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# *Staff Paper*

## **COST OF PRODUCING FRESH MARKET APPLES IN WESTERN MICHIGAN, 1998**

by  
Myron Kelsey  
Philip Schwallier

Staff Paper #99-43

September 1999



Department of Agricultural Economics  
MICHIGAN STATE UNIVERSITY  
East Lansing, Michigan 48824

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**COST OF PRODUCING FRESH MARKET  
APPLES IN WESTERN MICHIGAN, 1998**

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46 pages

**Summary**

Cost data on three high density orchard systems developed from focus group discussions in the winter and spring of 1998. The computer program utilized is available on the Fruit Area of Expertise web page at <http://www.msue.msu.edu> which will allow individuals to adjust this data and/or enter their own information.

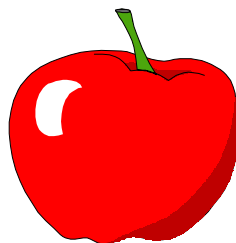
The staff paper includes 65 tables of consensus information from the focus group discussions. All three planting systems, vertical axe, central leader and slender spindle, took 9 years to break even under the assumptions utilized in this analysis.

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## **COST OF PRODUCING FRESH MARKET APPLES IN WESTERN MICHIGAN, 1998**

by  
Myron P. Kelsey  
Philip Schwallier

This cost and return evaluation of fresh apple production in western Michigan is an expansion of Extension Bulletin E-1107, September 1999. It includes all of the detailed tables provided in the Excel spreadsheet available through Philip Schwallier at the West Central Michigan Horticultural Research Station, 9302 Portland Road, Clarksville, MI, 48815, or call: (616) 693-2193.

This computer program will allow you to change costs, prices and other variables to better fit your situation. This may be very desirable to do given the close results in accumulated profit in the analysis given the cost and yield assumptions.

This program is also available on the Fruit Area of Expertise Web page at: <http://www.msue.msu.edu>.

The original data was developed from focus group discussions with apple growers in the winter and spring of 1998. It is a comparison of the development and annual growing costs of the three most common training systems for new orchards currently used in western Michigan – central leader, vertical axe and slender spindle (see Figure 1).

For the assumptions made in this analysis, the central leader system generated the greatest total accumulated profit over the 20-year productive life of the orchard, assuming \$0.12 per pound return to the grower. This return is higher than the average return for fresh market apples over the past 28 years. However, recent plantings of new varieties have generated significantly higher returns to growers. The slender spindle system accumulated the greatest up-front investment cost and took 12 years before fully recovering the initial year's investments and carrying charges (see Figure 3). A summary of the annual costs, yields and accumulated profit for the three systems are given in Tables 5, 17 and 27. The remaining tables provide a detailed analysis of the costs associated with each of the three training systems.

This cost analysis does not include a charge for land. Therefore, net income can be evaluated as a return to the fixed land investment on a before income tax basis.

### **LABOR COSTS**

The full-time labor classification includes the working time of the operator and regular hired help devoted to apples. Operator labor is not considered a cash expense. But, to allow for differences in the proportion of work performed by regular hired help, which is a cash expense, or by the operator, both have been included at the \$12.50 per hour rate. As a result, producers who do a major portion of the work may have a lower cash labor cost than the figures indicate. This rate includes Social Security, Worker's Compensation and other fringe benefits. An \$8 per hour rate was used for unskilled part-time help.

## **EQUIPMENT COSTS**

Some major factors considered in the computation of equipment costs are initial cost, salvage value, years of life, annual usage, repair costs, insurance, interest and operating expenses such as gas and oil (see Table 65). The operating costs for each piece of equipment are charged to the crop on the basis of direct hourly use of the equipment.

## **VARIABLE COSTS**

Variable costs incurred in apple production are categorized by labor, machinery and materials. The details of hours and types of labor, machinery used and hours of use, and kinds and amounts of materials used by operation are shown in the annual growing cost tables. If your costs for particular items are substantially higher than those shown, you may need to analyze those components closely to see if they can be reduced. A high cost for a particular component may be justified if it contributes to a sufficiently higher yield or improved quality.

The variable costs incurred in harvesting an acre are shown in Tables 35, 36 and 37. Labor is the major cost. Therefore, good labor management should enhance the profit picture. In most cases, there will be some higher or lower costs for some items associated with higher or lower yields.

## **PRODUCTION COSTS PER HUNDREDWEIGHT**

Per acre yields are very important in determining cost per bushel of apples (Table 2). Costs per bushel vary with yield because pre-harvest costs per acre – such as spraying, pruning, mowing, etc. – do not vary greatly, regardless of the yield obtained. The Michigan Department of Agriculture annually publishes sale prices for fresh and processed apples and an overall average price of the two groups which reflects average prices to growers (Figure 2). This information will help you determine profitability in your farm analysis of costs.

## **PRESENT VALUE ANALYSIS**

Streams of income and expense incurred in future years do not have the same real value as dollars incurred today. Investment in an orchard will generate income and expenses for many years into the future. Discounting these future streams of dollars is a recommended analytical technique that determines the net present value (NPV) in today's dollars. By comparing the net present values of each investment, the most profitable investment over time can be determined by selecting that investment with the highest NPV.

In this analysis, using a discount rate of 7%, the central leader system has the highest net present value and therefore would be the preferred investment. However, different assumptions on yields, costs, useful life of the orchard, etc., could change the results.

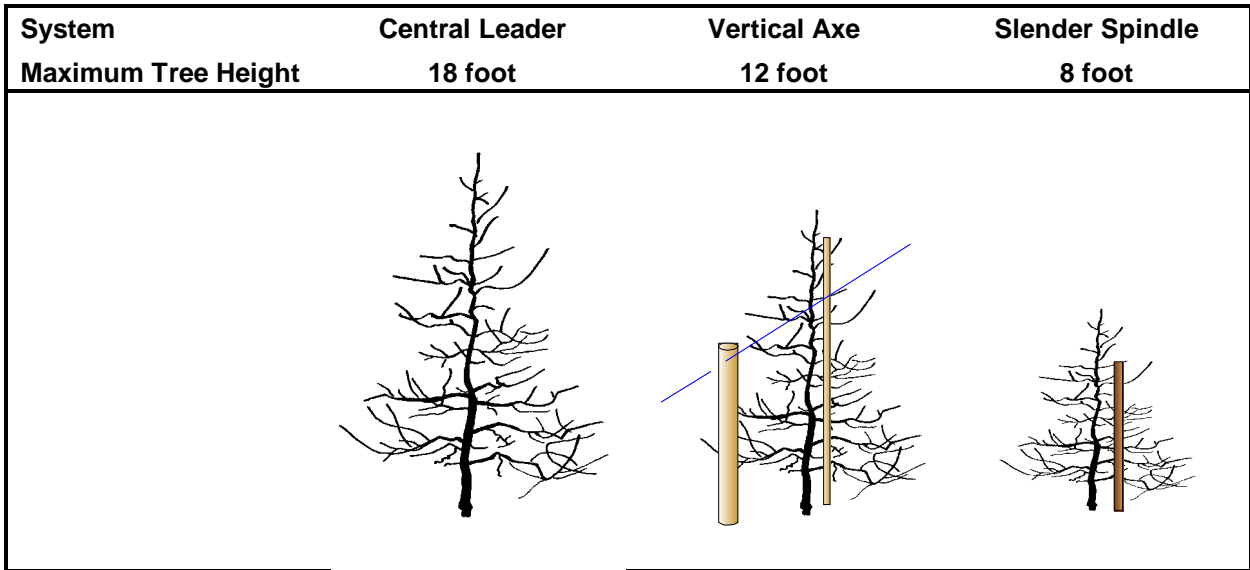
## **TRENDS**

Costs of production studies have been done at various times at MSU since 1970. Figure 2 provides a graphic presentation of the total cost trend since 1970. It is clear that during the 1970's and 1980's apple prices have been variable, but there has been very little trend toward higher prices, while the cost of production has increased considerably.

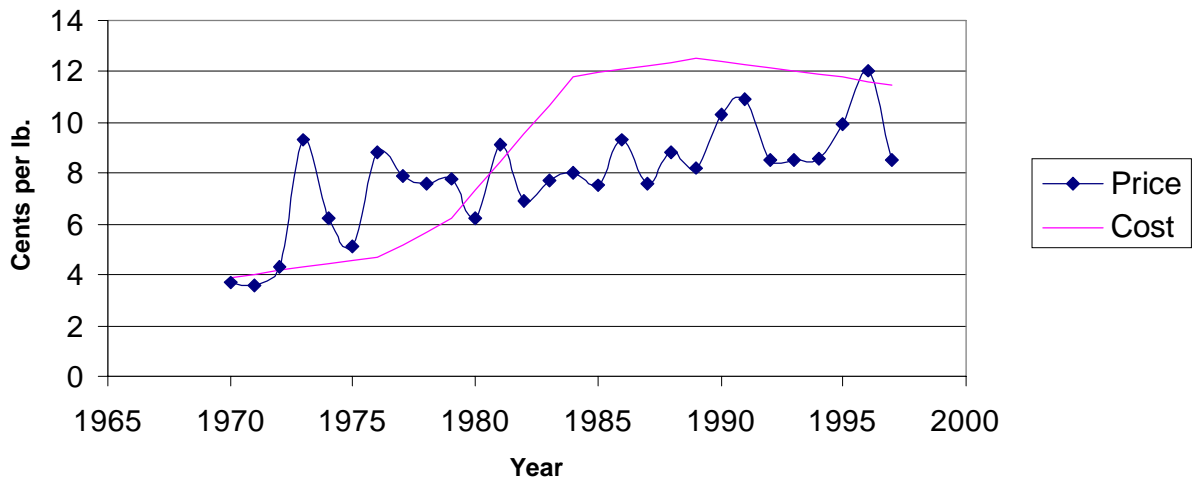


**Figure 1. Orchard Characteristics**

System	Density	Trees/Acre	Spacing	Rows/Acre
Central Leader	Low	182	12 x 20	4.4
Vertical Axe	Medium	519	6 x 14	6.2
Slender Spindle	High	908	4 x 12	7.3



**Figure 2. Total Cost and Price Per Pound for Apples, Michigan, 1970-1996**



<b>Table 1. Price Factors for Costs of Apple Production, Michigan, 1998</b>			
Labor Cost/hr. (no-skill)	8.00	Cost of Gasoline/gal.	1.15
Labor Cost/hr. (skilled)	12.50	Cost of Diesel/gal.	0.88
Harvest Piece Rate/bin	13.00		
Harvest Cost/lb.	0.033	Interest Rate on Land	0.09
		Interest Rate on Operating	0.09
Bulldozer Cost/hr.	70.00	Expected Apple Price/lb.	0.14
Cost of Trees-feathered/tree	6.00	Land Investment/acre	2000.00
Cost of Wildlife Control/tree	0.05	Real Estate Tax/acre	30.00
Cost of Mouse Guards/tree	0.25	Expected Life of Orchard (yrs.)	25.00
Custom Planting Cost/tree	0.30		
Lime Cost/ton	35.00	Overhead Misc. Costs/acre	12.50
<b>System Characteristics</b>			
	<b>Central Leader</b>	<b>Vertical Axe</b>	<b>Slender Spindle</b>
Tree Spacing	12	6	4
Row Spacing	20	14	12
Sq. ft.	240	84	48
Trees/acre	182	519	908
Rows/acre	4.4	6.2	7.3
Tree Height	18	12	8

These factors are used universally throughout this spreadsheet.

<b>Table 2. Yields</b>	The yield for different systems @ 42# bushels.		
<b>Year</b>	<b>Central Leader</b>	<b>Vertical Axe</b>	<b>Slender Spindle</b>
0	0	0	0
1	0	0	0
2	0	0	100
3	0	150	500
4	100	400	800
5	150	750	800
6	400	800	800
7	650	800	800
8	800	800	800
9	800	800	800
10	800	800	800
11	800	800	800
12	800	800	800
13	800	800	800
14	800	800	800
15	800	800	800
16	800	800	800
17	800	800	800
18	800	800	800
19	800	800	800
20	800	800	800

The yields of each system is based on grower survey at the time this cost study was completed. Some believe that a more realistic yield for the central leader system should be 700 bushel per acre.

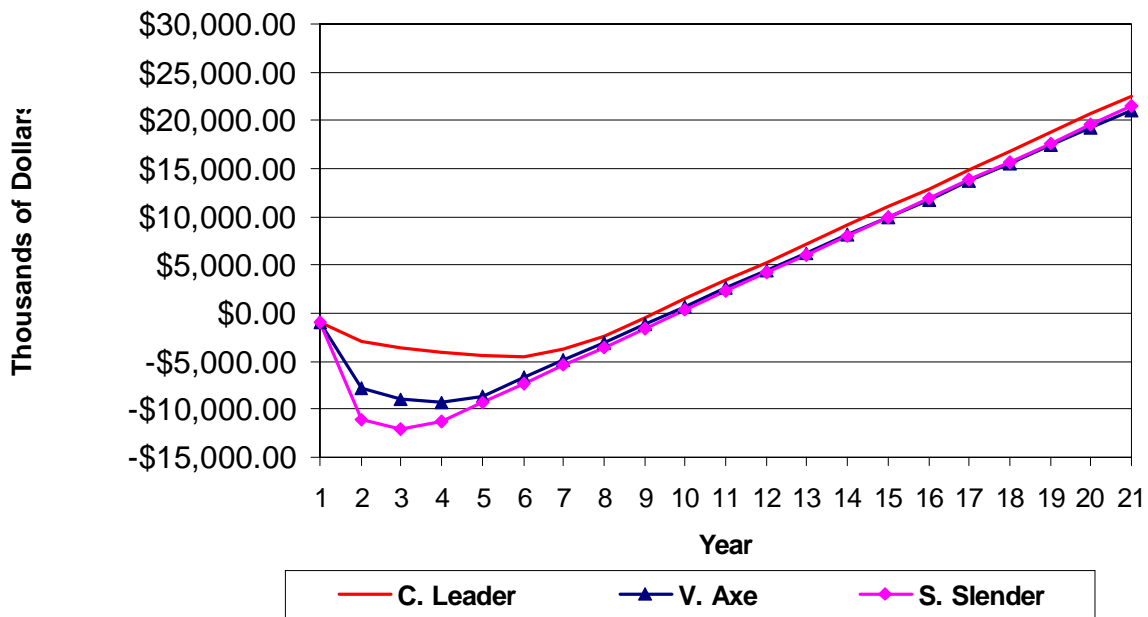
**Table 3. Profit Comparison of the Three Systems, 1998**

Effect of varying yield.

This chart is based on Mature Bearing Years for each system.  
Bin costs based on 850 lb bins.

Yield /Acre	Central Leader			Vertical Axe			Slender Spindle		
	Cost /Bin	Cost /Bushel	Cost /lb.	Cost /Bin	Cost /Bushel	Cost /lb.	Cost /Bin	Cost /Bushel	Cost /lb.
200	197.20	9.74	0.23	203.81	10.07	0.24	197.30	9.75	0.23
300	140.84	6.96	0.17	145.24	7.18	0.17	140.90	6.96	0.17
400	112.65	5.57	0.13	115.95	5.73	0.14	112.70	5.57	0.13
500	95.74	4.73	0.11	98.38	4.86	0.12	95.78	4.73	0.11
600	84.47	4.17	0.10	86.67	4.28	0.10	84.50	4.18	0.10
700	76.42	3.78	0.09	78.30	3.87	0.09	76.44	3.78	0.09
800	70.38	3.48	0.08	72.03	3.56	0.08	70.40	3.48	0.08
900	65.68	3.25	0.08	67.15	3.32	0.08	65.70	3.25	0.08
1000	61.92	3.06	0.07	63.24	3.12	0.07	61.94	3.06	0.07
1100	58.85	2.91	0.07	60.05	2.97	0.07	58.87	2.91	0.07
1200	56.29	2.78	0.07	57.39	2.84	0.07	56.30	2.78	0.07
1300	54.12	2.67	0.06	55.13	2.72	0.06	54.13	2.67	0.06
1400	52.26	2.58	0.06	53.20	2.63	0.06	52.27	2.58	0.06
1500	50.65	2.50	0.06	51.53	2.55	0.06	50.66	2.50	0.06

**Figure 3. Accumulated Profit for Three Training Systems, 1998**



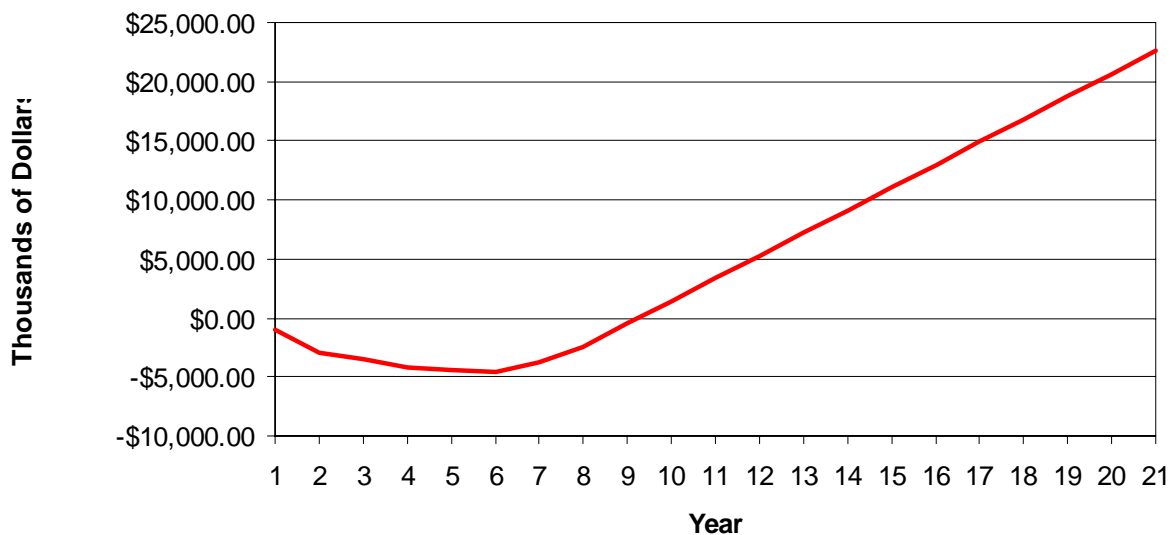
**Table 4. Summaries of Costs Per Acre**

Activity Year	Central Leader				Vertical Axe				Slender Spindle			
	Labor Hours	Equipment Cost	Labor Cost	Total	Labor Hours	Equipment Cost	Labor Cost	Total	Labor Cost	Equipment Cost	Labor Cost	Total
0	1.0	224.00	12.50	784.00	1.0	224.00	12.50	784.00	1.0	224.00	12.50	784.00
1	19.6	115.04	179.35	1707.26	73.3	158.73	611.07	6361.62	84.5	182.58	706.13	9460.02
2	12.3	77.67	102.75	399.61	49.4	189.82	403.61	927.01	31.9	232.17	269.87	1220.10
3	13.7	83.06	114.15	380.97	38.1	200.70	313.98	778.08	33.5	260.14	288.35	1099.91
4	20.8	85.51	171.40	553.68	27.8	239.35	236.51	831.87	54.8	341.96	462.85	1379.94
5	22.5	108.55	188.55	589.07	32.6	280.46	280.30	1257.03				
6	24.5	136.50	208.20	703.78	48.1	334.65	409.59	1441.50				
7	38.3	189.93	326.25	1331.27								
8	40.4	213.47	348.40	1379.06								

**Table 5. Potential Profit for Central Leader System**

Year	Bushel Yield	Gross Income	Annual Costs	Harvest Costs	Interest	Total	Annual Profit	Accumulated Profit
0	0	0	784	0	215	999	-999	-999
1	0	0	1707	0	257	1964	-1964	-2963
2	0	0	400	0	198	598	-598	-3561
3	0	0	381	0	197	578	-578	-4139
4	100	588	554	139	211	904	-316	-4455
5	150	882	589	208	216	1013	-131	-4586
6	400	2352	704	555	237	1496	856	-3730
7	650	3822	1331	903	281	2514	1308	-2422
8	800	4704	1379	1111	292	2782	1922	-500
9	800	4704	1379	1111	292	2782	1922	1422
10	800	4704	1379	1111	292	2782	1922	3344
11	800	4704	1379	1111	292	2782	1922	5266
12	800	4704	1379	1111	292	2782	1922	7188
13	800	4704	1379	1111	292	2782	1922	9110
14	800	4704	1379	1111	292	2782	1922	11032
15	800	4704	1379	1111	292	2782	1922	12954
16	800	4704	1379	1111	292	2782	1922	14876
17	800	4704	1379	1111	292	2782	1922	16798
18	800	4704	1379	1111	292	2782	1922	18720
19	800	4704	1379	1111	292	2782	1922	20642
20	800	4704	1379	1111	292	2782	1922	22564
	11700	68796	24377	16247	5608	46232	22564	22564

**Figure 4. Accumulated Profit for Central Leader System**



**Table 6. Effect of Varying Yield on Potential Profit for Central Leader System**

This chart is based on Year 8, Mature Bearing Year.

Yield /Acre	Growing Costs	Interest Costs	Harvest Costs	Total Costs	Cost /Bushel	Cost /lb.
200	1379	292	278	1949	9.74	0.23
300	1379	292	417	2088	6.96	0.17
400	1379	292	555	2227	5.57	0.13
500	1379	292	694	2365	4.73	0.11
600	1379	292	833	2504	4.17	0.10
700	1379	292	972	2643	3.78	0.09
800	1379	292	1111	2782	3.48	0.08
900	1379	292	1250	2921	3.25	0.08
1000	1379	292	1389	3060	3.06	0.07
1100	1379	292	1527	3199	2.91	0.07
1200	1379	292	1666	3337	2.78	0.07
1300	1379	292	1805	3476	2.67	0.06
1400	1379	292	1944	3615	2.58	0.06
1500	1379	292	2083	3754	2.50	0.06

**Table 7. Year 0, Site Preparation Cost, Central Leader System**

Activity	Labor	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total
Tiling							400.00	400.00
Bulldoze Old Trees		3.2			224.00			224.00
Lime (3 ton)						105.00		105.00
Real Estate Tax Management	1.0		12.50				30.00	30.00
							12.50	25.00
<b>Total</b>	<b>1.0</b>	<b>3.2</b>	<b>12.50</b>		<b>224.00</b>	<b>105.00</b>	<b>442.50</b>	<b>784.00</b>

**Table 8. Year 1, Planting Year Cost, Central Leader System**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Ground Preparation</b>								
80hp Tractor	0.5	0.5	6.25	2	7.31			13.56
Plow		0.5		8	2.42			2.42
80hp Tractor	0.3	0.3	3.75	2	4.38			8.13
Disc		0.3		9	1.49			1.49
Pick Stone & Roots	3.0	3.0	24.00	15	17.08			41.08
<b>Planting Trees</b>								
Layout	0.5	0.5	6.25	1	6.73			12.98
Marking	0.5	0.5	6.25	1	6.73			12.98
Purchase Trees						1089.00		1089.00
Custom Plant @ .30 /tree							155.57	155.57
<b>Watering Trees</b>	2.0	2.0	16.00	13	9.22			25.22
40 hp Tractor		0.0		3	0.00			0.00
<b>Training</b>	3.0	2.0	24.00	1	26.91	10.00		60.91
<b>Pruning</b>	0.0	0.0	0.00	18	0.00			0.00
Nematode Control								0
<b>Herbicide Program</b>								
40 hp Tractor	0.8	0.8	10.00	3	4.72			14.72
Weed Sprayer		0.8		5	3.33	13.98		17.30
<b>Spray Program</b>								
80 hp Tractor	0.2	0.2	2.50	2	2.92	29.73		35.15
Airblast Sprayer		0.2		4	1.98			1.98
<b>Fertilizer</b>								0.00
40 hp Tractor	0.3	0.3	2.00	3	1.47	1.13		4.61
Vicon Spreader		0.2		6	0.66			0.66
<b>Sod Establishment</b>								
40 hp Tractor	0.3	0.9	3.75	3	5.31			9.06
Spreader		0.3		6	0.99	11.00		11.99
Cultipack	0.3	0.3	2.40	12	2.31			4.71
Drag	0.3	0.3	2.40	12	2.31			4.71
<b>Mowing</b>								
40 hp Tractor	0.0	0.0	0.00	3	0.00			0.00
Mower		0.0		7	0.00			0.00
<b>Mouse control</b>								
40 hp Tractor	0.3	0.3	2.40	3	1.77			4.17
Vicon Spreader		0.3		6	0.99	5.50		6.49
Mouse Guards	5.0		40.00			45.38		85.38
Wildlife Control	0.3	0.3	2.40	1	4.04	9.08		15.51
Scouting								0.00
Bees								0.00
Real Estate Tax Management	2.0		25.00		0.00		30.00	30.00
							12.50	37.50
<b>Total</b>	<b>19.6</b>	<b>14.8</b>	<b>179.35</b>		<b>115.04</b>	<b>1214.79</b>	<b>198.07</b>	<b>1707.26</b>

**Table 9. Year 2, Growing Year Cost, Central Leader System**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	5.0	2.0	40.00	1	26.91	10.00		76.91
<b>Pruning</b>	0.0	0.0	0.00	18	0.00			0.00
Brush Removal	0.0	0.0	0.00	3	0.00			0.00
Tree Replacement	0.3	0.3	2.42	1	4.07	54.45		60.94
<b>Herbicide Program</b>								
40 hp Tractor	0.8	0.8	10.00	3	4.72			14.72
Weed Sprayer		0.8		5	3.33	13.98		17.30
<b>Spray Program</b>								
80 hp Tractor	0.2	0.2	2.50	2	2.92	81.43		86.85
Airblast Sprayer		0.2		4	1.98			1.98
<b>Fertilizer</b>								
40 hp Tractor	0.3	0.3	2.00	3	1.77	2.27		6.04
Vicon Spreader		0.3		6	0.99			0.99
<b>Mowing</b>								
40 hp Tractor	1.4	1.4	11.43	3	8.43			19.85
Mower		1.4		7	6.36			6.36
<b>Mouse Control</b>								
40 hp Tractor	0.3	0.3	2.40	3	1.77			4.17
Vicon Spreader		0.3		6	0.99	5.50		6.49
Wildlife Control	2.0	1.0	16.00	1	13.45	9.08		38.53
Scouting								0.00
Bees								0.00
Trickle Irrigation	0.0	0.0	0.00	17	0.00			0.00
Real Estate Tax	0.0		0.00		0.00		30.00	30.00
Management	2.0		16.00		0.00		12.50	28.50
<b>Total</b>	<b>12.3</b>	<b>9.4</b>	<b>102.75</b>		<b>77.67</b>	<b>176.69</b>	<b>42.50</b>	<b>399.61</b>



**Table 10. Year 3, Growing Year Cost, Central Leader System**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	8.0	2.0	64.00	1	26.91	10.00		100.91
<b>Pruning</b>	0.0	0.0	0.00	18	0.00			0.00
Brush Removal	0.0	0.0	0.00	3	0.00			0.00
Tree Replacement	0.5	0.5	4.00	1	6.73	10.89		21.62
<b>Herbicide Program</b>								
40 hp Tractor	0.8	0.8	10.00	3	4.72			14.72
Weed Sprayer		0.8		5	3.33	20.96		24.29
<b>Spray Program</b>								
80 hp Tractor	0.3	0.3	3.75	2	4.38	81.43		89.56
Airblast Sprayer		0.3		4	2.97			2.97
<b>Fertilizer</b>								
40 hp Tractor	0.3	0.3	2.00	3	1.47	3.40		6.88
Vicon Spreader		0.3		6	0.82			0.82
Lime						0.00		0.00
<b>Mowing</b>								
40 hp Tractor	1.5	1.5	12.00	3	8.85			20.85
Mower		1.5		7	6.67			6.67
<b>Mouse Control</b>								
40 hp Tractor	0.3	0.3	2.40	3	1.77			4.17
Vicon Spreader		0.3		6	0.99	5.50		6.49
Wildlife Control	2.0	1.0	16.00	1	13.45	9.08		38.53
Scouting								0.00
Bees								0.00
Trickle Irrigation	0.0	0.0	0.00	17	0.00			0.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>13.7</b>	<b>9.8</b>	<b>114.15</b>		<b>83.06</b>	<b>141.26</b>	<b>42.50</b>	<b>380.97</b>

**Table 11. Year 4, Growing Year Cost, Central Leader System**

<b>Activity</b>	<b>Labor Hours</b>	<b>Equipment Hours</b>	<b>Labor Cost</b>	<b>Equipment Code</b>	<b>Equipment Cost</b>	<b>Material Cost</b>	<b>Other Cost</b>	<b>Total Cost</b>
<b>Training</b>	15.0	2.0	120.00	1	26.91	10.00		156.91
<b>Pruning</b>	0.0	0.0	0.00	18	0.00			0.00
Brush Removal	0.0	0.0	0.00	3	0.00			0.00
Tree Replacement	0.5	0.5	4.00	1	6.73	10.89		21.62
<b>Herbicide Program</b>								
40 hp Tractor	0.8	0.8	10.00	3	4.72			14.72
Weed Sprayer		0.8		5	3.33	20.96		24.29
<b>Spray Program</b>								
80 hp Tractor	0.4	0.4	5.00	2	5.84	158.30		169.14
Airblast Sprayer		0.4		4	3.97			3.97
<b>Mowing</b>								
40 hp Tractor	1.5	1.5	12.00	3	8.85			20.85
Mower		1.5		7	6.67			6.67
<b>Mouse Control</b>								
40 hp Tractor	0.3	0.3	2.40	3	1.77			4.17
Vicon Spreader		0.3		6	0.99	5.50		6.49
Wildlife Control	2.0	1.0	16.00	1	13.45	9.08		38.53
<b>Fertilizer</b>								
40 hp Tractor	0.3	0.3	2.00	3	1.47	4.54		8.01
Vicon Spreader		0.3		6	0.82			0.82
Lime (1 ton)						35.00		35.00
Scouting								0.00
Bees								0.00
Trickle Irrigation	0.0	0.0	0.00	17	0.00			0.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>20.8</b>	<b>10.0</b>	<b>171.40</b>		<b>85.51</b>	<b>254.27</b>	<b>42.50</b>	<b>553.68</b>

**Table 12. Year 5, Growing Year Cost, Central Leader System**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	10.0	2.0	80.00	1	26.91	10.00		116.91
<b>Pruning</b>	6.1	6.1	48.40	18	15.19			63.59
Brush Removal	0.5	0.5	6.25	3	2.95			9.20
Tree Replacement	0.5	0.5	4.00	1	6.73	10.89		21.62
<b>Herbicide Program</b>								
40 hp Tractor	0.8	0.8	10.00	3	4.72			14.72
Weed Sprayer		0.8		5	3.33	12.94		16.26
<b>Spray Program</b>								
80 hp Tractor	0.6	0.6	7.50	2	8.77	158.30		174.57
Airblast Sprayer		0.6		4	5.95			5.95
<b>Mowing</b>								
40 hp Tractor	1.5	1.5	12.00	3	8.85			20.85
Mower		1.5		7	6.67			6.67
<b>Mouse Control</b>								
40 hp Tractor	0.3	0.3	2.40	3	1.77			4.17
Vicon Spreader		0.3		6	0.99	5.50		6.49
Wildlife Control	2.0	1.0	16.00	1	13.45	9.08		38.53
<b>Fertilizer</b>								
40 hp Tractor	0.3	0.3	2.00	3	1.47	7.77		11.24
Vicon Spreader		0.3		6	0.82			0.82
Lime (1 ton)						35.00		35.00
Scouting								0.00
Bees								0.00
Trickle Irrigation	0.0	0.0	0.00	17	0.00			0.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>22.5</b>	<b>17.0</b>	<b>188.55</b>		<b>108.55</b>	<b>249.47</b>	<b>42.50</b>	<b>589.07</b>

**Table 13. Year 6, Growing Year Cost, 1<sup>st</sup> Crop, Central Leader System**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	5.0	2.0	40.00	1	26.91	5.00		71.91
<b>Pruning</b>	12.1	12.1	96.80	18	30.37			127.17
Brush Removal	1.0	1.0	12.50	3	5.90			18.40
Tree Replacement	0.5	0.5	4.00	1	6.73	10.89		21.62
<b>Herbicide Program</b>								
40 hp Tractor	0.8	0.8	10.00	3	4.72			14.72
Weed Sprayer		0.8		5	3.33	17.25		20.58
<b>Spray Program</b>								
80 hp Tractor	1.0	1.0	12.50	2	14.61	174.00		201.11
Airblast Sprayer		1.0		4	9.91			9.91
<b>Mowing</b>								
40 hp Tractor	1.5	1.5	12.00	3	8.85			20.85
Mower		1.5		7	6.67			6.67
<b>Mouse Control</b>								
40 hp Tractor	0.3	0.3	2.40	3	1.77			4.17
Vicon Spreader		0.3		6	0.99	5.50		6.49
Wildlife Control	2.0	1.0	16.00	1	13.45	9.08		38.53
<b>Fertilizer</b>								
40 hp Tractor	0.3	0.3	2.00	3	1.47	9.87		13.34
Vicon Spreader		0.3		6	0.82			0.82
Lime						35.00		35.00
Scouting							15.00	15.00
Bees							35.00	35.00
Trickle Irrigation	0.0	0.0	0.00	17	0.00			0.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>24.5</b>	<b>24.3</b>	<b>208.20</b>		<b>136.50</b>	<b>266.58</b>	<b>92.50</b>	<b>703.78</b>

**Table 14. Year 7, Growing Year Cost, 2<sup>nd</sup> Crop, Central Leader System**

<b>Activity</b>	<b>Labor Hours</b>	<b>Equipment Hours</b>	<b>Labor Cost</b>	<b>Equipment Code</b>	<b>Equipment Cost</b>	<b>Material Cost</b>	<b>Other Cost</b>	<b>Total Cost</b>
<b>Training</b>	5.0	2.0	40.00	1	26.91	0.00		66.91
<b>Pruning</b>	24.2	24.2	193.60	18	60.74			254.34
Brush Removal	2.0	2.0	25.00	3	11.80			36.80
Tree Replacement	0.5	0.5	4.00	1	6.73	10.89		21.62
<b>Herbicide Program</b>								
40 hp Tractor	0.8	0.8	10.00	3	4.72			14.72
Weed Sprayer		0.8		5	3.33	17.25		20.58
<b>Spray Program</b>								
80 hp Tractor	1.7	1.7	21.25	2	24.84	631.78		677.87
Airblast Sprayer		1.7		4	16.85			16.85
<b>Mowing</b>								
40 hp Tractor	1.5	1.5	12.00	3	8.85			20.85
Mower		1.5		7	6.67			6.67
<b>Mouse Control</b>								
40 hp Tractor	0.3	0.3	2.40	3	1.77			4.17
Vicon Spreader		0.3		6	0.99	5.50		6.49
Wildlife Control	2.0	1.0	16.00	1	13.45	9.08		38.53
<b>Fertilizer</b>								
40 hp Tractor	0.3	0.3	2.00	3	1.47	13.10		16.58
Vicon Spreader		0.3		6	0.82			0.82
Lime						35.00		35.00
Scouting							15.00	15.00
Bees							35.00	35.00
Trickle Irrigation	0.0	0.0	0.00	17	0.00			0.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>38.3</b>	<b>38.8</b>	<b>326.25</b>		<b>189.93</b>	<b>722.59</b>	<b>92.50</b>	<b>1331.27</b>

**Table 15. Year 8, Growing Year Cost, Full Bearing, Central Leader System**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	0.0	2.0	0.00	1	26.91	0.00		26.91
<b>Pruning</b>	30.3	30.3	242.00	18	75.93			317.93
Brush Removal	3.0	3.0	37.50	3	17.69			55.19
Tree Replacement	0.5	0.5	4.00	1	6.73	10.89		21.62
<b>Herbicide Program</b>								
40 hp Tractor	0.8	0.8	10.00	3	4.72			14.72
Weed Sprayer		0.8	0.00	5	3.33	17.25		20.58
<b>Spray Program</b>								
80 hp Tractor	1.8	1.8	22.50	2	26.30	631.78		680.58
Airblast Sprayer		1.8		4	17.84			17.84
<b>Mowing</b>								
40 hp Tractor	1.5	1.5	12.00	3	8.85			20.85
Mower		1.5	0.00	7	6.67			6.67
<b>Mouse Control</b>								
40 hp Tractor	0.3	0.3	2.40	3	1.77			4.17
Vicon Spreader		0.3	0.00	6	0.99	5.50		6.49
Wildlife Control	2.0	1.0	16.00	1	13.45	9.08		38.53
<b>Fertilizer</b>								
40 hp Tractor	0.3	0.3	2.00	3	1.47	15.20		18.68
Vicon Spreader		0.3	0.00	6	0.82			0.82
Lime (1 ton)						35.00		35.00
Scouting							15.00	15.00
Bees							35.00	35.00
Trickle Irrigation	0.0	0.0	0.00	17	0.00			0.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>40.4</b>	<b>46.1</b>	<b>348.40</b>		<b>213.47</b>	<b>724.69</b>	<b>92.50</b>	<b>1379.06</b>

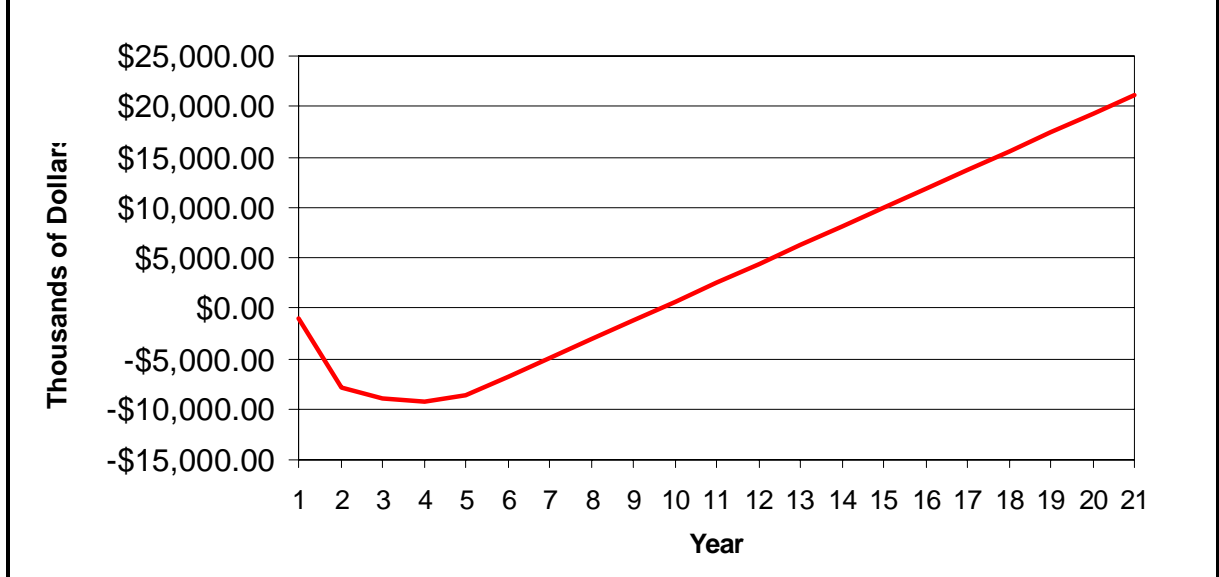
**Table 16. Summary of System Development Costs, Central Leader System**

	Total Cost
Year 0, Site Preparation Cost	784.00
Year 1, Planting Year.	2491.26
Year 2, Growing Year	2890.87
Year 3, Growing Year	3271.84
Year 4, Growing Year	3825.52
Year 5, Growing Year	4414.59
Year 6, Growing Year, 1st Crop	5118.37
Year 7, Growing Year, 2nd Crop	6449.64
Year 8, Growing Year, Full Bearing	7828.70

**Table 17. Potential Profit for Vertical Axe System**

Year	Bushel Yield	Gross Income	Annual Costs	Harvest Costs	Interest	Total Cost	Annual Profit	Accumulated Profit
0	0	0	784	0	215	999	-999	-999
1	0	0	6362	0	466	6828	-6828	-7827
2	0	0	927	0	222	1149	-1149	-8976
3	150	882	778	208	224	1211	-329	-9305
4	400	2352	832	555	242	1630	722	-8582
5	750	4410	1257	1041	283	2582	1828	-6754
6	800	4704	1442	1111	295	2847	1857	-4898
7	800	4704	1442	1111	295	2847	1857	-3041
8	800	4704	1442	1111	295	2847	1857	-1184
9	800	4704	1442	1111	295	2847	1857	673
10	800	4704	1442	1111	295	2847	1857	2529
11	800	4704	1442	1111	295	2847	1857	4386
12	800	4704	1442	1111	295	2847	1857	6243
13	800	4704	1442	1111	295	2847	1857	8100
14	800	4704	1442	1111	295	2847	1857	9956
15	800	4704	1442	1111	295	2847	1857	11813
16	800	4704	1442	1111	295	2847	1857	13670
17	800	4704	1442	1111	295	2847	1857	15527
18	800	4704	1442	1111	295	2847	1857	17383
19	800	4704	1442	1111	295	2847	1857	19240
20	800	4704	1442	1111	295	2847	1857	21097
	13300	78204	32562	18468	6076	57107	21097	21097

**Figure 5. Accumulated Profit for Vertical Axe System**



**Table 18. Effect of Varying Yield on Potential Profit for Vertical Axe System**

This chart is based on Year 6, Mature Bearing Year.

Yield /Acre	Growing Costs	Interest Costs	Harvest Costs	Total Costs	Cost /Bushel	Cost /lb.
200	1442	295	278	2014	10.07	0.24
300	1442	295	417	2153	7.18	0.17
400	1442	295	555	2292	5.73	0.14
500	1442	295	694	2431	4.86	0.12
600	1442	295	833	2570	4.28	0.10
700	1442	295	972	2708	3.87	0.09
800	1442	295	1111	2847	3.56	0.08
900	1442	295	1250	2986	3.32	0.08
1000	1442	295	1389	3125	3.12	0.07
1100	1442	295	1527	3264	2.97	0.07
1200	1442	295	1666	3403	2.84	0.07
1300	1442	295	1805	3542	2.72	0.06
1400	1442	295	1944	3680	2.63	0.06
1500	1442	295	2083	3819	2.55	0.06

**Table 19. Year 0, Site Preparation Cost, Vertical Axe System**

Activity	Labor	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total
Tiling							400.00	400.00
Bulldoze Old Trees		3.2			224.00			224.00
Lime (3 ton)						105.00		105.00
Real Estate Tax Management	1.0		12.50				30.00 12.50	30.00 25.00
<b>Total</b>	<b>1.0</b>	<b>3.2</b>	<b>12.50</b>		<b>224.00</b>	<b>105.00</b>	<b>442.50</b>	<b>784.00</b>



**Table 20. Year 1, Planting Year Cost, Vertical Axe System, 1998**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Ground Preparation</b>								
80hp Tractor	0.5	0.5	6.25	2	7.31			13.56
Plow		0.5		8	2.42			2.42
80hp Tractor	0.3	0.3	3.75	2	4.38			8.13
Disc		0.3		9	1.49			1.49
Pick Stone & Roots	3.0	3.0	24.00	15	17.08			41.08
<b>Planting Trees</b>								
Layout	0.5	0.5	6.25	1	6.73			12.98
Marking	0.5	0.5	6.25	1	6.73			12.98
Purchase Trees						3111.43		3111.43
Custom Plant @ .30 /tree							155.57	155.57
<b>System</b>								
Trellis	40.0		320.00		0.00	1247.83		1567.83
Trickle Irrigation	8.0	20.0	64.00	17	44.00	933.37		1041.37
<b>Training</b>	15.0	2.0	120.00	1	26.91	20.00		166.91
<b>Pruning</b>	0.0	0.0	0.00	18	0.00			0.00
Nematode Control								0.00
<b>Herbicide Program</b>								
40 hp Tractor	1.1	1.1	13.75	3	6.49			20.24
Weed Sprayer		1.1		5	4.58	19.96		24.54
<b>Spray Program</b>								
80 hp Tractor	0.4	0.4	4.64	2	5.43	22.30		32.37
Airblast Sprayer		0.4		4	3.68			3.68
<b>Fertilizer</b>								
40 hp Tractor	0.4	0.4	3.03	3	2.23	1.62		6.88
Vicon Spreader		0.2		6	0.66			0.66
<b>Sod Establishment</b>								
40 hp Tractor	0.3	0.9	3.75	3	5.31			9.06
Spreader		0.3		6	0.99	11.00		11.99
Cultipack	0.3	0.3	2.40	12	2.31			4.71
Drag	0.3	0.3	2.40	12	2.31			4.71
<b>Mowing</b>								
40 hp Tractor	0.0	0.0	0.00	3	0.00			0.00
Mower		0.0		7	0.00			0.00
<b>Mouse Control</b>								
40 hp Tractor	0.4	0.4	3.20	3	2.36			5.56
Vicon Spreader		0.4		6	1.31	5.50		6.81
Mouse Guards								0.00
Wildlife Control	0.3	0.3	2.40	1	4.04	20.74		27.18
Scouting								0.00
Bees								0.00
Real Estate Tax							30.00	30.00
Management	2.0		25.00		0.00		12.50	37.50
<b>Total</b>	<b>73.3</b>	<b>34.0</b>	<b>611.07</b>		<b>158.73</b>	<b>5393.75</b>		<b>6361.62</b>

**Table 21. Year 2, Growing Year Cost, Vertical Axe System, 1998**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	40.0	2.0	320.00	1	26.91	25.00		371.91
<b>Pruning</b>	0.0	0.0	0.00	18	0.00			0.00
Brush Removal	0.0	0.0	0.00	3	0.00			0.00
Tree Replacement	0.9	0.9	6.91	1	11.63	155.57		174.11
<b>Herbicide Program</b>								
40 hp Tractor	1.1	1.1	13.75	3	6.49			20.24
Weed Sprayer		1.1		5	4.58	19.96		24.54
<b>Spray Program</b>								
80 hp Tractor	0.7	0.7	9.29	2	10.85	61.07		81.21
Airblast Sprayer		0.7		4	7.36			7.36
<b>Fertilizer</b>								
40 hp Tractor	0.4	0.3	3.03	3	1.77	3.24		8.04
Vicon Spreader		0.3	0.00	6	0.99			0.99
<b>Mowing</b>								
40 hp Tractor	1.4	1.4	11.43	3	8.43			19.85
Mower		1.4		7	6.36			6.36
<b>Mouse Control</b>								
40 hp Tractor	0.4	0.4	3.20	3	2.36			5.56
Vicon Spreader		0.2		6	0.66	5.50		6.16
Wildlife Control	2.0	1.0	16.00	1	13.45	20.74		50.20
Scouting								0.00
Bees								0.00
Trickle Irrigation	0.5	40.0	4.00	17	88.00			92.00
Real Estate Tax	0.0		0.00		0.00		30.00	30.00
Management	2.0		16.00		0.00		12.50	28.50
<b>Total</b>	<b>49.4</b>	<b>51.6</b>	<b>403.61</b>		<b>189.82</b>	<b>291.09</b>	<b>42.50</b>	<b>927.01</b>

**Table 22. Year 3, Growing Year Cost, Vertical Axe System, 1998**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	30.0	2.0	240.00	1	26.91	20.00		286.91
<b>Pruning</b>	0.0	0.0	0.00	18	0.00			0.00
Brush Removal	0.0	0.0	0.00	3	0.00			0.00
Tree Replacement	0.5	0.5	4.00	1	6.73	31.11		41.84
<b>Herbicide Program</b>								
40 hp Tractor	1.1	1.1	13.75	3	6.49			20.24
Weed Sprayer		1.1		5	4.58	19.96		24.54
<b>Spray Program</b>								
80 hp Tractor	1.0	1.0	12.86	2	15.03	118.73		146.61
Airblast Sprayer		1.0		4	10.20			10.20
<b>Fertilizer</b>								
40 hp Tractor	0.4	0.4	3.03	3	2.23	4.86		10.12
Vicon Spreader		0.4		6	1.24			1.24
Lime						0.00		0.00
<b>Mowing</b>								
40 hp Tractor	2.1	2.1	17.14	3	12.64			29.78
Mower		2.1		7	9.53			9.53
<b>Mouse Control</b>								
40 hp Tractor	0.4	0.4	3.20	3	2.36			5.56
Vicon Spreader		0.4		6	1.31	5.50		6.81
Wildlife Control	2.0	1.0	16.00	1	13.45	20.74		50.20
Scouting								0.00
Bees								0.00
Trickle Irrigation	0.5	40.0	4.00	17	88.00			92.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>38.1</b>	<b>53.6</b>	<b>313.98</b>		<b>200.70</b>	<b>220.91</b>	<b>42.50</b>	<b>778.08</b>

**Table 23. Year 4, Growing Year Cost, 1<sup>st</sup> Crop, Vertical Axe System, 1998**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	10.0	2.0	80.00	1	26.91	10.00		116.91
<b>Pruning</b>	8.6	8.6	69.14	18	21.69			90.84
Brush Removal	0.5	0.5	6.25	3	2.95			9.20
Tree Replacement	0.5	0.5	4.00	1	6.73	31.11		41.84
<b>Herbicide Program</b>								
40 hp Tractor	1.1	1.1	13.75	3	6.49			20.24
Weed Sprayer		1.1		5	4.58	29.95		34.52
<b>Spray Program</b>								
80 hp Tractor	1.6	1.6	20.00	2	23.38	118.73		162.10
Airblast Sprayer		1.6		4	15.86			15.86
<b>Mowing</b>								
40 hp Tractor	2.1	2.1	17.14	3	12.64			29.78
Mower		2.1		7	9.53			9.53
<b>Mouse Control</b>								
40 hp Tractor	0.4	0.4	3.20	3	2.36			5.56
Vicon Spreader		0.4		6	1.31	5.50		6.81
Wildlife Control	2.0	1.0	16.00	1	13.45	20.74		50.20
<b>Fertilizer</b>								
40 hp Tractor	0.4	0.4	3.03	3	2.23	12.48		17.74
Vicon Spreader		0.4		6	1.24			1.24
Lime (1 ton)						35.00		35.00
Scouting							15.00	15.00
Bees							35.00	35.00
Trickle Irrigation	0.5	40.0	4.00	17	88.00			92.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>27.8</b>	<b>63.9</b>	<b>236.51</b>		<b>239.35</b>	<b>263.51</b>	<b>92.50</b>	<b>831.87</b>

**Table 24. Year 5, Growing Year Cost, 2<sup>nd</sup> Crop, Vertical Axe System, 1998**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	5.0	2.0	40.00	1	26.91	5.00		71.91
<b>Pruning</b>	17.3	17.3	138.29	18	43.39			181.67
Brush Removal	1.0	1.0	12.50	3	5.90			18.40
Tree Replacement	0.5	0.5	4.00	1	6.73	31.11		41.84
<b>Herbicide Program</b>								
40 hp Tractor	1.1	1.1	13.75	3	6.49			20.24
Weed Sprayer		1.1		5	4.58	18.48		23.06
<b>Spray Program</b>								
80 hp Tractor	2.3	2.3	28.39	2	33.19	473.83		535.41
Airblast Sprayer		2.3		4	22.52			22.52
<b>Mowing</b>								
40 hp Tractor	2.1	2.1	17.14	3	12.64			29.78
Mower		2.1		7	9.53			9.53
<b>Mouse Control</b>								
40 hp Tractor	0.4	0.4	3.20	3	2.36			5.56
Vicon Spreader		0.4		6	1.31	5.50		6.81
Wildlife Control	2.0	1.0	16.00	1	13.45	20.74		50.20
<b>Fertilizer</b>								
40 hp Tractor	0.4	0.4	3.03	3	2.23	14.10		19.36
Vicon Spreader		0.4		6	1.24			1.24
Lime (1 ton)						35.00		35.00
Scouting							15.00	15.00
Bees							35.00	35.00
Trickle Irrigation	0.5	40.0	4.00	17	88.00			92.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>32.6</b>	<b>74.4</b>	<b>280.30</b>		<b>280.46</b>	<b>603.77</b>	<b>42.50</b>	<b>1257.03</b>

**Table 25. Year 6, Growing Year Cost, Full Bearing, Vertical Axe System, 1998**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	2.0	2.0	16.00	1	26.91	3.00		45.91
<b>Pruning</b>	34.6	34.6	276.57	18	86.77			363.35
Brush Removal	2.0	2.0	25.00	3	11.80			36.80
Tree Replacement	0.5	0.5	4.00	1	6.73	31.11		41.84
<b>Herbicide Program</b>								
40 hp Tractor	1.1	1.1	13.75	3	6.49			20.24
Weed Sprayer		1.1		5	4.58	18.48		23.06
<b>Spray Program</b>								
80 hp Tractor	2.5	2.5	30.89	2	36.11	473.83		540.84
Airblast Sprayer		2.5		4	24.50			24.50
<b>Mowing</b>								
40 hp Tractor	2.1	2.1	17.14	3	12.64			29.78
Mower		2.1		7	9.53			9.53
<b>Mouse Control</b>								
40 hp Tractor	0.4	0.4	3.20	3	2.36			5.56
Vicon Spreader		0.4		6	1.31	5.50		6.81
Wildlife Control	2.0	1.0	16.00	1	13.45	20.74		50.20
<b>Fertilizer</b>								
40 hp Tractor	0.4	0.4	3.03	3	2.23	17.10		22.36
Vicon Spreader		0.4		6	1.24			1.24
Lime						35.00		35.00
Scouting							15.00	15.00
Bees							35.00	35.00
Trickle Irrigation	0.5	40.0	4.00	17	88.00			92.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>48.1</b>	<b>93.1</b>	<b>409.59</b>		<b>334.65</b>	<b>604.77</b>	<b>92.50</b>	<b>1441.50</b>

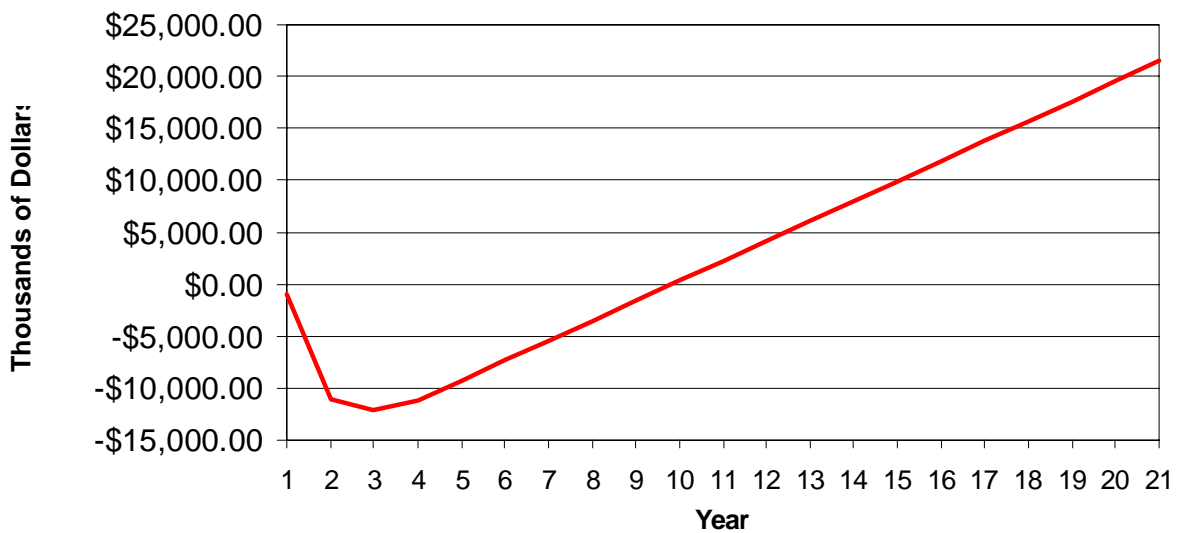
**Table 26. Summary of System Development Costs, Vertical Axe System, 1998**

	Total Cost
Year 0, Site Preparation Cost	784.00
Year 1, Planting Year.	7145.62
Year 2, Growing Year	8072.63
Year 3, Growing Year	8850.71
Year 4, Growing Year, 1st Crop	9682.58
Year 5, Growing Year, 2nd Crop	10,939.61
Year 6, Growing Year, Full Bearing	12,381.11

**Table 27. Potential Profit for Slender Spindle System, 1998**

Year	Bushel Yield	Gross Income	Annual Costs	Harvest Costs	Interest	Total Cost	Annual Profit	Accumulated Profit
0	0	0	784	0	215	999	-999	-999
1	0	0	9460	0	606	10066	-10066	-11065
2	100	588	1220	139	241	1600	-1012	-12077
3	500	2940	1100	694	261	2055	885	-11192
4	800	4704	1380	1111	292	2783	1921	-9271
5	850	4704	1380	1111	292	2783	1921	-7350
6	800	4704	1380	1111	292	2783	1921	-5429
7	800	4704	1380	1111	292	2783	1921	-3508
8	800	4704	1380	1111	292	2783	1921	-1587
9	800	4704	1380	1111	292	2783	1921	334
10	800	4704	1380	1111	292	2783	1921	2256
11	800	4704	1380	1111	292	2783	1921	4177
12	800	4704	1380	1111	292	2783	1921	6098
13	800	4704	1380	1111	292	2783	1921	8019
14	800	4704	1380	1111	292	2783	1921	9940
15	800	4704	1380	1111	292	2783	1921	11861
16	800	4704	1380	1111	292	2783	1921	13782
17	800	4704	1380	1111	292	2783	1921	15703
18	800	4704	1380	1111	292	2783	1921	17624
19	800	4704	1380	1111	292	2783	1921	19545
20	800	4704	1380	1111	292	2783	1921	21466
	14200	83496	36023	19718	6288	62030	21466	21466

**Figure 6. Accumulated Profit for Slender Spindle System, 1998**



**Table 28. Effect of Varying Yield on Potential Profit for Slender Spindle System, 1998**

This chart is based on Year 6, Mature Bearing Year.

Yield /Acre	Growing Costs	Interest Costs	Harvest Costs	Total Costs	Cost /Bushel	Cost /lb.
200	1380	292	278	1950	9.75	0.23
300	1380	292	417	2089	6.96	0.17
400	1380	292	555	2227	5.57	0.13
500	1380	292	694	2366	4.73	0.11
600	1380	292	833	2505	4.18	0.10
700	1380	292	972	2644	3.78	0.09
800	1380	292	1111	2783	3.48	0.08
900	1380	292	1250	2922	3.25	0.08
1000	1380	292	1389	3061	3.06	0.07
1100	1380	292	1527	3199	2.91	0.07
1200	1380	292	1666	3338	2.78	0.07
1300	1380	292	1805	3477	2.67	0.06
1400	1380	292	1944	3616	2.58	0.06
1500	1380	292	2083	3755	2.50	0.06

**Table 29. Year 0, Site Preparation Cost, Slender Spindle System, 1998**

Activity	Labor	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total
Tiling							400.00	400.00
Bulldoze Old Trees		3.2			224.00			224.00
Lime (3 ton)						105.00		105.00
Real Estate Tax Management	1.0		12.50				30.00	30.00
							12.50	25.00
<b>Total</b>	<b>1.0</b>	<b>3.2</b>	<b>12.50</b>		<b>224.00</b>	<b>105.00</b>	<b>442.50</b>	<b>784.00</b>



**Table 30. Year 1, Planting Year Cost, Slender Spindle System, 1998**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Ground Preparation</b>								
80hp Tractor	0.5	0.5	6.25	2	7.31			13.56
Plow		0.5		8	2.42			2.42
80hp Tractor	0.3	0.3	3.75	2	4.38			8.13
Disc		0.3		9	1.49			1.49
Pick Stone & Roots	3.0	3.0	24.00	15	17.08			41.08
<b>Planting Trees</b>								
Layout	0.5	0.5	6.25	1	6.73			12.98
Marking	0.5	0.5	6.25	1	6.73			12.98
Purchase Trees						5445.00		5445.00
Custom Plant @ .30 /tree							272.25	272.25
<b>System</b>								
Trellis	40.0		320.00		0.00	1624.43		1944.43
Trickle Irrigation	8.0	20.0	64.00	17	44.00	1005.97		1113.97
<b>Training</b>	25.0	2.0	200.00	1	26.91	40.00		266.91
<b>Pruning</b>	0.0	0.0	0.00	18	0.00			0.00
Nematode Control								0.00
<b>Herbicide Program</b>								
40 hp Tractor	1.4	1.4	17.50	3	8.26			25.76
Weed Sprayer		1.4		5	5.82	23.29		29.11
<b>Spray Program</b>								
80 hp Tractor	1.2	1.2	14.58	2	17.05	71.30		102.93
Airblast Sprayer		1.2		4	11.56			11.56
<b>Fertilizer</b>								
40 hp Tractor	0.5	0.5	3.60	3	2.65	2.84		9.09
Vicon Spreader		0.2		6	0.66			0.66
<b>Sod Establishment</b>								
40 hp Tractor	0.3	0.9	3.75	3	5.31			9.06
Spreader		0.3		6	0.99	11.00		11.99
Cultipack	0.3	0.3	2.40	12	2.31			4.71
Drag	0.3	0.3	2.40	12	2.31			4.71
<b>Mowing</b>								
40 hp Tractor	0.0	0.0	0.00	3	0.00			0.00
Mower		0.0		7	0.00			0.00
<b>Mouse Control</b>								
40 hp Tractor	0.5	0.5	4.00	3	2.95			6.95
Vicon Spreader		0.5		6	1.64	5.50		7.14
Mouse Guards								0.00
Wildlife Control	0.3	0.3	2.40	1	4.04	27.23		33.66
Scouting								0.00
Bees								0.00
Real Estate Tax							30.00	30.00
Management	2.0		25.00		0.00		12.50	37.50
<b>Total</b>	<b>84.5</b>	<b>36.5</b>	<b>706.13</b>		<b>182.58</b>	<b>8256.55</b>		<b>9460.02</b>

**Table 31. Year 2, Growing Year Cost, Slender Spindle System, 1998**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	20.0	2.0	160.00	1	26.91	35.00		221.91
<b>Pruning</b>	0.0	0.0	0.00	18	0.00			0.00
Brush Removal	0.0	0.0	0.00	3	0.00			0.00
Tree Replacement	1.5	1.5	12.10	1	20.35	272.25		304.70
<b>Herbicide Program</b>								
40 hp Tractor	1.4	1.4	17.50	3	8.26			25.76
Weed Sprayer		1.4		5	5.82	23.29		29.11
<b>Spray Program</b>								
80 hp Tractor	1.9	1.9	23.33	2	27.28	308.04		358.65
Airblast Sprayer		1.9		4	18.50			18.50
<b>Fertilizer</b>								
40 hp Tractor	0.5	0.3	3.60	3	1.77	4.25		9.62
Vicon Spreader		0.3		6	0.99			0.99
<b>Mowing</b>								
40 hp Tractor	1.7	1.7	13.33	3	9.83			23.16
Mower		1.7		7	7.42			7.42
<b>Mouse Control</b>								
40 hp Tractor	0.5	0.5	4.00	3	2.95			6.95
Vicon Spreader		0.2		6	0.66	5.50		6.16
Wildlife Control	2.0	1.0	16.00	1	13.45	27.23		56.68
Scouting								0.00
Bees								0.00
Trickle Irrigation	0.5	40.0	4.00	17	88.00			92.00
Real Estate Tax	0.0		0.00		0.00		30.00	30.00
Management	2.0		16.00		0.00		12.50	28.50
<b>Total</b>	<b>31.9</b>	<b>55.7</b>	<b>269.87</b>		<b>232.17</b>	<b>675.56</b>	<b>42.50</b>	<b>1220.10</b>

**Table 32. Year 3, Growing Year Cost, Slender Spindle System, 1998**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	15.0	2.0	120.00	1	26.91	10.00		156.91
<b>Pruning</b>	7.6	7.6	60.50	18	18.98			79.48
Brush Removal	1.0	1.0	12.50	3	5.90			18.40
Tree Replacement	0.5	0.5	4.00	1	6.73	54.45		65.18
<b>Herbicide Program</b>								
40 hp Tractor	1.4	1.4	17.50	3	8.26			25.76
Weed Sprayer		1.4		5	5.82	34.94		40.76
<b>Spray Program</b>								
80 hp Tractor	2.1	2.1	26.25	2	30.69	315.89		372.82
Airblast Sprayer		2.1		4	20.82			20.82
<b>Fertilizer</b>								
40 hp Tractor	0.5	0.5	3.60	3	2.65	10.92		17.17
Vicon Spreader		0.5		6	1.48			1.48
Lime						0.00		0.00
<b>Mowing</b>								
40 hp Tractor	2.5	2.5	20.00	3	14.74			34.74
Mower		2.5		7	11.12			11.12
<b>Mouse Control</b>								
40 hp Tractor	0.5	0.5	4.00	3	2.95			6.95
Vicon Spreader		0.5		6	1.64	5.50		7.14
Wildlife Control	2.0	1.0	16.00	1	13.45	27.23		56.68
Scouting							15.00	15.00
Bees							35.00	35.00
Trickle Irrigation	0.5	40.0	4.00	17	88.00			92.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>33.5</b>	<b>66.0</b>	<b>288.35</b>		<b>260.14</b>	<b>458.92</b>	<b>42.50</b>	<b>1099.91</b>

**Table 33. Year 4, Growing Year Cost, Full Bearing, Slender Spindle System, 1998**

Activity	Labor Hours	Equipment Hours	Labor Cost	Equipment Code	Equipment Cost	Material Cost	Other Cost	Total Cost
<b>Training</b>	5.0	2.0	40.00	1	26.91	4.00		70.91
<b>Pruning</b>	37.8	37.8	302.50	18	94.91			397.41
Brush Removal	2.0	2.0	25.00	3	11.80			36.80
Tree Replacement	0.5	0.5	4.00	1	6.73	54.45		65.18
<b>Herbicide Program</b>								
40 hp Tractor	1.4	1.4	17.50	3	8.26			25.76
Weed Sprayer		1.4		5	5.82	21.56		27.39
<b>Spray Program</b>								
80 hp Tractor	2.1	2.1	26.25	2	30.69	315.89		372.82
Airblast Sprayer		2.1		4	20.82			20.82
<b>Mowing</b>								
40 hp Tractor	2.5	2.5	20.00	3	14.74			34.74
Mower		2.5		7	11.12			11.12
<b>Mouse Control</b>								
40 hp Tractor	0.5	0.5	4.00	3	2.95			6.95
Vicon Spreader		0.5		6	1.64	5.50		7.14
Wildlife Control	2.0	1.0	16.00	1	13.45	27.23		56.68
<b>Fertilizer</b>								
40 hp Tractor	0.5	0.5	3.60	3	2.65	19.00		25.25
Vicon Spreader		0.5		6	1.48			1.48
Lime						35.00		35.00
Scouting							15.00	15.00
Bees							35.00	35.00
Trickle Irrigation	0.5	40.0	4.00	17	88.00			92.00
Real Estate Tax			0.00		0.00		30.00	30.00
Management			0.00		0.00		12.50	12.50
<b>Total</b>	<b>54.8</b>	<b>97.2</b>	<b>462.85</b>		<b>341.96</b>	<b>482.63</b>	<b>92.50</b>	<b>1379.94</b>

**Table 34. Summary of System Development Costs, Slender Spindle System, 1998**

	Total Cost
Year 0, Site Preparation Cost	784.00
Year 1, Planting Year.	7145.62
Year 2, Growing Year	8072.63
Year 3, Growing Year	8850.71
Year 4, Growing Year, Full Bearing	9682.58

<b>Table 35. Worker Factors for Apple Costs, 1998</b>						
	<b>Bushel Picked /Hour</b>	<b>Manhours /Season /Worker</b>	<b>Bushel Picked /Worker</b>	<b>Piece Rate /Bin</b>	<b>Rate /Bushel</b>	<b>Earnings /Worker</b>
	12.5	520	6500	13.00	0.65	4225.00
	<b>People /Camp</b>	<b>Workers /Camp</b>	<b>Weeks Use</b>	<b>Manhours /Season</b>	<b>Camp Cost /Man Hour</b>	<b>Camp Cost /Bushel</b>
	20	12	13	6240	0.44	0.04

<b>Table 36. Harvest Cost Summary for Apple Costs, 1998</b>			
	<b>Cost /Bin</b>	<b>Cost /Bushel</b>	<b>Cost /lb.</b>
Housing Cost	2.31	0.115	0.0027
Harvest Worker Wage Costs	15.92	0.796	0.0187
Potable Toilets	0.06	0.003	0.0001
Harvest Supervision	1.60	0.080	0.0019
Hauling Bins Out of Orchard	1.22	0.061	0.0014
Bin Rent	7.00	0.350	0.0082
<b>Total</b>	<b>28.10</b>	<b>1.41</b>	<b>0.0331</b>

This farm example has a migrant camp (cost \$50,000) that is used 13 weeks per year. It houses 20 people and of these 20 people, 13 are workers. The cost of housing 1 worker is \$750 per season. Total harvest cost per bushel is \$1.41 or \$.033 per pound.

**Table 37. Migrant Housing Cost, 1998**

	<b>Cost</b>	<b>Basis</b>	<b>Years Life</b>	<b>Cost /Year</b>	
Migrant Housing	50000.00	45000	15	3000	
	<b>Camp Cost /Month</b>	<b>Cost /Worker /Week</b>	<b>Cost /Worker /Man Hour</b>	<b>Cost /Worker /Season</b>	<b>Cost /Bin</b>
Migrant Housing Depreciation	923.08	19.23	0.48	250.00	0.77
Repairs	750.00	15.63	0.39	203.13	0.63
Heat & Cooking	110.00	2.29	0.06	29.79	0.09
Electric	130.00	2.71	0.07	35.21	0.11
Central Facilities	800.00	16.67	0.42	216.67	0.67
Waste	55.00	1.15	0.03	14.90	0.05
<b>Total Camp Cost</b>	<b>2768.08</b>	<b>57.67</b>	<b>1.44</b>	<b>749.69</b>	<b>2.31</b>
<b>Total Camp Cost</b>			<b>1.44</b>		<b>2.31</b>
Portable Toilets Costs	69.00	1.44	0.04	18.69	0.06
Harvest Supervision	per hour per worker		1.00		1.60
<b>Total Harvest Cost</b>			<b>2.48</b>		<b>3.96</b>
	<b>Cost /Bushel</b>				
Bin Rent	7.00	0.35			7.00
Piece Rate	13.00				
Labor Taxes and Costs	0.22				
Cost/ Bin	15.92				15.92
			<b>Cost /Bin</b>		
Hauling Bins Out of Orchard			1.22		1.22
<b>Total Harvest Cost/Bin</b>					<b>28.10</b>

**Table 38. Mouse and Wildlife Control**

Year	Central Leader Mouse Control			Vertical Axe Mouse Control			Slender Spindle Mouse Control		
	Time /Acre	Percent Applied	Cost /Acre	Time /Acre	Percent Applie	Cost /Acre	Time /Acre	Percent Applied	Cost /Acre
1	0.3	100	5.50	0.4	100	5.50	0.5	100	5.50
2	0.3	100	5.50	0.4	100	5.50	0.5	100	5.50
3	0.3	100	5.50	0.4	100	5.50	0.5	100	5.50
4	0.3	100	5.50	0.4	100	5.50	0.5	100	5.50
5	0.3	100	5.50	0.4	100	5.50			
6	0.3	100	5.50	0.4	100	5.50			
7	0.3	100	5.50						
8	0.3	100	5.50						

Application every other row with Vicon spreader @ 10# Bait per acre.

		<u>\$/#</u>	<u>Rate</u> <u>/Acre</u>	<u>Cost</u> <u>/Acre</u>
Mouse Bait	50#	0.55	10	5.50

**Table 39. Summary of Wildlife Control Cost Per Tree**

<b>Ribbons, Soap, etc.</b>	<b>Cost/Tree</b>
Central Leader	0.05
Vertical Axe	0.04
Slender Spindle	0.03

## Spray Program for Apple Production, 1998

<b>Table 40. Planting Year Spray Material Cost, 1998</b>						
<b>Apps. &amp; Timing</b>	<b>Pests</b>	<b>Material</b>	<b>Rate Used</b>	<b>Price</b>	<b>Total Cost/Acre</b>	
<b>Planting Year</b>						
1 Spring	AS, PW	Nova	2 oz.	3.80 oz.	7.60	
2 Spring	AS, PW	Nova	2 oz.	3.80 oz.	7.60	
3 Summer	Sucking	Provado	1.5 oz.	460.00 gal.	5.39	
4 Summer	Sucking	Provado	1.5 oz.	460.00 gal.	5.39	
	Chewing	Lorsban 50W	0.5 lb.	7.50 lb.	3.75	
<b>Total</b>					29.73	29.73

<b>Table 41. Non-bearing Year Spray Material Cost, 1998</b>						
<b>Apps. &amp; Timing</b>	<b>Pests</b>	<b>Material</b>	<b>Rate Used</b>	<b>Price</b>	<b>Total Cost/Acre</b>	
<b>Planting Year</b>						
1 Spring	AS, PW	Nova	3 oz.	3.80 oz.	11.40	
2 Spring	AS, PW	Nova	3 oz.	3.80 oz.	11.40	
	Fireblight	Strep	0.5 lb.	17.50 lb.	8.75	
3 Summer	AS, PW	Nova	3 oz.	3.80 oz.	11.40	
	Fireblight	Strep	0.5 lb.	17.50 lb.	8.75	
4 Summer	Sucking	Provado	2 oz.	460.00 gal.	7.19	
5 Summer	Sucking	Provado	2 oz.	460.00 gal.	7.19	
	Chewing	Lorsban 50W	1 lb.	7.50 lb.	7.50	
<b>Total</b>					73.58	73.58

<b>Table 42. Early Cropping Years Spray Material Cost, 1998</b>						
<b>Apps. &amp; Timing</b>	<b>Pests</b>	<b>Material</b>	<b>Rate Used</b>	<b>Price</b>	<b>Total Cost/Acre</b>	
<b>Planting Year</b>						
1 Green Tip	AS, FB	Copper	3 lb.	2.40 lb.	7.20	
		Oil	0.5 qt./100	7.00 gal.	0.88	
2 Tight Cluster	AS, PM	Nova	3 oz.	3.80 oz.	11.40	
3 Pink	AS, PM	EBDC	2 lb.	2.90 lb.	5.80	
		Nova	3 oz.	3.80 oz.	11.40	
4 Bloom	AS, PM	Strep	3 oz.	3.80 oz.	11.40	
	FB	Strep	0.75 lb.	17.50 lb.	13.13	
5 Bloom	FB	Strep	0.75 lb.	17.50 lb.	13.13	
6 Bloom	FB	Strep	0.75 lb.	17.50 lb.	13.13	
7 Petal Fall	FB	Nova	3 oz.	3.80 oz.	11.40	
8 6th Cover	OBLR	Lorsban 50W	1 lb.	7.50 lb.	7.50	
	Aphids, Leafhoppers	Provado	4 oz.	460.00 gal.	14.38	
9 6th Cover	OBLR	Lorsban 50W	1 lb.	7.50 lb.	7.50	
	Aphids, Leafhoppers	Provado	4 oz.	460.00 gal.	14.38	
<b>Total</b>					73.58	73.58



**Table 43. Full Program, Spray Material Cost, 1998**

<b>Apps. &amp; Timing</b>	<b>Pests</b>	<b>Material</b>	<b>Rate Used</b>	<b>Price</b>	<b>Total Cost/Acre</b>
<b>Planting Year</b>					
1 Green Tip	AS, FB	Copper	6 lb.	2.40 lb.	14.40
		Oil	1 qt./100	7.00 gal.	1.75
2 ½" Green	AS	EBDC	3 lb.	2.90 lb.	8.70
3 Tight Cluster	AS, PM	EBDC	3 lb.	2.90 lb.	8.70
		Nova	5 oz.	3.80 oz.	19.00
4 Pink	AS, PM	EBDC	3 lb.	2.90 lb.	8.70
		Nova	5 oz.	3.80 oz.	19.00
	SJS, RA, OBLR	Lorsban 4E	1 qt.	50.00 gal.	12.50
	ERM	Savey	3 oz.	14.00 oz.	42.00
5 King Bloom	Type	Promalin	1 pt.	25.00 pt.	25.00
6 Bloom	AS, PM	EBDC	3 lb.	2.90 lb.	8.70
		Nova	5 oz.	3.80 oz.	19.00
	FB	Strep	1 lb.	17.50 lb.	17.50
7 Bloom	FB	Strep	1 lb.	17.50 lb.	17.50
	AS, PM	EBDC	3 lb.	2.90 lb.	8.70
		Nova	5 oz.	3.80 oz.	19.00
8 Bloom	FB	Strep	1 lb.	17.50 lb.	17.50
9 Petal Fall	FB	EBDC	3 lb.	2.90 lb.	8.70
		Nova	5 oz.	3.80 oz.	19.00
	OBLR	Lannate	1 lb.	18.90 lb.	18.90
	PC	Guthion 50W	2 lb.	8.50 lb.	17.00
10 1 <sup>st</sup> Cover	PC, CM	Guthion 50W	2 lb.	8.50 lb.	17.00
		Captan 50W	6 lb.	2.90 lb.	17.40
		Benlate	8 oz.	18.00 lb.	13.00
11 Thinning		Sevin XLR	1 qt.	26.00 gal.	6.50
12 Thinning		NAA	0.5 lb.	30.00 lb.	15.00
13 2 <sup>nd</sup> Cover	CM, SJS	Guthion 50W	2 lb.	8.50 lb.	17.00
		Captan 50W	6 lb.	2.90 lb.	17.40
14 3 <sup>rd</sup> Cover	OBLR	Lorsban 50W	2 lb.	7.50 lb.	15.00
	Aphids, Leafhoppers	Provado	6 oz.	460.00 gal.	21.56
		Captan 50W	2 lb.	2.90 lb.	5.80
	Summer Diseases	Benlate	8 oz.	1.00 oz.	8.00
15 Summer Miticide	ERM	Vydate	2 qt.	55.00 gal.	27.50
16 4 <sup>th</sup> Cover	OBLR	Lorsban 50W	2 lb.	7.50 lb.	15.00
	Summer Diseases	Captan 50W	2 lb.	2.90 lb.	5.80
17 5 <sup>th</sup> Cover	CM, AM	Guthion 50W	2 lb.	8.50 lb.	17.00
	Aphids, Leafhoppers	Provado	6 oz.	460.00 gal.	21.56
	Summer Diseases	Captan 50W	2 lb.	2.90 lb.	5.80
18 6 <sup>th</sup> Cover	CM, AM	Guthion 50W	2 lb.	8.50 lb.	17.00
	Summer Diseases	Captan 50W	2 lb.	2.90 lb.	5.80
<b>Total</b>					<b>600.38 600.38</b>

<b>Table 44. Foliar Nutrients Cost, Full Spray Program, 1998</b>					
Prebloom	Boron		2 lbs.	0.70 lb.	1.40
Post Bloom	Complete Foliar	20-20-20	5 lbs.	0.75 lb.	3.75
June	Complete Foliar	20-20-20	5 lbs.	0.75 lb.	3.75
July	Complete Foliar	20-20-20	5 lbs.	0.75 lb.	3.75
July	Calcium Sprays	CorClear	5 lbs.	0.75 lb.	3.75
July	Calcium Sprays	CorClear	5 lbs.	0.75 lb.	3.75
August	Complete Foliar	20-20-20	5 lbs.	0.75 lb.	3.75
August	Calcium Sprays	CorClear	5 lbs.	0.75 lb.	3.75
August	Calcium Sprays	CorClear	5 lbs.	0.75 lb.	3.75
<b>Total</b>					<b>31.40</b>

<b>Table 45. Applications and Total Material Costs for Different Density Orchards</b>			
18 application trips for low density orchards	100%	Total	631.78
16 application trips for medium density orchards	75%	Total	473.84
14 application trips for high density orchards	50%	Total	315.89

**Table 46. Summary of Spray Material Costs by Planting System, 1998**

Cost of pesticide and foliar fertilizer materials applied per acre per season.

Year	Central Leader		Vertical Axe		Slender Spindle	
	Program Applied	Cost /Acre	Program Applied	Cost /Acre	Program Applied	Cost /Acre
1	Planting Year	29.73	Planting Year	22.30	Early Cropping	71.30
2	Young Non-Bearing	81.43	Young Non-Bearing	61.07	Full Program	308.04
3	Young Non-Bearing	81.43	Early Cropping	118.73	Full Program	315.89
4	Early Cropping	158.30	Early Cropping	118.73	Full Program	315.89
5	Early Cropping	158.30	Full Program	473.83		
6	Early Cropping	174.00	Full Program	473.83		
7	Full Program	631.78				
8	Full Program	631.78				

**Table 47. Summary of Pesticide Costs by Planting System, 1998**

Cost of pesticides applied each year.

Year	Central Leader		Vertical Axe		Slender Spindle	
	Program Applied	Cost /Acre	Program Applied	Cost /Acre	Program Applied	Cost /Acre
1	Planting Year	29.73	Planting Year	22.30	Early Cropping	71.30
2	Young Non-Bearing	73.58	Young Non-Bearing	55.18	Full Program	300.19
3	Young Non-Bearing	73.58	Early Cropping	106.95	Full Program	300.19
4	Early Cropping	142.60	Early Cropping	106.95	Full Program	300.19
5	Early Cropping	142.60	Full Program	450.28		
6	Early Cropping	142.60	Full Program	450.28		
7	Full Program	600.38				
8	Full Program	600.38				

**Table 48. Summary of Foliar Fertilizer Costs by Planting System, 1998**

Cost of pesticides applied each year.

Year	Central Leader		Vertical Axe		Slender Spindle	
	Program Applied	Cost /Acre	Program Applied	Cost /Acre	Program Applied	Cost /Acre
1	No Foliar	0.00	No Foliar	0.00	No Foliar	0.00
2	25% Program	7.85	25% Program	5.89	50% Program	7.85
3	25% Program	7.85	50% Program	11.78	Full Foliar Program	15.70
4	50% Program	15.70	50% Program	11.78	Full Foliar Program	15.70
5	50% Program	15.70	Full Foliar Program	23.55		
6	Full Foliar Program	31.40	Full Foliar Program	23.55		
7	Full Foliar Program	31.40				
8	Full Foliar Program	31.40				

<b>Table 49. Summary of Spray Program Costs by Planting System, 1998</b>				
		<b>Central Leader</b>	<b>Vertical Axe</b>	<b>Slender Spindle</b>
		<b>Percent of Spray Program Used in Each System</b>		
		<b>100</b>	<b>75</b>	<b>50</b>
Planting Year	29.73	29.73	22.30	14.87
Non-bearing Years	73.58	73.58	55.18	36.79
Early Cropping Years	142.60	142.60	106.95	71.30
Full Program	600.38	600.38	450.28	300.19
Foliar Program	31.40	31.40	23.55	15.70

<b>Table 50. Application Time for Spray Program, 1998</b>									
The time it takes to apply the spray program per acre per season.									
Year	Central Leader			Vertical Axe			Slender Spindle		
	# of Trips Applied	# of Trips E.O.R.	Hours /Acre	# of Trips Applied	# of Trips E.O.R.	Hours /Acre	# of Trips Applied	# of Trips E.O.R.	Hours /Acre
1	4	4	0.2	4	4	0.4	10	10	1.2
2	4	4	0.2	8	8	0.7	16	16	1.9
3	6	6	0.3	10	8	1.0	18	18	2.1
4	6	4	0.4	14	8	1.6	18	18	2.1
5	8	4	0.6	18	6	2.3			
6	12	4	1.0	18	2	2.5			
7	18	2	1.7						
8	18	0	1.8						

Trip Time	Row Spacing	% of C.L.	Hours /Tank	Acres /Tank	Time /Acre
Central Leader	20	100	1.5	1.5	0.10
Vertical Axe	14	143			0.14
Slender Spindle	12	167			0.17

**Table 51. Herbicide Program by Planting System, 1998**

	Central Leader			Vertical Axe			Slender Spindle		
	Herbicide Strip			Herbicide Strip			Herbicide Strip		
Year	Width	Program	Cost	Width	Program	Cost	Width	Program	Cost
1	4	Soft	13.98	4	Soft	19.96	4	Soft	23.29
2	4	Soft	13.98	4	Soft	19.96	4	Soft	23.29
3	6	Soft	20.96	4	Soft	19.96	6	Soft	34.94
4	6	Soft	20.96	6	Soft	29.95	6	Standard	21.56
5	6	Standard	12.94	6	Standard	18.48			
6	8	Standard	17.25	6	Standard	18.48			
7	8	Standard	17.25						
<b>Hours to Apply</b>									
2 Trips	0.8			1.1			1.4		

**Table 52. Soft Early Years Herbicide Program, 1998**

Trips	Material	Rate Used	Price	Total Cost /Acre
2	Gramoxone	1 qt.	36.00 gal.	9.00
	Surflan	3 qt.	65.00 gal.	48.75
	2,4-D	1 qt.	12.50 gal.	3.13
	Gramoxone	1 qt.	36.00 gal.	9.00
<b>Total cost per treated acre</b>				<b>69.88</b>

**Table 53. Standard Herbicide Program, 1998**

Trips	Material	Rate Used	Price	Total Cost /Acre
2	Round-up	1 qt.	51.00 gal.	12.75
	Princep	2 qt.	18.50 gal.	9.25
	Karmex	2 lb.	4.50 lb.	9.00
	2, 4-D	1 qt.	12.50 gal.	3.13
	Gramoxone	1 qt.	36.00 gal.	9.00
<b>Total cost per treated acre</b>				<b>43.13</b>

**Table 54. Fertilizer Program by Planting System, 1998**

<u>Material</u>	<u>Cost/Ton</u>
Urea	200.00
Potash	185.00

Year	Material	Central Leader			Vertical Axe			Slender Spindle		
		Oz. /Tree	Rate /Acre	Total Cost /Acre	Oz. /Tree	Rate /Acre	Total Cost /Acre	Oz. /Tree	Rate /Acre	Total Cost /Acre
1	Urea Potash	1 0	11 0	1.13	0.5 0	16 0	1.62	0.5 0	28 0	2.84
2	Urea Potash	2 0	23 0	2.27	1 0	32 0	3.24	0.75 0	43 0	4.25
3	Urea Potash	3 0	34 0	3.40	1.5 0	49 0	4.86	1 1	57 57	10.92
4	Urea Potash	4 0	45 0	4.54	2 2	65 65	12.48	1.5 2	85 113	19.00
5	Urea Potash	5 2	57 23	7.77	2.5 2	81 65	14.10			
6	Urea Potash	5 4	57 45	9.87	2.5 3	81 97	17.10			
7	Urea Potash	6 6	68 68	13.10						
8	Urea Potash	6 8	68 91	15.20						

**Table 55. Application Time of Fertilizer by Planting System, 1998**

The time it takes to apply the fertilizer program per acre per season with vicon spreader.

Year	Central Leader			Vertical Axe			Slender Spindle		
	# of Trips Applied	# of Trips E.O.R.	Hours /Acre	# of Trips Applied	# of Trips E.O.R.	Hours /Acre	# of Trips Applied	# of Trips E.O.R.	Hours /Acre
1	1	1	0.3	1	1	0.4	1	1	0.5
2	1	1	0.3	1	1	0.4	1	1	0.5
3	1	1	0.3	1	1	0.4	1	1	0.5
4	1	1	0.3	1	1	0.4	1	1	0.5
5	1	1	0.3	1	1	0.4			
6	1	1	0.3	1	1	0.4			
7	1	1	0.3						
8	1	1	0.3						

Trip Time	Row Spacing	% of C.L.	Hours /Load	Acres /Load	Time /Acre
Central Leader	20	100	0.3	1	0.30
Vertical Axe	14	143			0.43
Slender Spindle	12	167			0.50

**Table 56. Cost of Support System by Planting System, 1998**

	Central Leader	0.00	No Support System
	Vertical Axe	1247.83	
	Slender Spindle	1624.43	

**Table 57. Cost of Trellis System for Vertical Axe System, 1998**

Posts		Rows	Quantity	Price	Cost/Acre
5" Tops, 12' Long Anchors	2 per row	6.2	12.4	11.40	141.88
4" Tops, 12' Line Posts	11 per row	6.2	68.5	8.44	577.73
				Price	Cost/Acre
#12 High Tensil Wire	3111		per foot	0.025	77.79
Wire Vice Anchors	6.2		each	1.55	9.65
Bamboo	519		each	0.80	414.86
Wire Ties	519		each	0.01	5.19
Tree Ties	1037		each	0.02	20.74
<b>Total Cost/Acre</b>					<b>1247.83</b>
<b>Cost/Tree</b>					<b>2.41</b>

**Table 58. Cost of Staking for Slender Spindle System, 1998**

		Rows	Quantity	Price	Cost/Acre
2" Posts	1 per tree	908	each	1.75	1588.13
Tree Ties	1815		each	0.02	36.30
<b>Total Cost/Acre</b>					<b>1624.43</b>
<b>Cost/Tree</b>					<b>1.79</b>



<b>Table 59. Cost of Drip Irrigation System by Planting System, 1998</b>		
Central Leader	0.00	No Irrigation System
Vertical Axe	933.37	
Slender Spindle	1005.97	

<b>Table 60. Cost of Drip Irrigation System for Vertical Axe Planting System, 1998</b>				
Item	Quantity		Cost	Total Cost
Ram tubing	3111	per foot	0.14	435.60
Main 3"	100	per foot	0.65	65.00
Sub main 2"	87	per foot	0.30	26.14
Custom trenching	187	per foot	0.75	140.34
Fittings & misc.		20%		46.30
Well	6000.00	per 30 acres		200.00
Controller	200.00	per 10 acres		20.00
<b>Total Cost</b>				<b>933.37</b>

<b>Table 61. Cost of Drip Irrigation System for Slender Spindle Planting System, 1998</b>				
Item	Quantity		Cost	Total Cost
Ram tubing	3630	per foot	0.14	508.20
Main 3"	100	per foot	0.65	65.00
Sub main 2"	87	per foot	0.30	26.14
Custom trenching	187	per foot	0.75	140.34
Fittings & misc.		20%		46.30
Well	6000.00	per 30 acres		200.00
Controller	200.00	per 10 acres		20.00
<b>Total Cost</b>				<b>1005.97</b>

**Table 62. Mowing Hours Per Acre by Planting System, 1998**

The time it takes to mow per acre per season.

Year	Central Leader		Vertical Axe		Slender Spindle	
	# of Times Mowed	Hours /Acre	# of Times Mowed	Hours /Acre	# of Times Mowed	Hours /Acre
1	0	0.0	0	0.0	0	0.0
2	2	1.0	2	1.4	2	1.7
3	3	1.5	3	2.1	3	2.5
4	3	1.5	3	2.1	3	2.5
5	3	1.5	3	2.1		
6	3	1.5	3	2.1		
7	3	1.5				
8	3	1.5				

Trip Time	Row Spacing	% of C.L.	Hours of Time	Acres Completed	Time /Acre
Central Leader	20	100	5	10	0.50
Vertical Axe	14	143			0.71
Slender Spindle	12	167			0.83

**Table 63. Tree Training Time and Materials by Planting System, 1998**

The time it takes to prune and train trees per acre per season with unskilled labor.

Year	Central Leader		Vertical Axe		Slender Spindle	
	Hours /Acre	Material Cost	Hours /Acre	Material Cost	Hours /Acre	Material Cost
1	3	10.00	15	20.00	25	40.00
2	5	10.00	40	25.00	20	35.00
3	8	10.00	30	20.00	15	10.00
4	15	10.00	10	10.00	5	4.00
5	10	10.00	5	5.00		
6	5	5.00	2	3.00		
7	5	0.00				
8	0					

**Table 64. Pruning Time and Equipment by Planting System, 1998**

The time it takes to prune trees per acre per season with unskilled labor.

Equipment used is a Browie hydraulic pruner or a pneumatic pruners.

Year	Central Leader		Vertical Axe		Slender Spindle	
	Minutes /Tree	Hours /Acre	Minutes /Tree	Hours /Acre	Minutes /Tree	Hours /Acre
1	0.0	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.5	7.6
4	0.0	0.0	1.0	8.6	2.5	37.8
5	2.0	6.1	2.0	17.3		
6	4.0	12.1	4.0	34.6		
7	8.0	24.2				
8	10.0	30.3				

**Table 65. Development of Hourly Equipment Cost for Apple Production, 1998**

Code Item	Cost	Index Cost	Years Life	Annual Depr.	Interest 9.0	Gal. Fuel /Hr.	Fuel Used /Year	Repair & Main.	3% Other Costs	Total Annual Cost	Hours of Use	Cost /Hour	Rate Used /Hour
1 Pick-up	20000	18000	5	3600	810	1.7	996	720	600	6726	500	13.45	13.45
2 Tractor 80 hp Diesel	40000	28800	10	2880	1296	3.5	1540	390	1200	7306	500	14.61	14.61
3 Tractor 40 hp Diesel	17000	11000	10	1100	495	1.9	1014	420	510	3539	600	5.90	5.90
4 Sprayer, Airblast	22000	17000	10	1700	765			840	660	3965	400	9.91	9.91
5 Sprayer, Weed	3500	2275	10	228	102			189	105	624	150	4.16	4.16
6 Fertilizer Spreader, 3 pt. (Vicon)	2000	1500	7	214	68			151	60	493	150	3.29	3.29
7 Mower, Rotary	5000	3800	7	543	171			471	150	1335	300	4.45	4.45
8 Plow, 3/16	1400	770	15	51	35			17	42	145	30	4.83	4.83
9 Disc, Spring Tooth	3000	1650	15	110	74			98	90	372	75	4.96	4.96
10 Harrow or Drag	1600	880	15	59	40			45	48	191	75	2.55	2.55
11 Tree Planter	1800	1170	10	117	53			15	54	239	40	5.97	5.97
12 Cultipacker	1200	660	15	44	30			6	36	116	15	7.71	7.71
13 Water Tank, Engine to Pump Water (not used)	1500	1260	5	252	57	1.6	368	200	45	922	200	4.61	4.61
14 Dump Truck	2500	2100	5	420	95	1.6	276	150	75	1016	150	6.77	6.77
15 Truck, Flat Bed	5000	4250	5	850	191	1.6	736	350	150	2277	400	5.69	5.69
16 Drip Irrigation	0	0	0	0	0		2	0	0	88	40	2.20	2.20
17 Pruner, Browie Check Fuel	9000	6000	10	600	270	0.8	920	450	270	2510	1000	2.51	2.51
18 Bin Hauler	4500	4000	20	200	180				135	515	120	4.29	4.29
19 Lift Attachment	2500	2400	10	240	108				75	423	120	3.53	3.53
Rent Bins	\$7.00												
Out Buildings													
21 Equipment Barn (40x 60)	30000	25000	30	833	1125				900	2858	1	2858.33	2858.33
22 Pesticide Storage	10000	8000	20	400	360				300	1060	1	1060.00	1060.00