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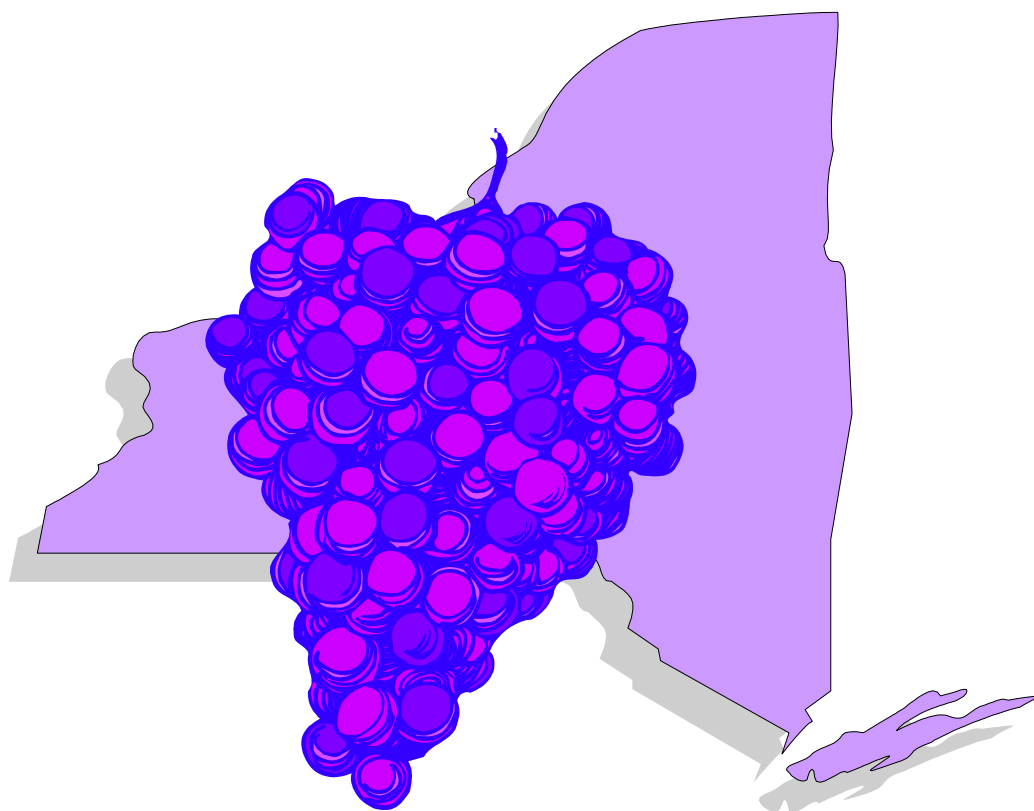
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COST OF ESTABLISHMENT AND PRODUCTION OF VINIFERA GRAPES IN THE FINGER LAKES REGION OF NEW YORK-2001



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COST OF ESTABLISHMENT AND PRODUCTION OF *VINIFERA* GRAPES IN
THE FINGER LAKES REGION OF NEW YORK,
2001

By Gerald B. White and Mark E. Pisoni*

INTRODUCTION

In recent years there has been increased interest in the Finger Lakes, as well as in other producing regions in New York state, in planting *Vitis vinifera* grapes for premium wine production. Red varieties such as Pinot Noir, Cabernet Sauvignon, and Cabernet Franc all experienced increased acreage in the most recent orchard and vineyard survey compiled by The New York Agricultural Statistics Service.

Several factors are affecting the interest in new *V. vinifera* plantings. First is the declining real prices (adjusted for inflation) or in some cases, declining nominal prices for traditional American wine varieties and some French American hybrid varieties (e.g. Aurore, Catawba, DeChaunac, Delaware, and Dutchess). A second factor has been an increase in consumer demand for quality wines (roughly defined as French American hybrid or *V. vinifera* varietals or appellation wines). Wine consumption in the United States has increased during the last seven years, driven by good news regarding the health benefits of moderate wine consumption. A third factor is that most Finger Lakes wineries are reporting increased winery visitation by tourists as well as local area repeat purchasers. Well-managed wineries in the Finger Lakes are reporting annual sales increases of ten to as high as 25 per cent over the last several years. In addition to the increase in the number of tourists resulting from promotional efforts that have been made by several local agencies, New York is gaining stature as a producer of high quality wines that command premium prices.

Growers who are considering planting additional *V. vinifera* acreage need to carefully weigh the cost of planting and establishing a vineyard, the cost of production of a mature vineyard, and the expected yields and prices in order to determine whether the investment of \$13,000 per acre or more required to bring a *V. vinifera* vineyard into production will result in a profitable return on investment.

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This question is complicated by the long-run nature of the investment (payback periods are in excess of ten years and can be even much longer), as well as the risk from an over supply from significant plantings of wine grapes worldwide that could lead to price cutting at the retail level. There has been a great increase in new plantings of *V. vinifera* in California. By some estimates, nonbearing or not yet mature acreage in California is now 100,000 acres (Wines and Vines). Although the New York industry is somewhat insulated by a market structure of the premium wine sector that is based on most wineries selling over 50 per cent of their wine (volume) through direct sales, wineries cannot expect to be completely unaffected if national supply outstrips demand in the future. The acreage of *V. vinifera* varieties in the Finger Lakes is still quite limited. For example, the two most widely planted *V. vinifera* varieties, Chardonnay and Riesling, accounted for just 314 acres and 231 acres, respectively, in the most recent survey of acreage by New York Agricultural Statistics. Given the limited area planted, a small increase in planted acreage can have a large impact on supply when the new acreage begins bearing.

The objective of this project was to determine the cost of producing *V. vinifera* grapes in the Finger Lakes region in a commercial sized operation. Estimates of the total investment in land, machinery, vineyard establishment and development costs, and annual operating costs were developed.

These estimates may be used by growers and potential investors to compute and analyze the costs and profit potential for their own situations. The estimates are not necessarily representative of average costs for grape production in the Finger Lakes, but rather are typical costs for well-managed vineyards using recommended practices. The yield estimates used for estimation of typical returns assume better sites (well-drained, productive soils with appropriate slopes for air drainage). We also assumed that vineyard practices were used which would result in premium quality grapes. Practices such as leaf pulling and cluster thinning of certain varieties, would limit yields and contribute to higher quality wine. Poorer sites and/or failure to follow optimal management practices can have a significant negative impact on the earnings estimates presented in this publication.

METHODS

The methods used to construct cost estimates were a combination of 1) a panel comprised of grower representatives, and 2) economic engineering using recommended practices. In July of 2001, we met with a panel of four growers and vineyard managers. The growers reviewed the data prepared for the most recent (1997) estimates of the cost of establishing and growing *V. vinifera* grapes (White, et al.). Consensus estimates were developed for labor requirements and wage rates for the various operations in a *V. vinifera* vineyard and for a typical machinery complement for a full time commercial vineyard. The panel reviewed the machinery time estimates, which had been updated from the '97 study, and made recommendations for changes.

The panel also provided estimates, based on their own experience in the vineyard, of time required to perform various vineyard operations, such as tillage, spraying, mowing, etc., and hand operations such as pruning, tying & removal, suckering, and cluster & shoot thinning.

Land. The study assumes land was purchased at \$2,000 per acre. The size of the vineyard was decided in consultation with the grower panel. The specified size was 40 acres, 36 of which are planted with grapes. The other four acres are occupied by roads, headlands, and a shop. The 36-acre vineyard is large enough to use vineyard machinery and equipment efficiently, but small enough to be operated by one working manager with one other full-time worker. Some hand labor operations would be done by hired part-time labor or, increasingly in recent years, by migrant labor crews.

Vineyard layout. The vineyard was assumed to be planted on a 6' X 9' spacing (vine by row) resulting in a planting density of 807 vines per acre. There were 11 rows to an acre and rows were 440 feet long. Vines were estimated to average \$3.00 each and were planted using laser planting. The fee for laser planting was \$30 per row and \$.40 per vine. Each year it was assumed that 2 percent of the vines had to be replanted.

Varietals. The 36-acre vineyard was planted to the following four *V. vinifera* varieties: Pinot Noir, Cabernet Franc, Chardonnay, and Riesling. These four varieties were selected because they are well suited for the cool climate of the Finger Lakes region and exhibit excellent potential for premium wine production.

Tile Drainage. It was assumed that tile drainage was installed in the middle of every third row or 27 feet apart. The tile drainage system consisted of 4" lateral pipes running down the middle of every third row, and these lateral pipes connected to a 6" mainline pipe that ran along the width of the vineyard.

Trellis System. It was assumed that the vines were trained using the vertically shoot positioned (VSP) training system. The trellis system was made up of two pairs of catch wires and two cordon wires (for a total of six wires), a 3" X 8' wooden line posts at every third vine, two catch wire clips per line post, and a 5" X 8' wooden end post and anchor support post at the end of each row.

Spray Costs. Pesticide costs were formulated using Cornell and Penn State Cooperative Extension's 2001 New York and Pennsylvania Pest Management Recommendations for Grapes. The program was reviewed by Dr. Wayne Wilcox, Plant Pathologist at the Geneva Experiment Station. Fertilizer and herbicide practices were also based on current Cornell Cooperative Extension recommendations.

Wage Rates. Wage rates used represented the consensus of the grower panel. The rates assumed were \$15.60 per hour for skilled labor (i.e. \$12.00 per hour plus 30 per cent fringe benefits). Fringe benefits consist of workers compensation, social security,

Medicare, insurance, and other benefits. For unskilled labor, the rate was \$9.92 per hour (\$8.00 per hour plus 24 per cent fringe benefits). Piece rate wage rates were used for pruning the vines in the third and fourth year. The rate was \$.30/vine in the third year and \$.35/vine in the fourth year.

Harvesting & Hauling. Grapes were custom hand harvested in the third year of production and hand-harvesting rates were estimated at \$200 per ton. It was determined that hand harvesting was necessary in the third year because the vines were not yet fully mature. Grapes were custom machine harvested in the fourth year and beyond. Machine harvesting rates are \$40 per ton if the yield is greater than four tons per acre, or \$200 per acre if the yield is less than four tons per acre. Hauling costs were estimated at \$25 per ton and represent the additional expense of transporting the grapes to the winery.

Machinery. Machinery depreciation and interest were charged on the basis of prices for new equipment. Diesel fuel at \$1.00 per gallon was budgeted for machine operations. (Note: the diesel being used is green diesel, which may only be used for agricultural purposes). Hourly machinery variable costs (repairs, fuel, and lube) are shown in Table 1 of the appendix. Hourly machinery variable costs were estimated according to American Society of Agricultural Engineers 2000 Standards.

Overhead. Annual insurance expense was estimated at 1 percent of the initial investment in buildings and machinery. Office supplies, phone, etc. was estimated at \$2,500 per year. School and property taxes were \$24.324 per \$1,000 of assessed value of the initial land investment.

Management Charge. A management fee of five per cent of gross receipts was assessed for the vineyard. All labor requirements were assessed as a cash cost. Therefore, in situations where the owner or manager is performing vineyard tasks, actual cash outlays would be lower than are represented in these cost estimates.

Cost of Capital. A five per cent interest charge on capital investment and operating capital was charged. This rate represents a real rate based on a seven percent nominal rate of interest and an expected rate of inflation of two percent. (For a discussion of using the real rate of interest in capital investment analysis, see Casler, et al.)

Yields. Yields were specified as the long-term average attainable on suitable sites (near the lake, sloping, good air drainage, somewhat well-drained with soil depth at least medium). These yields assume better than average management practices that are consistent with the attainment of premium quality *V. vinifera* wines. These management practices include shoot thinning and cluster removal that often decrease yields, but improve wine quality. Table 1 summarizes the yield assumptions.

Table 1: Yield Assumptions

Variety	Year 3	Year 4+
Pinot Noir	1.0 ton/acre	2.5 tons/acre
Cabernet Franc	1.0 ton/acre	3.5 tons/acre
Chardonnay	1.0 ton/acre	3.0 tons/acre
Riesling	1.0 ton/acre	3.0 tons/acre

Grape Prices. Prices were the average of the most recent five-year period (1996-2000) in the Finger Lakes region plus a factor of 10 percent to account for the fact that the yield limiting practices mentioned above were assumed, and thus higher than average quality will be attained. The base prices were obtained from the *Finger Lakes Vineyard Notes* newsletter.

RESULTS

Grape Prices

Prices for the five years ending in 2000 are shown in Table 2. These mean prices plus 10 percent were assumed for the base analysis. (Note: the 1996-2000 New York state average price per ton for *V. Vinifera* varietals was \$1,240.)

Table 2: Average Price for selected *V. Vinifera* Grapes in the Finger Lakes Region, 1996-2000, Dollars per ton.

	Chardonnay	Riesling	Pinot Noir	Cabernet Franc
1996	\$ 1,082	\$ 1,018	\$ 1,288	\$ 1,337
1997	\$ 1,186	\$ 1,159	\$ 1,342	\$ 1,458
1998	\$ 1,188	\$ 1,167	\$ 1,342	\$ 1,515
1999	\$ 1,195	\$ 1,208	\$ 1,356	\$ 1,518
2000	\$ 1,154	\$ 1,188	\$ 1,405	\$ 1,540
Mean	\$ 1,161	\$ 1,148	\$ 1,347	\$ 1,474
Mean +10%	\$ 1,277	\$ 1,263	\$ 1,481	\$ 1,621

Source: *Finger Lakes Vineyard Notes*, 1996-2000

Machinery and Buildings Costs

The investment costs and annual costs for new equipment and buildings are summarized in Table 3. The machinery investment required totals \$125,700, an average investment of \$3,492 per acre of vineyard. The investment for a shop is estimated at \$52,500, or \$1,458 per acre. The shop was 1,500 ft², and the construction cost was estimated at \$35 per ft² which includes basic amenities such as water and electricity. The total annual costs for depreciation and interest amount to \$17,425 for machinery and

\$3,415 for buildings, or \$484 and \$95 annual costs per acre, respectively. Machinery investment would be much greater if a mechanical grape harvester was necessary.

Pesticide Program Spray Costs

Table 4 indicates the **recommended** spray program and costs for years one, two and three through twenty-five. Beginning in year three, sprays are assumed to be approximately the same from year to year, with the necessity on average for ten sprays averaging \$225 per acre for spray materials annually. Of course, spray programs will have to be adjusted slightly from year to year to accommodate variable weather and/or pest pressure. Additionally, fungicide applications may vary slightly among vinifera varieties due to the differences in disease resistance. For example, Pinot Noir is more susceptible to Botrytis and rot problems.

Pesticide applications costs for labor and machinery, as well as herbicide costs, are developed in Tables 7 and 9 to follow.

Table 3: Machinery, Equipment, and Building Capital Recovery and Interest Costs,
36 acre *V. Vinifera* Vineyard, Finger Lakes Region, NY 2001.

<i>Machinery and Equipment</i>	Purchase Price	Years of Life	Salvage Value	Capital to be Recovered	Cost Recovery Factor	Annual Recovery	Interest on Salvage Value	Total Capital Recovery & Interest
Tractor, 62-HP, 2WD, spray cab	\$ 36,000	10	\$ 3,600	\$ 32,400	0.1295052	\$ 4,196	\$ 180	\$ 4,376
Tractor, 45-HP	\$ 23,000	10	\$ 2,300	\$ 20,700	0.1295052	\$ 2,681	\$ 115	\$ 2,796
Air-blast sprayer- 300 gallon	\$ 10,000	10	\$ 1,000	\$ 9,000	0.1295052	\$ 1,166	\$ 50	\$ 1,216
Herbicide sprayer- 50 gallon	\$ 2,000	10	\$ 200	\$ 1,800	0.1295052	\$ 233	\$ 10	\$ 243
Mower/brush chopper (7ft)	\$ 6,500	5	\$ 650	\$ 5,850	0.2309736	\$ 1,351	\$ 33	\$ 1,384
Fertilizer Spreader	\$ 2,500	10	\$ 250	\$ 2,250	0.1295052	\$ 291	\$ 13	\$ 304
Small disc (used)	\$ 900	10	\$ 90	\$ 810	0.1295052	\$ 105	\$ 5	\$ 109
Grape hoe	\$ 4,200	10	\$ 420	\$ 3,780	0.1295052	\$ 490	\$ 21	\$ 511
Post driver	\$ 2,500	10	\$ 250	\$ 2,250	0.1295052	\$ 291	\$ 13	\$ 304
Trailer	\$ 2,000	10	\$ 200	\$ 1,800	0.1295052	\$ 233	\$ 10	\$ 243
Pickup truck	\$ 17,000	5	\$ 1,700	\$ 15,300	0.2309736	\$ 3,534	\$ 85	\$ 3,619
Auger	\$ 1,100	10	\$ 110	\$ 990	0.1295052	\$ 128	\$ 6	\$ 134
Mechanical hedger (used)	\$ 2,500	10	\$ 250	\$ 2,250	0.1295052	\$ 291	\$ 13	\$ 304
Leaf remover	\$ 6,000	10	\$ 600	\$ 5,400	0.1295052	\$ 699	\$ 30	\$ 729
Bird control equipment	\$ 2,500	10	\$ 250	\$ 2,250	0.1295052	\$ 291	\$ 13	\$ 304
Shop Equipment	\$ 7,000	10	\$ 700	\$ 6,300	0.1295052	\$ 816	\$ 35	\$ 851
Total Machine & Equipment costs	\$ 125,700			\$ 113,130				\$ 17,425
Cost per planted acre	\$ 3,492							\$ 484
<i>Buildings</i>								
Shop (1,500 ft ² @ 35 ft ²)	\$ 52,500	30	\$ 0	\$ 52,500	0.0650512	\$ 3,415	\$ 0	\$ 3,415
Cost per planted acre	\$ 1,458							\$ 95

Table 4: Sample Fungicide & Insecticide Spray Program for *V. Vinifera* Grapes,
Finger Lakes Region, NY, 2001.

	Material	Rate/acre	Price	\$/acre
Year 1				
Sprays 1-3	Mancozeb 80 WP	3 lbs.	2.35 lbs.	\$ 7.05
	Sulfur	4 lbs.	0.21 lbs.	\$ 0.85
	Spreader	4 oz.	18.30 gal.	\$ 0.57
				\$ 25.42
Year 2				
Sprays 1-4	Mancozeb 80 WP	3 lbs.	2.35 lbs.	\$ 7.05
	Sulfur	4 lbs.	0.21 lbs.	\$ 0.85
	Spreader	4 oz.	18.30 gal.	\$ 0.57
				\$ 33.89
Years 3-25				
Sprays 1-4	Mancozeb	3 lbs.	2.35 lbs.	\$ 7.05
	Rubigan	2 fl oz.	61.73 qt.	\$ 3.86
	Spreader	4 oz.	18.30 gal.	\$ 0.57
				\$ 45.92
Sprays 5& 6	Abound 2SC	11 fl oz.	215.30 gal.	\$ 18.50
				\$ 37.00
Spray 7	Mancozeb	4 lbs.	2.35 lbs.	\$ 9.40
	Sulfur	4 lbs.	0.21 lbs.	\$ 0.85
	Sevin 80 WP	2.5 lbs.	4.94 lbs.	\$ 12.35
	Spreader	4 oz.	18.30 gal.	\$ 0.57
				\$ 23.17
Spray 8	Abound 2SC	11 fl oz.	215.30 gal.	\$ 18.50
				\$ 18.50
Spray 9	Captan 80 WP	2.5 lbs.	3.99 lbs.	\$ 9.98
	Sulfur	4 lbs.	0.21 lbs.	\$ 0.85
	Vanguard 75 WP	10 oz.	3.35 oz.	\$ 33.50
	Spreader	4 oz.	18.30 gal.	\$ 0.57
				\$ 44.90
Spray 10	Captan 80 WP	2.5 lbs.	3.99 lbs.	\$ 9.98
	Sulfur	4 lbs.	0.21 lbs.	\$ 0.85
	Elevate 50 WP	1 lbs.	44.52 lbs.	\$ 44.52
	Spreader	4 oz.	18.30 gal.	\$ 0.57
				\$ 55.92
Total cost per year (years 3-25)				\$ 225.41

Drainage Construction Costs

Table 5 contains an estimate of drainage construction costs. These drainage construction costs are transferred in the site preparation section of the establishment and development costs. Drainage construction costs will vary greatly from site to site depending on the soil conditions and preferences of the vineyard manager. This study assumed that tile drainage was placed in the middle of every third row or 27' apart.

Table 5: Tile Drainage Costs per acre for *V. Vinifera* Grapes,
Finger Lakes Region, NY, 2001.

Item	Quantity	Price	Total Cost per acre
Main line: 6" pipe	99 ft	\$ 0.69 ft	\$ 68
Laterals: 4" pipe	1,613 ft	\$ 0.25 ft	\$ 403
Installation	1,712 ft	\$ 0.52 ft	\$ 890
Total Drainage Construction per acre			\$ 1,362

Trellis Construction Costs

Table 6 contains an estimate of trellis constructions costs. The total cost for materials is estimated at \$2,144 per acre. These costs are transferred to Table 7 in the first year of establishment and development. Labor and machinery costs for trellis establishment are also shown in Table 7.

The trellis was designed for Vertically Shoot Positioned (VSP) vines. It was made up of two pairs of catch wires and two cordon wires (a total of six wires). Wooden line posts were used every third vine, and two catch wire clips were used for each post to hold the catch wires in place. Wooden anchor posts were used to support each end post. Rows were 440 feet long and there were 11 rows to an acre and 73 vines per row.

Table 6: Trellis Construction Costs per acre for *V. Vinifera* Grapes,
Finger Lakes Region, NY, 2001.

Item	Quantity	Price	Total per acre
Wood end posts (8 ft X 5" diameter)	22 posts	\$ 9.08 post	\$ 200
Wood anchor posts (8 ft X 5" diameter)	22 posts	\$ 9.08 anchor	\$ 200
Wood line posts (8 ft, 3" diameter, every 3 rd vine)	269 posts	\$ 4.66 post	\$ 1,253
12.5 gauge HT foliage & cordon wire (\$59.95 roll of 4000 ft)	29,040 ft	\$ 0.015 ft	\$ 435
Catch wire clips (2 per grape stake)	538 clips	\$ 0.09 clip	\$ 48
Staples, lbs.	3 lbs.	\$ 1.20 lb.	\$ 4
Crimping sleeves (for joining wire ends)	50 crimps	\$ 0.08 crimp	\$ 4
Total cost per acre			\$ 2,144

Establishment and Development Costs

The costs for labor machinery and materials for site preparation and years one through three constitute the establishment and development (E&D) costs (Table 7). First year costs, to include site preparation, trellis construction, and planting, are substantial, amounting to \$7,740 per acre. A planting of 807 vines (6' x 9') (vine by row) was assumed. The largest cost in the first year is the expenditure of \$2,420 for vines. In year two, costs are a relatively modest \$790 per acre with lower spray costs and less labor required than for mature vines. In the third year, a full spray program is required, and hand harvesting is required to protect the young vines. Total costs for the third year are \$1,446 per acre.

Table 7: *V. Vinifera* Grape Establishment and Development Costs per acre,
Finger Lakes Region, NY, 2001

Operation	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Site Preparation							
Drainage (see table 5 for details)	Custom			\$ 445.21	\$ 445.21	\$ 471.64	\$ 1,362
Lime (2 tons/acre)	Custom					\$ 62.00	\$ 62
Herbicide application	Custom					\$ 30.00	\$ 30
Stone removal & land maintenance.	Unskilled	1	0.8	\$ 9.92	\$ 4.38		\$ 14
Soil Sampling	Skilled	0.2		\$ 3.12			\$ 3
Plowing	Custom				\$ 15.10		\$ 15
Disking (2X)	Custom				\$ 22.20		\$ 22
Miscellaneous							\$ 37
Total		1.2	0.8	\$ 458.25	\$ 486.88	\$ 563.64	\$ 1,546
First Year							
Floating	Skilled	0.25	0.2	\$ 3.90	\$ 0.99		\$ 5
Laser Planting	Custom	n/a	n/a	\$ 326.33	\$ 326.33	\$ 2,420.00	\$ 3,073
Fertilization (hand application)	Skilled	0.6	0.5	\$ 9.36	\$ 2.74	\$ 11.81	\$ 24
Hilling up	Skilled	1.5	1.2	\$ 23.40	\$ 7.37		\$ 31
Chem. weed control -trellis	Skilled	2.5	2	\$ 39.00	\$ 11.08	\$ 36.00	\$ 86
Trellis construction (see table 6 for details)	Skilled	41	8	\$ 639.60	\$ 52.44	\$ 2,144.00	\$ 2,836
Chem. weed control- middle	Skilled	0.6	0.5	\$ 9.36	\$ 2.77	\$ 10.38	\$ 23
Spray 1	Skilled	0.4	0.3	\$ 6.24	\$ 2.71	\$ 8.47	\$ 17
Spray 2	Skilled	0.4	0.3	\$ 6.24	\$ 2.71	\$ 8.47	\$ 17
Spray 3	Skilled	0.4	0.3	\$ 6.24	\$ 2.71	\$ 8.47	\$ 17
Mowing (2X)	Skilled	1.3	1	\$ 20.28	\$ 8.10		\$ 28
Miscellaneous							\$ 37
Total		50.15	14.3	\$ 1,089.95	\$ 419.94	\$ 4,647.14	\$ 6,194

Table 7 continued

	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Second Year							
Pruning & brush removal	Skilled	6		\$ 93.60			\$ 94
Tying & renewal	Unskilled	4		\$ 39.68		\$ 4.00	\$ 44
Vine Replacement	Skilled	2	2	\$ 31.20	\$ 10.94	\$ 48.40	\$ 91
Spring Fertilization	Skilled	0.6	0.5	\$ 9.36	\$ 3.30	\$ 9.60	\$ 22
Chem. weed control-trellis	Skilled	2.5	2	\$ 39.00	\$ 11.08	\$ 36.00	\$ 86
Suckering	Unskilled	5		\$ 49.60			\$ 50
Cluster removal	Unskilled	5		\$ 49.60			\$ 50
Take away	Skilled	3	2.5	\$ 46.80	\$ 15.35		\$ 62
Hand hoe	Unskilled	8		\$ 79.36			\$ 79
Chem. weed control- middle	Skilled	0.6	0.5	\$ 9.36	\$ 2.77	\$ 10.38	\$ 23
Hilling up	Skilled	1.7	1.5	\$ 26.52	\$ 9.21		\$ 36
Spray 1	Skilled	0.4	0.3	\$ 6.24	\$ 2.71	\$ 8.47	\$ 17
Spray 2	Skilled	0.4	0.3	\$ 6.24	\$ 2.71	\$ 8.47	\$ 17
Spray 3	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 8.47	\$ 22
Spray 4	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 8.47	\$ 22
Mowing	Skilled	1.3	1	\$ 20.28	\$ 8.10		\$ 28
Rogueing	Unskilled	1		\$ 9.92			\$ 10
Miscellaneous							\$ 37
Total		42.7	11.6	\$ 535.48	\$ 75.19	\$ 142.27	\$ 790

Table 7 continued

	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Third Year							
Pruning	Custom	Piece rate*		\$ 242.00			\$ 242
Brush removal	Unskilled	2		\$ 19.84			\$ 20
Tying & renewal	Unskilled	10		\$ 99.20		\$ 4.00	\$ 103
Vine replacement	Skilled	2	2	\$ 31.20	\$ 10.94	\$ 48.40	\$ 91
Spring fertilization	Skilled	0.6	0.5	\$ 9.36	\$ 3.30	\$ 9.60	\$ 22
Chem. weed control- trellis	Skilled	2.6	2	\$ 40.56	\$ 11.08	\$ 36.00	\$ 88
Suckering	Unskilled	7		\$ 69.44			\$ 69
Cluster removal	Unskilled	8		\$ 79.36			\$ 79
Take away	Skilled	3	2.5	\$ 46.80	\$ 15.35		\$ 62
Hand hoe	Unskilled	8		\$ 79.36			\$ 79
Chem. weed control-middle	Skilled	0.6	0.5	\$ 9.36	\$ 2.77	\$ 10.38	\$ 23
Spot herbicide treatment	Skilled	0.4	0.3	\$ 6.24	\$ 1.66	\$ 10.38	\$ 18
Spray 1	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 11.48	\$ 25
Spray 2	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 11.48	\$ 25
Spray 3	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 11.48	\$ 25
Spray 4	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 11.48	\$ 25
Spray 5	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 18.50	\$ 32
Spray 6	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 18.50	\$ 32
Spray 7	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 23.17	\$ 37
Spray 8	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 18.50	\$ 32
Spray 9	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 44.90	\$ 59
Spray 10	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 55.92	\$ 70
Mowing (2X)	Skilled	1.3	1	\$ 20.28	\$ 8.10		\$ 28
Brush chopping (1X)	Skilled	1.2	1	\$ 18.72	\$ 8.10		\$ 27
Hilling up	Skilled	1.7	1.5	\$ 26.52	\$ 9.21		\$ 36
Rogueing	Unskilled	1		\$ 9.92			\$ 10
Petiole test	Skilled	0.1		\$ 1.56		\$ 1.60	\$ 3
Fall fertilization	Skilled	0.6	0.5	\$ 9.36	\$ 3.30	\$ 32.00	\$ 45
Miscellaneous							\$ 37
Total		56.1	16.8	\$ 912.68	\$ 118.93	\$ 377.77	\$ 1,446

* Note: if one decides not to use piece rate labor the estimated pruning time is 18 hours per acre, and with skilled labor the cost is \$280.80. Thus total labor requirements using regular hired labor would be 74.1 hours per acre.

The total costs for the entire E&D period are summarized in Table 8. The totals from Table 7 for each of the three years are brought into the row labeled 'annual variable costs'. Hand harvesting costs are added in for the third year only. Fixed costs (capital recovery for machinery and equipment and buildings, property taxes, office supplies, land charge, insurance, and management) are added. Interest, at a real rate of five per cent, is added to the cumulative costs. Credit is given for the revenue from the estimated one ton of grapes harvested in year three. The price of grapes in year three is the average of the four varieties produced. The total cumulative cost for the E&D period is \$13,654 per acre. Amortized at a five per cent real rate of interest for the estimated years of life from year four through 25 (or 22 years), the annual cost for capital recovery (interest and depreciation) is \$1,037 per acre. This amount was charged as a fixed cost in Table 11, which summarizes the costs and returns for a mature vineyard. Cash costs for establishment, including labor, are \$9,976 for site preparation and the first three years.

Table 8: Summary of Establishment and Development Costs by Year
for *V. Vinifera* Grapes, Finger Lakes Region, NY 2001

Item	Year 1	Year 2	Year 3
Revenue			
Yield per acre (tons)	0	0	1
Market price (ave. of 4 varieties)	n.a.	n.a.	\$ 1,411
Total revenue	\$ 0	\$ 0	\$ 1,411
Costs			
Site preparation	\$ 1,546	\$ 0	\$ 0
Annual variable costs			
Preharvest	\$ 6,194	\$ 790	\$ 1,446
Harvest (Hand)	n.a.	n.a.	\$ 200
<i>Total variable costs and site preparation</i>	<i>\$ 7,740</i>	<i>\$ 790</i>	<i>\$ 1,646</i>
Annual fixed costs			
Machines & equipment amortization	\$ 484	\$ 484	\$ 484
Buildings amortization	\$ 95	\$ 95	\$ 95
Property taxes	\$ 49	\$ 49	\$ 49
Land opportunity cost	\$ 100	\$ 100	\$ 100
Office supplies, phone, etc.	\$ 69	\$ 69	\$ 69
Insurance	\$ 50	\$ 50	\$ 50
Management	\$ 212	\$ 212	\$ 212
<i>Total fixed costs</i>	<i>\$ 1,059</i>	<i>\$ 1,059</i>	<i>\$ 1,059</i>
Interest on cumulative costs	\$ 440	\$ 564	\$ 717
<i>Total costs</i>	<i>\$ 9,239</i>	<i>\$ 2,403</i>	<i>\$ 3,423</i>
Net returns	(\$ 9,239)	(\$ 2,403)	(\$ 2,012)
Total cumulative costs	\$ 9,239	\$11,642	\$13,654
Amortization of vineyard:			\$ 1,037
Cash costs of vineyard establishment (3 Yrs.)			\$ 9,976

Costs and Returns for a Mature Vineyard

Annual growing costs for years four through 25 are developed in Table 9. Total growing costs for a typical year in the mature vineyard are estimated to be \$2,033 per acre. The most costly operations are spraying (ten times, for a total of \$364 per acre, including labor, machinery and materials costs) and pruning (\$323 per acre). By year four, the well-managed vineyard will nearly have reached its full yield potential and will require approximately the same management each year for the duration of its life.

Table 9: Growing Costs, Years Four through Twenty-five, *V. Vinifera* Grapes, Finger Lakes Region, New York, 2001

Operation	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Pruning	Custom	Piece Rate*		\$ 322.67			\$ 323
Brush removal	Unskilled	5		\$ 49.60			\$ 50
Trellis maintenance	Skilled	3	1	\$ 46.80	\$ 5.47	\$ 30.00	\$ 82
Tying & renewal	Unskilled	18		\$ 178.56		\$ 2.80	\$ 181
Spring fertilization	Skilled	0.6	0.5	\$ 9.36	\$ 3.30	\$ 9.60	\$ 22
Vine replacement	Skilled	2	2	\$ 31.20	\$ 10.94	\$ 48.40	\$ 91
Chem.weed control-trellis (Spring)	Skilled	2.6	2	\$ 40.56	\$ 11.08	\$ 36.00	\$ 88
Chem. weed control-middle	Skilled	0.6	0.5	\$ 9.36	\$ 2.77	\$ 10.38	\$ 23
Spot herbicide treatment	Skilled	0.4	0.3	\$ 6.24	\$ 1.66	\$ 10.38	\$ 18
Suckering	Unskilled	7		\$ 69.44			\$ 69
Cluster removal & shoot thinning	Unskilled	10		\$ 99.20			\$ 99
Take-away	Skilled	3	2.5	\$ 46.80	\$ 15.35		\$ 62
Chem. weed control-trellis (Summer)	Skilled	2.6	2	\$ 40.56	\$ 11.08	\$ 36.00	\$ 88
Hand hoe	Unskilled	8		\$ 79.36			\$ 79
Spray 1	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 11.48	\$ 25
Spray 2	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 11.48	\$ 25
Spray 3	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 11.48	\$ 25
Spray 4	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 11.48	\$ 25
Spray 5	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 18.50	\$ 32
Spray 6	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 18.50	\$ 32
Spray 7	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 23.17	\$ 37
Spray 8	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 18.50	\$ 32
Spray 9	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 44.90	\$ 59
Spray 10	Skilled	0.6	0.5	\$ 9.36	\$ 4.51	\$ 55.92	\$ 70
Mowing (2X)	Skilled	1.3	1	\$ 20.28	\$ 8.10		\$ 28
Brush chopping	Skilled	1.2	1	\$ 18.72	\$ 8.10		\$ 27
Lime	Custom	n/a				\$ 6.20	\$ 6
Pickup truck	n/a	n/a			\$ 50.09		\$ 50

Table 9 Continued

Operation	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Shoot positioning/move catch wires	Unskilled	6		\$ 59.52			\$ 60
Shoot positioning/move catch wires	Unskilled	6		\$ 59.52			\$ 60
Leaf removal	Skilled	1.25	1	\$ 19.50	\$ 8.42		\$ 28
Summer pruning	Skilled	1.3	1	\$ 20.28	\$ 5.74		\$ 26
Petiole sampling	Skilled	0.1		\$ 1.56		\$ 0.80	\$ 2
Soil sampling	Skilled	0.2		\$ 3.12		\$ 0.26	\$ 3
Hilling-up	Skilled	1.7	1.5	\$ 26.52	\$ 9.21		\$ 36
Rogueing	Unskilled	1		\$ 9.92			\$ 10
Fall fertilization	Skilled	0.3	0.3	\$ 4.68	\$ 1.98	\$ 10.67	\$ 17
Bird Control	Skilled	0.25		\$ 3.90			\$ 4
Miscellaneous							\$ 37
Total		89.4	21.6	\$1,370.83	\$ 198.41	\$ 426.90	\$ 2,033

* Note: if one decides not to use piece rate labor the estimated pruning time is 30 hours per acre, and with skilled labor the cost is \$468.

Thus total labor requirements, using regular hired labor, would be 119.4 hours per acre.

Table 10 Summarizes the growing, establishment, and development costs for a *V. Vinifera* vineyard. Growing costs are largest in the first year when a significant amount must be spent preparing the site, planting the vines, and constructing the trellis. Growing costs are \$2,033 in years four through 25, and this number is transported to Table 11 to find the costs and returns for the mature vineyard.

Table 10: Summary of Growing Costs for *V. Vinifera* Vineyard, Trained to a Vertically Shoot Positioned System, Finger Lakes Region, NY, 2001

Item	Year 1	Year 2	Year 3	Year 4+
Site preparation	\$ 1,546			
Vines & planting	\$ 3,078			
Trellis materials & construction	\$ 2,836			\$ 82
Replanting & Rogueing		\$ 100	\$ 100	\$ 100
Dormant pruning & removal		\$ 94	\$ 262	\$ 372
Weed control	\$ 109	\$ 188	\$ 208	\$ 295
Fertilization	\$ 24	\$ 22	\$ 70	\$ 52
Canopy management		\$ 143	\$ 252	\$ 523
Disease & insect control	\$ 52	\$ 80	\$ 364	\$ 364
Take away & hilling up	\$ 31	\$ 98	\$ 98	\$ 98
Mowing	\$ 28	\$ 28	\$ 55	\$ 55
Bird Control				\$ 4
Pick-up				\$ 50
Miscellaneous	\$ 37	\$ 37	\$ 37	\$ 37
Total Growing Costs	\$ 7,740	\$ 790	\$ 1,446	\$ 2,033

Table 11 summarizes the costs and returns expected from a mature vineyard. The estimated revenue per acre varies from \$3,703 to \$5,673, depending upon variety. The growing costs from Table 9 are added to the harvesting costs and the cost of operating capital to obtain the total variable costs of \$2,283 to \$2,410 per acre. Fixed costs, to include the amortized costs for E&D of the vineyard from Table 8, are added. The result is total annual fixed costs of \$2,069 to 2,167 per acre. Total costs vary from \$4,357 to \$4,578 per acre by variety. The break-even price prices and yields are shown in table 11.

Table 11: Costs and Returns for a mature *V. Vinifera* Vineyard, Trained to a Vertically Shoot Positioned System, Finger Lakes Region, NY, 2001

Item	Pinot Noir	Cab. Franc	Chardonnay	Riesling
Receipts:				
Yield, tons per acre	2.5	3.5	3.0	3.0
Price, \$ per ton	\$ 1,481	\$ 1,621	\$ 1,277	\$ 1,263
Total receipts	\$ 3,703	\$ 5,673	\$ 3,831	\$ 3,788
Costs:				
Variable Costs:				
Growing	\$ 2,033	\$ 2,033	\$ 2,033	\$ 2,033
Cluster removal (Cab. Franc and P. Noir)	\$ 99	\$ 99		
Interest on operating capital	\$ 51	\$ 51	\$ 51	\$ 51
Machine Harvesting	\$ 200	\$ 228	\$ 200	\$ 200
Total variable costs	\$ 2,383	\$ 2,410	\$ 2,284	\$ 2,284
Fixed Costs:				
Vineyard capital recovery	\$ 1,037	\$ 1,037	\$ 1,037	\$ 1,037
Machinery and equipment capital recovery	\$ 484	\$ 484	\$ 484	\$ 484
Buildings capital recovery	\$ 95	\$ 95	\$ 95	\$ 95
Property taxes	\$ 49	\$ 49	\$ 49	\$ 49
Land opportunity cost	\$ 100	\$ 100	\$ 100	\$ 100
Office supplies, phone, etc.	\$ 69	\$ 69	\$ 69	\$ 69
Insurance	\$ 50	\$ 50	\$ 50	\$ 50
Management	\$ 185	\$ 284	\$ 192	\$ 189
Total fixed costs	\$ 2,069	\$ 2,167	\$ 2,075	\$ 2,073
Total costs	\$ 4,452	\$ 4,578	\$ 4,359	\$ 4,357
Profit or loss	(\$ 749)	\$ 1,095	(\$ 528)	(\$ 569)
Breakeven price (\$ /ton)	\$ 1,781	\$ 1,308	\$ 1,453	\$ 1,452
Breakeven yield	3.0	2.8	3.4	3.5

Three of the varieties show a loss given the assumed yields and prices. To put this in perspective, it should be remembered that we assumed recommended practices throughout the model. Some growers will be able to reduce some of these costs considerably. All labor, including the owner's labor, is charged a cash wage. There is an imputed charge on all capital used. The vineyard capital expense is written off after 25 years, but we have not accounted for the fact that the vineyard at the end of 25 years has a value that is as much, or even more, than it was worth in the early years of the planting. The assumption of slightly higher yields (about a half ton per acre for the three varieties that show negative profit) would result in a breakeven situation. At the assumed yield

and prices, Cabernet Franc looks extremely profitable. Growers and investors should be forewarned, however, that even 20 or 30 more acres of the variety planted in the Finger Lakes could cause a surplus that would drive down prices from their current high level. In addition to the high prices that were assumed, the grower panel estimated higher yields as well for Cabernet Franc.

Capital Requirement

Table 12 indicates the capital investment necessary to get into grape production in the Finger Lakes region, assuming a vineyard of 36 total acres and reliance on either custom hand or machine harvesting of grapes. The table uses the value of new machinery and equipment and buildings. Land costs assume a prime site close to the lake. Table 12 indicates that it would require \$20,604 per acre to get a vineyard into maturity in the Finger Lakes under the assumptions indicated above. Established growers, with depreciated vineyards, machinery and equipment, and buildings, would have lower capital investment (book value) depending upon the age of their depreciable assets. Growers with smaller acreage will typically have higher investment costs per acre. This is due to less efficient use of the machinery complement unless they hire more tasks to be done by custom operators, thus giving them the possibility to buy fewer pieces of machinery and equipment.

Table 12: Investment Per Acre of *V. vinifera* Grapes,
Finger Lakes Region of New York, for a 36-Acre Vineyard.

Assets	\$/acre
Land*	\$ 2,000
Machinery & equipment	\$ 3,492
Buildings (shop & tool shed)	\$ 1,458
Vineyard establishment and development	\$13,654
Total Investment per acre	\$20,604

*Prime site close to the lake

DISCUSSION AND SENSITIVITY ANALYSIS

Costs per ton of grapes and profits for Finger Lakes vineyards will vary widely due to factors such as land costs, site factors, farm size, managerial ability and labor efficiency. The cost and return estimates developed in this publication represent typical costs for well-managed vineyards producing premium quality grapes on prime sites.

The panel did not believe there was sufficient data to adjust costs for varietal differences. In reality, vigorous cultivars such as Cabernet Franc may require a greater labor input for pruning, brush removal, tying and other hand labor tasks. Differences in fungicide applications may be necessary due to the differences in disease resistance among the various varieties. For example, Pinot Noir and Cabernet Franc are more susceptible to Botrytis and rot problems.

The total cost per ton, or breakeven price, is quite sensitive to yield as shown in Table 13. If yields are two tons per acre or less and/or with low yielding cultivars, over \$2,100 per ton would be required to break even. Even the highest price paid in the most

recent seasons of relatively high prices would result in unprofitable production with such a low yielding scenario. The grower panel felt, however, that with the current emphasis on premium quality grapes going into wine priced at higher price points (e. g. \$15 to \$20 per bottle) that yield limitation was necessary to produce the required premium product. Higher yields are probably marketable at the grape prices assumed in Table 11.

Yields of more than four tons per acre for red vinifera varieties or more than five tons per acre for white vinifera varieties may be incompatible with the quality requirements of the market for premium wines, but this is a question that needs more definitive research.

Table 13: Total Cost Per Ton (Breakeven Price) At Varying Yields,
V. vinifera Grapes, Finger Lakes Region of New York, 2001

Pinot Noir		Cab Franc		Chardonnay		Riesling	
Yield (tons/acre)	Cost/ton*	Yield (tons/acre)	Cost/ton*	Yield (tons/acre)	Cost/ton*	Yield (tons/acre)	Cost/ton*
1.5	\$2,900	1.5	\$2,965	1.5	\$2,838	1.5	\$2,836
2.0	\$2,191	2.0	\$2,240	2.0	\$2,145	2.0	\$2,144
2.5	\$1,781	2.5	\$1,805	2.5	\$1,729	2.5	\$1,728
3.0	\$1,482	3.0	\$1,515	3.0	\$1,453	3.0	\$1,452
3.5	\$1,280	3.5	\$1,308	3.5	\$1,253	3.5	\$1,253
4.0	\$1,128	4.0	\$1,153	4.0	\$1,105	4.0	\$1,104
				4.5	\$ 989	4.5	\$ 989
				5.0	\$ 897	5.0	\$ 896

* Cost at different yield levels adjusted for machine harvesting and hauling.

Assumes a 5% real interest rate and a \$2,000 land value.

CONCLUSIONS

The cost and returns estimates derived in this publication indicate results for *V. vinifera* in the Finger Lakes under the assumption of prime sites, the use of recommended practices, good management, current prices for inputs, and prices for grapes that reflect several quality enhancing practices such as leaf pulling, cluster removal for two varieties, and limited yields.

Potential investors should be forewarned that the current economic climate for grape growing in the Finger Lakes can change. There is concern about the potential impact of large plantings of *V. vinifera* in California (White) and the increasing availability of inexpensive, high quality imported wine. In some years, given the thin markets for certain varieties, a surplus situation can develop when a few growers plant additional acres. The total acreage of some varieties in New York is quite limited. For example, in 1996, the New York Crop Reporting Service estimated acreage of certain varieties in New York state as follows: Cabernet Franc, 130 acres; Cabernet Sauvignon, 231 acres; Merlot, 260 acres; Pinot Gris, 29 acres, and Pinot Noir, 139 acres. With such limited acreage, a few small plantings or one large planting of these varieties can lead to a

large percentage increase in grapes produced, temporarily depressing the cash market. This happened with Chardonnay in the Finger Lakes in the early 1990's.

Nevertheless, given the growing consumption of table wine in the United States, the developing tourist trade in the Finger Lakes, and the growing reputation of Finger Lakes wine quality, the long run potential appears favorable for investors who can weather the inevitable ups and downs associated with an agricultural enterprise subject to the usual vagaries of weather and market forces.

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APPENDIX

Appendix Table 1: Hourly Equipment Variable Costs

Item	Purchase Price	Hours of life	Total life Repairs cost	Repairs	Fuel	Lube (15% of fuel)	Total Hourly Variable Cost
Tractor, 62-HP, 2WD, spray cab	\$ 36,000	12000	100%	\$3.00	\$2.63	\$0.39	\$6.02
Tractor, 45-HP	\$ 23,000	12000	100%	\$1.92	\$2.63	\$0.39	\$4.94
Air-blast sprayer- 300 gallon	\$ 10,000	2000	60%	\$3.00			\$3.00
Herbicide sprayer- 50 gallon	\$ 2,000	2000	60%	\$0.60			\$0.60
Mower/brush chopper (7ft)	\$ 6,500	2500	80%	\$2.08			\$2.08
Fertilizer Spreader	\$ 2,500	1200	80%	\$1.67			\$1.67
Small disk	\$ 900	2000	60%	\$0.27			\$0.27
Grape hoe	\$ 4,000	2000	60%	\$1.20			\$1.20
Post driver	\$ 2,500	2000	80%	\$1.00			\$1.00
Trailer	\$ 2,000	3000	80%	\$0.53			\$0.53
Pickup truck	\$ 17,000	2500	83%	\$5.64	\$3.00	\$0.45	\$9.09
Auger	\$ 1,100	2000	80%	\$0.44			\$0.44
Mechanical hedger	\$ 2,000	2000	80%	\$0.80			\$0.80
Leaf remover	\$ 6,000	2000	80%	\$2.40			\$2.40

Diesel Fuel Factor: .0438

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