pounds per acre in the seventh through ninth years or 3,000 pounds per acre higher than a similar planting without irrigation. Peak yields are projected to be lower on marginal soils reaching a maximum yield of 6,000 pounds per acre on an irrigated planting, which is double the yield of a planting without irrigation.

Good highbush blueberry soils in coastal North Carolina are primarily coarse sands with an organic base, open, porous, and with a water table of at least 14 inches but not more than 30 inches below the surface. Most commercial blueberry plantings in eastern North Carolina are growing on either a Lynn Haven or Leon type soil. These sandy soils are characterized by an organic matter content of 2 percent or greater in the surface layer, underlain with a white sand layer above an organic hardpan. The white sandy layer underneath the topsoil, referred to as the A2 horizon is extremely important. Production, vigor, and livability of bushes are much higher in soils where this A2 horizon is present, compared to soils where it is absent.

After subtracting expenses from revenues in each year, the flow-of-funds, or net cash flow, pattern emerges as it appears in Table 3. Farmers establishing new blueberry plantings will experience net outflows of cash during the first three years of establishment. Some fruit is harvested during the third year but not enough to cover the costs of planting maintenance and building construction. The income streams are positive for production on good soil after the third year and after the fourth year on marginal soil. When irrigation is used on marginal soil, the income stream is negative in the sixteenth year when the irrigation equipment is replaced. When irrigation is not used on marginal soil, the income stream is negative in the sixth when the color sorter, the second packing line and pneumatic pruners are purchased and in the thirteen and fourteenth years due to equipment replacement.

The net accumulated cash flows for each production scenario are listed in Table 4. Double-starred figures note the year of payback, that is, the year in which growers finally get their heads above water in terms of cash flow. The payback year or breakeven year is an important consideration in arranging

financing. Farmers must secure loans that cover the period in which the enterprise operates in a deficit cash position. Only during the breakeven year will enough revenues have been generated to cover start-up expenses.

The projected breakeven year for blueberry production on good soil with irrigation was in the eighth year while the breakeven year for production on good soil without irrigation and on marginal soil with irrigation was projected to occur in the ninth and tenth years, respectively. The projected accumulated cash flow for the blueberry planting on marginal soil where no irrigation was used was never positive. It is important to note that this analysis assumes that maximum production was achieved and that the harvested fruit was sold at the average prices every year the planting is in production. Obviously, adverse weather or natural disasters that lower yields or poor market conditions that result in decreased sales will have a negative impact on the net accumulated cash flow stream and could extend the time period needed to reach the breakeven year.

The next step is to compare these streams of net revenues with other opportunities. There are two ways to do this. The first way is to assume that farmers could invest their money elsewhere at a given interest rate, such as 6 percent, and compare the blueberry enterprise with this other investment. The interest rate selected for this analysis should represent the “best” low risk alternative, such as a long-term certificate of deposit, available for off-farm investments. For a single enterprise, the essence of the net present value (NPV) approach is that the project should be accepted if its NPV is greater than zero. This procedure uses the discounting procedure to compare the value of a dollar at the time of the planting decision with a dollar received for blueberries at some future time. Discounting is based on the concept that a dollar received in the future is worth less than a dollar received today. For example, \$1,000 received 10 years from now is worth \$558 received today at a 6 percent interest rate.

Table 5 shows today’s cash equivalent value of applying land and management to blueberries after considering a 6, 7 and 8 percent return to other opportunities. The figures are interpreted in just one way, but the interpretation can be phrased in several ways. At an interest rate of 6 percent, for example: a) A new, 100-acre blueberry stand on good soil with irrigation is worth \$1,127,073 today; b) If a farmer was just about to begin a blueberry business on good soil and irrigation, someone would have to pay him \$1,127,073 to bribe him to forget his plans and c) One could pay up to \$11,271 per acre for good blueberry

soil and still do as well as he could in other investments. On good soil, irrigation can be responsible for over a 200 percent increase in the value of the planting, from \$372,654 to \$1,127,073. On marginal soil, the blueberry enterprise with irrigation yields positive NPV's assuming interest rates of 6 and 7 percent, but a negative NPV at 8 percent. The NPV for the blueberry planting without irrigation was never positive. Under these assumptions, blueberry stands on good soils are winning propositions while a blueberry planting on marginal soil without irrigation is a losing venture.

The second method for financial comparison of the blueberry enterprise with other opportunities is to assume a price for land, calculate the rate of return on the total investment in blueberries and then compare this rate of return with the interest yields on other investments. In this analysis blueberry production was compared to Treasury bonds, which are typically a 20-year low risk investment. Table 6 shows the rates of return to investments in the blueberry enterprise under various soil and irrigation conditions. On good soils, the blueberry business yields a 16.6 percent return with irrigation and an 11.6 percent return without irrigation. With dividends on Treasury bonds currently yielding around 4.85 percent returns, the 16.6 percent return to blueberries looks pretty good. Of course, revenues from blueberries are usually more risky due to price fluctuations and weather conditions, but blueberry production looks profitable on good soil.

On marginal soil, blueberry production with irrigation yields a rate of return of 7.8 percent. After considering the riskiness of blueberry production, the relative risklessness of paper investments and the amount of management time required in blueberry production, this return loses some of its attractiveness. Without irrigation blueberry production on marginal soils yields a negative rate of return. Under our assumptions, Treasury bonds appear to be better investment than a non-irrigated blueberry planting on marginal soil.

Irrigation

Given the fact that a farmer has decided to produce blueberries, he can evaluate the decision whether to irrigate on its own merits. Table 7 shows the results of installing irrigation for the 100-acre plantings. The revenue difference attributable to irrigation in any year is equal to the net revenue obtainable with irrigation less the net revenue obtainable without irrigation. The irrigation system is put in

place the first year at a cost of \$236,090, and the annual fuel use, repairs, labor, taxes and insurance costs amount to \$270.90 per acre. Since no berries are produced during the first two years, only costs appear, making net revenues attributable to irrigation negative. Positive revenue differences accrue to irrigation after the third year for good soil and after the fourth year for marginal soil due to more consistent and higher yields. Net revenue in the sixteenth year is negative again due to the cost of irrigation equipment replacement.

The payback period for irrigation equipment is 7 years on good soil and 8 years marginal blueberry soil. The rates of return on the irrigation investment, having already made the decision to produce blueberries, are 26 percent on good soil and 22 percent on marginal soil. In both cases, these are good returns. One may interpret these results to say that if you have marginal soil and have decided to produce blueberries, you can afford to add an irrigation system as long as interest rates are below 22 percent. This does not guarantee, however, that the \$236,090 cannot be more profitable if it is invested in another enterprise rather than on blueberry production on marginal soil.

Annual Receipts and Maintenance Expenses

Other cost factors growers want to consider when deciding whether to start producing blueberries or to expand an existing operation are the annual receipts and expenses that they will incur. These estimates are typically presented in the form of an enterprise budget. An enterprise budget represents an estimate of the combination of inputs that can achieve a level of output and represents a single point of production. While any production year or level of output could have been selected to show the relationship between the inputs and estimated outputs, the eighth year of production was selected as the representative year because the plantings are assumed to be fully established and in peak production by this year.

The estimated annual receipts and maintenance expenses for blueberry production on good soil and on marginal soil using irrigation are shown in Tables 8 through 10. It is not surprising that harvest costs were projected to be the most expensive cost category, accounting for about 82 percent of the total costs of growing blueberries on good soil and over 77 percent of the production costs on marginal soil. When utilized, irrigation was the second largest cost category comprising 6.5 and 8.1 percent of the total costs for the berries grown on good and marginal soil, respectively. Disease and insect control was the

second most expensive cost category, making up 7.8 percent of the total costs for blueberries cultivated on good soil without the use of irrigation, and was the third largest category when irrigation was used, accounting for 4.9 percent of the costs on good soil and 6.1 percent on marginal soil.

After subtracting the maintenance expenses from the expected receipts, the estimated returns for blueberries produced on good soil using irrigation was \$3,526 per acre, while the returns for blueberries grown on good soil without irrigation was \$2,185 per acre and \$2,314 per acre for berries produced on marginal soil with irrigation. It should be noted that these values represent the projected returns to: a) the owner's managerial ability, b) the overhead cost needed to operate the business, and c) the revenue required to recoup the initial establishment costs.

Conclusions

In summary, three conclusions can be drawn from this analysis. First, blueberry production on the scale of 100-acre plantings using recommended practices can be a profitable venture on good blueberry soil and a losing proposition on marginal soil if irrigation is not used. Second, even though growing blueberries on marginal soil using irrigation appears to be a good investment when the estimated annual returns are examined, cash flow, NPV and IRR analysis reveal that it can be a risky endeavor. Finally, irrigation for frost control and soil moisture pays handsomely. The added revenues from the increased yields make the outlays for the irrigation system a worthwhile investment.

Those considering entering the blueberry business should remember that any budget is only a guide, not a substitute for individuals calculating their own costs and estimating their own breakeven periods. Costs vary from one producer to another because of market conditions, labor supply, age and condition of equipment, managerial skill, input costs, and many other factors. Because every situation is unique, growers should estimate their individual production, marketing, and harvest costs based on their own production techniques, price expectations, and local market situations.

Table 1. Capital Investment by Years to Initiate and Maintain a 100-Acre Blueberry Planting over the Life of the Planting

Year	Item	Estimated Cost	
1	Tractors (2) 70– 80 hp	\$65,000	
	Mower, 5 ft, heavy duty	1,000	
	Fertilizer spreader	1,200	
	Herbicide sprayer, 200 gal	2,000	
	Shielded herbicide sprayer, 200 gal	4,000	
	Tapered disk, 5 ft	1,800	
	V-bladed sweep plow	2,000	
	Drain runner (spinner)	1,900	
	Land clearing (\$3,000 per acre)	300,000	
	Ditching & drainage (\$120 per acre)	12,000	
	Forming beds (\$25 per acre)	2,500	
	Plants (1210 per Acre at \$0.50 per plant)	60,500	
	Irrigation pond (Four - 30,000 cu yd at \$0.30 per cu yd)	36,000	
	Irrigation well, 300 gpm	15,000	
	Sprinklers, pipes and valves	120,000	
	Pumps (Four – 1,400 gpm pumps at \$9,500 each)	38,000	
	2	Airblast sprayer, 220 gal	7,600
		Farm trailers for transporting picking trays (4)	4,000
3	Truck, 1 Ton	26,000	
	Mower, articulated fail, 40"	12,000	
	Mower, Flail 40"	5,000	
	Metal Building: insulated, precooled (125'x50' at \$25 per sq ft)	156,250	
4	Packing Equipment (line #1)	35,000	
	Harvester, self-propelled, mechanical, over-the-row	114,000	
5	Farm trailers (4)	4,000	
6	Packing Equipment (line #2)	35,000	
	Color sorter	70,000	
	Pneumatic pruner (compressor, hoses & 3 loppers)	12,000	
13	Replacement of sprayers purchased in the 1 st year and the 1-ton truck	32,000	
14	Replacement of sprayer purchased in the 2 nd year and the harvester	121,000	
16	Replacement of mower, taper disk, drain runner and irrigation equipment purchased in the 1 st year	162,700	
17	Replacement of farm trailers purchased in the 2 nd year	2,000	
18	Replacement of mowers purchased in the 3 rd year and the pneumatic pruners purchased in the 6 th year	29,000	

Table 2. Yield Patterns under Various Assumptions of Soil Quality and Irrigation
(Pounds per Acre)

Year	Good Blueberry Soil		Marginal Blueberry Soil	
	Irrigation	No Irrigation	Irrigation	No Irrigation
1	----	----	----	----
2	----	----	----	----
3	2,000	1,500	1,500	750
4	4,000	3,000	3,000	1,000
5	5,500	4,000	4,000	2,000
6	7,000	4,500	5,000	2,500
7	8,000	5,000	6,000	3,000
8	8,000	5,000	6,000	3,000
9	8,000	5,000	6,000	2,500
10	7,000	4,000	5,000	2,500
11	7,000	4,000	5,000	2,000
12	7,000	4,000	5,000	2,000
13	6,000	3,500	4,000	1,500
14	6,000	3,500	4,000	1,500
15	6,000	3,500	4,000	1,000
16	5,000	3,000	3,500	
17	5,000	3,000	3,500	
18	5,000	3,000	3,500	
19	4,000	2,500	3,000	
20	4,000	2,500	3,000	

Table 3. Flow of Funds under Various Assumptions of Soil Quality and Irrigation

Year	Good Blueberry Soil		Marginal Blueberry Soil	
	Irrigation	No Irrigation	Irrigation	No Irrigation
1	-\$804,064	-\$567,974	-\$804,064	-\$567,974
2	-\$58,264	-\$31,174	-\$58,264	-\$31,174
3	-\$193,727	-\$190,434	-\$217,524	-\$226,939
4	\$60,832	\$24,867	-\$2,223	-\$101,350
5	\$247,561	\$180,069	\$152,979	\$53,743
6	\$199,036	\$68,489	\$72,926	-\$57,890
7	\$379,090	\$217,016	\$252,981	\$90,583
8	\$379,090	\$217,016	\$252,981	\$90,583
9	\$379,090	\$217,016	\$252,981	\$59,110
10	\$316,036	\$153,962	\$189,926	\$59,110
11	\$316,036	\$153,962	\$189,926	\$27,636
12	\$316,036	\$153,962	\$189,926	\$27,636
13	\$227,009	\$96,462	\$100,900	-\$29,809
14	\$165,490	\$34,943	\$39,381	-\$91,328
15	\$252,981	\$122,434	\$126,872	\$122,056
16	\$43,479	\$86,660	-\$51,103	
17	\$186,378	\$87,359	\$91,796	
18	\$163,826	\$64,807	\$69,244	
19	\$129,464	\$61,972	\$66,409	
20	\$130,156	\$62,664	\$67,101	

Table 4. Accumulated Cash Flows under Various Assumptions of Soil Quality and Irrigation

Year	Good Blueberry Soil		Marginal Blueberry Soil	
	Irrigation	No Irrigation	Irrigation	No Irrigation
1	-\$804,064	-\$567,974	-\$804,064	-\$567,974
2	-\$862,328	-\$599,148	-\$862,328	-\$599,148
3	-\$1,056,055	-\$789,582	-\$1,079,852	-\$826,087
4	-\$995,224	-\$764,715	-\$1,082,075	-\$927,437
5	-\$747,663	-\$584,646	-\$929,096	-\$873,694
6	-\$548,627	-\$516,157	-\$856,170	-\$931,584
7	-\$169,537	-\$299,141	-\$603,189	-\$841,001
8	**\$209,553	-\$82,125	-\$350,208	-\$750,418
9	\$588,644	**\$134,892	-\$97,227	-\$691,309
10	\$904,679	\$288,853	**\$92,699	-\$632,199
11	\$1,220,715	\$442,815	\$282,626	-\$604,563
12	\$1,536,751	\$596,777	\$472,552	-\$576,926
13	\$1,763,760	\$693,239	\$573,452	-\$606,735
14	\$1,929,250	\$728,182	\$612,832	-\$698,063
15	\$2,182,231	\$850,617	\$739,704	-\$576,007
16	\$2,225,710	\$937,277	\$688,601	
17	\$2,412,088	\$1,024,636	\$780,398	
18	\$2,575,915	\$1,089,443	\$849,642	
19	\$2,705,378	\$1,151,414	\$916,051	
20	\$2,835,534	\$1,214,078	\$983,152	

**Denotes the breakeven year. To secure loan commitments of shorter duration will leave the operation insolvent.

Table 5. Today's Cash Equivalent of Land and Management Applied to a 100-Acre Blueberry Planting over a 20-Year Period for Various Interest Rates

Conditions	6%	7%	8%
Good Blueberry Soil:			
Irrigated	\$1,127,073	\$950,795	\$795,006
Non-irrigated	\$372,654	\$286,236	\$210,000
Marginal Blueberry Soil:			
Irrigated	\$146,889	\$60,617	-\$15,493
Non-irrigated	-\$625,119	-\$627,689	-\$629,187

Table 6. Internal Rates of Return on Investments in a 100-Acre Blueberry Planting under Various Assumptions of Soil Quality and Irrigation Conditions: 20-year Plantings

Conditions	Rate of return
Good Blueberry Soil:	
Irrigated	16.6%
Non-irrigated	11.6%
Marginal Blueberry Soil:	
Irrigated	7.8%
Non-irrigated	-11.7%

Table 7. Annual Revenues Attributable to Irrigation and Internal Rates of Return on Irrigation Investment

Year	Revenues Differences with Irrigation	
	Good Blueberry Soil	Marginal Blueberry Soil
1	-236,090	-236,090
2	-27,090	-27,090
3	-3,293	-9,415
4	35,965	-99,127
5	67,492	99,235
6	130,547	130,817
7	**162,074	**162,398
8	162,074	162,398
9	162,074	193,871
10	162,074	130,817
11	162,074	162,290
12	162,074	162,290
13	130,547	130,709
14	130,547	130,709
15	130,547	4,815
16	-43,181	-51,103
17	99,019	91,796
18	99,019	69,244
19	67,492	66,409
20	67,492	67,101

** Breakeven year.

Table 8. Estimated Annual Receipts and Maintenance Expenses for Highbush Blueberry Production on Good Soil with Irrigation in Eastern North Carolina, Eighth Year of Production

Item	Quantity	Price per Unit	Amount	Total
Estimate Yield	pounds		8,000	8,000
Receipts				
1. Harvest for Fresh Market:				
a. Hand Harvest (60%)	4,800 lbs			
	533.3 flats	\$14.11/flat	7,524.86	
b. Machine Harvest (20%)	1,600 lbs			
	177.8 flats	\$14.11/flat	2,508.76	10,033.62
2. Harvest for Process Market:				
a. Hand Harvest (1.8%)	144 lbs	\$0.60/lb	86.40	
b. Machine Harvest (16.2%)	1,296 lbs	\$0.60/lb	777.60	864.000
3. Economic Loss (2% loss)	160 lbs	\$0.0/lb	0.00	0.00
Total Receipts				10,897.62
Annual Expenses				
1. Pruning:				
a. Winter Pruning				
- Labor (4 man crew)	16 hrs	\$8.00/hr	128.00	
- Tractor	4 hrs	\$13.84/hr	55.36	
- Pneumatic Pruners	4 hrs	\$6.08/hr	24.32	207.32
b. Chopping Clippings				
- Labor	1 hr	\$8.00/hr	8.00	
- Tractor	1 hr	\$13.84/hr	13.84	
- Flail Mower	1 hr	\$7.46/hr	7.46	29.30
c. Summer Mechanical Topping				
- Labor	2 hrs	\$8.00/hr	16.00	
- Tractor	2 hrs	\$13.84/hr	27.68	
- Articulated Flail Mower	2 hrs	\$8.61/hr	17.22	60.90
2. Weed Control:				
a. Herbicide Applications (2x)				
- Velpar 2L (1x)	1 qt	\$56.60/gal	14.15	
- Roundup (1x – row middles)	1.33 qt	\$40.00/gal	13.33	
- Labor	2 hrs	\$8.00/hr	16.00	
- Tractor	2 hrs	\$13.84/hr	27.68	
- Shielded Herbicide Sprayer	2 hrs	\$3.82/hr	7.64	78.77
b. Cultivation				
- Hand Hoeing (Labor)	5 hrs	\$8.00/hr	40.00	
- Labor	1 hr	\$8.00/hr	8.00	
- Tractor	1 hr	\$13.84/hr	13.84	
- Tapered Disk	1 hr	\$3.13/hr	3.13	64.97
3. Disease & Insect Control:				
- 70-sec Superior Oil (2x)	2 gal	\$8.00/gal	32.00	
- Indar (4x)	2 oz	\$97.00/lb	48.48	
- Captec 4L (3x)	2.5 qt	\$21.50/gal	40.32	
- Cabrio (3x)	14 oz	\$24.00/lb	63.00	
- Asana (4x)	6 oz	\$80.00/gal	15.00	
- Malathion 25 WP (4x)	2 lb	\$4.50/lb	36.00	
- Thiodan 3 EC (1x)	1 qt	\$32.00/gal	8.00	
- Labor (13x)	4.67 hrs	\$8.00/hr	37.36	

- Tractor	4.67 hrs	\$13.84/hr	64.63	
- Airblast Sprayer	4.67 hrs	\$3.31/hr	15.46	360.25
4. Irrigation:				
- Freeze Protection	32 hrs	\$6.36/hr	203.52	
- Soil moisture	43 hrs	\$6.36/hr	273.48	477.00
5. Land Rental	Acre	\$40.00/A	40.00	40.00
6. Harvest for Fresh Market:				
- Hand harvest	533 flats	\$8.29/flat ⁶	4,418.57	
- Machine harvest	178 flats	\$5.67/flat ⁷	1,009.26	5,427.83
7. Harvest for Processed Market:				
- Hand harvest	144 lbs	\$0.83/lb ⁸	119.52	
- Machine harvest	1,296 lbs	\$0.39/lb ⁹	505.44	624.96
Total Annual Expenses				\$7,371.30
Receipts less Annual Expenses ¹⁰				\$3,526.32

⁶ Includes harvest labor cost, packing supplies, packing labor and marketing assessments.

⁷ Includes the labor and machine costs for harvesting, packing supplies, packing labor and marketing assessments.

⁸ Includes harvest labor cost and marketing assessments.

⁹ Includes the labor and machine costs for harvesting the fruit and marketing assessments.

¹⁰ Estimated returns to management, overhead, and establishment costs.

Table 9. Estimated Annual Receipts and Maintenance Expenses for Highbush Blueberry Production on Good Soil without Irrigation in Eastern North Carolina, Eighth Year of Production

Item	Quantity	Price per Unit	Amount	Total
Estimate Yield	pounds		5,000	5,000
Receipts				
1. Harvest for Fresh Market:				
a. Hand Harvest (60%)	3,000 lbs			
	333.3 flats	\$14.11/flat	4,702.86	
b. Machine Harvest (20%)	1,000 lbs			
	111.1 flats	\$14.11/flat	1,567.62	6,270.48
2. Harvest for Process Market:				
a. Hand Harvest (1.8%)	90 lbs	\$0.60/lb	54.00	
b. Machine Harvest (16.2%)	810 lbs	\$0.60/lb	486.00	540.00
3. Economic Loss (2% loss)	100 lbs	\$0.0/lb	0.00	0.00
Total Receipts				6,810.48
Annual Expenses				
1. Pruning:				
a. Winter Pruning				
- Labor (4 man crew)	16 hrs	\$8.00/hr	128.00	
- Tractor	4 hrs	\$13.84/hr	55.36	
- Pneumatic Pruners	4 hrs	\$6.08/hr	24.32	207.32
b. Chopping Clippings				
- Labor	1 hr	\$8.00/hr	8.00	
- Tractor	1 hr	\$13.84/hr	13.84	
- Flail Mower	1 hr	\$7.46/hr	7.46	29.30
c. Summer Mechanical Topping				
- Labor	2 hrs	\$8.00/hr	16.00	
- Tractor	2 hrs	\$13.84/hr	27.68	
- Articulated Flail Mower	2 hrs	\$8.61/hr	17.22	60.90
2. Weed Control:				
a. Herbicide Applications (2x)				
- Velpar 2L (1x)	1 qt	\$56.60/gal	14.15	
- Roundup (1x – row middles)	1.33 qt	\$40.00/gal	13.33	
- Labor	2 hrs	\$8.00/hr	16.00	
- Tractor	2 hrs	\$13.84/hr	27.68	
- Shielded Herbicide Sprayer	2 hrs	\$3.82/hr	7.64	78.77
b. Cultivation				
- Hand Hoeing (Labor)	5 hrs	\$8.00/hr	40.00	
- Labor	1 hr	\$8.00/hr	8.00	
- Tractor	1 hr	\$13.84/hr	13.84	
- Tapered Disk	1 hr	\$3.13/hr	3.13	64.97
3. Disease & Insect Control:				
- 70-sec Superior Oil (2x)	2 gal	\$8.00/gal	32.00	
- Indar (4x)	2 oz	\$97.00/lb	48.48	
- Captec 4L (3x)	2.5 qt	\$21.50/gal	40.32	
- Cabrio (3x)	14 oz	\$24.00/lb	63.00	
- Asana (4x)	6 oz	\$80.00/gal	15.00	
- Malathion 25 WP (4x)	2 lb	\$4.50/lb	36.00	
- Thiodan 3 EC (1x)	1 qt	\$32.00/gal	8.00	
- Labor (13x)	4.67 hrs	\$8.00/hr	37.36	

- Tractor	4.67 hrs	\$13.84/hr	64.63	
- Airblast Sprayer	4.67 hrs	\$3.31/hr	15.46	360.25
4. Land Rental	Acre	\$40.00/A	40.00	40.00
5. Harvest for Fresh Market:				
- Hand harvest	333.3 flats	\$8.29/flat ¹¹	2,763.06	
- Machine harvest	111.1 flats	\$5.67/flat ¹²	629.94	3,393.00
6. Harvest for Processed Market:				
- Hand harvest	90 lbs	\$0.83/lb ¹³	74.70	
- Machine harvest	810 lbs	\$0.39/lb ¹⁴	315.90	390.60
Total Annual Expenses				4,625.11
Receipts less Annual Expenses¹⁵				2,185.37

¹¹ Includes harvest labor cost, packing supplies, packing labor and marketing assessments.

¹² Includes the labor and machine costs for harvesting, packing supplies, packing labor and marketing assessments.

¹³ Includes harvest labor cost and marketing assessments.

¹⁴ Includes the labor and machine costs for harvesting the fruit and marketing assessments.

¹⁵ Estimated returns to management, overhead, and establishment costs.

Table 10. Estimated Annual Receipts and Maintenance Expenses for Highbush Blueberry Production on Marginal Soil with Irrigation in Eastern North Carolina, Eighth Year of Production

Item	Quantity	Price per Unit	Amount	Total
Estimate Yield	pounds		6,000	6,000
Receipts				
1. Harvest for Fresh Market:				
a. Hand Harvest (60%)	3,600 lbs			
	400 flats	\$14.11/flat	5,644.00	
b. Machine Harvest (20%)	1,200 lbs			
	133.3 flats	\$14.11/flat	1,880.86	7,524.86
2. Harvest for Process Market:				
a. Hand Harvest (1.8%)	108 lbs	\$0.60/lb	64.80	
b. Machine Harvest (16.2%)	972 lbs	\$0.60/lb	583.20	648.00
3. Economic Loss (2% loss)	120 lbs	\$0.0/lb	0.00	0.00
Total Receipts				8,172.86
Annual Expenses				
1. Pruning:				
a. Winter Pruning				
- Labor (4 man crew)	16 hrs	\$8.00/hr	128.00	
- Tractor	4 hrs	\$13.84/hr	55.36	
- Pneumatic Pruners	4 hrs	\$6.08/hr	24.32	207.32
b. Chopping Clippings				
- Labor	1 hr	\$8.00/hr	8.00	
- Tractor	1 hr	\$13.84/hr	13.84	
- Flail Mower	1 hr	\$7.46/hr	7.46	29.30
c. Summer Mechanical Topping				
- Labor	2 hrs	\$8.00/hr	16.00	
- Tractor	2 hrs	\$13.84/hr	27.68	
- Articulated Flail Mower	2 hrs	\$8.61/hr	17.22	60.90
2. Weed Control:				
a. Herbicide Applications (2x)				
- Velpar 2L (1x)	1 qt	\$56.60/gal	14.15	
- Roundup (1x – row middles)	1.33 qt	\$40.00/gal	13.33	
- Labor	2 hrs	\$8.00/hr	16.00	
- Tractor	2 hrs	\$13.84/hr	27.68	
- Shielded Herbicide Sprayer	2 hrs	\$3.82/hr	7.64	78.77
b. Cultivation				
- Hand Hoeing (Labor)	5 hrs	\$8.00/hr	40.00	
- Labor	1 hr	\$8.00/hr	8.00	
- Tractor	1 hr	\$13.84/hr	13.84	
- Tapered Disk	1 hr	\$3.13/hr	3.13	64.97
3. Disease & Insect Control:				
- 70-sec Superior Oil (2x)	2 gal	\$8.00/gal	32.00	
- Indar (4x)	2 oz	\$97.00/lb	48.48	
- Captec 4L (3x)	2.5 qt	\$21.50/gal	40.32	
- Cabrio (3x)	14 oz	\$24.00/lb	63.00	
- Asana (4x)	6 oz	\$80.00/gal	15.00	
- Malathion 25 WP (4x)	2 lb	\$4.50/lb	36.00	
- Thiodan 3 EC (1x)	1 qt	\$32.00/gal	8.00	
- Labor (13x)	4.67 hrs	\$8.00/hr	37.36	

- Tractor	4.67 hrs	\$13.84/hr	64.63	
- Airblast Sprayer	4.67 hrs	\$3.31/hr	15.46	360.25
4. Irrigation:				
- Freeze Protection	32 hrs	\$6.36/hr	203.52	
- Soil moisture	43 hrs	\$6.36/hr	273.48	477.00
5. Land Rental	Acre	\$40.00/A	40.00	40.00
6. Harvest for Fresh Market:				
- Hand harvest	400 flats	\$8.29/flat ¹⁶	3,3316.00	
- Machine harvest	133.3 flats	\$5.67/flat ¹⁷	755.81	4,071.81
7. Harvest for Processed Market:				
- Hand harvest	108 lbs	\$0.83/lb ¹⁸	89.64	
- Machine harvest	972 lbs	\$0.39/lb ¹⁹	379.08	468.72
Total Annual Expenses				5,859.04
Receipts less Annual Expenses²⁰				2,313.82

¹⁶ Includes harvest labor cost, packing supplies, packing labor and marketing assessments.

¹⁷ Includes the labor and machine costs for harvesting, packing supplies, packing labor and marketing assessments.

¹⁸ Includes harvest labor cost and marketing assessments.

¹⁹ Includes the labor and machine costs for harvesting the fruit and marketing assessments.

²⁰ Estimated returns to management, overhead, and establishment costs.