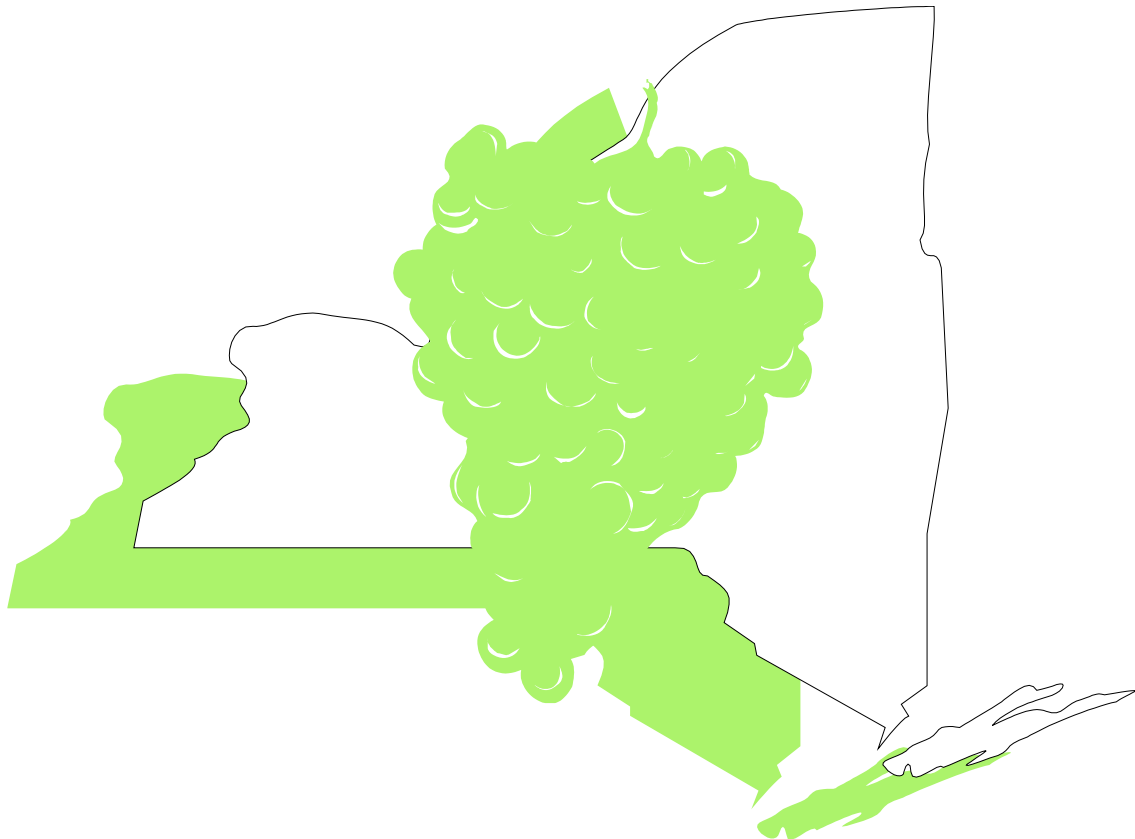


COST OF ESTABLISHMENT AND PRODUCTION OF V. VINIFERA GRAPES IN THE FINGER LAKES REGION OF NEW YORK-2013



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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 2011. Acreage of Riesling has increased by 56 percent from 2006, while acreage of Chardonnay stayed about the same. Overall, *vinifera* acreage increased by 30 percent (to 2,047 acres) in the Finger Lakes region in this five year period, led by Riesling, with a total acreage of 849 acres. *Vinifera* grape varieties accounted for 22 percent of grape acreage in the Finger Lakes in 2011.

There has been an increase in consumer demand for quality wines, including interspecific French American hybrid and *V. vinifera* cultivars as well as from designated appellations. Wine consumption in the United States has increased during the past 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. The Finger Lakes region 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 to increased plantings of *vinifera* in New York in recent years. Prices for the major *vinifera* varieties either held steady or increased slightly after 2011.

Growers who are considering planting additional *V. vinifera* vineyards need to carefully weigh the cost of planting and establishing a vineyard, as well the annual cost of operation of a mature vineyard, against the expected yields and prices to determine whether the investment of \$32,360 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 and which sites would 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 once every decade, with the last major freeze event occurring in 2004. The impacts of the unusually cold winter in 2013-2014 are yet to be assessed.

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 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. During the 2007 harvest, for example, there was a surplus in Cabernet Franc grapes that put downward pressure on prices. 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 Finger Lakes region reached 7,378 tons in 2011, an increase of 53 percent over the production from 2006 (4,833 tons).

The objective of this study is 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 assume that the vineyard practices employed 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 August of 2013, 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 (White, 2010). 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 2010 study, and made recommendations for changes.

The panel also provided estimates, based on their own experience in their vineyards, 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 \$6,000 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 4 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 \$3.50 per plant. Each year it was assumed that two percent of the vines had to be replanted due to damages caused by diseases or environmental factors. The initial planting was done 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 demonstrated their ability to produce premium wine.

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 fruiting 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. For details of the sample herbicide program, see Table A1 in Appendix. Glyphosate spot sprays should be made using some kind of shielded sprayer to avoid contact with green tissues. The study assumes the use of an Enviromist sprayer for this purpose because of the larger acreage. The sample fertilizer/soil program was developed by Hans Walter-Peterson, Viticulture Extension Specialist, Finger Lakes Grape Program. See Table A2 for details.

Wage Rates

Wage rates used represented the consensus of the grower panel. The rates assumed were \$20.00 per hour for skilled labor (i.e. \$15.38 per hour, plus fringe benefits). Fringe benefits consist of workers compensation, social security, medical insurance, and other benefits. For unskilled labor, the rate was \$13.50 per hour (including fringe benefits). Piece rate wage rates were used for pruning the vines in the third and fourth through twenty-five year. The rate was \$.45 per vine. The piece rates for tying were specified at \$.23 per vine.

Harvesting & Hauling

Grapes were custom machine harvested in the fourth year and beyond. The machine harvesting rate is assumed at \$95 per ton, with an additional \$30 per ton expenses for transporting the grapes. Hauling costs are included in this rate.

Machinery and Building Costs

The investment costs and annual costs for equipment and buildings are summarized in Table A3. The machinery investment required totals \$221,850, which represents an average investment of \$4,437 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.

Machinery depreciation and interest were charged on the basis of prices for new equipment with the minor exceptions for a pickup truck, a small disc and a mechanical hedger, which were assumed to be used. Diesel fuel at \$3.90 per gallon was budgeted for machine operations. Gasoline was charged at \$3.83 per gallon (for unleaded). These were representative of prices in Central New York as of December 2013. Hourly machinery variable costs (repairs, fuel, and lube) are shown in Table A4. Hourly machinery variable costs were estimated according to American Society of Agricultural Engineers 2000 Standards.

The total annual costs for depreciation and interest amount to \$22,726 for machinery and \$3,081 for buildings, or \$455 and \$62 annual costs per acre, respectively. Machinery investment would be much greater if a mechanical grape harvester was necessary.

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 two percent interest charge on capital investment and operating capital was charged. This rate represents a real rate based on a four percent nominal rate of interest and an expected rate of inflation of two 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 Assumption

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

Results

Grape Prices

Prices for the five years ending in 2013 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 harvest 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 weighted 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, 2009-2013, Dollars per Ton.

	Pinot Noir	Cabernet Franc	Chardonnay	Riesling
2009	\$1,532	\$1,242	\$1,238	\$1,417
2010	\$1,571	\$1,264	\$1,233	\$1,443
2011	\$1,605	\$1,250	\$1,169	\$1,362
2012	\$1,677	\$1,263	\$1,248	\$1,477
2013	\$1,682	\$1,317	\$1,271	\$1,479
Mean	\$1,613	\$1,267	\$1,232	\$1,436
Prices Used	\$1,650	\$1,350	\$1,250	\$1,450

Source: Finger Lakes Vineyard Notes, Harvest Issues, 2009-2013

Pesticide Program Spray Costs

Table 3 indicates the recommended spray program and costs for years one, two and three (establishment), and years 4-22 (operation). In year three, eight sprays are recommended. Beginning in year four, the spray programs 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 estimated at \$369.38 per acre for Cabernet Franc and \$428.01 per acre for Chardonnay, Riesling, and Pinot Noir. Fungicide applications may vary slightly among *vinifera* cultivars due to the differences in disease susceptibility. 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 or Pristine) necessary with the sixth 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 presented in Tables 6 and Table 8.

Table 3: Sample Spray Program for *V. Vinifera* Grapes, Finger Lakes NY, 2013

Year	Material	Rate/acre	Price	\$/acre
Year 1				
Spray 1-3	Mancozeb 75DF	3 lbs.	\$4.05 lb.	\$12.15
	Sulfur	4 lbs.	\$0.50 lb.	\$2.00
	Spreader	4 oz.	\$20.00 gal.	\$0.63
Total per spray				\$14.78
Total for year 1 (3 sprays)				\$44.33
Year 2				
Sprays 1-4	Mancozeb 75DF	3 lbs.	\$4.05 lb.	\$12.15
	Sulfur	4 lbs.	\$0.50 lb.	\$2.00
	Spreader	4 oz.	\$20.00 gal.	\$0.63
Total per spray				\$14.78
Total for year 2 (4 sprays)				\$59.10
Year 3				
Sprays 1-2	Mancozeb 75DF	3 lbs.	\$4.05 lb.	\$12.15
	Sulfur	4 lbs.	\$0.50 lb.	\$2.00
	Spreader	4 oz.	\$20.00 gal.	\$0.63
Total per spray				\$14.78
Total per year (2 sprays)				\$29.55
Sprays 3-4	Revus Top	7 oz.	\$2.34 oz	\$16.41
	Sulfur	4 lbs.	\$0.50 lb	\$2.00
	Spreader	4 oz.	\$20.00 oz	\$0.63
Total per spray				\$19.03
Total per year (2 sprays)				\$38.06
Sprays 5-8	Captan 80WP	2.5 lbs.	\$6.60 lb	\$16.50
	Sulfur	5 lbs.	\$0.50 lb	\$2.50
	Spreader	4 oz.	\$20.00 oz	\$0.63
Total per spray				\$19.63
Total per year (3 sprays)				\$58.88
Total for year 3 (8 sprays)				\$126.49

Years 4-25

Sprays 1-2	Mancozeb 75DF	3 lbs.	\$4.05	lb.	\$12.15
	Sulfur	4 lbs.	\$0.50	lb.	\$2.00
	Spreader	4 oz.	\$20.00	gal.	\$0.63
Total per spray					\$14.78
Total per year (2 sprays)					\$29.55
Spray 3	Mancozeb 75DF	3 lbs.	\$4.05	lb.	\$12.15
	Sulfur	5 lbs.	\$0.50	lb.	\$2.50
	Spreader	4 oz.	\$20.00	gal.	\$0.63
Total Spray 3					\$15.28
Spray 4	Revus Top	7 oz.	\$2.34	oz	\$16.41
	Sulfur	5 lbs	\$0.50	lb.	\$2.50
	Spreader	4 oz.	\$20.00	gal.	\$0.63
Total Spray 4					\$19.53
Spray 5	Vivando	10 oz	\$1.88	oz	\$18.75
	Mancozeb 75DF	4 lb	\$4.05	lb.	\$16.20
Total Spray 5					\$34.95
Sprays 6*	Pristine 38WG	10 fl.oz.	\$3.25	oz	\$32.50
	Sulfur	5 lbs.	\$0.50	lb.	\$2.50
Total Spray 6					\$35.00
Spray 7	Revus Top	7 oz.	\$2.34	oz.	\$16.41
	Carvaryl 4L	2 qt.	\$45.00	gal.	\$22.50
	Spreader	4 oz.	\$20.00	gal.	\$0.63
Total spray 7					\$39.53
Spray 8*	Pristine 38WG	12.5 oz	\$3.25	oz	\$40.63
	Sulfur	5 lbs.	\$0.50	lb.	\$2.50
	ProPhyt	2.5 pt.	\$3.16	pt.	\$7.89
Total spray 8					\$51.02

Spray 9 & 10	Sulfur	8 lbs.	\$0.50 lb.	\$4.00
	Prophyt	2.5 pt.	\$3.16 pt.	\$7.89
	Spreader	4 oz.	\$20.00 gal.	\$0.63
Total per spray				\$12.52
Total per year (2 sprays)				\$25.03
Spray 11	Captan 80 WP	2.5 lbs.	\$6.60 lb.	\$16.50
	Sulfur	5 lbs.	\$0.50 lb.	\$2.50
	Vanguard 75WP	10 oz.	\$3.75 oz.	\$37.50
	Spreader	4 oz.	\$20.00 gal.	\$0.63
Total spray 11				\$57.13
Spray 12	Captan 80 WP	2.5 lbs.	\$6.60 lb.	\$16.50
	Sulfur	5 lbs.	\$0.50 lb.	\$2.50
	Elevate 50 WP	1 lbs.	\$42.75 lb.	\$42.75
	Spreader	4 oz.	\$20.00 gal.	\$0.63
Total spray 12				\$62.38
Total cost of all year 4+ (12 sprays)				\$369.38
*For Spray 6, add for Chardonnay, Riesling and Pinot Noir				
	Vanguard 75 WP	10 oz.	\$3.75 oz.	\$37.50
	(OR 12.5 oz/ac of Pristine)			
**For Spray 8, increase rate of Pristine 38WG for Chardonnay, Riesling and Pinot Noir				
	Pristine 38WG	19 oz.	\$3.25 oz.	\$61.75
Total cost of all year 4+ sprays for Chardonnay, Riesling and Pinot Noir				\$428.01

The sample fungicide and insecticide spray program was developed by Professor Wayne Wilcox, Department of Plant Pathology and Plant Microbe Biology, Cornell University.

Drainage Construction Costs

Table 4 contains an estimate of drainage construction costs. These costs are transferred to the site preparation section of the establishment and development costs (see Table 6). Costs will vary greatly from site to site depending on the soil conditions and preferences of the vineyard manager. Growers should consult with their county's Soil & Water District staff to determine the proper amount of drainage a particular site requires. This study assumed that tile drainage was placed in the middle of every second row or 18 feet apart. Costs were estimated to total \$4,360 per acre.

Table 4: Tile Drainage Costs per acre for *V. Vinifera* Grapes,
Finger Lakes Region, NY, 2013.

Item	Quantity (ft)	Price \$/ft	Total Cost per acre
Main line: 6" pipe	99.00	\$1.20	118.80
Laterals: 4" pipe	2,420	\$0.42	\$1,016
Installation	2,519	\$1.28	\$3,224
Total Drainage Construction per acre			\$4,360

Trellis Construction Costs

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 5 contains an estimate of trellis constructions costs. The total cost for materials is estimated at \$3,470 per acre. These costs are transferred to Table 6 in the first year of establishment and development. Labor and machinery costs for trellis establishment are also shown in Table 6. The total cost of trellis construction for materials, labor, and machinery is \$4,987 per acre.

Table 5: Trellis Construction Costs per acre for *V. Vinifera* Grapes,
Finger Lakes Region, NY, 2013.

VSP Trellis Construction Materials per Acre	Quantity	Price	Total per acre
Wood end posts (8 ft X 5" diameter)	22 posts	\$10.00 post	\$220
Wood anchor posts (8 ft X 5" diameter)	22 posts	\$10.00 post	\$220
Wood grape stakes (8 ft, 3" diameter, every 3rd plant)	269 stakes	\$7.95 stake	\$2,138
12.5 gauge HT foilage & cordon wire (\$110 roll of 4000 ft)	26,889 ft	\$0.028 ft	\$739
Catchwire clips (4 per line post)	1,078 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

Establishment and Development Costs

The costs for labor machinery and materials for site preparation and in years one through three constitute the establishment and development (E&D) costs in Table 6. First year costs, including site preparation, trellis construction, and planting, are substantial, amount to \$14,613 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 \$4,987. In year two, costs are a relatively modest at \$1,057 per acre with 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 estimated at \$1,864 per acre. Note that the usage of pickup truck is estimated at 10,000 miles for a 50-acre farm per year, which is \$75 per acre (including gas and maintenances costs).

The total costs for the entire E&D period (years 1-3) are summarized in Table 7. The totals from Table 6 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 two percent, is added to the cumulative costs. Credit is given for the revenue from the estimated one ton of grapes per acre harvested in year three. The price of grapes in year three is the average price of the four varieties produced. The total cumulative cost for the E&D period is \$17,534 per acre. Amortized at a two percent real rate of interest for the estimated years of life from year four through 22, the annual cost for capital recovery (interest and depreciation) is \$1,143 per acre. This amount was charged as a fixed cost labeled 'vineyard capital recovery' in Table 10, which summarizes the costs and returns for a mature vineyard. Cash costs for establishment, including labor, are \$17,534 per acre for site preparation and the first three years.

Table 6: *V.Vinifera* Grape Establishment and Development Costs, Finger Lakes Region, New York, 2013

(Unit: Acre)	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Site Preparation							
Drainage (see table 5 for details)	Custom						\$4,360
Lime (2 tons/acre)	Custom					\$90.00	\$100
Herbicide application	Custom				\$10.50	\$30.24	\$41
Stone removal & land maint.	Unskilled	10	10	\$135.00	\$165.87		\$301
Soil Sampling	Skilled	0.2		\$4.00		\$4.00	\$8
Fall fertilization	Skilled	0.6	0.5	\$12.00	\$8.56	\$75.00	\$96
Plowing	Custom						\$50
Discing (2X)	Custom						\$46
Pickup truck (10,000 miles for 50 ac/year)	n/a	n/a	n/a		\$75.03		\$75
Total for site preparation		10.8	10.5	\$151.00	\$184.93	\$199.24	\$5,076
First Year							
Floating/dragging	Skilled	1	1	\$20.00	\$15.79		\$36
Laser Planting (\$3.5/vine)	Custom			\$1,250.00		\$2,823.33	\$4,073
Fertilization (banded)	Skilled	0.6	0.5	\$12.00	\$8.56	\$7.50	\$28
Hilling up	Skilled	1.5	1.2	\$30.00	\$21.64		\$52
Hilling up	Unskilled	1.5		\$20.25			\$20
Chem. weed control -trellis	Skilled	1.25	1.25	\$25.00	\$20.56	\$14.34	\$60
Trellis construction (see table 6 for details)	Skilled	60	16	\$1,200.00	\$317.50	\$3,470	\$4,987
Spot herbicide-hand application	Skilled	1		\$20.00		\$15.24	\$35
Cultivation (2X)	Skilled	1.2	1.2	\$24.00	\$21.64		\$46
Spray 1	Skilled	0.4	0.3	\$8.00	\$8.38	\$14.78	\$31
Spray 2	Skilled	0.4	0.3	\$8.00	\$8.38	\$14.78	\$31
Spray 3	Skilled	0.4	0.3	\$8.00	\$8.38	\$14.78	\$31
Seed cover crop	Skilled	0.6	0.5	\$12.00	\$8.56	\$11.25	\$32
Pickup truck (10,000 miles for 50 ac/year)	n/a	n/a	n/a		\$75.03		\$75
Total for first year		80.65	22.55	\$2,637.25	\$514.43	\$6,385.96	\$9,538

(Unit: Acre)	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Total for first year and site prep							\$14,613

Second Year

Pruning & brush removal	Skilled	3		\$60.00			\$60
Tying & renewal	Unskilled	2		\$27.00		\$4.50	\$32
Vine Replacement	Skilled	2	2	\$40.00	\$37.97	\$56.47	\$134
Spring Fertilization	Skilled	0.6	0.5	\$12.00	\$8.56	\$7.50	\$28
Chem. weed control-trellis	Skilled	1.25	1.25	\$25.00	\$22.25	\$66.00	\$113
Suckering	Unskilled	2.5		\$33.75			\$34
Cluster removal	Unskilled	2.5		\$33.75			\$34
Take away (de-hilling)	Skilled	3	2.5	\$60.00	\$45.09		\$105
Hand hoe	Unskilled	4		\$54.00			\$54
Spot herbicide treatment	Skilled	0.4	0.3	\$8.00	\$4.93	\$21.38	\$34
Spot herbicide treatment	Skilled	0.4	0.3	\$8.00	\$4.93	\$21.38	\$34
Hilling up	Skilled	3	1.5	\$60.00	\$27.05		\$87
Spray 1	Skilled	0.4	0.3	\$8.00	\$8.38	\$14.78	\$31
Spray 2	Skilled	0.4	0.3	\$8.00	\$8.38	\$14.78	\$31
Spray 3	Skilled	0.4	0.3	\$8.00	\$8.38	\$14.78	\$31
Spray 4	Skilled	0.4	0.3	\$8.00	\$8.38	\$14.78	\$31
Mowing (4X)	Skilled	2.6	2	\$52.00	\$42.28		\$94
Rogueing	Unskilled	1		\$13.50			\$14
Pickup truck (10,000 miles for 50 ac/year)	n/a	n/a	n/a		\$75.03		\$75
Total for second year		29.85	11.55	\$519.00	\$226.61	\$236.32	\$1,057

Third Year

Pruning and brush pulling (\$0.45/vine)	Custom	piece rate		\$363.00			\$363
Tying & renewal (\$0.23/vine)	Custom	piece rate		\$185.53		\$4.50	\$190
Brush chopping (1X)	Skilled	1.2	1	\$24.00	\$21.36		\$45
Vine replacement	Skilled	2	2	\$40.00	\$37.97	\$56.47	\$134

(Unit: Acre)	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Chem. weed control- trellis	Skilled	2.6	2	\$52.00	\$32.89	\$66.00	\$151
Suckering	Unskilled	4		\$54.00			\$54
Cluster removal	Unskilled	4		\$54.00			\$54
Take away (de-hilling)	Skilled	3	2.5	\$60.00	\$45.09		\$105
Hand hoe	Unskilled	4		\$54.00			\$54
Bird control	Skilled	3		\$60.00			\$60
Spot herbicide treatment	Skilled	0.4	0.3	\$8.00	\$4.93	\$21.38	\$34
Spot herbicide treatment	Skilled	0.4	0.3	\$8.00	\$4.93	\$21.38	\$34
Spray 1	Skilled	0.6	0.5	\$12.00	\$13.97	\$14.78	\$41
Spray 2	Skilled	0.6	0.5	\$12.00	\$13.97	\$14.78	\$41
Spray 3	Skilled	0.6	0.5	\$12.00	\$13.97	\$19.03	\$45
Spray 4	Skilled	0.6	0.5	\$12.00	\$13.97	\$19.03	\$45
Spray 5	Skilled	0.6	0.5	\$12.00	\$13.97	\$19.63	\$46
Spray 6	Skilled	0.6	0.5	\$12.00	\$13.97	\$19.63	\$46
Spray 7	Skilled	0.6	0.5	\$12.00	\$13.97	\$19.63	\$46
Spray 8	Skilled	0.6	0.5	\$12.00	\$13.97	\$19.63	\$46
Mowing (4X)	Skilled	2.6	2	\$52.00	\$42.28		\$94
Hilling up	Skilled	1.7	1.5	\$34.00	\$27.05		\$61
Pickup truck (10,000 miles for 50 ac/year)	n/a	n/a	n/a		\$75.03		\$75
Total for third year		33.7	15.6	\$1,144.53	\$403.33	\$315.83	\$1,864

Table 7: Summary of establishment and development costs by year,
V. Vinifera grapes, Finger Lakes Region, NY, 2013

Item	Year 1	Year 2	Year 3
Revenue			
Yield per acre (tons)	0	0	1
Market price (average of 4 varieties)	n/a	n/a	\$1,425
Total revenue	\$0	\$0	\$1,425
Costs			
Site preparation	\$5,076	\$0	\$0
Annual variable costs			
-Pre-harvest	\$9,538	\$1,057	\$1,864
-Harvest (hand)+hauling	\$0	\$0	\$275
Total Variable Costs & Site preparation	\$14,613	\$1,057	\$2,139
Annual fixed costs			
-Machines & equipment depreciation	\$455	\$455	\$455
-Buildings depreciation	\$62	\$62	\$62
-Property taxes	\$150	\$150	\$150
-Land opportunity cost	\$120	\$120	\$120
-Office Supplies, phone, etc.	\$60	\$60	\$60
-Insurance	\$58	\$58	\$58
Total Fixed Costs	\$904	\$904	\$904
Interest on cumulative costs	\$310	\$356	\$424
Total costs	\$15,828	\$2,317	\$3,467
Net returns	-\$15,828	-\$2,317	-\$2,042
Total cumulative costs	\$15,828	\$18,145	\$20,187
Amortization of vineyard (in 22 years)			\$1,143
Cash costs of vineyard establishment (3 years)			\$17,534

Costs and Returns for a Mature Vineyard

Annual growing costs for years four through 22 are presented in Table 8. Total growing costs for a typical year in the mature vineyard are estimated to be \$2,762 per acre. The most costly operations are canopy management (\$718 per acre), spraying (12 times, for a total of \$681 per acre, including labor, machinery and materials costs) and pruning and brush removal (\$363 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 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 \$2,762 per acre in years four through 22, and this number is transported to Table 10 to use in the computation of the costs and returns for the mature vineyard. The cost of crop insurance is added at an average cost of \$109 per acre, which generally starts at the fifth year of positive production (i.e. year 8). Costs for crop insurance will actually vary a few dollars per acre depending upon the grape variety planted.

Table 8: Growing Costs, Years Four through Twenty-two, *V. Vinifera* Grapes, Finger Lakes Region, 2013

(Unit: Acre)	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Operation							
Pruning+brush pulling (\$0.45/vine)	Custom	piece rate		\$363.00			\$363
Brush chopping	Skilled	1.2	1	\$24.00	\$21.36		\$45
Trellis maintenance	Skilled	4	1	\$80.00	\$16.59	\$30.00	\$127
Tying & renewal (\$0.23/vine)	Custom	piece rate		\$185.53		\$3.15	\$189
Vine replacement	Skilled	2	2	\$40.00	\$37.97	\$56.47	\$134
Chem.weed control-trellis	Skilled	2.6	2	\$52.00	\$32.89	\$9.19	\$94
Soil applic of Solubor (w. herb. spray)						\$4.23	\$4
Spot herbicide treatment	Skilled	0.4	0.3	\$8.00	\$4.93	\$21.38	\$34
Suckering	Unskilled	4		\$54.00			\$54
Cluster removal	Unskilled	4		\$54.00			\$54
Shoot thinning	Unskilled	6		\$81.00			\$81
Take-away (de-hilling)	Skilled	3	2.5	\$60.00	\$45.09		\$105
Bird control	Skilled	3		\$60.00			\$60
Spray 1	Skilled	0.6	0.5	\$12.00	\$13.97	\$14.78	\$41
Spray 2	Skilled	0.6	0.5	\$12.00	\$13.97	\$14.78	\$41
Spray 3	Skilled	0.6	0.5	\$12.00	\$13.97	\$15.28	\$41
Spray 4	Skilled	0.6	0.5	\$12.00	\$13.97	\$19.53	\$46
Spray 5	Skilled	0.6	0.5	\$12.00	\$13.97	\$34.95	\$61
Spray 6	Skilled	0.6	0.5	\$12.00	\$13.97	\$35.00	\$61
Spray 7	Skilled	0.6	0.5	\$12.00	\$13.97	\$39.53	\$66
Spray 8	Skilled	0.6	0.5	\$12.00	\$13.97	\$51.02	\$77
Spray 9	Skilled	0.6	0.5	\$12.00	\$13.97	\$12.52	\$38
Spray 10	Skilled	0.6	0.5	\$12.00	\$13.97	\$12.52	\$38
Spray 11	Skilled	0.6	0.5	\$12.00	\$13.97	\$57.13	\$83
Spray 12	Skilled	0.6	0.5	\$12.00	\$13.97	\$62.38	\$88
Mowing (4X)	Skilled	2.6	2	\$52.00	\$42.28		\$94
Lime (1 in 5 years)	Skilled	0.1	0.1	\$2.00	\$4.88	\$9.00	\$16
Pickup truck	n/a	n/a	n/a		\$75.03		\$75

(Unit: Acre)	Labor Used	Labor Hours	Equipment Hours	Labor Cost	Equipment Cost	Materials Cost	Total Cost
Shoot positioning/move catch wires (first path)	Unskilled	6		\$81.00			\$81
Shoot positioning/move catch wires (second path)	Unskilled	6		\$81.00			\$81
Mechanical leaf removal	Skilled	3.2	3	\$64.00	\$19.20		\$83
Summer pruning (2X)	Skilled	2.6	2.4	\$52.00	\$42.69		\$95
Petiole sampling (\$88 for every 2 years)	Skilled	0.1		\$2.00		\$1.00	\$3
Soil sampling (every 5 years)	Skilled	0.1		\$2.00		\$0.40	\$2
Hilling-up	Skilled	1.7	1.5	\$34.00	\$27.05		\$61
Fall fertilization	Skilled	0.3	0.3	\$6.00	\$5.14	\$25.00	\$36
Crop insurance							\$109
Total		60.1	24.1	\$1,581.53	\$542.77	\$529.19	\$2,762

Table 9: Summary of Growing Costs for *V. Vinifera* Vineyard, Trained to a Vertically Shoot Positioned System, Finger Lakes Region, NY, 2013

Item	Year 1	Year 2	Year 3	Year 4+
Site preparation	\$5,076			
Vines & planting	\$4,109			
Trellis materials & construction	\$4,987			\$127
Replanting & Rougeing		\$148	\$134	\$134
Dormant pruning & removal		\$60	\$363	\$363
Weed control	\$173	\$182	\$220	\$128
Fertilization	\$28	\$28		\$62
Canopy management		\$99	\$298	\$718
Disease & insect control	\$93	\$125	\$354	\$681
Take away & hilling up	\$72	\$246	\$220	\$166
Mowing		\$94	\$140	\$140
Bird Control			\$60	\$60
Pick-up (fuel, maintenances... etc)	\$75	\$75	\$75	\$75
Crop Insurance*				\$109
Total Growing Costs	\$14,613	\$1,057	\$1,864	\$2,762

*Crop Insurance generally starts at the fifth year of positive production (i.e., year 8)

Table 10 summarizes the costs and returns expected from a mature vineyard. The estimated revenue per acre varies from \$4,125 to \$4,930 depending upon variety. Total costs vary from \$5,490 to \$5,568 per acre by variety. The break-even prices and yields are shown in Table 10. A yield of 4.2 tons per acre is the break-even yield for Cabernet Franc, and a yield of 3.4 tons per acre would be necessary to break even with Pinot Noir. Yields at these higher levels may be inconsistent with quality requirements.

Chardonnay shows a large loss (-\$1,390) given the assumed yield and prices. At the assumed yield and prices, all varieties exhibited negative net returns. 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 (establishment costs from Table 7) is written off after 22 years, which increase the fixed costs by \$1,143. In Table 13, we will discuss the scenario that vineyard holds a positive value which may be as much, or even more, than it was worth in the early years of the planting.

Table 10: Costs and Returns for a Mature V. *Vinifera* Vineyard -1,
Finger Lakes Region, New York, 2013

Item	Pinot Noir	Cab. Franc	Chardonnay	Riesling
Receipts:				
Yield target , tons per acre	2.6	3.3	3.3	3.4
Price, \$ per ton	\$1,650	\$1,350	\$1,250	\$1,450
Total receipts	\$4,290	\$4,455	\$4,125	\$4,930
Costs:				
Variable Costs:				
Growing costs	\$2,762	\$2,762	\$2,762	\$2,762
Cluster removal (Cab. Franc and P. Noir)	\$54	\$54	\$0	\$0
Additional spray materials for Botrytis	\$59	\$0	\$59	\$59
Interest on operating capital	\$28	\$28	\$28	\$28
Machine Harvesting (\$95/ton)	\$247	\$314	\$314	\$323
Trucking (\$30/ton)	\$78	\$99	\$99	\$102
Total variable costs	\$3,228	\$3,257	\$3,261	\$3,274
(Optional) Side netting for bird control*	\$30	\$0	\$0	\$0
Fixed Costs:				
Vineyard establishment capital recovery	\$1,143	\$1,143	\$1,143	\$1,143
Machinery and equipment capital recovery	\$455	\$455	\$455	\$455
Buildings capital recovery	\$62	\$62	\$62	\$62
Property taxes	\$150	\$150	\$150	\$150
Land opportunity cost	\$120	\$120	\$120	\$120
Office supplies, phone, etc.	\$60	\$60	\$60	\$60
Insurance	\$58	\$58	\$58	\$58
Management	\$215	\$223	\$206	\$247
Total fixed costs	\$2,262	\$2,270	\$2,254	\$2,294
Total costs	\$5,490	\$5,527	\$5,515	\$5,568
Profit or loss	-\$1,200	-\$1,072	-\$1,390	-\$638
Breakeven price (\$ /ton)	\$2,111	\$1,675	\$1,671	\$1,638
Breakeven yield (tons)	3.4	4.2	4.5	3.9

Capital Requirements

Table 11 indicates the capital investment per planted 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 11 indicates that it would require \$32,360 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 11: Investment per Planted Acre of *V. Vinifera* Grapes,
Finger Lakes Region of New York, 2013

Assets	\$/acre
Land*	\$6,480
Machinery & equipment	\$4,437
Buildings (shop & tool shed)	\$1,380
Vineyard establishment and development**	\$20,063
Total Investment per planted acre	\$32,360

*Assume 54 acres purchased (including support land) for 50 planted acres

** Investment for E&D period is calculated by E&D costs in Table 7,
excluding revenue, machinery, equipment and building depreciation

Sensitivity Analysis

Costs per ton of grapes and profits for Finger Lakes vineyards will vary widely due to factors such as price of land, site-specific 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 in details 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 \$59 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 12. If yields are two tons per acre or less and/or with low yielding cultivars, prices around \$2,680 per ton would be required to break even. Even the highest price 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 may be incompatible with the quality requirements of the market for premium wines, but this will depend greatly on the characteristics of the given growing season and the contractual agreement between grower and winery purchasing the fruit.

Table 12: Total Cost per Ton (Breakeven price) at Varying Yields,
V. *Vinifera* Grapes, Finger Lakes Region of New York, 2013

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	\$3,568	1.5	\$3,535	1.5	\$3,527	1.5	\$3,554
2.0	\$2,707	2.0	\$2,682	2.0	\$2,676	2.0	\$2,696
2.5	\$2,191	2.5	\$2,171	2.5	\$2,166	2.5	\$2,182
3.0	\$1,847	3.0	\$1,830	3.0	\$1,826	3.0	\$1,839
3.5	\$1,601	3.5	\$1,586	3.5	\$1,583	3.5	\$1,594
4.0	\$1,416	4.0	\$1,404	4.0	\$1,401	4.0	\$1,411
				4.5	\$1,259	4.5	\$1,268
				5.0	\$1,146	5.0	\$1,154

*Cost at different yield levels adjusted for harvesting and hauling at \$95/ton, trucking at \$30/ton

Discussion: Costs and Returns for a Mature Vineyard -An established vineyard holds positive value

Table 13 indicates the estimated annual cash flow for a mature vineyard (similar to table 10), but assuming that an established vineyard is able to partially recover selected capital investments after 22 years of operation.

In this study, we do not discuss the returns of land investment, as it is mostly case-sensitive and this is not including in the vineyard's establishment capital recovery costs in table 10. Implicitly, the study thus assumes that land values increase by a rate equal to the real interest rate over the 22 years of operation. Instead, we assume that the trellis maintenance is done annually, so the trellis system has half of the value after 22 years. In addition, certain practices, such as drainage, lime application, land maintenance, herbicide application system do not need to

be done when starting a new production cycle, and add value to the vineyard. The costs of these activities are therefore dropped from the annual vineyard capital recovery estimates. As a result, the capital recovery costs per acre decreases from \$1,143 (Table 10) to \$764 (Table 13). In Table 13, Riesling exhibits the lowest loss at \$139 per acre. The other three varieties exhibit per-acre losses that ranges from \$573 to \$891.

Table 13: Cash and Returns for a Mature *V. Vinifera* Vineyard -2,
Assuming that E&D costs can be partially recovered, Finger Lakes Region, New York, 2013

Item	Pinot Noir	Cab. Franc	Chardonnay	Riesling
Receipts:				
Yield target, tons per acre	2.6	3.3	3.3	3.4
Price, \$ per ton	\$1,650	\$1,350	\$1,250	\$1,450
Total receipts	\$4,290	\$4,455	\$4,125	\$4,930
Costs:				
Variable Costs:				
Growing costs	\$2,762	\$2,762	\$2,762	\$2,762
Cluster removal (Cab. Franc and P. Noir)	\$54	\$54	\$0	\$0
Additional spray materials for Botrytis	\$59	\$0	\$59	\$59
Interest on operating capital	\$28	\$28	\$28	\$28
Machine Harvesting (\$95/ton)	\$247	\$314	\$314	\$323
Trucking (\$30/ton)	\$78	\$99	\$99	\$102
Total variable costs	\$3,228	\$3,257	\$3,261	\$3,274
(Optional) Side netting for bird control	\$30	\$0	\$0	\$0
Fixed Costs:				
Vineyard establishment capital recovery*	\$764	\$764	\$764	\$764
Machinery and equipment capital recovery	\$455	\$455	\$455	\$455
Buildings capital recovery	\$62	\$62	\$62	\$62
Property taxes	\$150	\$150	\$150	\$150
Land opportunity cost	\$0	\$0	\$0	\$0
Office supplies, phone, etc.	\$60	\$60	\$60	\$60
Insurance	\$58	\$58	\$58	\$58
Management	\$215	\$223	\$206	\$247
Total fixed costs	\$1,763	\$1,771	\$1,755	\$1,795
Total costs	\$4,991	\$5,028	\$5,016	\$5,069
Profit or loss	-\$701	-\$573	-\$891	-\$139
Breakeven price (\$ /ton)	\$1,920	\$1,524	\$1,520	\$1,491
Breakeven yield (tons)	3.1	3.8	4.1	3.5

*Discounting practices generally need not to be redone or remains positive salvage value

Concluding Comments

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, 2013 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 2011 (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, 236 acres; Chardonnay, 351 acres; Pinot Noir, 194 acres; and Riesling, 849 acres. Total *vinifera* acreage in the Finger Lakes was only 2,047 acres, or about 22 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 from 2008 - 2010, but recovered after 2011. Lower grape prices were arguable the result of the recent recession as well as the expansion of acreage of major *vinifera* varieties.

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 David DeMarco, Matthew Doyle, Dave Stamp, and Mark Wagner who served as the growers' panel for helping to establish the costs reported in this bulletin. Hans Walter-Peterson, Specialist of Finger Lake Grape Program, 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 - 2013 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

Table A1: Sample Herbicide Program for *V. Vinifera* Grapes, Finger Lakes NY, 2013

	Material	Rate/acre	Price	\$/acre
Year 0 (Site prep.)				
Custom herbicide	Glyphosate	4.0 qt.	\$7.50	qt. \$30.00
	Am.sulfate	1.7 lb.	\$0.14	lb. \$0.24
Total for site preparation				\$30.24
Year 1				
Chem. weed control- trellis	Surflan	1.25 qt.	\$11.47	qt. \$14.34
Chem. weed control-spot	Glyphosate	2.0 qt.	\$7.50	qt. \$15.00
	Am.sulfate	1.7 lb.	\$0.14	lb. \$0.24
Total for treatment				\$15.24
Total for Year 1				\$29.58
Year 2-3				
Chem.weed control- trellis	Prowl H2O	6 qt.	\$11.00	qt. \$66.00
Spot herbicide treatment	Glyphosate	2 qt.	\$7.50	qt. \$15.00
	Am sulfate	1.7 lb.	\$3.75	lb. \$6.38
Total for treatment				\$21.38
Spot herbicide treatment	Glyphosate	2 qt.	\$7.50	qt. \$15.00
	Am. Sulfate	1.7 lb.	\$3.75	lb. \$6.38
Total for treatment				\$21.38
Total for Year 2-3				\$108.75
Year 4-25				
Chem.weed control- trellis	Chateau	12 fl oz.	\$0.77	qt. \$9.19
Spot herbicide treatment	Glyphosate	2 qt.	\$7.50	qt. \$15.00
	Am. Sulfate	1.7 lb.	\$3.75	lb. \$6.38
Total for treatment				\$21.38
Total for years 4-25				\$30.56

Table A2: Sample Fertilizer/Soil Program for *V. Vinifera* Grapes,
Finger Lakes Region, NY, 2013

	Material	Rate/acre		Price		\$/acre
Year 0 (Site prep.)						
Soil sampling- 1 test/5 acres, 2 depths	n/a	0.4	acre	\$10	test	\$4.00
Lime (custom application)	Lime	2	tons	\$45	ton	\$90.00
Fall fertilization	Muriate of Potash	300	lbs	\$500	ton	\$75.00
Total for year 0						\$169.00
Year 1						
Fertilization (banded)	10:10:10	30	lbs	\$0.25	lb.	\$7.50
Mulch (if irrigation not installed-optional)	Round hay bales	20	bales	15.00	ea.	\$300.00
Total for year 1						\$7.50
Year 2						
Spring Fertilization (banded)	10:10:10	30	lbs	\$0.25	lb.	\$7.50
Total for year 2						\$7.50
Year 3						
(no suggested application)	n/a	n/a	n/a	n/a	n/a	n/a
Year 4+						
Soil application	Solubor(20%B)	2.5	lbs.	\$1.69	lb.	\$4.23
Fall fertilization (every 3rd year)	Muriate of Potash	300	lbs.	\$500	ton	\$25.00
Lime (1 in 5 years)	Lime	1	ton	45.00	ton	\$9.00
Petiole sampling		0.16	acre	\$24	test	\$3.84
Soil sampling (every 5th year)		0.2	acre	\$10	test	\$0.40
Total for Year 4+						\$42.47

Table A3: Machinery, equipment, and building capital recovery and interest costs, *V. Vinifera* Grapes, Finger Lakes Region, NY, 2013

<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	\$48,000	10	\$4,800	\$43,200	0.1113	\$4,809	\$96	\$4,905
Tractor, 45-HP	\$28,000	10	\$2,800	\$25,200	0.1113	\$2,805	\$56	\$2,861
Air-blast sprayer- 400 gallon	\$31,000	10	\$3,100	\$27,900	0.1113	\$3,106	\$62	\$3,168
Herbicide sprayer- 50 gallon	\$2,200	10	\$220	\$1,980	0.1113	\$220	\$4	\$225
Environmist sprayer	\$6,700	10	\$670	\$6,030	0.1113	\$671	\$13	\$685
Mower	\$7,800	7	\$1,114	\$6,686	0.1545	\$1,033	\$22	\$1,055
Brush chopper (6ft)	\$8,500	7	\$1,214	\$7,286	0.1545	\$1,126	\$24	\$1,150
Fertilizer Spreader	\$2,000	10	\$200	\$1,800	0.1113	\$200	\$4	\$204
Small disc (used)	\$600	10	\$60	\$540	0.1113	\$60	\$1	\$61
Grape hoe	\$7,500	10	\$750	\$6,750	0.1113	\$751	\$15	\$766
Post driver	\$4,000	10	\$400	\$3,600	0.1113	\$401	\$8	\$409
Vineyard Trailer	\$3,000	10	\$300	\$2,700	0.1113	\$301	\$6	\$307
Pickup truck (used)	\$28,000	10	\$2,800	\$25,200	0.1113	\$2,805	\$56	\$2,861
Auger	\$1,000	10	\$100	\$900	0.1113	\$100	\$2	\$102
Mechanical hedger (used)	\$5,000	10	\$500	\$4,500	0.1113	\$501	\$10	\$511
Mechanical Leaf remover	\$16,000	10	\$1,600	\$14,400	0.1113	\$1,603	\$32	\$1,635
Replanter	\$4,800	10	\$480	\$4,320	0.1113	\$481	\$10	\$491
Bird control equipment (\$100/acre)	\$5,000	10	\$500	\$4,500	0.1113	\$501	\$10	\$511
Shop Equipment	\$8,000	10	\$800	\$7,200	0.1113	\$802	\$16	\$818
Pruning Shears (X5)	\$250	5	\$50	\$200	0.2122	\$42	\$1	\$43
Macrobin (X15)	\$4,500	10	\$450	\$4,050	0.1113	\$451	\$9	\$460
Total Machine & Equipment costs	\$221,850		\$22,409	\$194,691				\$22,726
Cost per planted acre	\$4,437							\$455
<i>Buildings</i>								
Shop (1,500 ft ² @ \$46 ft ²)	\$69,000	30	\$0	\$69,000	0.0446	\$3,081	\$0	\$3,081
Cost per planted acre	\$1,380							\$62

Table A4: Hourly Machinery and Equipment Variable Costs, *V. Vinifera* Grapes,
Finger Lakes Region, NY, 2013

Item	Purchase Price	Hours of life	Total Repairs	Repairs	Fuel	Lube (15% of fuel)	Total Hourly Variable Costs
Tractor, 62-HP, 2WD, spray cab	\$ 48,000	7000	100%	\$6.86	\$10.25	\$1.54	\$18.64
Tractor, 45-HP	\$ 28,000	7000	100%	\$4.00	\$10.25	\$1.54	\$15.79
Air-blast sprayer- 400 gallon	\$ 31,000	2000	60%	\$9.30			\$9.30
Herbicide sprayer- 50 gallon	\$ 2,200	2000	60%	\$0.66			\$0.66
Enviromist sprayer	\$ 6,700	2000	60%	\$2.01			\$2.01
Mower (6ft)	\$ 7,800	2500	80%	\$2.50			\$2.50
Brush Chopper	\$ 8,500	2500	80%	\$2.72			\$2.72
Fertilizer Spreader	\$ 2,000	1200	80%	\$1.33			\$1.33
Small disc (used)	\$ 600	2000	60%	\$0.18			\$0.18
Grape hoe	\$ 7,500	2000	60%	\$2.25			\$2.25
Post driver	\$ 4,000	2000	80%	\$1.60			\$1.60
Trailer	\$ 3,000	3000	80%	\$0.80			\$0.80
Pickup truck (used)	\$ 28,000	2500	83%	\$9.30	\$7.66	\$1.15	\$18.11
Auger	\$ 1,000	2000	80%	\$0.40			\$0.40
Mechanical hedger (used)	\$ 5,000	2000	80%	\$2.00			\$2.00
Mechanical leaf remover	\$ 16,000	2000	80%	\$6.40			\$6.40
Replanter	\$ 4,800	1200	80%	\$3.20			\$3.20
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Tractor Fuel Factors	Factor						
Diesel	0.0438						
Gasoline	0.0600						

OTHER A.E.M. EXTENSION BULLETINS

EB No	Title	Fee (if applicable)	Author(s)
2013-17	New York Economic Handbook, 2014		Extension Faculty and Staff
2013-16	Dairy Farm Business Summary, Northern New York Region, 2012	(\$12.00)	Knoblauch, W., Conneman, G., Dymond, C., Karszes, J., Howland, B., Buxton, S., Kiraly, M., and K. Shoen
2013-15	Dairy Farm Business Summary, Hudson and Central New York Region, 2012	(\$12.00)	Knoblauch, W., Conneman, G., Dymond, C., Karszes, J., Howland, B., Buxton, S., Kiraly, M., and K. Shoen
2013-14	Eastern Broccoli Crop Budgets		Atallah, S. and M. Gómez
2013-13	Dairy Farm Business Summary, New York Small Herd Farms, 120 Cows or Fewer, 2012	(\$16.00)	Knoblauch, W., Dymond, C., Karszes, J. and M. Kiraly
2013-12	Dairy Farm Business Summary, Western New York Region, 2012	(\$12.00)	Knoblauch, W., Dymond, C., Karszes, J., Hanchar, J., Grace, J., Carlberg, V. and J. Petzen
2013-11	Dairy Farm Business Summary, New York Large Herd Farms, 300 Cows or Larger, 2012	(\$16.00)	Karszes, J., Knoblauch, W. and C. Dymond
2013-10	Milking Center Cost Study, New York State, 2010-2011		Howland, B., Karszes, J. and K. Skellie
2013-09	Marketing Module 8 - Promotion		Gómez, M. and S. Cuellar-Healey
2013-09i	Marketing Module 8 - Promotion Example		Cuellar-Healey, S. and M. Gómez
2013-09ii	Marketing Module 8 - Promotion Teaching Slides		Cuellar-Healey, S. and M. Gómez

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