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ECONOMICS OF GRAPE PRODUCTION IN THE GREAT LAKES REGION OF NEW YORK



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by

G. B. White and T. D. Jordan*

Introduction

New York State growers produced about 97 thousand tons of grapes for processing in 1977, 64 percent of which were produced in the Great Lakes Region (primarily Chautauqua, Erie and Niagara Counties).^{1/} Eighty-seven percent of the Great Lakes Region production was Concords, while 75 percent of the total State production was Concords.

Although Concord is by far the dominant variety in the Great Lakes Region, there has been significant interest in recent years in growing French-American hybrid varieties for New York's premium wine industry. Concord production in the Great Lakes Region totaled an estimated 100,000 tons in 1978, 53,417 tons in 1977 and 100,089 tons in 1976. French-American hybrid production in New York State increased from about 5,000 tons in 1973 to almost 15,000 tons in 1974. In 1976, however, French-American hybrid production was only 13,026 tons. The Great Lakes Region accounted for 29 percent of the non-Concords and 79 percent of the Concords produced in the state in 1977.

In addition, there has been considerable change in the national grape industry. Grape acreage, particularly on the West Coast, has increased substantially while the growth rate in wine sales has declined quite drastically in the last 10 years. Even though the traditional market for the Great Lakes Region grape crop has been unfermented juice, jam and jelly, and sweet Concord wine, these recent changes have created much uncertainty. A need has been expressed for current cost of production information to assist the grape grower in decision making. This report presents cost analyses for growing Concord grapes, both on single curtain and on Geneva Double Curtain (GDC)

^{1/} New York Crop Reporting Service, Survey of Wineries and Grape Processing Plants-New York. Release No. 2, January 1978.

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training systems; and for growing French-American hybrid varieties such as DeChaunac, Aurora, Foch, Cascade, and Chelois with single curtain training. The report is essentially an up-date of an earlier report by D. G. Good and T. D. Jordan, The Economics of Grape Production in the Great Lakes Region of New York, A.E. Extension 75-18, June 1975.

DATA COLLECTION

The procedure followed in obtaining the data for the cost analysis was similar to that which has been used in other grape producing areas.^{2/} Small group discussions were held with grape growers in the Great Lakes Region. These growers provided information relative to "typical" growing and harvesting practices, input requirements for each practice and cost of inputs as of July 1978. Where diversity in production practices precluded complete agreement, the practices recommended by the New York Cooperative Extension Service were assumed. The cost analysis was reviewed by the grower group, other local growers, processor fieldmen, and Extension personnel.

Because of the diversity of production conditions and variations in practices among farms in the study area, the figures presented in this study should not be interpreted as averages of the industry. Instead, growers and prospective growers should use the information as a guide in making production decisions.

The data presented in this study are based on the assumption of a 50 acre single enterprise farm. When calculating costs for Concord single curtain, Concord GDC, and French-American hybrids, it was assumed that the entire 50 acres were devoted to each system, respectively. However, since all overhead costs were allocated on a per acre basis, an individual grower can compute an "average" cost for the farm by multiplying the per acre cost of each system by the number of acres then adding the products. For example,

^{2/} For example, see Kelsey, Myron P., Economics of Concord Grape Production in Southwestern Michigan, Agricultural Economics Report No. 262, Department of Agricultural Economics, Michigan State University, May 1974 or Kissler, James J., Wine Grapes Cost of Production - San Joaquin Valley, 1974, University of California, Agricultural Extension Report, March 1974. The format of this study draws heavily from Kelsey and Kissler.

a grower with 25 acres of Concord single curtain grapes and 25 acres of French-American hybrids could compute an average cost for the farm by multiplying the per acre cost of each system by 25 and then adding the two products.

COST COMPONENTS

The costs in this report are divided into two general groups--fixed and variable. Fixed costs are broadly defined as those costs that do not change as the acreage or yield of grapes changes within the farm unit. Conversely, variable costs are defined as those costs that change directly with changes in yield or acreage of grapes. Within the fixed cost category, machinery and equipment costs, building and vineyard overhead costs, and management costs are presented separately.

The division of costs into fixed and variable components is desirable for decision making purposes. Managers making decisions relative to type or intensity of growing practices, for example, should give primary consideration to variable costs of production. On the other hand, decisions relative to significant expansion of grape acreage requires consideration of fixed as well as variable cost components.

FIXED COSTS

Grape Equipment Fixed Costs

Table 1 presents the typical machinery and equipment complement necessary to operate 50 acres of vineyard in the Great Lakes Region. It was assumed that this machinery is all relatively modern, but not all new, and would be the same for each production alternative analyzed. The one exception is the bird control equipment necessary for the French-American hybrid varieties. As noted in the footnotes to Table 1, additional pieces of equipment may be owned on some farms in this area.

The annual fixed costs associated with owning the complement of machinery and equipment include depreciation, interest and insurance. In addition, the repair and maintenance costs are included in the fixed cost category for purposes of this study. Each of these cost components was defined as a percentage of the market value or the average value of the

Table 1. Typical Grape Equipment Fixed Costs - Great Lakes Region, 1978

Item	Purchase Price	Years of Use	Salvage Value	Average Value	Annual Depreciation	Interest	Annual Repairs, Maintenance, Insurance	Total Fixed Costs
40 H.P. Tractor	\$ 9,200	10	\$ 1,840	\$ 5,520	\$ 736	\$ 552	\$ 920	\$ 2,203
30 H.P. Tractor (used)	4,250	5	850	2,550	680	255	425	1,360
Sprayer (small, air blast)	7,000	10	700	3,850	630	385	700	1,715
Brush Chopper	1,030	5	103	567	185	57	103	345
Fertilizer Spreader	830	10	83	457	75	46	83	204
Large Disc or Rotovator	2,500	10	250	1,375	225	138	250	613
Small Disc	1,030	10	103	567	93	57	103	253
Weed Sprayer	1,160	10	116	638	104	64	116	284
Post Driver	1,120	10	112	616	101	62	112	275
Trailer	450	10	45	248	41	25	45	111
Pickup (1/2 tn., min. equip.)	6,000	5	600	3,300	1,080	330	600	2,010
Auger	900	10	90	495	81	50	90	221
Containers (500 plastic crates)	750	10	75	413	68	41	75	184
Bird Control	2,830	10	283	1,557	255	156	283	694
Shop Equipment	3,000	10	300	1,650	270	165	300	735
Mis. Equipment	3,000	10	300	1,650	270	165	300	735
TOTAL	\$45,050		\$5,850	\$25,453	\$4,894	\$2,548	\$4,505	\$11,947

1/ 20 percent of purchase price for 40 H.P. tractor and 30 H.P. tractor. 10 percent of purchase price for other items.

2/ Average Value = (Purchase Price + Salvage Value) ÷ 2.

3/ Annual Depreciation = (Purchase Price - Salvage Value) ÷ years of use.

4/ 10 percent of Average Value.

5/ 10 percent of Purchase Price.

6/ Annual Depreciation + Interest + Annual Repairs, Maintenance, and Insurance.

7/ For French Hybrids only.

8/ Includes items such as subsoiler, mold board plow, spray pump, grape planter, wire reel, wire stretchers, wire crimper, flat bed truck, and grape hoe.

9/ Some grape farms having access to grape pomace may have additional equipment including a front end loader, and manure spreader.

These pieces of equipment would increase fixed costs by \$1,062 or \$21.24 per acre.

equipment. Growers provided information relative to market value and expected years of life of each piece of equipment. Salvage value was assumed to be 10 percent of market value. Average value was the sum of purchase price plus salvage value divided by two. Depreciation was calculated on a straight-line basis and interest costs were charged at the rate of 10 percent of average value. Annual repairs, maintenance and insurance costs were estimated at 10 percent of purchase price.

As a rough check of the validity of these equipment cost calculations, comparisons were made to Cornell Cost Account figures on "fruit farm" equipment costs in 1977.^{3/} Cost Account data indicate that total annual costs for machinery and equipment specific to New York State fruit farms averaged 49 percent of the investment in that equipment. Using this factor and the average value calculations in Table 1, would yield annual machinery and equipment cost estimates of \$11,709 for Concords and \$12,472 for French hybrids. The method used in this study resulted in total annual machinery and equipment cost estimates (fixed costs from Table 1 plus variable costs from later sections) of \$12,190 for Concord single curtain, \$12,211 for Concord GDC and \$12,909 for French-American hybrid production. From this comparison, it was concluded that the machinery cost estimates presented in this study are "reasonable."

Fixed Growing Costs

Table 2 summarizes another category of fixed costs defined as "fixed growing costs." Included are costs associated with owning a farm shop and machinery and equipment storage facility; interest, depreciation and taxes on the vineyard; interest on operating funds; utilities; a general category of business support activities and management; and liability insurance.

Shop and Storage Building - The type and age of buildings on grape farms vary substantially. For purposes of this study, one building with combined shop and machinery storage was assumed to be the only facility required. The building was assumed to be 48 by 36 feet. One end of the shop, with an area of 16 by 36 feet, had a concrete floor. Annual depreciation, interest,

^{3/} Snyder, D. P., Overhead Costs from Farm Cost Accounts, 1977, A.E. Res. 78-13, September 1978, p.19.

Table 2. Typical Fixed Costs for Growing Grapes, Great Lakes Region, 1978

Item	Cost Per Acre of Grapes		
	Concord		French Hybrid
	Single Curtain	Geneva Double Curtain	
Shop and Storage Building (48' x 36')			
Initial Cost - \$8,100			
Depreciation - 20 years, SL	8.10	8.10	8.10
Interest - 10% x Av. Value	8.10	8.10	8.10
Taxes - 5% x Av. Value	4.05	4.05	4.05
Insurance - .7% x Av. Value	.57	.57	.57
Repairs - 5% x Av. Value	4.05	4.05	4.05
Vineyard Overhead			
Interest			
Land ^{1/} - \$700/Acre x 10%	84.00	84.00	84.00
Single Curtain Vineyard - \$800/Acre			
Av. Value - \$400 x 10%	40.00		
Geneva Double Curtain Vineyard - \$1800/Acre			
Av. Value - \$900 x 10%		90.00	
French Hybrid Vineyard - \$1300/Acre			
Av. Value - \$650 x 10%			65.00
Depreciation on Vineyard ^{2/}			
Single Curtain - \$800/Acre - 25 years	32.00		
Geneva Double Curtain - \$1800/Acre - 25 years		72.00	
French Hybrid - \$1300/Acre - 25 years			52.00
Taxes (including supporting land) ^{1/}	33.00	33.00	33.00
Interest on Operating Funds (Growing Cost x 10% x 1/2 year)	20.14	23.60	24.19
Utilities	7.00	7.00	7.00
Office, Accountant, Business Organizations, etc.	13.00	13.00	13.00
Liability Insurance	2.00	2.00	2.00
Subtotal ^{3/}	\$256.01	\$349.47	\$305.06
Management ^{4/}	40.85	52.25	53.55
TOTAL	\$296.86	\$401.72	\$358.61

- ^{1/} It is estimated that 60 acres of land are required to yield 50 acres of vineyard. The other 10 acres allow for headland, drainage, and access roads, and is included in the per acre of vineyard taxes. These taxes do not include village, city, or special district taxes (light, water, fire, sewer) which are assessed against some vineyards.
- ^{2/} Land is not a depreciable item according to IRS regulations. Vineyards (vines and trellis) are depreciable, but the useful life depends on variety, site, market requirements, and vineyard care.
- ^{3/} Approximately 20 percent of vineyards in the region carry Federal Crop Insurance. For these vineyards, \$30.00 per acre should be added to the subtotal to cover premium costs.
- ^{4/} Management cost is calculated as 5 percent of gross receipts. For yield estimates, see Table 7. Concords were priced at \$190 per ton and French Hybrids at \$306 per ton. These prices were preliminary estimates for the 1977 crop year reported by the New York Crop Reporting Service, January 1978.

taxes, insurance, and repair costs were \$1,243.50, or \$24.87 per acre.

Vineyard Overhead - Vineyard values consist of two major components, the value of the land and the value of trellis and vines. Concord single curtain, Concord GDC and French-American hybrid vineyards in the Great Lakes Region were valued at \$1,500, \$2,500 and \$2,000 per acre, respectively. In each instance, the land portion of this vineyard was valued at \$700 per acre. It was assumed that 60 acres of land would be required to support 50 acres of vineyard, resulting in a total annual interest cost (at a 10 percent rate) on land of \$4,200, or \$84 per acre of vineyard. The other ten acres of land allow for headland, drainage, and access roads.

An interest cost is also associated with that value of the vineyard beyond the land value for vines and trellis. These values (based on the purchase price of vineyards reaching maturity in 1978) were estimated to be \$800, \$1,800 and \$1,300 per acre, for the Concord single curtain, Concord GDC, and French-American hybrid vineyards, respectively. Under the assumptions of this study, these values would be depreciated to zero over a 25 year period. An interest charge of 10 percent was made on one-half the value of the non-land portion of the vineyard.

Vineyard Depreciation - Vineyard depreciation is a non-cash cost, but one which must be recovered because the vineyard was either purchased or established, and development costs were incurred in bringing the vineyard to productive age. The non-land portion of the vineyard values (vines and trellis) were depreciated over a 25 year period, assuming a straight-line method of depreciation.

Management - On most Great Lakes grape farms, management is another non-cash cost. But, since management is often the major difference between high and low yielding vineyards and successful and unsuccessful farming operations, its value should be recognized. Production decisions, labor management, purchasing decisions, marketing decisions, planning and coordinating as well as financing and recordkeeping are all aspects of vineyard management on the typical family grape farm. However, the value of management is difficult to isolate on most farms because the operator is both a manager and a laborer--frequently simultaneously. Not only is it difficult to estimate the amount of time that a typical operator spends performing the management function, but it is also difficult to estimate a value per unit of time.

Several alternative methods of estimating the value of management have been used. A search of the literature yielded the following alternative procedures:

- 1) a flat annual fee, independent of farm size;
- 2) a flat per acre fee;
- 3) a percentage of gross receipts;
- 4) a percentage of total expenses;
- 5) a flat annual fee, plus a percentage of net receipts; and
- 6) a charge per unit of time worked.

It is impossible to determine the validity of each of these procedures, but some are more appealing than others. A charge per unit of time worked as a method of valuing the management function has been ruled out for this study because of the difficulties in measuring the time actually devoted to management. Flat rates, either on a per acre or an annual basis, are not appealing because no allowances are made for differences in ability or performance. Management valued as a percentage of production expenses appears to reward management for the wrong reason.

On the other hand, valuing management as a function of receipts seems to be logical as it explicitly rewards managerial ability on the basis of performance. For this reason, a percentage of gross receipts was selected for valuing management in this study. This procedure first requires the determination of gross receipts and secondly the selection of a percentage factor.

For purposes of this study, long-term "typical" grape yields were estimated to be 4.3 tons for the Concord single curtain training system, 5.5 tons for the Concord GDC, and 3.5 tons for the French-American hybrids. The New York State Crop Reporting Service reported an average price of approximately \$190 per ton for Concords and \$306 per ton for French-American hybrids in 1977. Based on the above yield and price assumptions, gross receipts for the "typical" grape farm depicted in this study, would have been \$817 per acre, \$1,045 per acre and \$1,071 per acre, for the Concord single curtain, Concord GDC and French-American single curtain hybrid vineyards, respectively.

Based on practices followed in those parts of the country where managers are hired on a percentage-of-gross-receipts basis, as well as on procedures followed in studies similar to this one, management was valued at 5 percent of the estimated gross receipts. As a result, management value totaled \$40.85 per acre for Concord single curtain, \$52.25 per acre for Concord GDC

and \$53.55 per acre for French-American hybrid production.

As a check on the validity of these estimates, the limited number of vineyard operations in the Great Lakes Region which employ full time managers were questioned with respect to their management costs (i.e., salaries or portions of salaries and other costs within their organizations attributed to vineyard management functions as defined here for a private vineyard owner-operator).^{4/} The results of this formal inquiry indicated that vineyard management costs for these particular operations ranged from approximately \$35 to \$70 per acre. From these comparisons, it was concluded that the management cost estimates presented in this study are "reasonable."

VARIABLE GROWING COSTS

Calculation of variable growing costs consisted of identifying cultural practices and associated labor, equipment and material inputs required for each of the three production systems. Labor was divided into two types: operator (non-management), and part-time hourly and piecework. Each type of labor was charged at a different rate to reflect the differences in skill level required for the respective operations. All machinery and equipment costs, except fuel costs, were accounted for in the "grape equipment fixed costs." A charge of \$1.00 per hour was made under variable growing costs to cover the fuel costs of operating the tractors. Input costs reflect prevailing costs in the producing area as of July 1978. It was assumed that harvesting and delivery to the processor were custom hired at a constant rate of \$35 per ton. The cost per acre, therefore, depended on yield. Harvesting costs were included in the analysis of cost per ton of grapes presented in a later section.

Single Curtain Training System

Table 3 summarizes the cultural practices, typical input requirements and per acre variable cost of growing Concord grapes on a single curtain training system. The largest item of variable growing expense is pruning,

^{4/} Functions included as vineyard management were production decision making, planning and coordinating, labor management, purchasing, marketing and recordkeeping.

Table 3. Typical Variable Cost Per Acre of Growing Concord Grapes - Single Curtain Training^{1/}, Great Lakes Region, 1978

Operation	Labor			Equipment			Materials		Total Variable Cost
	Type	Hours	Rate ^{2/}	Type	Hours	Rate ^{3/}	Item	Cost	
Fall fertilization (1/3 of acreage)	Hourly	.17	4.47	\$.76		400# Potash	\$8.00	\$ 8.93
Pruning ^{4/} (1/3 of acreage)	Piecework @ \$.20/vine								121.00
Brush pulling ^{4/}	Piecework @ \$.03/vine								18.15
Brush chopping	Hourly	.50	4.47			.50			2.74
Trellis maintenance ^{5/}	Hourly	4.00	4.47	Tractor/Chopper	.50	1.00	6 Posts @2.30	13.80	32.68
				Tractor	1.00	1.00	Misc. supplies	1.15	1.15
				Post Driver Trailer					
Tying (Umbrella)	Hourly	20.00	3.13				2 lbs. wire	1.75	65.79
Spring fertilization	Hourly	.50	4.47	Tractor	.50	1.00	2 lbs. twine	1.44	18.49
				Spreader		.50	210 lbs. Am. Nit.	15.75	
Layering	Hourly	2.00	4.47	Tractor	1.50	1.00	Herbicide	7.74	8.94
Weed spray (1.5 x)	Hourly	1.50	4.47	Sprayer		1.50			15.95
Phomopsis spray	Hourly	.33	4.47	Tractor	.33	1.00	Fungicide	2.00	3.81
Suckering & sprouting	Hourly	3.00	3.13	Sprayer			Twine-1 lb.	.72	10.11
Diseased & dead trunk removal ^{6/}	Hourly	1.00	4.47	Tractor	4.00	1.00			4.47
Tillage (3 x)	Hourly	4.00	4.47	Disc		4.00			21.88
Spraying (4 x) ^{7/}	Hourly	2.00	4.47	Tractor	2.00	1.00	Spray mat.	33.59	44.53
Seeding cover crop	Hourly	.33	4.47	Sprayer	.33	1.00	50 lb. rye	3.00	4.81
Chopping cover crop	Hourly	.33	4.47	Spreader	.33	1.00			1.81
Crop estimate	Hourly	.25	4.47	Tractor		.33			1.12
Leaf analysis (1/4 of acreage)	Hourly	.25	4.47	Mower			Leaf & soil kit	2.87	3.99
Pickup truck (gas)						7.07			7.07
Land Maintenance	Hourly	1.00	4.47	Tractor	1.00	1.00			5.47
TOTAL ^{8/}						18.73		91.81	402.89

^{1/} Pruning, brush pulling, and tying cost figures are for "Umbrella Kniffen." If vineyard is trained to a top-wire cordon (well-established) such as Hudson River umbrella, the sum of these 3 operations will be approximately 25% less than the sum presented here.

^{2/} Wage rates are \$4.00/hour for labor of the same quality as the owner's labor, and \$2.80 for other hired labor. Additional costs for Social Security at .605% and Workmen's Compensation at 5.73% are included in the rate for labor.

^{3/} Fuel, oil, and lubrication for tractor only. Based on gasoline at 63¢/gallon and diesel fuel at 47.5¢/gallon minus 10¢ gas tax refund.

^{4/} Assumes 605 vines (9'x8' spacing) per acre. Piecework rate includes Social Security and Workmen's Compensation.

^{5/} Dependent on age; assumes high tensile crop support wire, treated posts, and anchored end structures.

^{6/} Diseased and dead trunk removal include "Eutypa Dieing Arm" plus winterkilled or mechanically damaged trunks.

^{7/} Includes the standard three post-bloom insect and disease control sprays plus one additional spray that could be a pre-bloom insect/disease control application, an alar application on 1/3 of acreage, a mid-summer red banded leaf roller application, or a late season mildew control application. Cost is the average of prices quoted to 50-acre growers by two major area chemical suppliers.

^{8/} On the farms spreading grape pomace, variable cost per acre would be increased by an estimated \$3.50.

followed by tying and by spraying. These three activities account for approximately 57 percent of the total variable cost. Labor is by far the largest component of variable growing cost, accounting for 73 percent of the total. Much of the labor cost is represented by the operator's labor, which on most grape farms is not a cash cost (depending on business organization). However, grape producers must be paid for their labor if grape growing is to compete with alternative uses of operator labor.

It is intended that the format of Table 3 (as well as Tables 4 and 5) would allow individual growers to identify where their production practices and costs differ from those calculated here. Then appropriate substitutions, deletions, and additions in estimating their own cost of production could be made.

Geneva Double Curtain Training System

The variable cost of producing Concord grapes with Geneva Double Curtain training exceeded that of single curtain training by \$69.20 per acre or 17 percent (Table 4). Differences identified for Geneva Double Curtain production include:

- (1) no separate brush pulling operation;
- (2) less time required for tying after GDC is well established;^{5/}
- (3) increased fertilizer requirements to maintain larger crops;
- (4) additional time requirements for sprouting;
- (5) shoot positioning; and
- (6) mowing of low hanging shoot tips just prior to harvest.

It should be emphasized that the costs presented in Table 4 are for a well established Geneva Double Curtain training system. Practices and costs will be different for those years during conversion from a single curtain system.

French-American Hybrid Grapes

French-American hybrid grapes have the largest per acre variable growing cost, totaling \$483.77 (Table 5). The major differences in production practices for the hybrids include:

^{5/} Cost of pruning, tying, sprouting and shoot positioning may all be higher during the first two years of GDC training.

Table 4. Typical Variable Cost Per Acre of Growing Concord Grapes - Geneva Double Curtain Training, Great Lakes Region, 1978

Operation	Labor			Equipment			Materials		Total Variable Cost
	Type	Hours	Rate ^{1/}	Type	Hours	Rate ^{2/}	Item	Cost	
Fall fertilization (1/3 of acreage)	Hourly	.17	4.47	Tractor	.17	1.00	500# Potash	10.00	\$ 10.93
Pruning ^{3/}	Piecework @ \$.20/vine			Spreader					121.00
Brush chopping	Hourly	.50	4.47	Tractor	.50	1.00		.50	2.74
Trellis maintenance ^{4/}	Hourly	4.00	4.47	Chopper					
				Tractor	1.00	1.00	6 posts@\$.2.30	13.80	37.68
				Trailer			Misc. supplies	5.00	
				Post driver					
Tying	Hourly	5.00	3.13				Ties	.6.00	21.65
Spring fertilization	Hourly	.50	4.47	Tractor	.50	1.00	350 lbs. Am. Nit.	26.25	28.99
				Spreader					
Layering	Hourly	2.00	4.47	Tractor	1.50	1.00	Herbicides	7.47	8.94
Weed spray (1.5 x)	Hourly	1.50	4.47	Sprayer					15.68
Phomopsis spray	Hourly	.33	4.47	Tractor	.33	1.00	Fungicide	2.00	3.81
				Sprayer			Twine-1 lb.	.72	23.07
Suckering & sprouting	Hourly	5.00	4.47						
Diseased & dead trunk removal ^{5/}	Hourly	1.00	4.47	Tractor	4.00	1.00		4.00	4.47
Shoot positioning (2 x)	Hourly	32.00	3.13	Disc					100.16
Tillage (3 x)	Hourly	4.00	4.47	Tractor	2.00	1.00	Spray materials	33.59	21.88
Spraying (4 x) ^{6/}	Hourly	2.00	4.47	Sprayer					
Seeding cover crop	Hourly	.33	4.47	Tractor	.33	1.00	50 lb. Rye	3.00	4.81
				Spreader					
Chopping cover crop & mowing shoot tips	Hourly	.75	4.47	Tractor	.75	1.00		.75	4.10
Crop estimate	Hourly	.25	4.47	Mower					1.12
Leaf analysis (1/4 of acre- age)	Hourly	.25	4.47				Leaf & soil kit	2.87	3.99
Pickup truck (gas)	Hourly	1.00	4.47	Tractor	1.00	1.00		7.07	7.07
Land maintenance	Hourly							1.00	5.47
TOTAL								19.15	472.09

^{1/} Wage rates are \$4.00/hour for labor of the same quality as the owner's labor, and \$2.80 for other hired labor. Additional costs for Social Security at 6.05% and Workmen's Compensation at 5.73% are included in the rate for labor.

^{2/} Fuel, oil, and lubrication for tractor only. Based on gasoline at 63¢/gallon and diesel fuel at 47.5¢/gallon minus 10¢ gas tax refund.

^{3/} Assumes 605 vines (9'x8' spacing) per acre. Piecework rate includes Social Security and Workmen's Compensation.

^{4/} Dependent on age; assumes high tensile support wire, treated posts, and anchored end structures

^{5/} Diseased and dead trunk removal includes "Entypa Dicing Arm" plus winter-killed or mechanically damaged trunks.

^{6/} Includes the standard three post-bloom insect and disease control sprays plus one additional spray that could be a pre-bloom insecticide control application, an alar application on 1/3 of acreage, a mid-summer red banded leaf roller application, or a late season mildew control application. Cost is the average of prices quoted to 50-acre growers by two major area chemical suppliers. On those farms spreading grape promace, variable cost per acre would be increased by an estimated \$3.50.

Table 5. Typical Variable Cost Per Acre of Growing French Hybrid Grapes, Great Lakes Region, 1978

Operation	Labor			Equipment			Materials		Total Variable Cost
	Type	Hours	Rate ^{1/}	Cost	Type	Hours	Rate ^{2/}	Cost	
Fall fertilization (1/3 of acreage)	Hourly	.17	4.47	.76	Tractor	.17	1.00	.17	8.93
Pruning ^{3/}	Piecework @ \$.20/vine			138.20	Spreader				
Brush pulling ^{3/}	Piecework @ \$.03/vine			20.73					138.20
Brush chopping	Hourly	.50	4.47	2.24	Tractor	.50	1.00	.50	20.73
Trellis maintenance ^{4/}	Hourly	4.00	4.47	17.88	Chopper				2.74
					Tractor	1.00	1.00	1.00	34.43
					Post driver				
					Trailer				
Tying	Hourly	20.00	3.13	62.60					65.79
Spring fertilization	Hourly	.50	4.47	2.24	Tractor	.50	1.00	.50	18.49
Layering	Hourly	2.00	4.47	8.94	Spreader				
Weed spray (1.5 x)	Hourly	1.50	4.47	6.71	Tractor	1.50	1.00	1.50	8.94
Phomopsis spray	Hourly	.33	4.47	1.48	Sprayer				15.68
Suckering & sprouting ^{5/}	Hourly	9.00	3.13	28.17	Tractor	.33	1.00	.33	3.81
Diseased & dead trunk removal ^{6/}	Hourly	1.00	4.47	4.47	Sprayer				
Sprouting & thinning ^{5/}	Hourly	8.00	3.13	25.04	Tractor	1.50	1.00	1.50	28.89
Tillage (3 x)	Hourly	4.00	4.47	17.88	Sprayer				
Spraying (5 x) ^{1/}	Hourly	2.50	4.47	11.18	Disc	4.00	1.00	4.00	4.47
Seeding cover crop	Hourly	.33	4.47	1.48	Tractor	2.50	1.00	2.50	25.04
Chopping cover crop	Hourly	.33	4.47	1.48	Sprayer	.33	1.00	.33	21.88
Crop estimate	Hourly	.25	4.47	1.12	Spreader				61.48
Leaf analysis (1/4 of acre-age)	Hourly	.25	4.47	1.12	Tractor	.33	1.00	.33	4.81
Pickup truck (gas)	Hourly	1.00	4.47	4.47	Tractor	.33	1.00	.33	1.81
Land maintenance	Hourly	1.00	4.47	4.47	Mower				
TOTAL				358.19					1.12
					Tractor	1.00	1.00	1.00	3.99
								7.07	7.07
								1.00	5.47
								19.23	483.77

^{1/} Wage rates are \$4.00/hour for labor of the same quality as the owner's labor, and 2.80 for other hired labor. Additional costs for Social Security at 6.05% and Workmen's Compensation at 5.73% are included in the cost of labor.

^{2/} Fuel, oil, and lubrication for tractor only. Based on gasoline at 63¢/gallon and diesel fuel @ 47.5¢/gallon minus 10¢ gas tax refund.

^{3/} Assumes 691 vines (9'x7' spacing) per acre. Piecework rate includes Social Security and Workmen's Compensation.

^{4/} Dependent on age; assumes high tensile crop support wire, treated posts, and anchored end structure.

^{5/} Suckering and sprouting costs vary considerably by variety and age of vineyard. Assumes mature (6+ years) vineyards of varieties like Aurora and DeChaunac.

^{6/} Diseased and dead trunk removal includes "Eutypa Dieing Arm" plus winter-killed or mechanically damaged trunks.

^{7/} Includes a pre-bloom and the standard three post-bloom insect and disease control sprays plus one additional spray that could be a pre-bloom insect/disease control application, an alar application on 1/3 of acreage, a mid-summer banded leaf roller application, or a late season mildew control application. Cost is the average of prices quoted to 50 acre growers by two major area chemical suppliers.

^{8/} On those farms spreading grape promace, the variable cost per acre would be increased by an estimated \$3.50.

- (1) more vines per acre, requiring more labor for pruning and brush pulling;
- (2) more suckering, sprouting, and trunk renewal than for Concords, regardless of training system;
- (3) additional spray applications for disease control; and
- (4) additional crop regulation by separate sprouting and thinning operations for some varieties.

SUMMARY AND ANALYSIS OF TYPICAL COSTS

Total Cost Per Acre

Table 6 summarizes the cost components of each of the three production systems outlined above. Total cost is lowest for the Concord single curtain training system and greatest for the Geneva Double Curtain system.

Fixed equipment costs are nearly \$14 per acre greater for French-American hybrids than for Concords, reflecting the necessity of bird control equipment. Fixed growing costs for Concord GDC are approximately \$105 greater than for single curtain Concords and \$43 greater than for French-American hybrids. Variable growing costs are slightly higher for French-American hybrids than for Concord GDC, and exceed variable growing costs for single curtain Concords by \$81.

Cost Per Ton

Based on the per acre costs presented in Table 6, the cost per ton of grapes produced was calculated for each system at several yield levels, Table 7.

In calculating cost per ton, it was assumed that grapes would be custom machine harvested and delivered to the processor at a cost of \$35 per ton. In practice, some French-American hybrids and vinifera, as well as premium American hybrids of high value, are hand harvested. This could double the cost assumed here. In addition, some minimum harvesting charge per acre may be made for yields below a given level (typically, if yields are two tons per acre or less).

Cash Costs, Non-Cash Costs, and Cash Flow

As indicated throughout this discussion, some costs associated with grape

Table 6. Typical Costs Per Acre for Growing Grapes, Great Lakes Region, 1978

Item	Concords		French-American Hybrid Single Curtain
	Single Curtain	Geneva Double Curtain	
Fixed equipment cost	225.06	225.06	238.94
Fixed growing cost	296.86	401.72	358.61
Variable growing cost	<u>402.89</u>	<u>472.09</u>	<u>483.77</u>
TOTAL	924.81	1,098.87	1,081.32

Table 7. Typical Cost Per Ton for Growing and Harvesting^{1/} Grapes, Great Lakes Region, 1978

Yield Per Acre	Concords		French-American Hybrid Single Curtain
	Single Curtain	Geneva Double Curtain	
2.0	497.41		575.66
3.0	343.27		395.44
3.5 ^{2/}	299.23		343.95
4.0	226.20	309.72	305.33
4.3 ^{2/}	250.07	-	-
4.5	240.51	279.19	275.29
5.0	219.96	254.77	251.26
5.5 ^{2/}	203.15	234.79	231.60
6.0	189.14	218.75	215.22
7.0	167.12	191.98	189.47
8.0		172.36	
9.0		157.10	
10.0		144.89	

^{1/} Assumes that grapes would be custom machine harvested and delivered to the processor for a cost of \$35 per ton. Will vary depending on hauling distance from plant.

^{2/} Long-term typical yields were estimated at 3.5 tons for French-American Hybrids, 4.3 tons for single curtain Concords, and 5.5 tons for Geneva Double Curtain Concords.

production may not be cash costs in that an annual payment is not required. The more notable cost items falling in this category are charges made for the operator's labor and management and annual depreciation. In addition, some or all of the interest charges made in this analysis may not be a cash cost, depending on the equity position of the individual grower.

The above items have been included in the cost analyses because it is recognized that labor, management and capital have alternative uses, and thus have an "opportunity cost". Grape producers must realize a return to their labor, management and capital if grape growing is to compete with alternative uses of these resources. Obviously, the cash flow for individual growers varies depending on whether these so-called non-cash costs are available for farm family use or actually expended for their labeled purposes. In the case of the typical full time grape operator, annual disposable income is the sum of net farm income, if any, plus non-cash costs earned by labor, management and equity in the farm business.

To demonstrate the impact of these items on the grape grower's cash flow, cost calculations are made under two alternative sets of assumptions:

- 1) The grower has 100 percent equity in the business and thus makes no interest payments; no charge is made for operator's labor and management; no charge is made for depreciation of buildings, machinery and vineyard; and operating funds are available without borrowing.
- 2) The grower has recently purchased an established vineyard, and has 50 percent equity in the machinery, land, vineyard, and buildings. Half of the investment in machinery was financed for seven years at 9 percent interest. Half of the investment in land, vineyard, and buildings was financed for 25 years at 9 percent interest. No charge is made for depreciation of buildings, machinery and vineyard. Operating capital is borrowed for the amount of growing costs (less the value of the operator's labor) at 10 percent interest.

The first set of assumptions represents the extreme case where none of the potential non-cash costs are incurred, and no debt payments are necessary. The second set of assumptions represents a more realistic case where the interest cost on operating capital is an actual cash cost, and debt repayment is necessary.

Table 8 presents those cash costs which are incurred under the first set of assumptions. Under this set of rather unrealistic assumptions, cash

Table 8. Cash Cost Per Acre, Assumption of 100 Percent Equity

	Concords		French-American Hybrid
	Single Curtain	Geneva Double Curtain	
Variable growing costs (less operator labor)	321.68	366.66	400.32
Repairs, maint, ins. on machinery	84.44	84.44	90.10
Taxes, ins., repairs on buildings	8.67	8.67	8.67
Taxes on land	33.00	33.00	33.00
Utilities	7.00	7.00	7.00
Office, accountant, bus. organizations	13.00	13.00	13.00
Liability insurance	2.00	2.00	2.00
Total cash costs per acre	469.79	514.77	554.09
Total cost per acre (Table 6)	924.81	1098.87	1081.32
Total non-cash costs per acre	455.02	584.10	527.23

Table 9. Cash Costs Per Acre, Assumption of 50 Percent Equity

	Concords		French-American Hybrid
	Single Curtain	Geneva Double Curtain	
Total cash costs (from Table 8)	469.79	514.77	554.09
Interest on operating funds (less operator's labor)	16.08	18.33	20.02
Debt repayment--machinery	81.52	81.52	86.98
Debt repayment--land, bldgs., vineyard	90.73	141.09	115.91
Total cash outlay	658.12	755.71	777.00

costs amount to about half of total costs presented in Table 6. The difference between total cash receipts per acre and cash costs shown in Table 8 would be the amount available for family living expenses and new investment. However, many of the non-cash costs would eventually have to be incurred when machinery, buildings, or vineyards required replacement.

Table 9 shows costs which would be incurred under the second set of assumptions in which the grower has 50 percent equity. Under this set of assumptions, interest on operating capital and debt repayment for machinery, land, buildings, and vineyard are added to cash expenses to give an indication of cash flow. The difference between total receipts per acre and the total cash outlay shown in Table 9 would be available for family living expenses and new investment.

These two examples should make it apparent why established growers with a high percentage equity view the rising costs and variable yields and prices of recent years with less alarm than newer growers with lower equity, who are making debt payments on real estate and machinery. The assumptions result in additional cash outlays per acre of \$188, \$241, and \$223 for the Concord single curtain, Concord GDC, and French-American hybrids, respectively, for growers who have only 50 percent equity.

It is intended that individual growers use the cost information presented in this study in two major ways. One use is to compare their costs with those presented here in order to identify high and low cost areas in their own farm operations. Secondly, the format presented here should also be useful to individual growers in evaluating returns to their labor, management and/or capital from the grape enterprise as compared to alternative uses of their resources. In this manner, alternative production enterprises can be evaluated.