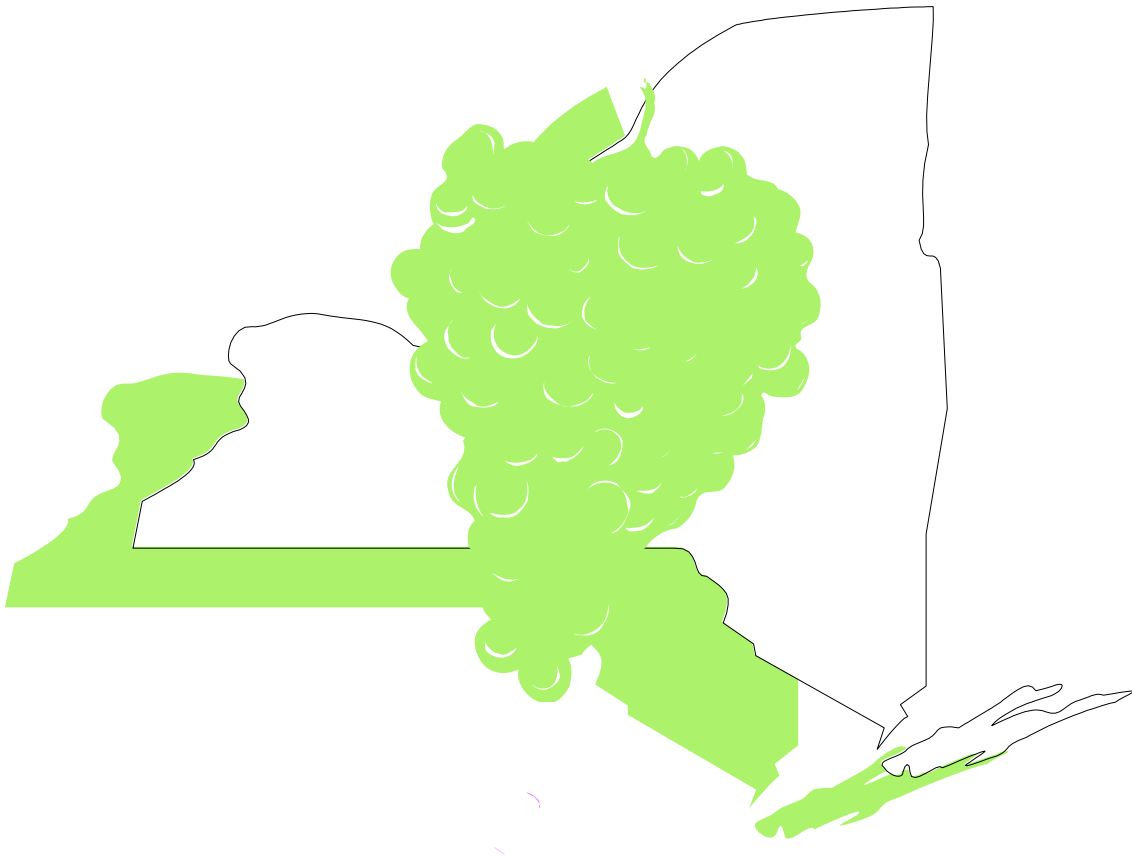


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COST OF ESTABLISHMENT AND PRODUCTION OF *VINIFERA* GRAPES IN THE FINGER LAKES REGION OF NEW YORK, 2010

By Gerald B. White *

INTRODUCTION

In recent years there has been increased interest in the Finger Lakes, as well as in other parts of New York State and the eastern United States, in planting *Vitis vinifera* grapes for premium wine production. Acreage of red varieties such as Pinot Noir, Cabernet Sauvignon, Merlot, and Cabernet Franc all increased in the most recent orchard and vineyard survey compiled by the New York Agricultural Statistics Service in 2006. Acreage of Riesling increased by 60 percent from the 2001 survey, while Chardonnay decreased by 16 percent. Overall, vinifera acreage increased by 38 percent (to 1596 acres) in the Finger Lakes in the five year period, led by Riesling, with a total acreage of 543. Vinifera accounted for 18 percent of grape acreage in the Finger Lakes. The acreage report by variety will not be conducted again until next year. However, it is likely to show strong growth, as indicated by the total production of vinifera grapes in New York state which has increased from 4,670 tons in 2000 to 9,790 tons in 2010, an annual growth rate of over seven per cent for the decade.

There has been an increase in consumer demand for quality wines (interspecific French American hybrid and *V. vinifera* cultivars, or designated appellations). Wine consumption in the United States has increased by about 3.3 percent during the last 10 years driven by good news regarding the health benefits of moderate wine consumption. New York is gaining stature as a producer of high quality wines that command premium prices, and the Finger Lakes has benefited from a surge of sales and interest nationally in Riesling varietal wines over the past three years. However, the prices received by Finger Lakes growers for vinifera grapes did decline for all major varieties in 2008 and 2009, probably due both to the recession in the US economy, and increased plantings of vinifera in New York in recent years. Prices for the major vinifera varieties rebounded slightly in 2010.

Growers who are considering planting additional *V. vinifera* vineyards need to carefully weigh the cost of planting and establishing a vineyard and the annual cost of production of a mature vineyard against the expected yields and prices to determine whether the investment of \$18,000 per acre or more required to bring a *V. vinifera* vineyard into production will result in a profitable return on investment. This requires a re-assessment of which varieties to plant on this acreage and which sites will support profitable *vinifera* production. Varieties to plant have to be considered relative to cold hardiness, as the Finger Lakes has experienced severe winter injury to vinifera about every decade, with the last major freeze event occurring in 2004.

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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 a worldwide over -- supply of wine grapes from significant plantings in “new world” competitors such as Australia, New Zealand, and Chile.

Although the New York industry is somewhat insulated by the small scale of its market structure in the premium wine sector, with most wineries selling over 50 percent of their wine (volume) through direct sales in the tasting room, wineries cannot expect to be completely unaffected if global supply outstrips demand in the future. Given the limited area planted, a small increase in planted acreage can have a relatively large impact on supply when the new acreage begins bearing, as occurred with Chardonnay in recent years. During the 2007 harvest, there was a surplus in Cabernet Franc grapes. This emphasizes the importance of selection of varieties, which is driven both by the marketing plan, and to a certain extent by the relative cold hardiness of *vinifera* varieties. Production of *vinifera* in NY reached 9,790 tons in 2010, an increase of 22.5 percent over the production in 2007.

The objective of this study was to determine the cost of producing *V. vinifera* grapes in the Finger Lakes region in a commercial size 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, 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. Operations such as special tillage practices (hilling up and take away) once again had their value demonstrated with the winter injury that was widespread in 2004.

METHODS

The methods used to construct cost estimates were a combination of 1) interviews with a panel comprised of grower representatives, and 2) economic engineering using recommended practices. In June of 2010, we met with a panel of four growers and vineyard managers. The growers reviewed the data prepared for the most recent estimates of the cost of establishing and growing *V. vinifera* grapes in 2007, the last time this study was conducted. Consensus estimates were developed for land prices, 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 and labor time estimates for the '07 study, and made recommendations for changes.

The panel also provided estimates, based on their own experience in the vineyard, of the 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 \$5,000 per acre. The size of the vineyard was decided in consultation with the grower panel. The specified size was 54 acres, with 50 acres planted to grapes. The other four acres are occupied by roads, headlands, and a shop. The 50-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 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. Vine cost was estimated to average \$3.25 each for the initial planting (assuming orders of vines in quantities over 1000). Each year it was assumed that two percent of the vines had to be replanted. At two percent, 807 vines would be used annually for replanting. For quantities of vines under 1000, the vine cost was assumed to be \$3.50 per vine. Vines were planted using contracted laser planting. The fee for laser planting was \$35 per row and \$.50 per vine.

Varieties. The 50-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 second row or 18 feet apart. The tile drainage system consisted of 4" lateral pipes running down the middle of every second row, and these lateral pipes were 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, four catch wire clips per line post, and a 5" X 8' wooden end post and anchor support post at the end of each row.

Herbicides and Fertilizer/Soil Program. The sample herbicide program was developed in consultation with the advisory panel of four growers. The herbicide program relies upon the use of an Environmist sprayer (purchase price of \$4,500). The program is based on the use of glyphosate in three applications under the trellis per season and one spot application applied by hand held equipment. The sample program is probably not sustainable for the 22 year useful life of the vineyard because of the potential development of weed resistance due to the long-term reliance on a single herbicide; however, new materials are being tested which should be available in the near future that can be used in combination with glyphosate. For details of the sample herbicide program, see Appendix, Table 1. The sample fertilizer/soil program was developed by

Hans Walter-Peterson, Extension Educator, Finger Lakes Grape Program. See Appendix, Table 2 for details.

Wage Rates. Wage rates used represented the consensus of the grower panel. The rates assumed were \$19.00 per hour for skilled labor (i.e. \$14.60 per hour (plus fringe benefits). Fringe benefits consist of workers compensation, social security, medical insurance, and other benefits. For unskilled labor, the rate was \$12.00 per hour (including fringe benefits). Piece rate wage rates were used for pruning the vines in the third and fourth year. The rate was \$.40 per vine. The piece rates for tying were specified at \$.20 per vine.

Harvesting & Hauling. Grapes were custom machine harvested in the fourth year and beyond. The machine harvesting rate is \$60 per ton or a minimum of \$240 per acre. Since all varieties were assumed to yield less than four tons per acre, the effective rate was \$240 per acre for all four varieties. Hauling costs are included in this rate 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 with the minor exceptions for a small disc and a mechanical hedger, which were assumed to be used. Diesel fuel at \$2.64 per gallon was budgeted for machine operations. (Note: the diesel fuel being used is green diesel, which may only be used for agricultural purposes). Gasoline was charged at \$3.04 per gallon (for unleaded). These were representative of prices in Central New York as of January 2011. Hourly machinery variable costs (repairs, fuel, and lube) are shown in Table 3 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. were estimated at \$3,000 per year. School and property taxes were \$25 per \$1,000 of assessed value of the initial land investment.

Management Charge. A management fee of five percent of gross receipts was assessed for the vineyard. This represents the opportunity cost for the vineyard owner to manage the operation. All labor requirements were assessed as cash costs. Therefore, in situations where the owner or manager is performing vineyard tasks and managing the operation, actual cash outlays would be lower than are represented in these cost estimates.

Cost of Capital. A four percent 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 three percent.

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 tons/acre	2.6 tons/acre
Cabernet Franc	1 tons/acre	3.3 tons/acre
Chardonnay	1 tons/acre	3.3 tons/acre
Riesling	1 tons/acre	3.4 tons/acre

Grape Prices. Prices for the most recent five-year period (2006-2010) in the Finger Lakes Region were obtained from Martinson and Walter-Peterson, *Finger Lakes Vineyard Notes* newsletter, Harvest Issues.

RESULTS

Grape Prices

Prices for the five years ending in 2010 are shown in Table 2. (These averages reflect price lists submitted to the NYS Department of Agriculture and Markets and forwarded to the Finger Lakes Grape Program.) A detailed list of varietal prices is summarized annually in the August issue of the *Finger Lakes Vineyard Notes*. These averages do not take into account quality and/or quantity of grapes purchased by each processor. Since larger processors often pay less, the true average price is often lower than the average reported in Table 2. However the prices in Table 2 are a reasonable indicator of price trends for the four varieties. The panel of grape growers and vineyard managers took these prices into account when specifying the prices shown in the last row of Table 2, which are the prices used in the profitability analysis reported in this bulletin. The prices specified by the panel reflect special quality practices that are used for premium wine production.

Table 2: Average Price Listings for Selected *V. Vinifera* Grapes in the Finger Lakes Region, 2006-2010, Dollars per Ton.

	Chardonnay	Riesling	Pinot Noir	Cabernet Franc
2006	\$ 1,332	\$ 1,582	\$ 1,654	\$ 1,575
2007	\$ 1,375	\$ 1,628	\$ 1,675	\$ 1,560
2008	\$ 1,299	\$ 1,565	\$ 1,663	\$ 1,328
2009	\$ 1,238	\$ 1,417	\$ 1,532	\$ 1,242
2010	\$ 1,295	\$ 1,443	\$ 1,571	\$ 1,264
Mean	\$ 1,295	\$ 1,527	\$ 1,619	\$ 1,394
Prices used	\$ 1,200	\$ 1,300	\$ 1,600	\$ 1,200

Source: *Finger Lakes Vineyard Notes*, Harvest Issues, 2006-2010

Machinery and Buildings Costs

The investment costs and annual costs for equipment and buildings are summarized in Table 3. The machinery investment required totals \$151,825, an average investment of \$3,037 per acre of vineyard. The investment for a shop is estimated at \$69,000, or \$1,380 per acre. The shop was 1,500 ft², and the construction cost was estimated at \$46.00 per ft² which includes basic amenities such as water and electricity. The total annual costs for depreciation and interest amount to \$20,710 for machinery and \$3,988 for buildings, or \$414 and \$80 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, three, and years four through twenty-five. In year three, eight sprays are recommended. Beginning in year four, sprays are assumed to be approximately the same from year to year, with the necessity on average for twelve sprays during the growing season. Spray materials costs were \$344.07 per acre for Cabernet Franc and \$379.97 for Chardonnay, Riesling, and Pinot Noir. Fungicide applications may vary slightly among vinifera cultivars due to the differences in disease resistance. For example, Pinot Noir, Chardonnay, and Riesling are more susceptible to Botrytis bunch rot. These varieties had extra costs for spray materials due to an extra fungicide material (Vanguard 75 WP) necessary with the 6th spray. Of course, spray programs will have to be adjusted slightly from year to year to accommodate variable weather and/or pest pressure. Pesticide application costs for labor and machinery, as well as herbicides, are developed in Tables 7 and 9 to follow.

Drainage Construction Costs

Table 5 contains an estimate of drainage construction costs. These costs are transferred to the site preparation section of the establishment and development costs. 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 second row or 18 feet apart. Costs were estimated to total \$4,110 per acre.

Trellis Construction Costs

Table 6 contains an estimate of trellis constructions costs. The total cost for materials is estimated at \$3,648 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 total cost of trellis construction for materials, labor, and machinery is \$4,523 per acre.

The trellis was designed for Vertically Shoot Positioned (VSP) vines. It was made up of two pairs of moveable catch wires and two fixed fruiting wires (a total of six wires). Wooden line posts were used for every third vine, and four catch wire clips were used on 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 3: Machinery, Equipment, and Building Capital Recovery and Interest Costs,
50 acre *V. vinifera* Vineyard, Finger Lakes Region, NY, 2010

<i>Machinery and Equipment</i>	Purchase Price	Years of Life	Salvage Value	Capital to be Recovered	Cost		Interest on Salvage Value	Total Capital Recovery & Interest
					Recovery Factor	Annual Recovery		
Tractor, 62-HP, 2WD, spray cab	\$38,000	10	\$3,800	\$34,200	0.1233	\$4,217	\$152	\$4,369
Tractor, 45-HP	\$28,000	10	\$2,800	\$25,200	0.1233	\$3,107	\$112	\$3,219
Air-blast sprayer- 300 gallon	\$16,000	10	\$1,600	\$14,400	0.1233	\$1,776	\$64	\$1,840
Herbicide sprayer- 50 gallon	\$1,500	10	\$150	\$1,350	0.1233	\$166	\$6	\$172
Enviromist sprayer	\$4,500	10	\$450	\$4,050	0.2246	\$910	\$18	\$928
Mower/brush chopper (7ft)	\$4,900	10	\$490	\$4,410	0.2246	\$990	\$20	\$1,010
Fertilizer Spreader	\$2,000	10	\$200	\$1,800	0.1233	\$222	\$8	\$230
Small disc (used)	\$600	10	\$60	\$540	0.1233	\$67	\$2	\$69
Grape hoe	\$6,750	10	\$675	\$6,075	0.1233	\$749	\$27	\$776
Post driver	\$2,575	10	\$258	\$2,318	0.1233	\$286	\$10	\$296
Trailer	\$3,000	10	\$300	\$2,700	0.1233	\$333	\$12	\$345
Pickup truck	\$26,000	5	\$2,600	\$23,400	0.2246	\$5,256	\$104	\$5,360
Mechanical hedger (used)	\$2,600	10	\$260	\$2,340	0.1233	\$289	\$10	\$299
Replanter	\$4,800	10	\$150	\$4,650	0.1233	\$573	\$6	\$579
Bird control equipment	\$2,600	10	\$260	\$2,340	0.1233	\$289	\$10	\$299
Shop Equipment	\$8,000	10	\$800	\$7,200	0.1233	\$888	\$32	\$920
Total Machine & Equipment costs	\$151,825							\$20,710
Cost per planted acre	\$3,037							\$414
Buildings								
Shop (1,500 ft ² @ \$46.00 ft ²)	\$69,000	30	\$0	\$69,000	0.0578	\$3,988	\$0	\$3,988
Cost per planted acre	\$1,380							\$80
Vineyard								
1 Ac. Vinifera Vineyard	\$18,792	22	\$0	\$18,792	0.0692	\$1,300	\$0	\$1,300

Table 4: Sample Fungicide & Insecticide Spray Program for *V. vinifera* Grapes,
Finger Lakes Region, NY, 2010

	Material	Rate/acre	Price	\$/acre
Year 1				
Sprays 1-3	Mancozeb 75 DF	3 lbs.	\$ 3.98 lb.	\$ 11.94
	Sulfur	4 lbs.	\$ 0.45 lb.	\$ 1.80
	Spreader	4 oz.	\$ 62.20 gal.	\$ 1.94
Total per spray				\$ 15.68
Total for year (3 sprays)				\$ 47.05
Year 2				
Sprays 1-4	Mancozeb 75 DF	3 lbs.	\$ 3.98 lb.	\$ 11.94
	Sulfur	4 lbs.	\$ 0.45 lb.	\$ 1.80
	Spreader	4 oz.	\$ 62.20 gal.	\$ 1.94
Total per spray				\$ 15.68
Total for year (4 sprays)				\$ 62.74
Year 3				
Sprays 1-2	Mancozeb 75 DF	3 lbs.	\$ 3.98 lb.	\$ 11.94
	Sulfur	4 lbs.	\$ 0.45 lb.	\$ 1.80
	Spreader	4 oz.	\$ 62.50 gal.	\$ 1.94
Total per spray				\$ 15.68
Total for year (2 sprays)				\$ 31.37
Sprays 3-4	Revus Top	7 oz.	\$ 2.03 lb.	\$ 14.21
	Sulfur	8 lbs.	\$ 0.45 lb.	\$ 3.60
	Spreader	4 oz.	\$ 62.50 gal.	\$ 1.94
Total per spray				\$ 19.75
Total per year (2 sprays)				\$ 39.51
Sprays 5-8	Captan 80 WP	2.5 lbs.	\$ 7.47 lb.	\$ 18.68
	Sulfur	5 lbs.	\$ 0.45 lb.	\$ 2.25
	Spreader	4 oz.	\$ 62.20 gal.	\$ 1.94
Total per spray				\$ 22.87
Total per year(3 sprays)				\$ 68.61
Total per year (8 sprays)				\$139.48
Years 4-25				
Sprays 1-2	Mancozeb 75 DF	3 lbs.	\$ 3.98. lb.	\$ 11.94
	Sulfur	4 lbs.	\$ 0.45 lb.	\$ 1.80
	Spreader	4 oz.	\$ 62.20 gal.	\$ 1.94
Total per spray per year				\$ 15.68

	Material	Rate/acre	Price	\$/acre
Total for year (2 sprays)				\$ 31.37
Sprays 3	Mancozeb 75 DF	3 lbs.	\$ 3.98 lb.	\$ 11.94
	Sulfur	5 lbs.	\$.45 lb.	\$ 2.25
	Spreader	4 oz.	\$ 62.20	\$ 1.94
Total per spray				\$ 16.13
Total per year (1 sprays)				\$ 16.13
Spray 4	Revus Top	7 oz.	\$ 2.03	\$ 14.21
	Sulfur	5 lbs.	\$ 0.45 lb.	\$ 2.25
	Spreader	4 oz.	\$ 62.20 gal.	\$ 1.94
Total per spray				\$ 18.40
Total per year				\$ 18.40
Sprays 5-6	Pristine 38 WG	10 fl.oz.	\$ 2.99 fl.oz	\$ 29.90
	Sulfur	5 lbs.	\$.45lb.	\$ 2.25
Total per spray				\$ 32.15
Total for year (2 sprays)				\$ 64.30
Spray 7	Revus Top	7 oz/.	\$ 2.03 oz	\$ 14.21
	Sevin 80 WP	2.5 lbs.	\$ 4.27 lb.	\$ 10.68
	Spreader	4 oz.	\$ 62.20gal.	\$ 1.94
Total spray 7				\$ 26.83
Spray 8	Quintec	4 fl. oz.	\$ 3.20fl oz.	\$ 12.80
	Sulfur	8 lbs.	\$ 0.45 lb.	\$ 3.60
	Prophyt	2.5 pt.	\$ 4.69 pt.	\$ 11.72
Total spray 8				\$ 28.12
Spray 9 & 10	Sulfur	8 lbs.	\$ 0.45 lb.	\$ 3.60
	Prophyt	2.5 pt.	\$ 4.69 pt.	\$ 11.72
	Spreader	4 oz.	\$ 62.20 gal.	\$ 1.94
Total per spray				\$ 17.26
Total for year (2 sprays)				\$ 34.53
Spray 11	Captan 80 WP	2.5 lbs.	\$ 7.47 lb.	\$ 18.68
	Sulfur	5 lbs.	\$ 0.45 lb.	\$ 2.25
	Vanguard	10 oz.	\$ 3.59 oz.	\$ 35.90
	Spreader	4 oz.	\$ 62.20 gal.	\$ 1.94

	Material	Rate/acre	Price	\$/acre
Total spray 11				\$ 58.77
Spray 12	Captan 80 WP	2.5 lbs.	\$ 7.47 lb.	\$ 18.68
	Sulfur	5 lbs.	\$ 0.45 lb.	\$ 2.25
	Elevate 50 WP	1 lb.	\$ 42.75 lb.	\$ 42.75
	Spreader	4 oz.	\$ 62,20 gal.	\$ 1.94
Total spray 12				\$ 65.62
Total cost of all year 3+ sprays				\$ 344.07
*For the sixth spray, add for Chardonnay, Riesling, and Pinot Noir	Vanguard 75 WP	10 oz.	\$ 3.59 oz.	\$ 35.90
Total cost of all year 4+ sprays, for Chardonnay, Riesling, and Pinot Noir				\$ 379.97

The sample fungicide and insecticide spray program was developed by Dr. Wayne Wilcox, Professor of Plant Pathology, Geneva Experiment Station.

Table 5: Tile Drainage Costs per acre for *V. Vinifera* Grapes,
Finger Lakes Region, NY, 2010.

Item	Quantity	Price	Total Cost per acre
Main line: 6" pipe	99 ft	\$ 1.18 ft	\$ 117
Laterals: 4" pipe	2,420 ft	\$.38 ft	\$ 920
Installation	2,519 ft	\$ 1.22 ft	\$ 3,073
Total Drainage Construction per acre			\$ 4,110

Table 6: Trellis Construction Costs per acre for *V. Vinifera* Grapes,
Finger Lakes Region, NY, 2010.

Item	Quantity	Price	Total per acre
Wood end posts (8 ft X 5" diameter)	22 posts	\$ 13.75 post	\$ 303
Wood anchor posts (8 ft X 5" diameter)	22 posts	\$ 13.75 anchor	\$ 303
Wood grape stakes (8 ft, 3" diameter, every 3 rd plant)	269 stakes	\$ 7.95 stake	\$ 2,138
12.5 gauge HT foliage & cordon wire (\$79.95 roll of 4000 ft)	26,889 ft.	\$ 0.03 ft	\$ 753
Catch wire clips (4 per line post)	1078 clips	\$ 0.13 clip	\$ 140
Staples, lbs.	3 lbs.	\$ 1.74 lb.	\$ 5
Crimping sleeves (for joining wire ends)	50 crimps	\$ 0.15 crimp	\$ 8
Total Trellis Construction materials			\$ 3,648

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, including site preparation, trellis construction, and planting, are substantial, amounting to \$12,660 per acre. A planting density of 807 vines (6' x 9') (vine by row) was assumed. The largest cost in the first year is for trellis construction, for a total of \$4,523. In year two, costs are a relatively modest \$876 per acre with lower spray costs and less labor required than for mature vines. In the third year, a spray program of eight sprays is recommended, and hand harvesting is required to protect the young vines. Total costs for the third year are \$1,608 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 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 four 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

Table 7: *V.vinifera* Grape Establishment and Development Costs
Finger Lakes Region, New York, 2010

	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Site Preparation							
Drainage (see table 5 for details)	Custom						\$4,110
Lime (2 tons/acre)	Custom					\$90.00	\$90
Herbicide application	Custom				\$10.50	\$9.72	\$20
Stone removal & land maint.	Unskilled	1	0.8	\$12.00	\$8.89		\$21
Soil Sampling	Skilled	0.2		\$3.80		\$4.00	\$8
Fall fertilization	Skilled	0.6	0.5	\$11.40	\$5.82	\$75.00	\$92
Plowing	Custom				\$22.60		\$23
Discing (2X)	Custom				\$33.00		\$33
Total		1.8	1.3	\$27.20	\$80.81	\$178.72	\$4,396
First Year							
Floating/dragging	Skilled	0.25	0.2	\$4.75	\$2.06		\$7
Laser Planting	Custom	n/a	n/a	\$394.17	\$394.17	\$2,621.67	\$3,410
Fertilization (banded)	Skilled	0.6	0.5	\$11.40	\$5.82	\$4.50	\$22
Hilling up	Skilled	1.5	1.2	\$28.50	\$14.80		\$43
Chem. weed control -trellis	Skilled	2.5	2	\$47.50	\$21.52	\$18.35	\$87
Trellis construction (see table for details)	Skilled	41	8	\$779.00	\$95.56	\$3,648	\$4,523
Spot herbicide-hand application	Skilled	1	0	\$19.00	\$0.00	\$4.98	\$24
Cultivation (2X)	Skilled	1.2	1	\$22.80	\$12.34		\$35
Spray 1	Skilled	0.4	0.3	\$7.60	\$4.78	\$15.68	\$28
Spray 2	Skilled	0.4	0.3	\$7.60	\$4.78	\$15.68	\$28
Spray 3	Skilled	0.4	0.3	\$7.60	\$4.78	\$15.68	\$28
Seed cover crop	Skilled	0.6	0.5	\$11.40	\$5.82	\$11.25	\$28
Total		51.65	14.3	\$1,341.32	\$566.45	\$6,356.22	\$8,264
Total for first year and site prep							\$12,660

Table 7 continued

		Labor	Equipment				
	Labor Used	Hours	Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Second Year							
Pruning & brush removal	Skilled	3		\$57.00			\$57
Tying & renewal	Unskilled	2		\$24.00		\$4.00	\$28
Vine Replacement	Skilled	2	2	\$38.00	\$27.02	\$52.43	\$117
Spring Fertilization	Skilled	0.6	0.5	\$11.40	\$5.82	\$4.50	\$22
Chem. weed control-trellis-1st applic.	Skilled	2.6	2	\$49.40	\$23.32	\$1.92	\$75
Chem. weed control-trellis-2nd applic.	Skilled	2.6	2	\$49.40	\$23.32	\$1.92	\$75
Chem. weed control-trellis-3rd applic.	Skilled	2.6	2	\$49.40	\$23.32	\$1.92	\$75
Suckering	Unskilled	2.5		\$30.00			\$30
Cluster removal	Unskilled	2.5		\$30.00			\$30
Take away	Skilled	3	2.5	\$57.00	\$30.84		\$88
Spot herbicide treatment	Skilled	0.4	0.3	\$7.60	\$3.23	\$4.98	\$16
Hilling up	Skilled	1.7	1.5	\$32.30	\$18.51		\$51
Spray 1	Skilled	0.4	0.3	\$7.60	\$4.78	\$15.68	\$28
Spray 2	Skilled	0.4	0.3	\$7.60	\$4.78	\$15.68	\$28
Spray 3	Skilled	0.6	0.5	\$11.40	\$7.97	\$15.68	\$35
Spray 4	Skilled	0.6	0.5	\$11.40	\$7.97	\$15.68	\$35
Mowing (4X)	Skilled	2.6	2	\$49.40	\$25.43		\$75
Rogueing	Unskilled	1		\$12.00			\$12
Total		31.1	16.4	\$534.90	\$206.33	\$134.41	\$876

Table 7 continued

	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Third Year							
Pruning and brush pulling	Custom	Piece rate*		\$322.67			\$323
Tying & renewal	Unskilled	Piece rate*		\$161.33		\$4.00	\$165
Brush chopping (1X)	Skilled	1.2	1	\$22.80	\$12.71		\$36
Vine replacement	Skilled	2	2	\$38.00	\$27.02	\$52.43	\$117
Spring fertilization	Skilled	0.6	0.5	\$11.40	\$5.82	\$4.50	\$22
Chem. weed control- trellis	Skilled	2.6	2	\$49.40	\$21.52	\$1.92	\$73
Chem. weed control- trellis	Skilled	2.6	2	\$49.40	\$21.52	\$1.92	\$73
Chem. Weed control-trellis	Skilled	2.6	2	\$49.40	\$21.52	\$1.92	\$73
Suckering	Unskilled	7		\$84.00			\$84
Cluster removal	Unskilled	8		\$96.00			\$96
Take away	Skilled	3	2.5	\$57.00	\$30.84		\$88
Spot herbicide treatment	Skilled	0.4	0.3	\$7.60	\$3.23	\$4.98	\$16
Spray 1	Skilled	0.6	0.5	\$11.40	\$7.97	\$15.68	\$35
Spray 2	Skilled	0.6	0.5	\$11.40	\$7.97	\$15.68	\$35
Spray 3	Skilled	0.6	0.5	\$11.40	\$7.97	\$19.75	\$39
Spray 4	Skilled	0.6	0.5	\$11.40	\$7.97	\$19.75	\$39
Spray 5	Skilled	0.6	0.5	\$11.40	\$7.97	\$22.87	\$42
Spray 6	Skilled	0.6	0.5	\$11.40	\$7.97	\$22.87	\$42
Spray 7	Skilled	0.6	0.5	\$11.40	\$7.97	\$22.87	\$42
Spray 8	Skilled	0.6	0.5	\$11.40	\$7.97	\$22.87	\$42
Mowing (4X)	Skilled	2.6	2	\$49.40	\$25.43		\$75
Hilling up	Skilled	1.7	1.5	\$32.30	\$18.51		\$51
Total		39.1	19.8	\$1,121.90	\$251.92	\$234.03	\$1,608

Table 8: Summary of Establishment and Development Costs by Year
for *V. vinifera* Grapes, Finger Lakes Region, NY 2010

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.	\$ 1,325
Total revenue	\$ 0	\$ 0	\$ 1,325
Costs			
Site preparation	\$ 4,396	\$ 0	\$ 0
Annual variable costs			
Preharvest	\$ 8,264	\$ 876	\$ 1,608
Harvest (Hand)+hauling	n.a.	n.a.	\$ 250
<i>Total variable costs and site preparation</i>	<i>\$12,660</i>	<i>\$ 876</i>	<i>\$ 1,858</i>
Annual fixed costs			
Machines & equipment amortization	\$ 414	\$ 414	\$ 414
Buildings amortization	\$ 80	\$ 80	\$ 80
Property taxes	\$ 125	\$ 125	\$ 125
Land opportunity cost	\$ 200	\$ 200	\$ 200
Office supplies, phone, etc.	\$ 60	\$ 60	\$ 60
Insurance	\$ 44	\$ 44	\$ 44
Management	\$ 0	\$ 0	\$ 0
<i>Total fixed costs</i>	<i>\$ 923</i>	<i>\$ 923</i>	<i>\$ 923</i>
Interest on cumulative costs	\$ 543	\$ 637	\$ 774
<i>Total costs</i>	<i>\$14,127</i>	<i>\$ 2,436</i>	<i>\$ 3,555</i>
Net returns	(\$14,127)	(\$ 2,436)	(\$ 2,230)
Total cumulative costs	\$14,127	\$16,563	\$18,792
Amortization of vineyard:			\$ 1,300
Cash costs of vineyard establishment (3 Yrs.)			\$15,144

cost for the E&D period is \$18,792 per acre. Amortized at a four percent 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 \$1,300 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 \$15,144 for site preparation and the first three years.

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 \$2,453 per acre. The most costly operations are canopy management (\$602 per acre), spraying (12 times, for a total of \$577 per acre, including labor, machinery and materials costs) and pruning and brush removal (\$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, 2010

Operation	Labor Used	Labor	Equipment	Labor Cost	Equipment Cost	Materials Cost	Total Cost
		Hours	Hours				
Pruning+brush pulling	Custom	Piece rate*		\$322.67			\$323
Brush chopping	Skilled	1.2	1	\$22.80	\$12.71		\$36
Trellis maintenance	Skilled	3	1	\$57.00	\$11.11	\$30.00	\$98
Tying & renewal	Custom	Piece rate*		\$161.33		\$2.80	\$164
Spring fertilization	Skilled	0.6	0.5	\$11.40	\$5.82	\$3.75	\$21
Vine replacement	Skilled	2	2	\$38.00	\$27.02	\$52.43	\$117
Chem.weed control-trellis	Skilled	2.6	2	\$49.40	\$21.52	\$1.92	\$73
Chem.weed control-trellis	Skilled	2.6	2	\$49.40	\$21.52	\$1.92	\$73
Chem.weed control-trellis	Skilled	2.6	2	\$49.40	\$21.52	\$1.92	\$73
Soil applic of Solubor (w. herb. Spray)						\$3.75	\$4
Spot herbicide treatment	Skilled	0.4	0.3	\$7.60	\$3.23	\$4.98	\$16
Suckering	Unskilled	7		\$84.00			\$84
Cluster removal & shoot thinning	Unskilled	10		\$120.00			\$120
Take-away	Skilled	3	2.5	\$57.00	\$30.84		\$88
Spray 1	Skilled	0.6	0.5	\$11.40	\$7.97	\$15.68	\$35
Spray 2	Skilled	0.6	0.5	\$11.40	\$7.97	\$15.68	\$35
Spray 3	Skilled	0.6	0.5	\$11.40	\$7.97	\$16.13	\$36
Spray 4	Skilled	0.6	0.5	\$11.40	\$7.97	\$18.40	\$38
Spray 5	Skilled	0.6	0.5	\$11.40	\$7.97	\$32.15	\$52
Spray 6	Skilled	0.6	0.5	\$11.40	\$7.97	\$32.15	\$52
Spray 7	Skilled	0.6	0.5	\$11.40	\$7.97	\$26.83	\$46
Spray 8	Skilled	0.6	0.5	\$11.40	\$7.97	\$28.12	\$47
Spray 9	Skilled	0.6	0.5	\$11.40	\$7.97	\$17.26	\$37
Spray 10	Skilled	0.6	0.5	\$11.40	\$7.97	\$17.26	\$37
Spray 11	Skilled	0.6	0.5	\$11.40	\$7.97	\$58.77	\$78
Spray 12	Skilled	0.6	0.5	\$11.40	\$7.97	\$65.62	\$85
Mowing (4X)	Skilled	2.6	2	\$49.40	\$25.43		\$75
Lime (1 in 5 years)	Skilled	0.1	0.1	\$1.90	\$2.06	\$9.00	\$13
Pickup truck	n/a	n/a			\$63.73		\$64

Table 9. Continued

	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Operation							
Shoot positioning/move catch wires	Unskilled	6		\$72.00			\$72
Shoot positioning/move catch wires	Unskilled	6		\$72.00			\$72
Leaf removal	Unskilled	4.5	1	\$54.00			\$54
Summer pruning	Skilled	1.3	1	\$24.70	\$11.35		\$36
Petiole sampling (every 2 years)	Skilled	0.1		\$1.90		\$3.84	\$6
Soil sampling (every 5 years)	Skilled	0.1		\$1.90		\$0.40	\$2
Hilling-up	Skilled	1.7	1.5	\$32.30	\$18.51		\$51
Fall fertilization	Skilled	0.3	0.3	\$5.70	\$3.49	\$25.00	\$34
Crop insurance							\$109
Total		64.9	25.2	\$1,482.60	\$375.56	\$485.78	\$2,453

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 \$2,453 per acre in years four through 25, and this number is transported to Table 11 to use in the computation of the costs and returns for the mature vineyard. The cost of crop insurance was added in the 2010 study at an average cost of \$109 per acre. Costs for crop insurance will actually vary a few dollars per acre depending upon the grape variety planted.

Table 10: Summary of Growing Costs for *V. vinifera* Vineyard, Trained to a Vertically Shoot Positioned System, Finger Lakes Region, NY, 2010

Item	Year 1	Year 2	Year 3	Year 4+
Site preparation	\$ 4,396			
Vines & planting	\$ 3,417			
Trellis materials & construction	\$ 4,523			\$ 98
Replanting & Rogueing		\$ 129	\$ 117	\$ 117
Dormant pruning & br. removal		\$ 57	\$ 323	\$ 323
Weed control	\$ 175	\$ 240	\$ 234	\$ 234
Fertilization	\$ 22	\$ 22	\$ 22	\$ 80
Canopy management		\$ 88	\$ 345	\$ 602
Disease & insect control	\$ 84	\$ 126	\$ 317	\$ 577
Take away & hilling up	\$ 43	\$ 139	\$ 139	\$ 139
Mowing		\$ 75	\$ 110	\$ 110
Pick-up truck				\$ 64
Crop insurance				\$ 109
Total Growing Costs	\$12,660	\$ 876	\$ 1,608	\$ 2,453

Table 11 summarizes the costs and returns expected from a mature vineyard. The estimated revenue per acre varies from \$3,960 to \$4,420 depending upon variety. Total costs vary from \$5,200 to \$5,330 per acre by variety. The break-even price prices and yields are shown in Table 11. A yield of 4.5 tons per acre is the break-even yield for Cabernet Franc. A yield of 4.4 tons per acre would be necessary to break even with Chardonnay. Yields at these higher levels may be inconsistent with quality requirements.

Cabernet Franc shows a large loss (-\$1,324) given the assumed yield 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 may be as much, or even more, than it was worth in the early years of the planting, assuming that vine replacement and trellis maintenance are done annually. At the assumed yield and prices, all varieties exhibited negative net returns.

Table 11: Costs and Returns for a mature *V. vinifera* Vineyard, Trained to a Vertically Shoot Positioned System, Finger Lakes Region, NY, 2010

Item	Pinot Noir	Cab. Franc	Chardonnay	Riesling
Receipts:				
Yield target , tons per acre	2.6	3.3	3.3	3.4
Price, \$ per ton	\$1,600	\$1,200	\$1,200	\$1,300
Total receipts	\$4,160	\$3,960	\$3,960	\$4,420
Costs:				
Variable Costs:				
Growing (incl. crop insurance @ \$109/Ac)	\$2,453	\$2,453	\$2,453	\$2,453
Cluster removal (Cab. Franc and P. Noir)	\$120	\$120		
Additional spray materials for Botrytis	\$36	\$0	\$36	\$36
Interest on operating capital	\$49	\$49	\$49	\$49
Machine Harvesting	\$240	\$240	\$240	\$240
Total variable costs	\$2,898	\$2,862	\$2,778	\$2,778
Fixed Costs:				
Vineyard capital recovery	\$1,300	\$1,300	\$1,300	\$1,300
Machinery and equipment capital recovery	\$414	\$414	\$414	\$414
Buildings capital recovery	\$80	\$80	\$80	\$80
Property taxes	\$125	\$125	\$125	\$125
Land opportunity cost	\$200	\$200	\$200	\$200
Office supplies, phone, etc.	\$60	\$60	\$60	\$60
Insurance	\$44	\$44	\$44	\$44
Management	\$208	\$198	\$198	\$221
Total fixed costs	\$2,432	\$2,422	\$2,422	\$2,445
Total costs	\$5,330	\$5,284	\$5,200	\$5,223
Profit or loss	-\$1,170	-\$1,324	-\$1,240	-\$803
Breakeven price (\$ /ton)	\$2,050	\$1,601	\$1,576	\$1,536
Breakeven yield (tons)	3.3	4.5	4.4	4.1

Capital Requirement

Table 12 indicates the capital investment per acre necessary to get into grape production in the Finger Lakes region, assuming a vineyard of 50 total planted acres with an additional four acres for roads, headlands, and a building; and reliance on either custom hand or machine harvesting of grapes. The table uses the value of new machinery and equipment and buildings. If a harvester is purchased, investment per acre for machinery would be considerably higher. Land costs assume a prime site close to the lake. Table 12 indicates that it would require \$28,609 per planted 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 these smaller growers hire some vineyard operations to be done by custom operators and/or vineyard management companies, thus giving them the possibility of buying fewer items of machinery and equipment.

Table 12: Investment Per Acre of *V. vinifera* Grapes,
Finger Lakes Region of New York,
for a 50-Acre Vineyard, 2010

Assets	\$/acre
Land*	\$ 5,400
Machinery & equipment	\$ 3,037
Buildings (shop & tool shed)	\$ 1,380
Vineyard establishment and development	\$18,792
Total investment per acre of grapes	\$28,609

*Prime site close to the lake. Assumes 54 acres purchased (including support land) for 50 planted acres.

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 grower 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, Chardonnay, and Riesling are more susceptible to Botrytis bunch rot, so additional spray materials at \$36 per acre were allocated to these varieties for Botrytis control.

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, a price of about \$2,600

Table 13: Total Cost Per Ton (Breakeven Price) At Varying Yields,
V. vinifera Grapes, Finger Lakes Region of New York, 2010

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	\$3,468	1.5	\$3,437	1.5	\$3,381	1.5	\$3,397
2.0	\$2,620	2.0	\$2,597	2.0	\$2,555	2.0	\$2,566
2.5	\$2,111	2.5	\$2,092	2.5	\$2,059	2.5	\$2,068
3.0	\$1,772	3.0	\$1,756	3.0	\$1,728	3.0	\$1,736
3.5	\$1,529	3.5	\$1,516	3.5	\$1,492	3.5	\$1,499
4.0	\$1,347	4.0	\$1,336	4.0	\$1,315	4.0	\$1,321
				4.5	\$1,177	4.5	\$1,182
				5.0	\$1,067	5.0	\$1,072

* Cost at different yield levels adjusted for machine harvesting and hauling.
 Assumes a 4 % real interest rate and a \$5,000 per acre land value.

per ton would be required to break even. Even the highest prices paid in the most recent seasons would result in unprofitable production with such a low yielding scenario.

Yields of more than four tons per acre for Cabernet Franc or more than 2.6 tons per acre for Pinot Noir; or more than five tons per acre for white vinifera varieties are probably incompatible with the quality requirements of the market for premium wines, but this is a question that needs more definitive research.

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, 2010 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. 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 the Finger Lakes is quite limited. For example, in 2006 (from the most recent vineyard survey available), the New York National Agricultural Statistics Service (NASS) estimated acreage of certain varieties in the Finger Lakes as follows: Cabernet Franc, 199 acres; Chardonnay, 351 acres; Pinot Noir, 149 acres; and Riesling, 543 acres. Total Vinifera acreage in the Finger Lakes was only 1,647 acres, or about 17 percent of total grape acreage in the Finger Lakes. 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 1990s and Cabernet Franc in recent years. Vinifera prices in the Finger Lakes had been on a downward trend in 2008 and 2009, but recovered slightly in 2010. Lower grape prices in 2008 and 2009 were probably due to some combination of the recent recession and expansion of acreage of major vinifera varieties.

Other concerns include the current macroeconomic conditions with high fuel prices, the potential for inflation of other inputs (especially pesticides and fertilizer), and the decreasing value of the US dollar. Over three-fourths of the wine marketed by New York farm wineries is sold direct to consumers. High prices for gasoline, especially during a recession, might limit visitors from the surrounding states from making trips to NY Wine Country. The weak dollar has some positive and some negative effects. To the extent producers buy special machinery or winery equipment from Europe, it raises those costs. However, on the other side, European and Australian wines cost more now, giving NY producers some new market opportunities.

Labor, especially with more reliance on Hispanic labor for pruning and tying, is a concern. More growers need to consider using H-2A labor to prevent the possibility of labor shortages. (Growers should be reminded that there is a long lead time involved in securing this labor). Since nearly all grapes in the Finger Lakes are harvested mechanically, the industry is not as vulnerable as the tree fruit and vegetable industries. Immigration reform would help ease growers' minds considerably, but meaningful reform is unsure at the time of writing this publication.

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.

Appreciation is expressed to Matt Doyle, Dave Stamp, Mark Wagner, and Chris Verrill who served as the growers' panel for helping to establish the costs reported in this bulletin. Hans Walter-Peterson, Extension Educator, Finger Lake Grape Program and Miguel Gómez of the Department of Applied Economics and Management at Cornell, provided helpful reviews of the manuscript.

Special recognition is extended to Mark Pisoni (M.S., Department of Agricultural, Resource, and Managerial Economics, Cornell University, 2001). While at Cornell, working on a grant funded by the New York State Department of Agriculture and Markets' "Grow New York" Program, Mark developed an Excel program which was used to develop the 2001, 2004, 2007, and 2010 Cost of Establishment and Production of Vinifera Grapes in the Finger Lakes publications. Mark is now viticulturist of the Pisoni Vineyards and Winery, Gonzales, California.

APPENDIX

Appendix Table 1: Sample Herbicide Program for *V. vinifera* Grapes,
Finger Lakes Region, NY, 2010

	Material	Rate/acre	Price	\$/acre
Year 0 (site prep.)				
Custom herbicide (in site prep.)	Glyphosate	2.0 qt.	\$ 4.74 qt.	\$ 9.48
	Am sulfate	.17 lb.	.14 lb.	\$.24
Total for site preparation				\$9.72
Year 1 (planting)				
Chem. weed control – trellis	Surflan	1.6 qt.	\$ 11.47 qt.	\$ 18.35
	Glyphosate	1.0 qt.	\$ 4.74 qt.	\$ 4.74
	Ammonium sulfate	1.7 lb.	\$.14 lb.	\$.24
Total for Year 1				\$ 23.34
Years 2-25				
Chem. weed control – trellis	Glyphosate	0.4 qt.	\$ 4.74 qt.	\$ 1.90
	Ammonium sulfate	0.17 lb.	\$.14 lb.	\$.02
Total for treatment				\$ 1.92
Chem. Weed control - trellis	Glyphosate	0.4qt.	\$ 4.74 qt.	\$.02
	Ammonium sulfate	0.17 lb.	\$.14 lb.	\$ 1.92
Total for treatment				
Chem. weed control – trellis	Glyphosate	0.4qt.	\$ 4.74 qt.	\$ 1.90
	Ammonium sulfate	0.17 lb.	\$.14 lb.	\$.02
Total for treatment				\$ 1.92
Spot herbicide treatment	Glyphosate	1.0 qt.	\$ 4.74 qt.	\$ 4.74
	Ammonium sulfate	1.7 lb.	\$.14 lb.	\$.24
Total for treatment				\$ 4.98
Average annual treatment costs for Years 2-25				\$ 10.74

Appendix Table 2: Sample Fertilizer/Soil Program for *V. vinifera* Grapes,
Finger Lakes Region, NY, 2010

	Material	Rate/acre	Price	\$/acre
Year 0 (site prep.)				
Soil sampling (1 test /5 acres@ two depths)	n/a	0.4 acre	\$ 10 test	\$ 4.00
Lime (custom application)	Lime	2.0 tons	\$ 45 ton	\$ 90.00
Fall fertilization	Potash	300 lbs.	\$500 ton	\$ 75.00
Total for year 0				\$ 169.00
Year 1				
Spring fertilization (banded)	10:10:10	30 lbs.	\$ 0.15 lb.	\$4.50
Total for year 1				\$4.50
(Optional: mulch-if irrigation is not installed)	Round hay bales	20 bales	\$ 15 bale	\$300.00
Year 2				
Spring fertilization (banded)	10:10:10	30 lbs.	\$ 0.15 lb.	\$ 4.50
Total for year 2				\$ 4.50
Years 3				
Spring fertilization (banded)	10:10:10	30 lbs.	\$ 0.15 lb.	\$ 4.50
Total for year 3				\$ 4.50
Years 4+				
Soil application (Spring)	Solubor	2.5 lbs.	\$1.50 lb.	\$3.75
Fall fert. (every 3 rd year)	Muriate of Potash	300 lbs.	\$ 500 ton	\$25.00
Lime (every 5 th year)	Lime	1 ton	\$ 45.00 ton	\$ 9.00
Petiole Sampling (one sample/ 3 acres, every other year)		0.16 acre	\$ 24.00 test	\$ 3.84
Soil sampling (1 sample/5 Ac. every 5 years)		0.04 acre	\$ 10.00	\$.40
Total for year 4				\$41.99

The sample Fertilizer/Soil Program was developed by Hans Walter-Peterson, Extension Educator, Finger Lakes Grape Program.

Appendix Table 3: Hourly Machinery and Equipment Variable Costs, *V. vinifera* Grapes,
Finger Lakes Region, NY, 2010

Item	Purchase Price	Hours of life	Total Repairs	Repairs	Fuel	Lube (15% of fuel)	Total Hourly Variable Costs
Tractor, 62-HP, 2WD, spray cab	\$38,000	12000	100%	\$3.17	\$6.94	\$1.04	\$11.15
Tractor, 45-HP	\$28,000	12000	100%	\$2.33	\$6.94	\$1.04	\$10.31
Air-blast sprayer- 300 gallon	\$16,000	2000	60%	\$4.80			\$4.80
Herbicide sprayer- 50 gallon	\$1,500	2000	60%	\$0.45			\$0.45
Environmist sprayer	\$4,500	2000	60%	\$1.35			\$1.35
Mower/brush chopper (7ft)	\$4,900	2500	80%	\$1.57			\$1.57
Fertilizer Spreader	\$2,000	1200	80%	\$1.33			\$1.33
Small disc	\$600	2000	60%	\$0.18			\$0.18
Grape hoe	\$6,750	2000	60%	\$2.03			\$2.03
Post driver	\$2,575	2000	80%	\$1.03			\$1.03
Trailer	\$3,000	3000	80%	\$0.80			\$0.80
Pickup truck	\$26,000	2500	83%	\$8.63	\$6.08	\$0.91	\$15.62
Mechanical hedger	\$2,600	2000	80%	\$1.04			\$1.04
Replanter	\$4,800	1200	80%	\$3.20			\$3.20
Tractor Fuel Factors	Factor						
Diesel	0.0438						
Gasoline	0.0600						

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