

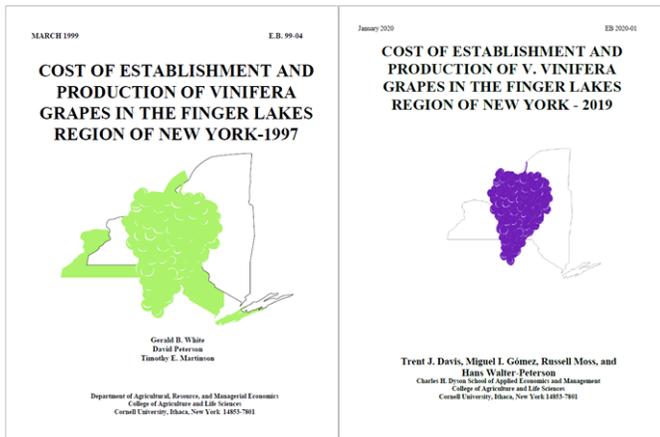


RESEARCH FOCUS

How "Cost of Establishment and Production of *V. vinifera* Grapes" has changed since 1997

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KEY CONCEPTS

- Over the past 23 years, seven “Cost of Establishment” bulletins have tracked costs and returns associated with *V. vinifera* vineyards in New York.
- Each publication started with interviews with a panel of growers to document production practices and associated costs.
- From 1997 to 2019, the total investment per acre increased from \$15,172 to \$46,527, at an annual rate of 4.8%.
- Annual growing costs per acre increased from \$3,500 to \$7,100 per acre, at an annual rate of 3.1%.
- Land prices increased from \$1,500 to \$1100 per acre, at an annual rate of 9%.
- Other costs have increased at an annual rate of 3% (machinery and equipment), 4% (vineyard establishment costs), and 5% (buildings).
- Grape prices have increased more slowly. Riesling increased from \$1,159 per ton in 1997 to \$1,600 per ton in 2019, at an annual rate of 1.4%. Pinot noir prices increased 1.5%; Chardonnay (0.6%) and Cabernet Franc (0.4%) prices have increased less.
- Considering all fixed and variable costs, at yield targets, the current model projects overall losses of \$500-\$1000 per acre over the 25 year life of the vineyard.
- Three previous bulletins (2001, 2010, and 2013) also projected losses, while the 1997, 2004, and 2007 projected profits of \$200-1,500 per acre.
- Profitability for Riesling was highly sensitive to yield targets, which varied from 2.8 to 4.0 tons per acre. At a constant 4 T/acre, revenues exceeded costs in all years except 2019.

Since emeritus professor Dr. Gerald White published the first *Cost of Establishment* bulletin in 1997, six additional bulletins modeling costs and revenues for *vinifera* grapes have been published, spanning 23 years.



In 1997 Dr. Gerald White published the first of a series of bulletins entitled “*Cost of Establishment and Production of vinifera Grapes In the Finger Lakes Region of New York.*” The seventh edition, published in January 2020, has updated costs and returns to 2019 levels.

In 1997, the total per-acre investment was \$15,000, and annual growing costs were estimated at \$3,000 per acre. Twenty-three years later in 2019, modeled investment costs have risen to \$47,000 per acre, and annual growing costs have increased to \$7,100 per acre. Prices received for grapes have gone up by ~\$500 per ton, but not as rapidly as establishment costs. In this article we will review how different costs have changed in the 23 years covered by the seven publications.

Background

From the late 1970s to 1990, demand for traditional hybrid and American wines with national distribution declined. Between 1985 and 1990, grape acreage in the Finger Lakes had shrunk by one-third, from 15,000 to about 10,000 acres. However, small to medium-sized wineries, marketing through local tasting rooms, began to emerge following the 1979 Farm Winery act.

By 1990, the small winery segment was expanding, particularly in the Finger Lakes and in Suffolk county on Long Island. As these wineries grew, they started planting *Vitis vinifera* cultivars. Up until 1990 a limited amount of *V. vinifera* varieties were grown in New York. Agricultural Statistics reported around 200 acres of *vinifera* through the 1990 survey. By 1995, however, reported acreage had increased to 1,800 statewide. (Figure 1)

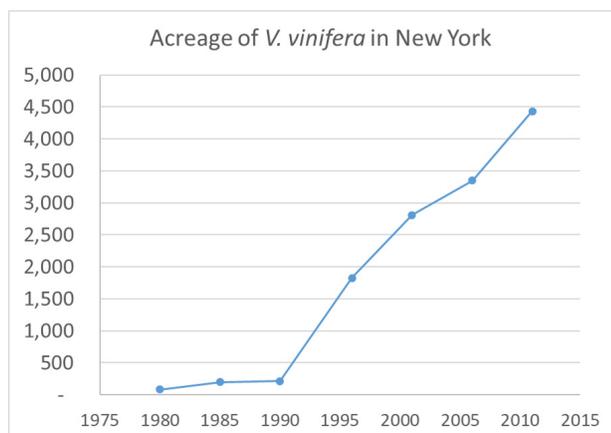


Figure 1. Acreage of *V. vinifera* reported in the New York Agricultural Statistics Service Fruit and Vineyard Acreage Surveys, produced at five year intervals until 2011.

In response to this increase in planting, Dr. Gerald White published the first Cost of Establishment and Production of *V. vinifera* grapes in the Finger Lakes Region of New York series in 1997. In the first edition, he cited “increasing interest in the Finger Lakes... in planting *Vitis vinifera* grapes for premium wine production.”

Prices paid to growers of traditional American and hybrid varieties that were the mainstay of the wine industry (Aurore, Catawba, DeChaunac, Delaware, and Dutchess) were declining, but winery tourism and tasting room visits were increasing. White cited sales increases at Finger Lakes tasting rooms of “ten to 25 percent over the last three years”, and the region’s emerging “stature as a producer of high quality wines that command premium prices.”

In subsequent 2001, 2004, 2007, and 2010 publications, continued growth in the number of wineries and sales were cited, along with increases in acreage and production of *V. vinifera* grapes statewide. From 2000 to 2010, the area planted to *vinifera* grapes expanded to 4,430 acres statewide, according to New York Agricultural Statistics Service surveys. *V. vinifera* plantings were approximately evenly distributed between Long Island (1,895 acres) and

the Finger Lakes (2,142 acres), with an estimated 400 acres elsewhere in the state.

Since then, *vinifera* plantings have continued with a more measured expansion, although current figures are not available, because the USDA NASS unit no longer collects variety-specific acreage statistics. However, Dr. Miguel Gomez’ horticultural marketing and economics program has continued publication of two editions in 2013 and 2019.

This series of seven publications has modeled costs and returns for *V. vinifera* plantings over the past 23 years. Publication of the current bulletin this past January offers an opportunity to look back at how the economics of starting a vineyard business have changed.

Methods

Each publication models costs, returns, and total investment needed to start a commercial vineyard, including land, equipment, buildings, and vineyard establishment costs. It then tracks annual production costs following vineyard establishment, including annual growing costs and fixed costs amortized over an expected 25 year productive span of the vineyard.

Cost estimates incorporate annual production operations (pruning, canopy management, disease and insect management) and establishment operations (site preparation, trellis and planting costs, and operations associated with nonbearing vineyards in years 1-3). Costs of labor and equipment required for vineyard operations and wage rates, along with typical production practices were estimated with a panel of experienced Finger Lakes growers. Equipment costs were based on purchase of new equipment and standard depreciation costs.

In the 1997 and 2001 bulletins, a 40-acre vineyard was modelled. Since the 2004 bulletin, the planted acreage modeled increased to 50 acres. Establishment and growing costs are expressed on a per-acre basis.

Other fixed costs included interest on capital investment and operating capital, and a management fee of 5% of gross receipts.

Table 1. Yield assumptions for specific *V. vinifera* varieties, 2019

Variety	Tons per acre
Pinot Noir	2.6
Cabernet Franc	3.3
Chardonnay	4
Riesling	4

Grape varieties

Vineyards in the Finger Lakes region commonly grow Pinot Noir, Cabernet Franc, Chardonnay, and Riesling so these were the varieties included. It was assumed that growers were able to produce grapes at an above average quality, and were taking the necessary steps such as ap-

appropriate spray programs, shoot thinning, cluster removal, etc., to maximize the quality of their grapes.

Growers provided yield targets (that varied over the years), and grape prices obtained from annual surveys by the Finger Lakes Grape Program were used to estimate revenues.

Profit or loss

Net returns were calculated by subtracting costs from revenues. In this context, a profit of \$0 per acre means that all costs, including land, machinery, capital, salary for skilled and unskilled labor, a 'return to management' fee, and other fixed and variable costs were recovered over the life of the vineyard.

Overall Results

We will present trends in a series of figures that include both the actual dollar amounts (blue lines) and the historical costs in inflation-adjusted 2019 dollars.

The total investment per acre increased from \$15,732 in 1997 to \$46,527 in 2019 – a 196% increase over 23 years, or a 4.8% annual increase over 23 years (Fig. 2). During this time, the consumer price index increased at an average 2% rate, so the 'real' cost in constant dollars increased by 87%. Total investment, including purchase of 54 acres, with 50 planted to *V. vinifera* grapes, was \$2,512,458.

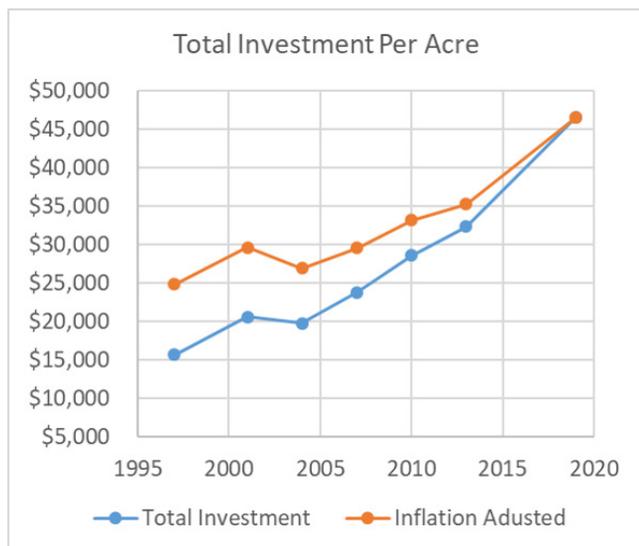


Figure 2. Total per acre investment associated with establishment of a *vinifera* vineyard in the Finger Lakes region. Inflation-adjusted figures based on the consumer price index.

Annual growing costs per acre (Figure 3) increased from \$3,500 per acre to \$7,100 per acre – a 103% increase over 23 years, or a 3.1% annual increase. Since the 2013 study, annual growing costs have increased by 27%, at an annual rate of 4.5%.

Both viticultural practice and equipment have changed since the original 1997 publication. What have been the main 'drivers' of the increased costs?

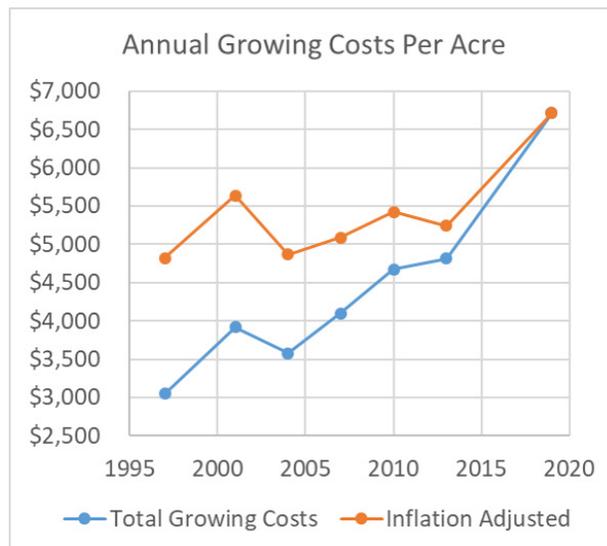


Figure 3. Total growing costs per acre from 1997 to 2019. Inflation-adjusted figures in '2019 dollars' were adjusted based on the consumer price index.

Land prices

Land prices have increased dramatically in the Finger Lakes (Figure 4). The study assumes a purchase of 54 total acres of land, 50 of which are dedicated to planting grapes while the other four acres are dedicated to roads, headlands, and a 1,500 square foot shop, with the assumption the land is in a favorable mesoclimate close to one of the Finger Lakes. After careful consideration, we settled on an average cost of \$10,370 per acre - a 72% increase since the previous study in 2013.

Historically, estimated land prices for developing a *V. vinifera* vineyard have increased 647% since the first estimate in 1997. Higher demand for residential and agricultural lakeside properties are likely the cause of this substantial increase in land prices.

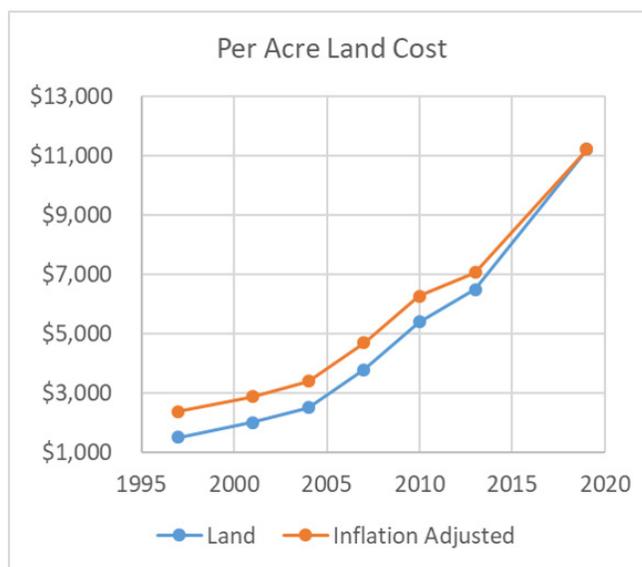


Figure 4. Estimated land cost (per-acre) in the Finger Lakes region, 1997 - 2019.

Machinery, equipment, & building costs

The study estimates a total investment in machinery and equipment of \$307,970 in 2019 (Fig. 5). This investment includes a tractor (\$57,000), an air-blast sprayer (\$35,000), a mechanical leaf remover (\$35,000), and a 1,500 square foot shop (\$82,500). This is a 26% increase since the previous 2014 study was conducted. Historically, the estimated cost has increased by 104% since 1997.

One significant change from earlier studies was the assumption that all of the machinery and equipment was purchased new. In previous studies we modeled used equipment for certain pieces of machinery, like a tractor. However, after talking to the grower panel all doubted that a new vineyard would consider buying used equipment. This may be one of the factors driving the large percentage increase in machinery, equipment, and building costs in the 2019 study (Fig. 6).

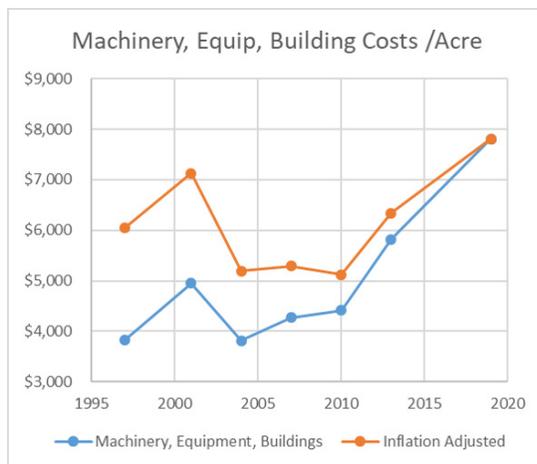


Figure 5. Machinery, equipment, & buildings cost (per-acre), 1997-2019. To calculate this number we estimated the total cost of all machinery, equipment, and buildings necessary to establish a new vineyard, then divided by 50 acres to obtain per-acre cost estimates.

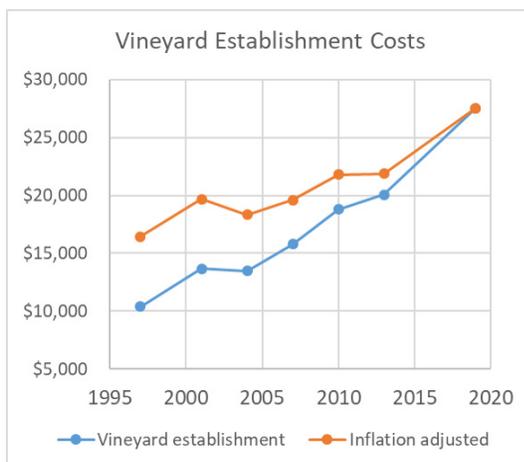


Figure 6. Vineyard establishment and development cost (per-acre), 1997-2019. This estimates the total costs of establishment (planting, trellis, drainage, etc.) based on a 54-acre land purchase, with 50 acres of grapes planted and the remaining 4 acres devoted to machine shop, access roads, and headlands.

Vineyard establishment & development

‘Total establishment and development costs’ is used as an umbrella term to account for all the establishment costs during an initial four year period. This encompasses all costs during the first 3 years of a non-bearing vineyard, from site preparation to vineyard planting, and annual production practices through year 3.

In total, the establishment and development cost of 54 acres (50 acres of planted grapes) is estimated at \$27,518 per-acre, a 37% increase since 2013 (Figure 6).

Labor costs

One of the largest increases was the total labor costs for establishment and development over the four year period with an increase of \$3.00 for skilled labor, and \$4.00 for unskilled labor, per hour (Fig. 7). Notably, labor costs for both skilled and unskilled workers closely tracked underlying inflation from 2001-2013. From 2013-2019, unskilled labor costs have risen dramatically, perhaps reflecting lower availability and increased use of H2A contracted labor. Current estimate is \$17 per hour for unskilled labor.



Figure 7. Skilled and unskilled labor wage rates 1997-2019. Note that inflation-adjusted wage rates between 2000 and 2013 were relatively stable, with a dramatic increase in unskilled labor costs since 2013.

Overall Investment per planted acre

The largest single category of investment is the actual vineyard establishment costs, which comprised 66% of the total investment in 1997 and 59% in 2019. The land investment increased dramatically from 10% in 1997 to 24% of investment costs in 2019. Despite rising machinery costs, the percentage associated with it declined from 21% to 13% of total investment costs (Fig. 8).

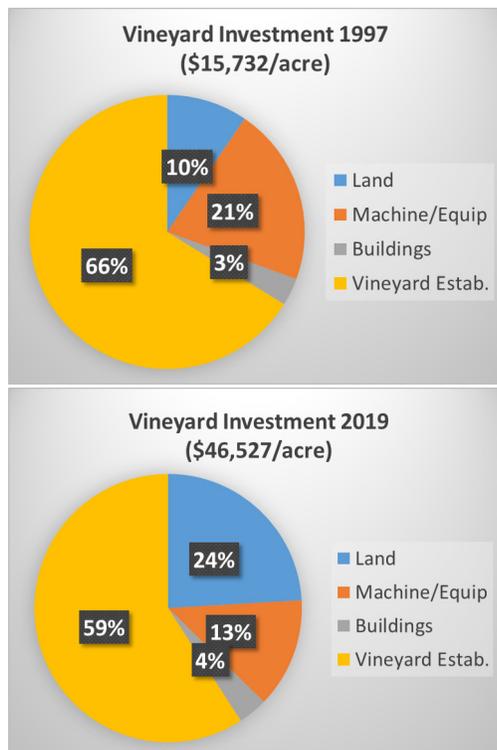


Figure 8. Breakdown of each cost component necessary for a new *V. vinifera* vineyard. The costs for machinery/equipment and buildings have been separated to show more detail of the total cost breakdown.

Breaking down average annual percentage change in investment between each bulletin (Table 2), it's notable that land prices increased at an annual 9% rate over 23 years, while other costs (Machinery, buildings, establishment costs) increased at overall annual rates of 3 to 5%. Note that overall investment costs increased at 5% per year over 23 years, while the consumer price index increased at an annual rate of 2.1%.

Table 2. Annual percentage change in investment per acre.

Year	Land	Machinery	Buildings	Vineyard Estab.	Total Investment
'97-'01	7.5%	1.3%	30.0%	7.0%	7.0%
'01-'04	7.7%	-9.1%	-6.4%	-0.4%	-1.3%
'04-'07	14.8%	4.2%	2.9%	5.4%	6.4%
'07-'10	12.6%	0.8%	1.9%	6.0%	6.3%
'10-'13	6.3%	13.5%	0.0%	2.2%	4.2%
'13-'19	9.5%	5.6%	3.0%	5.4%	6.2%
'97-'19	9%	3%	5%	4%	5%

Annual growing costs

Starting in year 4, the vineyard is assumed to have reached maturity and is reaching targeted yields. For the remaining 22 years of assumed production, revenues from the sale of grapes must support both annual growing costs, and also the fixed costs – to provide a return to the capital and investment needed to establish and maintain the vineyard.

Variable costs involve annual 'cash costs' for labor, vineyard operations and purchased inputs. Following a big jump between '97 and '01, they have increased at a fairly steady rate (annual rate averaging 3.5%). Following a 5.6% annual rate between '10 and '13, the rate slowed to 2% annually from '13 to '19 – closely tracking the 2% annual rate of inflation (Table 3).

Table 3. Annual rate of increase for fixed and variable annual growing costs for *vinifera* grapes from 1997-2019.

Year	Fixed	Variable	Total
'97-'01	3.6%	7.0%	5.3%
'01-'04	-3.9%	-0.1%	-1.9%
'04-'07	5.0%	3.2%	4.0%
'07-'10	4.7%	3.6%	4.1%
'10-'13	-2.1%	5.6%	2.2%
'13-'19	7.4%	2.2%	4.5%
'97-'19	3.1%	3.5%	3.3%

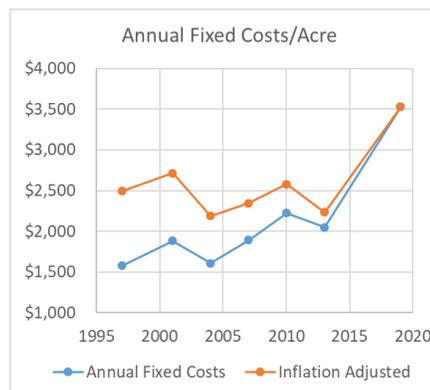
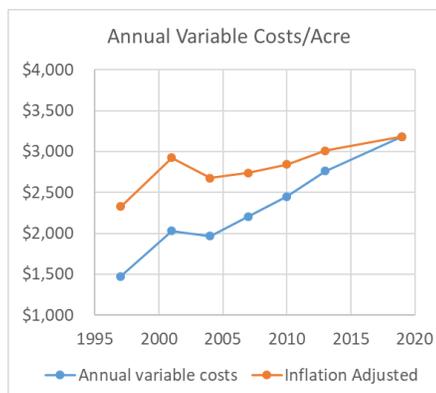


Figure 9. Changes in variable and fixed costs for the vineyard during its bearing years (Year 4 to 25). Note the steep increase in fixed costs since 2013

Fixed costs were relatively stable, before dramatically increasing at a 7% annual rate from '13 to '19. This reflects the combined impact of increased land, labor, and equipment costs. Cost increases from 2013-2019 (table 3) were dominated by the 7% per year fixed cost increase.

Notably, the relative percentage of overall annual growing costs (Figure 10) devoted to fixed costs, weed, disease, and insect management, canopy management, and harvest costs has not changed much from the first 1997 survey to the current one. Overall growing costs have doubled over 23 years, but relative contributions of different types of costs are almost identical.

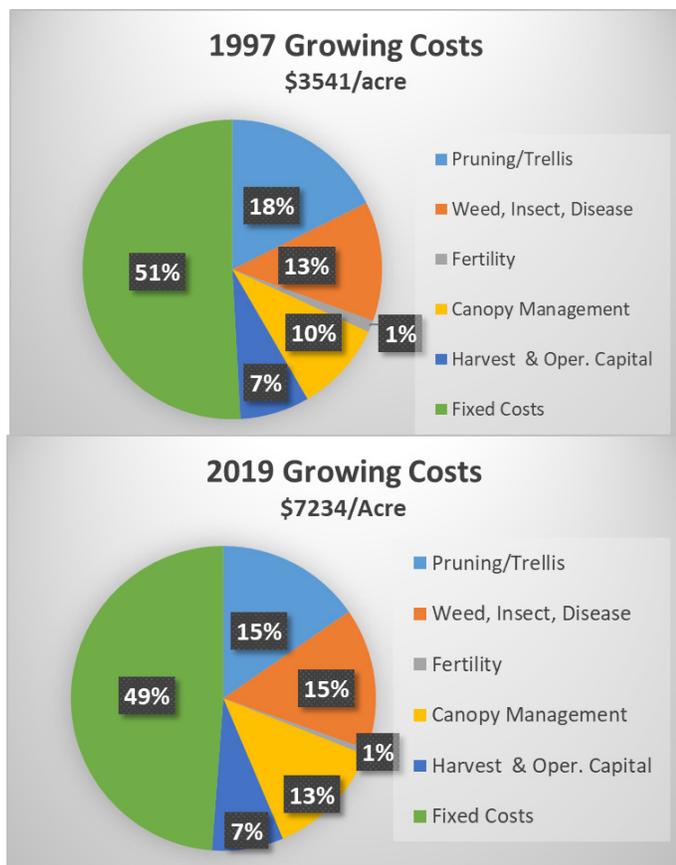


Figure 10 Annual growing costs for different categories (pruning, IPM, fertility, and canopy management) and fixed costs were similar in 1997 and 2019.

Revenues

Revenues modeled over the 25 year lifespan of the vineyard involve two elements: grape prices and expected yields.

Grape Prices. Each study used incorporated grape prices per ton based on grape price surveys compiled by the Finger Lakes Grape Program, and opinions of the grower

panel (Table 4, Fig. 11). In general, since 2010, the *vinifera* prices per-ton have been increasing. The prices we used for the 2019 study show an increase of 8-15% since the 2013 study.

However, from 1997 to 2019 prices have changed little. The annual rate of increase over 23 years ranges from 0.4% (Cabernet Franc) and 0.6% (Chardonnay) to 1.4% (Riesling) or 1.5% (Pinot noir). Price increases growers received have lagged behind the 2.1% inflation rate. In 2019 dollars, prices are lower than they were in 1997.

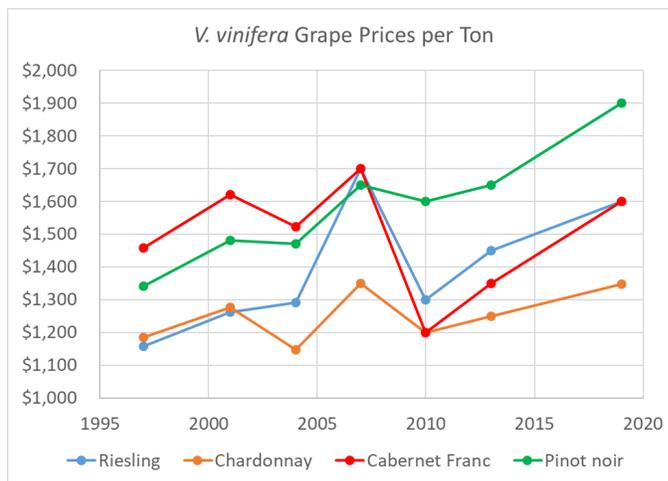


Figure 11. Trends in grape prices for four *vinifera* varieties from 1997 to 2017. Price spike in 2007 may have reflected supply issues associated with increased demand and short supply following severe winter injury in the 2004-2005 winter that reduced yields

Table 4. Grape prices for four *V. vinifera* varieties used in cost of production bulletins.

Year	Riesling	Chardonnay	Cabernet Franc	Pinot Noir
1997	\$1,159	\$1,186	\$1,458	\$1,342
2001	\$1,263	\$1,277	\$1,621	\$1,481
2004	\$1,291	\$1,147	\$1,523	\$1,471
2007	\$1,700	\$1,1350	\$1,700	\$1,650
2010	\$1,300	\$1,200	\$1,200	\$1,600
2013	\$1,450	\$1,250	\$1,350	\$1,650
2019	\$1,600	\$1,350	\$1,600	\$1,900
% Increase in price 2013-2019	10%	8%	19%	15%
Annual % rate of increase 2013-2019	1.7%	1.3%	2.9%	2.4%
% rate of increase 1997-2019	1.4%	0.6%	0.4%	1.5%

Targeted yields. For the 2019 study, growers set targeted yields, based on the assumption that growers would produce above-average quality, with crop level adjustment (shoot positioning and thinning, cluster thinning, and basal leaf removal for sunlight exposure) and spray practices appropriate for maximizing quality (Table 5).

Table 5. Estimated profit/loss per-acre for specific *V. vinifera* varieties, 2013 and 2019

Variety	Yield Target (tons/acre)	Profit/Loss 2019	Profit/Loss 2013
Pinot Noir	2.6	\$-2,141	\$-701
Cab Franc	3.3	\$-1,906	\$-573
Chardonnay	4.0	\$-1,809	\$-891
Riesling	4.0	\$-859	\$-139

Profitability

Under assumptions of the study, after accounting for all of the costs, and calculating the estimated receipts using the suggested yields and price per-ton for each of the four varieties, none were profitable. Estimated per-acre losses ranged from \$850 to \$2,141 (Table 5).

Projected losses approximately doubled from the 2013-2019 study, because overall costs increased at an annual 4.5% rate (Table 3), while per-ton prices (Table 4) increased at annual rates of 1.3% (Chardonnay) to 2.9% (Cabernet Franc).

Much of the increase was driven by higher fixed costs for land, machinery, and vineyard establishment. From 2013-2019, fixed costs increased at a 7.4% annual rate, while variable growing costs increased by only 2.2% annually. Much of the increase was associated with a 9.5% annual increase in land prices (from \$6,400 to 11,200 per acre), a 5.6% increase in equipment costs (from \$4,400 to \$6,200 per acre), and a 5.4% annual increase in vineyard establishment costs (\$20,000 to \$27,500/acre).

Increases in labor costs, and particularly unskilled labor, increased both fixed costs associated with vineyard establishment and annual variable growing costs.

Historical trends

Profit and loss projections have varied over the seven publications, as is illustrated by the results for Riesling.. Losses were projected in the 2001, 2010, 2013, and 2019 bulletins (Fig. 12, top) ranging from -\$500 to \$1,000 per acre. Profits were projected in 1997, 2004, and 2007, ranging from \$100 to \$1,000 per acre.

These profit and loss figures are very sensitive to yield targets, which varied from 2.8 to 4 T per acre in different bulletins (Table 6). If the yield target was set at a constant 4 T/acre, profitability would look quite different (Fig.12, bottom). With this yield target, all years prior to 2019 were profitable .

Table 6. Target yields for Riesling in 1997 to 2019 bulletins

Year of Publication	Yield Target (tons/acre)
1997	4.0
2001	3.0
2004	3.6
2007	2.8
2010	3.4
2013	3.4
2019	4.0

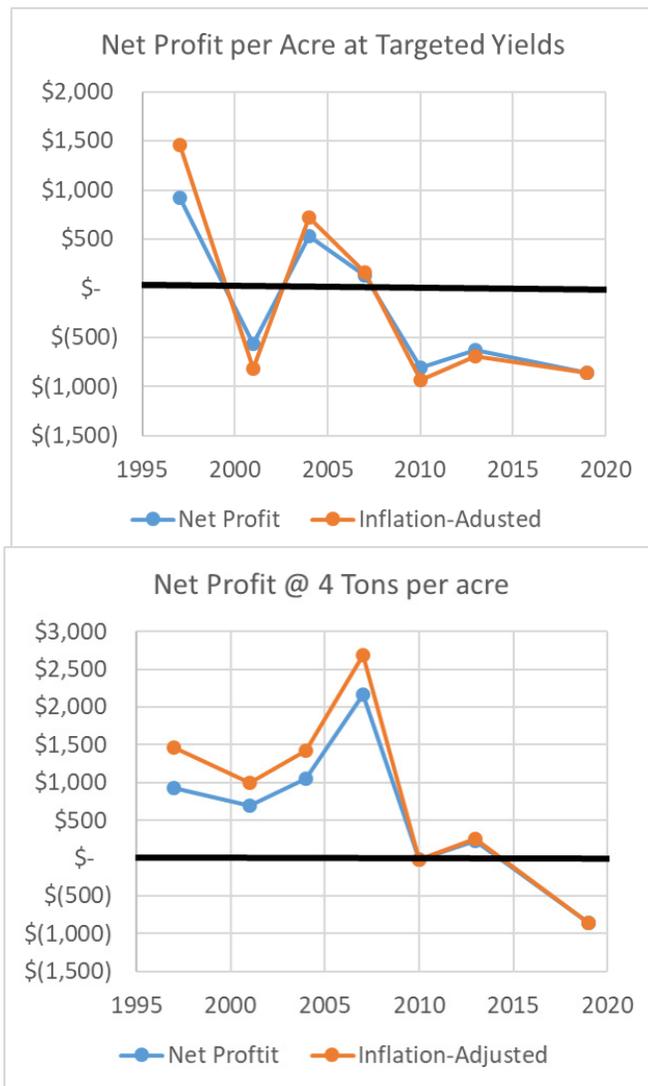


Figure 12. Projected profit or loss for Riesling establishment and production. The break-even point (zero profit) means that all fixed and variable costs, including wages for the operator and workers, capital recovery, and depreciation on equipment and buildings, as well as a return to management are covered. Target yields (left) ranged from 2.8 to 4.0 tons per acre. If target yields were a uniform 4 T/acre, only the 2019 model for Riesling shows a net loss (right).

What does this mean?

Under modeled assumptions, results show that a stand-alone 50 acre vineyard operation would not be a profitable investment. Escalating costs for land, equipment, and labor have outpaced increases in prices paid to growers for grapes.

Our results indicate that the investment of nearly \$2.5 million necessary for the land, equipment, buildings, planting costs, associated with a new vineyard enterprise would result in an overall loss (at minimum) of \$860 per-acre, or \$43,000 over the life of the 50 acre vineyard.

However, many of the increased costs are associated with escalating land prices – a 10-fold increase in the 23 years covered by these publications. Land prices elsewhere in New York (eg \$40,000 per acre on Long Island), or Napa (\$70,000-\$150,000/acre for vineyard land) are often not included in production costs. The latest Ontario cost of production bulletin (Molenhuis 2014) ignores land prices (\$40-50,000/acre). Many of these areas would be unprofitable with land costs included.

To account for variability within land prices we ran the model with various land prices with \$10,370/acre being the standard assumed price. The findings show that, at least for a vineyard in the Finger Lakes region, land price variation does not have an extreme effect on either breakeven prices per ton nor yields.

On average, for every \$2,000 the price of land decreases, the breakeven price per ton decreases roughly \$40, and the breakeven yield decreases by roughly 0.1 ton/acre. While land purchases may play a significant role in the upfront costs of starting a new vineyard it may not play a significant role in the vineyard's breakeven analysis in the long-run.

Projected losses may not be as applicable for wineries that grow their own fruit, and can extract additional value from processing their grapes into wine. Established growers expanding existing plantings may also have a different cost structure than what we have modeled. Increased mechanization to reduce labor costs could reduce the cost-per-ton of grapes produced.

Finally, growers might be able to improve quality if they can increase yields while maintaining quality. The breakeven yield for Riesling is 4.6 T per acre – a yield target that is clearly attainable at superior sites in the Finger Lakes. Higher yields for Chardonnay (5.5T breakeven) might be attainable, particularly if it is grown for sparkling wine production (earlier harvest).

Higher yield targets for reds (4.6 T/acre for Cabernet Franc; 3.8 T/acre for Pinot noir) may unacceptably compromise quality for these varieties. Increased prices would also improve profitability. Breakeven prices range from \$1,815 per ton for Riesling to \$2,720 for Pinot noir.

The trend over the past 23 years is that increased costs of establishment and production are outpacing any price increases growers have received. Since 1997, growing costs have increased at an annual rate of 3.3%, but prices have increased at 1 to 2% per year – and declined in some cases in relation to the consumer price index. For the industry to remain viable, this trend will need to change.

Over the past 23 years, this series of seven publications has provided guidance to a generation of prospective and current growers and investors throughout the eastern US and Canada. While current trends indicate that none of the varieties are profitable, prospective producers have a variety of goals and expectations for their operations. The detailed cost documentation described in these publications provides a basis for growers, wineries, and lenders to make informed planting decisions.

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