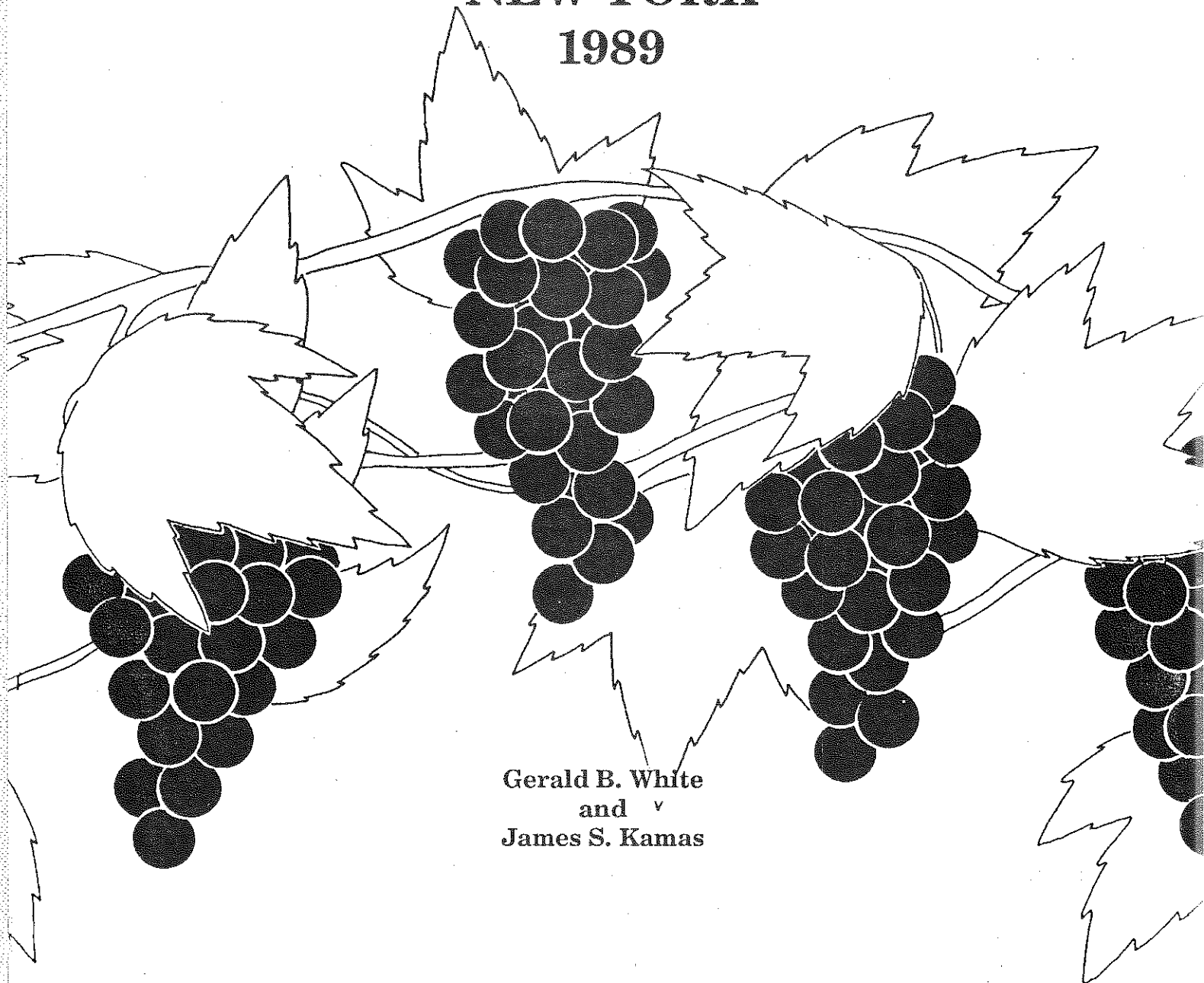


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THE ECONOMICS OF CONCORD AND NIAGARA GRAPE PRODUCTION IN THE GREAT LAKES REGION OF NEW YORK 1989



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THE ECONOMICS OF CONCORD AND NIAGARA GRAPE PRODUCTION IN
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INTRODUCTION

Recently there has been renewed interest in planting native American grapes, primarily of the Concord and Niagara varieties, for the juice market. Increased demand for juice grapes has resulted from new product development and strong promotion of juice products and a relatively weak dollar which has stimulated exports and decreased the price attractiveness of imported concentrate and grape products.

The purpose of this publication is to provide economic information to New York grape growers who are interested in planting Concord and/or Niagara grapes. Industry trends in production and prices since 1978 are discussed. The year 1978 was chosen as a year for comparison because there was a similar study done in that year (White and Jordan) against which the results can be compared. It should be noted that in 1978, the farm value of utilized production in New York State was \$45.9 million, the highest on record. Estimates of yields, costs, and returns are provided. The publication is intended to provide growers with guidelines to use in developing their own costs and returns for Concord and Niagara grapes.

BACKGROUND

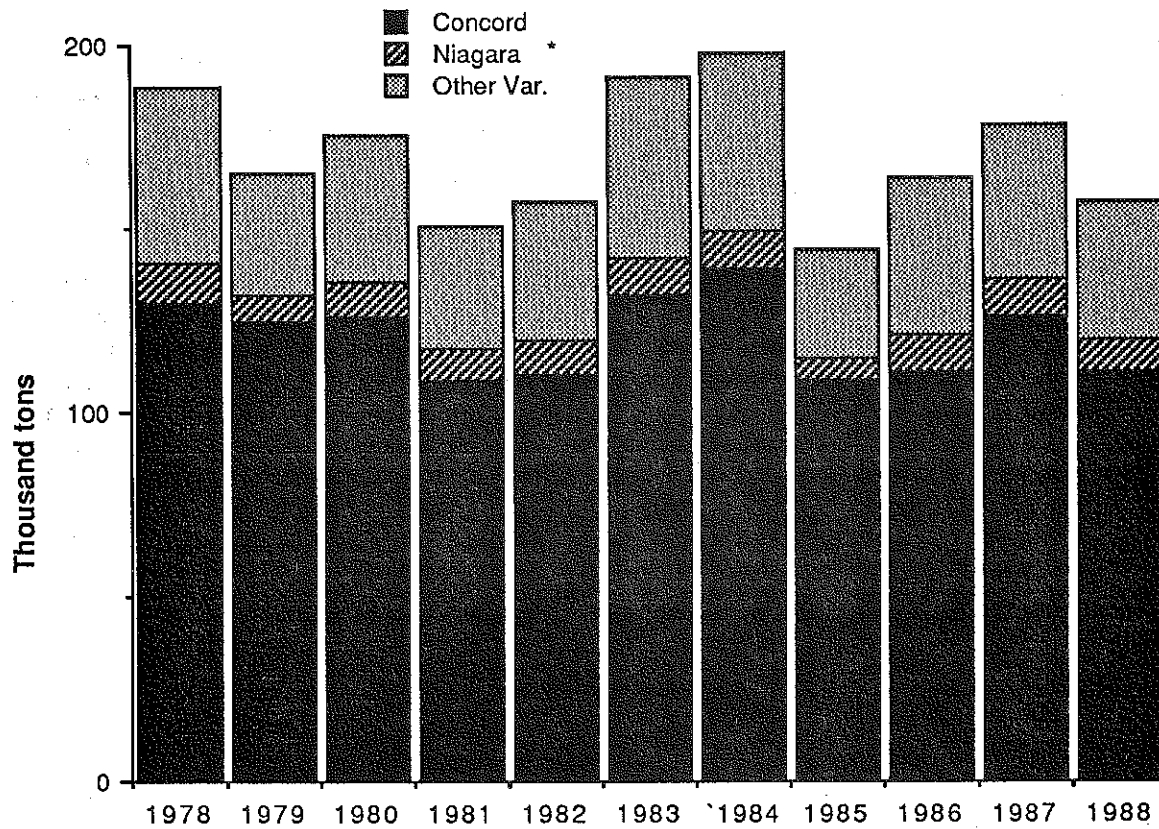
In the last Orchard and Vineyard Survey in 1985, there were 38,226 acres of grapes in New York State (Orchard and Vineyard Survey). Of this acreage, 22,963 acres, or 60.0 percent of the total, were planted to the Concord variety and 2,134 or 5.6 percent were planted to the Niagara variety.

Concord and Niagara grapes utilized for juice remain the backbone of the New York industry. Figure 1 illustrates the importance of these two varieties in relation to total grape production of the State. These varieties account for a combined 66 percent of acreage, but 76 percent of production, indicating that they are higher yielding than most other varieties.

Yields of National Grape Cooperative members, who account for about 41 percent of the Concord grapes and 29 percent of the Niagara grapes grown in New York, are shown in Figure 2. As can be seen in Figure 2, the average yields per acre for Concords exceeded the average for Niagaras in each of the 11 years shown. A simple average annual yield per acre for the varieties in 1984-88 is 4.8 for Concords and 4.2 for Niagaras. In the most recent three years, the difference between varieties has narrowed considerably.

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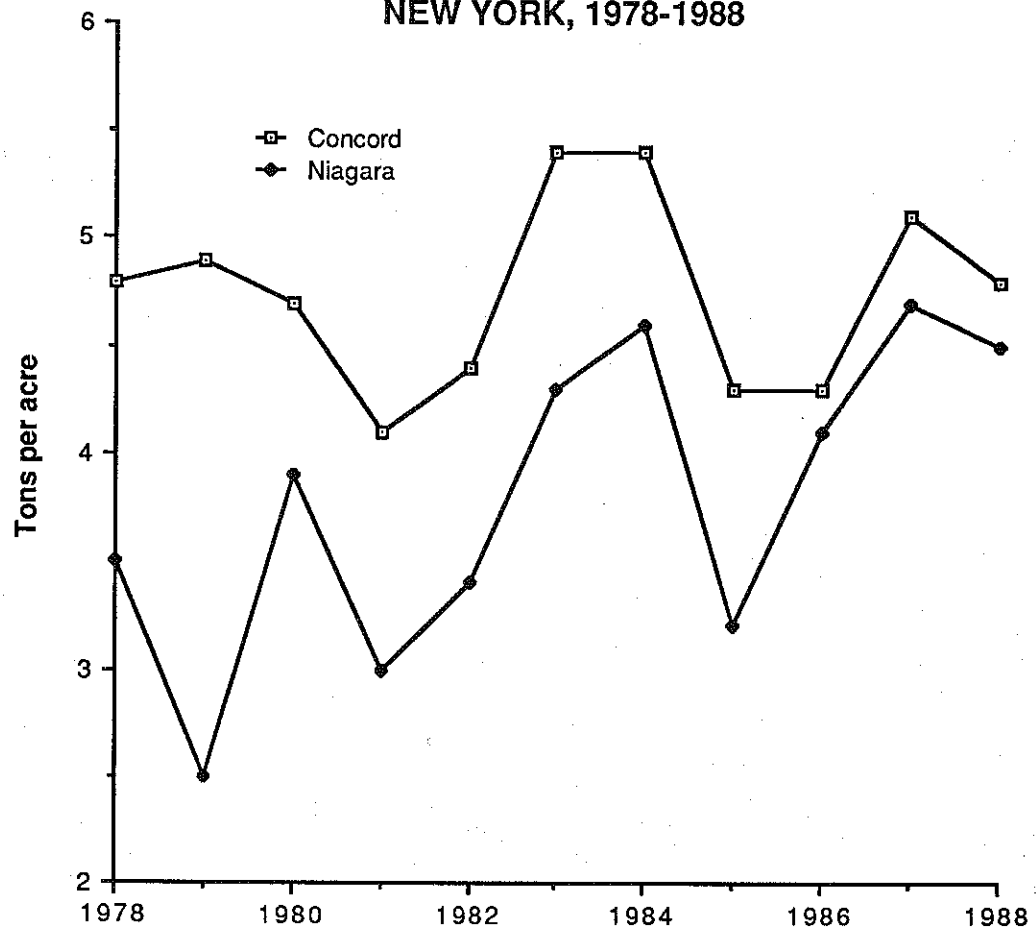
FIGURE 1. TOTAL PRODUCTION OF GRAPES AND PRODUCTION OF CONCORD AND NIAGARA GRAPES, NEW YORK, 1978-1988



*Niagaras sold for fresh grapes not included

Source: New York Agricultural Statistics

FIGURE 2. AVERAGE YIELD, TONS PER ACRE, CONCORD AND NIAGARA GRAPES, NATIONAL GRAPE COOPERATIVE MEMBERS, NEW YORK, 1978-1988



Source: National Grape Cooperative Co-op News, various Issues, and Tom Davenport

Price trends are shown in Figure 3. (New York Agricultural Statistics compute the price using all varieties crushed for juice and wine. Thus, the price for juice includes, for example, Catawba grapes and the price for wine includes prices of Vinifera and French-American hybrid grapes.) In general, the price of grapes utilized for wine exceeds the price of grapes utilized for juice. Concord and Niagara generally fall between the prices for juice and wine because they are used for both. Therein is one of the attractions of the varieties -- that they attract bidders from both the wine and juice processors. The price differential between grapes used for juice and grapes used for wine was over \$100 in the early 1980's; in recent years that differential has narrowed to less than \$20.

In the next few years, the outlook remains favorable for the juice market. The non-premium wine industry, however, faces stagnant or declining prices for grapes because of declining demand for these types of wine and also for wine coolers. The prospects for cash prices for ConCORDS and Niagaras in the range of \$200-\$250 over the next three to five years appear favorable. A key factor will be the continuation of favorable treatment by the Japanese for grape juice imports after the current agreement expires in April 1990. Japanese imports have contributed significantly to the favorable prices for juice grapes in recent years.

METHODS

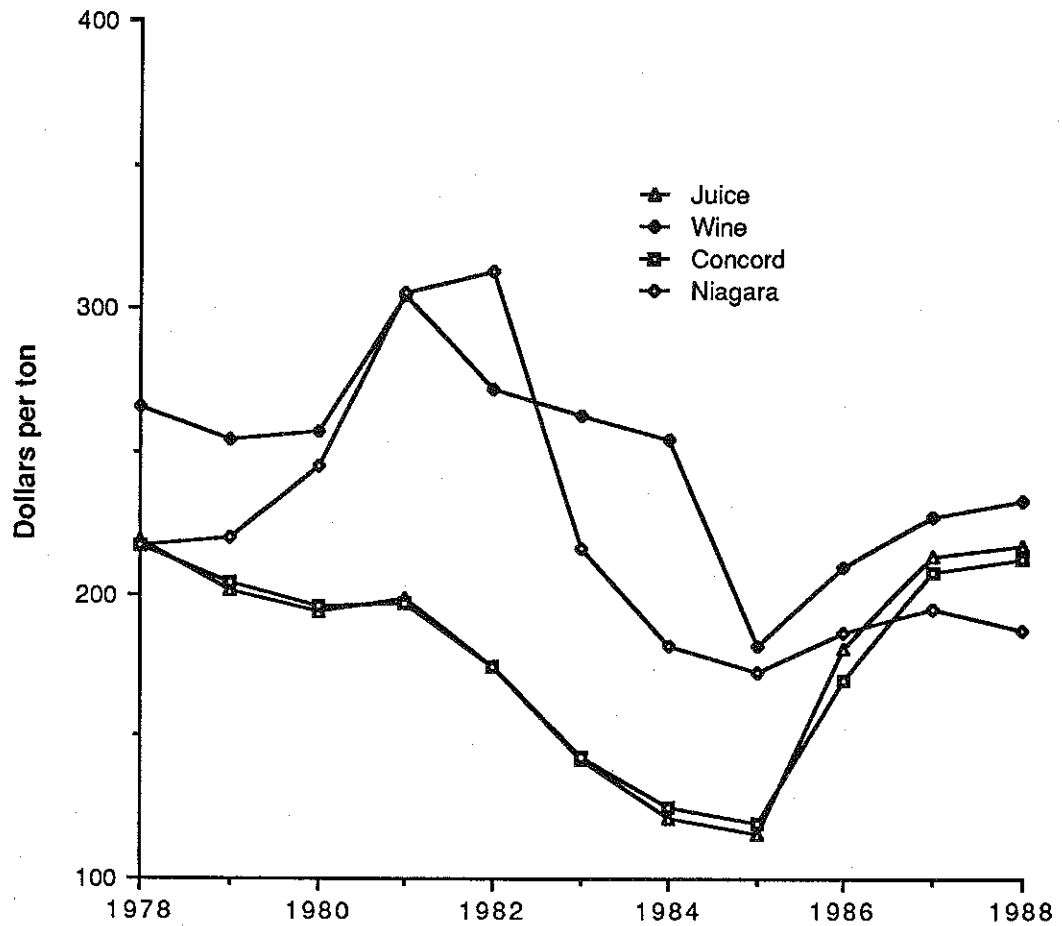
The methods used to construct cost estimates were a combination of 1) a panel comprised of grower and industry representatives and 2) economic engineering. In November of 1988, the authors met with a panel composed of six growers, one researcher from the Vineyard Lab at Fredonia, and one industry sales representative. Each person filled out a brief questionnaire relating to the following areas of commercial vineyard operations: machinery and equipment complement, land costs, wages, pest control practices, tillage practices, and yields.

The panel also provided estimates, based on their own experience in the vineyard, of time required to perform the various pruning and vine training operations. In addition, the panel provided estimates of trellis construction materials and costs.

Machinery cost estimation procedures were adapted from Warner, who estimated the costs and returns for growing table grapes on Long Island. The approach used by Warner involves economic engineering in which machinery costs are calculated based on row width, field speed, and field efficiency. Pesticide costs were formulated using Cooperative Extension's 1987 Grape Pest Control Guide.

The size of vineyard was decided in consultation with the panel. The specified size was 75 acres. The 75 acre vineyard is large enough to use vineyard machinery and equipment efficiently, but small enough to be operated by one working manager. Some hand labor operations would be done by hired part-time labor.

Wage rates indicated by the panel were \$5.68 per hour for skilled, full-time labor and \$3.75 per hour for unskilled. These rates included Workmen's Compensation and Social Security. Certain hand labor tasks, such as pruning and brush removal, tying and renewal, and suckering were charged on a piece rate basis.

FIGURE 3. PRICES PAID FOR GRAPES IN NEW YORK, 1978-1988

Source: Fruit, Division of Statistics, New York State Department of Agriculture and Markets

A seven percent interest charge on capital investment was charged. This rate represents a real rate based on a 12 percent nominal rate of interest and an expected rate of inflation of five percent. (For a discussion of using the real rate of interest in capital investment analysis, see Casler, Anderson, and Aplin.) The analysis ignored the impact of income taxes which can significantly affect investment decisions in some situations. The vineyard was amortized over a 22 year period. The interest on machinery investment utilizes the capital recovery method, including salvage values, as advocated by Reynolds and Luckham.

The cost estimates of certain overhead items such as insurance, office expense, and property taxes were also provided by the panel.

The Hudson River Umbrella (HRU) Training System was assumed for specifying hand labor costs such as pruning and brush removal, tying and renewal, and suckering and flower removal. The HRU training system has been increasing in favor among growers in recent years for three major reasons: 1) it requires less pruning and tying labor; 2) it generally leads to higher yields than the Umbrella Kniffen (UK) system; and 3) it is readily adaptable to the use of mechanized pruning. For the construction of budgets, it was assumed that all operations are done by hand; however, the use of mechanized pruning with follow-up pruning by hand is a common occurrence in Great Lakes Concord and Niagara vineyards. In a 1984 survey of 120 National Grape Cooperative growers, Snyder and White found that 59 growers used the HRU system, 72 growers used the UK system, and 12 used the Geneva Double Curtain system (GDC) (Table 1). (The total is more than 120 because some growers reported more than one system on their acreage.) Average yields for the respective systems are also shown in Table 1. The 1984 data are consistent with the observation that HRU yields are slightly higher than yields on the UK system. (For a description of training systems, see Jordan, Pool, Zabadal, and Tompkins.)

Table 1. Concord grape yields, 1984 season.

System	Number of Obs.	Yield (tons/acre)
Hudson River Umbrella	59	6.1
Umbrella Kniffen	72	5.9
Geneva Double Curtain	12	7.7

Source: Snyder and White, 1987.

The GDC system has the potential to produce higher yields, but it is more intensive and requires higher inputs. For a discussion of the economics of this system, see Snyder and White. On deep, well drained soils, the GDC system is the most profitable system provided that the grower has the management capability required to produce the higher yields.

The costs and returns for Concord and Niagara vineyards are provided in the following tables. The panel indicated that costs for these two varieties are virtually identical except that the Concord variety will result in slightly higher yields, and, hence, a lower cost per ton. One additional 25 day postbloom spray is required for the Niagara variety.

RESULTS

Operation of a 75 acre vineyard requires an investment of \$74,756 in machinery and equipment and \$17,000 for a pole barn used as a shop and for machinery storage, as shown in Table 2. Machinery and equipment were amortized over a 10 year life for most items, and for five years for the brush chopper and a pickup truck. This results in annual charges of \$11,422 for machinery, or \$152 per acre, and \$1,370 for buildings, or \$18 per acre.

Input prices in 1989 are shown in Table 3. These prices are used in computing trellis costs in Table 4 and establishment and development costs for site preparation and years one through three in Table 5. Growing costs for the mature vineyard are shown in Table 6. The costs are accumulated in Table 7, with interest added on the net investment at the end of each year and credit given for the production of three tons of grapes in the third year. Costs are amortized to derive the annual cost of \$331 for capital recovery and interest for years four through 25.

Finally, costs are summarized in Table 8 for the mature Concord vineyard. By the fourth year, the well-managed vineyard will have nearly reached its full yield potential and will require approximately the same management for the duration of its life. Spray schedules and other weather dependent operations will have to be varied slightly from year to year as dictated by special weather conditions. Yields, of course, will vary with weather conditions, as indicated in Figure 2. Total cost per acre is \$1,377. The grower panel indicated that they attained an average yield of 6.4 tons per acre. At that yield, costs per ton were \$215, and returns to management were -\$97 per acre. The break-even yield is 7.0 tons per acre at a conservative price of \$200 per ton. As indicated earlier, cash prices of \$200-\$250 are likely for the next few years.

Only three growers on the panel had Niagara grapes on a single curtain training system. They reported an average yield of 5.8 tons per acre, or about nine percent less than the Concord vineyards at 6.4 tons per acre. The data in Figure 2, when averaged over the 11 year period, indicate that National Grape Growers averaged 4.7 tons per acre for Concords and 3.8 tons per acre for Niagara, a 20 percent lower yield. This larger difference may be due to the fact that many Niagara vineyards were planted on poorer sites which are now being removed from production. Another reason is the generally smaller vine size of Niagaras in western New York.

For the purpose of analyzing the cost for the Niagara vineyard, we assumed a yield of 5.8 tons as indicated by the rather limited experience of panel members. Total costs per acre were \$1,378 or \$238 per ton for a 5.8 ton per acre yield as shown in Table 9. At a \$200 per ton price, an average yield of 7.1 tons per acre would again be required to break even. The break even price is \$238 per ton.

There are no data available to determine the difference in the prices paid for Concords and Niagaras for juice. National Grape Cooperative, the largest purchaser, has a policy of paying the same price for Concords and Niagaras. Historically, as shown in Figure 3, Niagaras in New York have brought a higher price than Concords; however, that was not the case in 1987 and 1988. The lower price for Niagaras received by growers in more recent years is probably attributable to the fact that a higher proportion of Niagaras than Concords go into the sagging non-premium wine market.

Table 2. Machinery, equipment, and building capital recovery and interest, 75 acre vineyard, Great Lakes Region, New York, 1989.

Item	Purchase Price	Years of Life	Salvage Value	Capital to be Recovered	Cost Recovery Factor	Annual Recovery	Interest on Salvage Value	Total Capital Recovery & Interest
MACHINERY & EQUIPMENT:								
Tractor, 40-hp	\$15,000	10	\$1,500	\$13,500	0.1424	\$1,922	\$105	\$2,027
Tractor, 30-hp	12,667	10	1,267	11,400	0.1424	1,623	89	1,712
Small air-blast sprayer	6,833	10	683	6,150	0.1424	876	48	924
Brush chopper	2,099	5	210	1,889	0.2439	461	15	475
Fertilizer spreader	1,165	10	117	1,049	0.1424	149	8	157
Small disc	1,200	10	120	1,080	0.1424	154	8	162
Herbicide sprayer	1,375	10	138	1,238	0.1424	176	10	186
Post driver	1,650	10	165	1,485	0.1424	211	12	223
Trailer	767	10	77	690	0.1424	98	5	104
Pickup truck	11,333	5	1,133	10,200	0.2439	2,488	79	2,567
Auger	1,500	10	150	1,350	0.1424	192	11	203
Containers (200 plastic)	1,750	10	175	1,575	0.1424	224	12	237
Bird control equipment	2,250	10	225	2,025	0.1424	288	16	304
Shop equipment	4,167	10	417	3,750	0.1424	534	29	563
Welder, air compressor	2,000	10	200	1,800	0.1424	256	14	270
Comber-shoot positioner	7,000	10	700	6,300	0.1424	897	49	946
Miscellaneous	2,000	10	200	1,800	0.1424	256	105	361
Total Machinery & Equipment Costs	\$74,756							\$11,422
Total Cost Per Acre	\$996.75							\$152.29
BUILDINGS:								
Shop (30'x40')	\$17,000	30	\$0	\$17,000	0.0806	\$1,370	\$0	\$1,370
Total Cost Per Acre	\$226.67							\$18.27

Table 3. Prices of inputs, Great Lakes Region, 1989.

Item	Price
Annual rye grass seed	\$.58/lb.
10-20-20 fertilizer	\$175/ton
Ammonium nitrate	\$180/ton
Murate potash	\$155/ton
3-inch treated posts	\$3.50 each
4-inch anchors	\$5.25 each
#10 high tensile wire	\$76.00/cwt.
Nicopress fastners	\$.20/each
Staples	\$23.50/50 lb. box
#9 non-crimped wire	\$50.00/cwt.
#11 crimped wire	\$60.00/cwt.
Lime spread custom on open field	\$29.00/ton
Lime spread custom in the vineyard	\$34.00/ton
Concord nursery stock	\$709/thousand
Niagara nursery stock	\$709/thousand

Table 4. Trellis construction costs, Concord and Niagara grapes, Great Lakes Region, 1989.

Item	Quantity	Price	Total
Posts (3", treated)	208	\$3.50	\$728.00
Anchors	16	5.25	84.00
High tensile wire (#10), lbs.	9.2	0.76	6.99
Nicopress fastners	32	0.20	6.40
Staples, lbs.	7	0.47	3.29
Non-crimped wire (#9), lbs.	188	0.50	94.00
Crimped wire (#11), lbs.	188	0.60	112.80
Total Cost Per Acre			\$1,035.48

Table 5. Concord grape establishment and development costs, Great Lakes Region, New York, 1989

Operation	Labor Hours	Equip. Hours	Labor Cost	Equip. Cost	Materials Cost	Total
<u>Site Preparation</u>						
Lime	custom				\$ 29.00	\$ 29.00
Herbicide application	custom			\$ 6.50	15.90	22.40
Miscellaneous						33.00
Total						\$ 84.40
<u>First Year</u>						
Plowing	custom			15.00		\$ 15.00
Discing (2x)	custom			16.00		16.00
Stone removal & land maintenance	4.0	3.0	\$15.00	11.19		26.19
Row marking	3.0	1.5	13.18	5.63		18.81
Planting	4.3	1.0	18.06	9.86	428.95	456.86
Fertilization	1.3	1.0	7.38	4.63	13.13	25.14
Push-up	0.5	0.4	2.84	1.56		4.40
Chemical weed control	2.5	2.0	14.20	9.66	16.57	40.43
Trellis construction	39.0	13.5	184.08	54.22	1,035.48	1,273.78
Tillage (2x)	3.2	2.6	18.19	10.14		28.33
Spraying (2x)	1.3	1.0	7.38	4.81	29.44	41.63
Mowing (2x)	1.3	1.0	7.38	4.02		11.40
Rogueing	1.0		5.68			5.68
Miscellaneous						33.00
Total						\$1,996.66
<u>Second Year</u>						
Pruning & brush removal	2.5c/vine		15.13			\$ 15.13
Tying & renewal	2c/vine		12.10			12.10
Fertilization	0.7	0.5	3.98	2.31	9.00	15.29
Chemical weed control	2.5	2.0	14.20	9.66	16.57	40.43
Suckering & flower removal	3c/vine		18.15			18.15
Tillage (2x)	3.2	2.6	18.19	10.14		28.33
Tillage (1x)	1.6	1.3	9.09	8.86		17.95
Spraying (2x)	1.3	1.0	7.38	4.63	29.44	41.45
Mowing (2x)	1.3	1.0	7.38	4.01		11.40
Vine replacement	1.0		5.68		8.62	14.30
Rogueing	1.0		5.68			5.68
Miscellaneous						33.00
Total						\$ 253.21
<u>Third Year</u>						
Pruning & brush removal	12.5c/vine		75.63			\$ 75.63
Tying & renewal	5c/vine		30.25			30.25
Fertilization	0.7	0.5	3.98	2.31	18.00	24.29
Chemical weed control	2.5	2.0	14.20	9.66	16.57	40.43
Suckering & flower removal	4c/vine		24.20			24.20
Tillage (2x)	3.2	2.6	18.19	10.14		28.33
Tillage (1x)	1.6	1.3	9.09	8.86		17.95
Spraying (5x)	3.1	2.5	17.61	12.03	67.12	96.76
Mowing (1x)	0.7	0.5	3.98	2.01		5.99
Miscellaneous						33.00
Total						\$ 376.83

Table 6. Growing costs, years 4 through 25, Concord grapes, Hudson River Umbrella Training System, Great Lakes Region, 1989

Operation	Labor Hours	Equip. Hours	Labor Cost	Equip. Cost	Materials Cost	Total
Fall fertilization	0.3	0.2	\$ 1.70	\$.92	\$10.31	\$ 12.93
Pruning & brush removal	25c/vine		151.25			151.25
Trellis maintenance	1.0	0.5	5.68	1.87	21.00	28.55
Tying & renewal	5c/vine		30.25			30.25
Spring fertilizer	0.7	0.5	3.98	2.31	27.00	33.29
Layering	2.0		11.36			11.36
Vineyard floor mgmt.	2.5	2.0	14.20	9.66	22.23	46.09
Suckering	5c/vine		30.25			30.25
Diseased & dead trunk removal	1.0		5.68			5.68
Spraying (5x)	3.1	2.5	17.61	12.03	67.12	96.76
Mowing (1x)	0.7	0.5	3.98	2.01		5.99
Lime	custom				4.25	4.25
Miscellaneous						33.00
Pick-up truck				26.00		26.00
Total						\$515.65

Table 7. Summary of establishment and development costs by year, Concord grapes, Great Lakes Region, 1989.

Item	Year of Establishment and Development		
	Year 1	Year 2	Year 3
<u>Revenue</u>			
Yield per acre (tons)	0	0	3
Market price (\$)	200	200	200
Total revenue (\$)	0	0	600
<u>Costs</u>			
Site preparation (\$)	84	0	0
Annual variable costs (\$):			
Preharvest	1,997	253	377
Harvest	0	0	93
Total	2,081	253	470
Annual fixed costs (\$)	267	267	267
Interest on cumulative costs (\$)	164	212	279
Total costs (\$)	2,513	733	1,016
Net returns (\$)	-2,513	-733	-416
Total cumulative costs (\$)	2,513	3,245	3,661
Amortization of vineyard: (.0904 x 3,661)			331

Table 8. Receipts and expenses for a mature Concord vineyard, Hudson River Umbrella Training system, Great Lakes Region, 1989

Item	Per Acre
<u>Receipts</u>	
Yield, tons per acre	6.4
Price, \$ per ton	200
Total receipts	\$1,280
<u>Costs</u>	
Variable	
Growing	\$516
Interest on operating capital	31
Harvesting	<u>198</u>
Total Variable Costs	\$745
Fixed	
Machinery & equipment capital recovery	\$152
Buildings capital recovery	18
Vineyard capital recovery	331
Property taxes	21
Land cost	75
Insurance	<u>33</u>
Total Fixed Costs	\$632
TOTAL COSTS	\$1,377
Returns to Management	\$(97)
Break-even price	\$215
Break-even yield (tons per acre)	7.0

Table 9. Receipts and expenses for a mature Niagara vineyard, Hudson River Umbrella Training system, Great Lakes Region, 1989

<u>Item</u>	<u>Per Acre</u>
<u>Receipts</u>	
Yield, tons per acre	5.8
Price, \$ per ton	200
Total receipts	\$1,160
<u>Costs</u>	
Variable	
Growing	\$535
Interest on operating capital	32
Harvesting	<u>180</u>
Total Variable Costs	\$747
Fixed	
Machinery & equipment capital recovery	\$152
Buildings capital recovery	18
Vineyard capital recovery	331
Property taxes	21
Land cost	75
Insurance	<u>33</u>
Total Fixed Costs	\$632
TOTAL COSTS	\$1,378
Returns to Management	\$(218)
Break-even price	\$238
Break-even yield (tons per acre)	7.1

DISCUSSION

It is interesting to compare the results of the 1989 study reported here to a similar study, utilizing approximately the same methodology, done 11 years ago by White and Jordan. Of special interest is the comparison of the labor requirement for the UK system (the predominant system in 1978) to the HRU system in 1989. This comparison is shown in Table 10.

Table 10. Comparisons of labor requirements per acre of grapes, 1978 and 1989

Item	UK 1978*	HRU 1989
Pruning & brush removal	31.1	26.6
Tying & renewal	20.0	5.3
Layering	2.0	2.0
Suckering & sprouting	3.0	5.3
Diseased & dead trunk removal	1.0	1.0
Trellis Maintenance	4.0	1.0
Operating machinery	<u>9.7</u>	<u>7.3</u>
	70.8	48.5

*White and Jordan, 1978.

Although the UK system is still widely used, more growers in recent years have changed to the HRU system. The reasons for the change are evident in Table 10, with the total labor requirement of about 49 hours per acre versus 71 hours for the UK system in 1978. Thus, growers achieve a total labor savings of about 30 percent while expecting higher yields as well. Growers who are using mechanical pruning plus follow up hand pruning are realizing even greater labor efficiency.

Another interesting difference is the yield assumption in the two studies. In the 1978 study, a 4.3 tons per acre yield was assumed since that was typical for growers at that time, giving a cost of \$250 per ton for Concord grapes. In this study, progressive growers indicated that they were achieving yields of 6.4 tons per acre for ConCORDs, and with lower costs for labor, costs per ton was \$215. Thus, the assumption of higher yields, plus the savings in labor from using the HRU System, resulted in more efficient production even though total costs per acre have risen due to inflation -- from \$1,075 in 1978 to \$1,377 in 1989. Average yields in the Great Lakes Region are still perhaps no more than five tons per acre; however, with the difficult years in the mid-1980's, as illustrated in the price trends in Figure 3, growers have realized that "average" yields no longer suffice in today's competitive market. A yield target of seven tons per acre for growers of Concord and Niagara is necessary to cover all costs in the current economic climate. Those who survive will be farming the most productive sites using the most progressive and efficient management practices.

It should be noted that the study assumed that new machinery would be purchased and that new vineyards were planted. Most growers have machinery which was purchased at lower prices and are farming established Concord and Niagara vineyards. Fixed costs, especially for capital recovery for machinery, buildings, and vineyards, will be lower for these growers than

costs shown in Tables 8 and 9. Furthermore, all labor was estimated as a cash cost and the owner would be receiving a return of \$5.68 per hour for the time he spends in the vineyard. For many established growers, cash flow would be higher and total cost per ton would be lower than indicated in Tables 8 and 9 if they are achieving yields of seven tons per acre.

SUMMARY

Costs for Concord and Niagara grape production in the study group were estimated to be \$215 per ton for Concord grapes and \$238 per ton for Niagara grapes. The only identifiable differences between the costs for the two varieties were the somewhat higher yields of 6.4 tons per acre for ConCORDS as compared to 5.8 tons per acre for Niagara vineyards and one additional spray application for Niagaras. Results also indicated how growers have improved efficiency primarily through use of the HRU training system which has resulted in substantial labor savings of 30 percent in addition to somewhat higher yields.

The production of Concord and Niagara grapes appears to be a viable alternative for growers on excellent sites and with excellent management assuming that markets remain as strong for the next few years as they have been for the last two years. The outlook for the juice grape market does appear favorable for the next few years.

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