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Establishment and Production Costs For a 50-Acre Wine Grape Vineyard

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Establishment and Production Costs For a 50-Acre Wine Grape Vineyard

ESTABLISHMENT AND PRODUCTION COSTS

FOR A 50-ACRE WINE GRAPE VINEYARD

Daniel J. Kirpes, Raymond J. Folwell, and M. Ahmedullah*

INTRODUCTION

The acreage of European varieties of grapes has increased at a faster rate than any of the other types of grapes produced in Washington. The European type grape nonbearing acreage increased from 1,621 acres in 1974 to 2,608 acres in 1978, a 61% expansion.

In 1978, thirty-three different varieties of European type grapes were found in Washington. Only 10 European varieties had over 100 acres. These were White Riesling (519 acres), Cabernet Sauvignon (426 acres), Grenach (280 acres), Chardonnay (194 acres), Chenin Blanc (178 acres), Gewurztraminer (180 acres), Semillon (158 acres), Merlot (143 acres), Sauvignon Blanc (142 acres), and Pinot Noir (101 acres). All other European varieties had less than 50 acres.

The nonbearing European type grapes were concentrated among even fewer varieties than the total acreage. White Riesling, Grenache, and Sauvignon Blanc were the only European varieties with more than 100 acres nonbearing. European varieties with between 70 and 100 nonbearing acres were Cabernet Sauvignon, Chardonnay, Chenin Blanc, Gewurztraminer, and Semillon.

Presently in Washington, there are 14 wineries. Of these wineries, 6 were founded between 1974 and 1978 with an addition of 5 new wineries since 1978. Storage capacity of these wineries ranges from 1,000 to 2 million gallons. Six wineries have a storage capacity of 7,500 to 16,500 gallons.

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*Research Associate; Professor of Agricultural Economics, Department of Agricultural Economics; and Extension Horticulturist, Irrigated Agriculture Research and Extension Center; College of Agriculture, Washington State University, respectively.

Individuals who contributed significantly to the information include Walter Clore, Retired Horticulturist, Washington State University, and currently grape producer and consultant, Prosser, Wa.; Bob Fay, grape producer, Grandview, Wa.; and George Carter, Retired Research Laboratory Technician, Washington State University, and currently grape producer, Prosser, Wa.

OBJECTIVES

The objectives of this study were to estimate the 1981 costs of establishing and maintaining a 50-acre wine grape vineyard. Specific objectives were to: (1) specify the cultural practices normally followed; (2) estimate the annual costs; and (3) estimate the rate of return for five different varieties of wine grapes.

The information is not meant as a guide to the best cultural practices, but is given as an example of a typical vineyard and its associated costs. It should allow the evaluation of a wine grape vineyard in terms of investment, profitability, and other economic concerns.

ASSUMPTIONS

Several major assumptions were used in developing the budgets:

1. A 50-acre wine grape vineyard on a 60-acre farm with 10 acres of homestead (see layout in Appendix Table A).

2. Ten acres of each of the following varieties:
   Cabernet Sauvignon
   Chardonnay
   Semillon
   White Riesling
   Gewurztraminer

3. The farm is owned, managed, and operated by the same person(s).

4. A solid-set irrigation system is used on relatively level ground. The irrigation system and its 20 horsepower pump are amortized over a 10-year period.

5. The grapes are planted with an 6 x 10 foot spacing with 656 plants per acre.

6. All hauling is on a custom basis. For this budget, a distance of 20 miles was selected. The W.U.T.C. rate is 25 cents per 100 pounds, given a minimum load weight of 15,000 pounds. 1/

1/ Custom hauling charges are based on item 561 of Washington Utilities and Transportation Commission Tariff 4-A, a special commodity tariff. It covers the movement of fresh fruits and vegetables when shipped on flatbed trailers or vans, neither of which require temperature control. For fresh fruit and vegetables, when shipped on straddle carriers only, in and between Yakima, Benton and Franklin Counties for distances not to exceed 100 miles item 563 of W.U.T.C. Tariff 4-A must be used.

7. The amount of irrigation water used was calculated by the modified Blaney-Criddle method (see Reference 5).

8. Establishment costs were amortized over 25 years at 10% interest. They consist of total costs in the four years of establishment minus receipts for the third and fourth year crops.

9. All variable costs are as of November-December, 1980, except irrigation water charges, which are for 1981. The water charges used were those for the Roza Irrigation District.

10. The electrical rate for the irrigation system was derived from the Benton Rural Electric Association. A $500/year minimum is charged; the horsepower charge is $13/HP and the energy charge is .6¢/KWH.

11. The property taxes were those for 1981 for Benton County. The first year property assessment of $900 per acre was for open land, the second and third year assessments of $2,300 per acre were for land, irrigation system, trellis, and plants; for the fourth year and all remaining years the assessment was $4,200 per acre for the land, irrigation system, trellis, and plants.

12. All land was assumed to be purchased and all investment and operating capital were assumed to be borrowed.

13. All machinery and equipment was assumed to be new and valued at current market prices.

14. All pruning was done on a custom basis.

Other minor assumptions involving costs are detailed in the text.

DATA

Data used to estimate costs were obtained from previous research at Washington State University, plus input of industry representatives. The 1980 and 1981 costs and prices were obtained from local agricultural input suppliers and service firms, irrigation districts, and county assessors. The cultural practices and costs are typical for a 50-acre wine grape vineyard and do not represent a statistical average for all wine grape producers in Washington.

ANNUAL ESTABLISHMENT COSTS

First Year

Table 1 lists the operations, equipment needed, month of operation, machine and labor hours needed, and fixed machinery costs, as well as other variable and fixed costs associated with first-year establishment. The irrigation system assumed for this vineyard was a custom installed solid-set irrigation system costing approximately $1,000 per acre. The machinery complement assumed for the vineyard is shown in Appendix Table B.

The largest single cost in the first year is the $1,000 cost for the irrigation system. The vines and planting comprise the second largest cost at $563.

Weed control was assumed to be both chemical and nonchemical. The chemical control consists of the application of Surflan during April. In other months, June and July, handhoeing is used for weed control. A cover crop of red fescue is planted in May which helps control the weeds in between rows. Mowing the cover crop takes place during July and August.

The entire tellis system is not established the first year. The only segment constructed is end posts and anchors so they become firmly established. Line posts and the rest of the trellis system are constructed the second year to minimize first-year capital investments.

In terms of monthly expenses, April and October have the greatest cash expenses (see Table 1). During April, the irrigation system, land preparation, and planting of the vines takes place. In October, setting end posts for the trellis occurs. Labor requirements by months are closely linked with the cash expenses, with the greatest labor requirements being in April and October.

Total variable costs for the first year of establishment are $2,197 per acre. However, fixed costs plus those costs associated with the income foregone by not investing the money elsewhere (opportunity costs) raise the total first year establishment costs to $2,582 per acre (Table 2). The taxes are based upon bare land for the first year with assessment of $900 per acre. The net land rent under fixed costs can be considered an economic cost in terms of income foregone by investing in the wine grape vineyard. This net land rent is $110 per acre and it is assumed that the land could have been rented out for this amount minus real estate taxes.

Second Year

Costs associated with the second year of establishment are shown in Table 3. The largest cash expenditure during the second year is the

Table 1. Estimated first-year costs for a 50-acre wine grape vineyard, 1981

Operation	Tooling	Month	Machinery Hours	Machinery Labor Hours	Fixed Costs Mach.	Fixed Costs Other	Variable Costs Fuel, Oil, Lube & Repairs	Variable Costs Mach. Labor	Variable Costs Service	Variable Costs Materials	Total Variable Costs	Total Cost
							$					
Fertilize	50 HP, 6' fertilizer spreader	Feb	.76	.92	5.23		3.26	3.68		16.50	23.44	28.67
Plow	50 HP, 3-16" M.B. plow	Feb	.86	1.04	16.05		6.00	4.16			10.16	26.21
Disk	50 HP, 6' disk	Feb	.57	.69	3.65		2.52	2.76			5.28	8.93
Survey & mark	40 HP, disk-blade marker & labor	Apr	.46	.55	2.23		1.60	2.20	12.00	2.40	18.20	20.43
Irrigation system	Solid-set, custom installation	Apr							1,000.00		1,000.00	1,000.00
Auger vine holes	50 HP w/auger--driver & 1 laborer	Apr	5.50	11.55	23.92		21.09	46.20			67.29	91.21
Planting vines	40 HP, trailer--driver & labor	Apr	.92	1.11	5.73		3.15	4.44	196.00	262.40	465.99	471.72
Weed control	40 HP, 100 gal. sprayer	Apr	.79	.95	4.42		2.78	3.80		55.96	62.54	66.96
Disk	50 HP, 6' disk	May	.57	.69	3.65		2.52	2.76			5.28	8.93
Plant cover crop	40 HP, grain drill	May	.65	.79	5.74		2.38	3.16		18.00	23.54	29.28
Hoeing	Hand hoeing	June							24.00		24.00	24.00
Hoeing	Hand hoeing	July							24.00		24.00	24.00
Mow cover crop	50 HP, 6' rotary mower	July	.57	.69	3.97		2.96	2.76			5.72	9.69
Mow cover crop	50 HP, 6' rotary mower	Aug	.57	.69	3.97		2.96	2.76			5.72	9.69
Hill vines	40 HP, hiller disk	Oct	.92	1.11	4.01		3.18	4.44			7.62	11.63
Spread end posts	40 HP, trailer--driver & 1 laborer	Oct	.92	2.03	4.31		3.15	8.12		57.20	68.47	72.78
Set end posts	40 HP w/post driver--2 laborers	Oct	3.00	6.30	11.95		9.48	25.20			34.68	46.63
Set anchors	50 HP w/auger--driver & 1 laborer	Oct	3.25	6.83	14.13		12.45	27.32		12.20	51.97	66.10
Pick-up	3/4 ton	Season	.50	.55	2.48		3.89	2.20			6.09	8.57
Motorcycle	110 cc	Season	.25	.28	.41		.27	1.12			1.39	1.80
Miscellaneous	Utilities, phone, postage, etc.	Season							118.51		118.51	118.51
Irrigate	Solid-set system, 24 ac-in	Season		2.95	148.20		6.00	11.80	36.00	10.00	63.80	212.00
Interest	Interest on operating capital	Season							103.58		103.58	103.58
Taxes	Real estate taxes	Annual				11.13						11.13
Land[a/]	Net land rent	Season				110.00						110.00
TOTAL COST PER ACRE			21.06	39.72	264.05	121.13	89.64	158.88	1,514.09	434.66	2,197.27	2,582.45

[a/] Income, rent minus real estate taxes, that is foregone during the establishment years due to investing in a wine grape vineyard.

Table 2. Summary of production costs per acre for first-year of establishment of a 50-acre wine grape vineyard, 1981

	Unit	Price or Cost/Unit	Quantity	Value or Cost	YOUR FARM
		($)		($)	($)
VARIABLE COSTS:					
Nitrogen	pounds	.30	55.00	16.50	
Survey & mark	hour	4.00	3.00	12.00	
Survey stakes	each	.16	15.00	2.40	
Solid-set irrigation system	acre	1,000.00	1.00	1,000.00	
Grape plant	plant	.40	656.00	262.40	
Hand plant	hour	4.00	49.00	196.00	
Surflan	pounds	10.50	5.33	55.96	
Red fescue	pounds	1.20	15.00	18.00	
Hand hoeing (June)	hour	4.00	6.00	24.00	
Hand hoeing (July)	hour	4.00	6.00	24.00	
End posts	post	4.40	13.00	57.20	
Concrete anchors	each	.60	13.00	7.80	
#9 anchor wire	feet	.022	200.00	4.40	
Miscellaneous	dollars	.06	1,975.18	118.51	
Irrigation water charge	acre	36.00	1.00	36.00	
Electricity (irrigation)	acre	10.00	1.00	10.00	
Machinery	acre	10.21	1.00	10.21	
Tractors	acre	73.43	1.00	73.43	
Irrigation machinery	acre	6.00	1.00	6.00	
Labor (tractor & machinery)	hour	4.00	36.77	147.08	
Labor (irrigation)	hour	4.00	2.95	11.80	
Interest on operating capital	dollars	.10	1,035.80	103.58	
TOTAL VARIABLE COSTS				2,197.27	
FIXED COSTS:					
Machinery	acre	28.29	1.00	28.29	
Tractors	acre	87.56	1.00	87.56	
Irrigation machinery	acre	148.20	1.00	148.20	
Real estate taxes	acre	11.13	1.00	11.13	
Net land rent[a/]	acre	110.00	1.00	110.00	
TOTAL FIXED COSTS				385.18	
TOTAL COSTS				2,582.45	

[a/] Income, rent minus real estate taxes, that is foregone during the establishment years due to investing in a wine grape vineyard.

Table 3. Estimated second-year costs for a 50-acre wine grape vineyard, 1981

Operation	Tooling	Month	Machinery Hours	Machinery Labor Hours	Fixed Costs Mach.	Fixed Costs Other	Variable Costs Fuel, Oil, Lube & Repairs	Variable Costs Mach. Labor	Variable Costs Service	Variable Costs Materials	Total Variable Costs	Total Cost
							$					
Spread line posts	40 HP, trailer--driver & 1 laborer	Feb	.92	2.03	4.31		3.15	8.12		472.50	483.77	488.08
Set line posts	40 HP w/post driver--2 laborers	Feb	10.00	21.00	39.82		31.60	84.00			115.60	155.42
String wire	40 HP, trailer--driver & 1 laborer	Feb	.92	1.11	4.31		3.15	4.44	48.00	61.45	117.04	121.35
Remove hills	40 HP, grape hoe (3 mph)	Mar	.92	1.11	5.05		3.36	4.44			7.80	12.85
Remove hills	40 HP, grape hoe (1 mph)	Mar	2.75	3.33	15.16		10.10	13.32			23.42	38.58
Prune vines	Pruning labor; 6 sets of shears	Mar							64.00	22.46	86.46	86.46
Replant (10%)	40 HP w/auger--hand planting	Apr	1.00	1.10	2.83		3.57	4.40	32.00	26.40	66.37	69.20
Weed control	40 HP, 100 gal. sprayer	Apr	.79	.95	4.42		2.78	3.80		43.68	50.26	54.68
String-up vines	Hand labor	May							48.00	6.00	54.00	54.00
Mow cover crop	50 HP, 6' rotary mower	May	.57	.69	3.97		2.96	2.76			5.72	9.69
Summer training	Hand labor (ribbon--500 ft/roll)	May							64.00	1.80	65.80	65.80
Dusting	40 HP, duster	May	.79	.95	3.93		2.98	3.80		1.26	8.04	11.97
Mow cover crop	50 HP, 6' rotary mower	June	.57	.69	3.97		2.96	2.76			5.72	9.69
Summer training	Hand labor	June							64.00		64.00	64.00
Hoeing	Hand hoeing	June							24.00		24.00	24.00
Mow cover crop	50 HP, 6' rotary mower	July	.57	.69	3.97		2.96	2.76			5.72	9.69
Summer training	Hand labor	July							64.00		64.00	64.00
Hill vines	40 HP, hiller disk	Oct	.92	1.11	4.01		3.18	4.44			7.62	11.63
Pick-up	3/4 ton	Season	.50	.55	2.48		3.89	2.20			6.09	8.57
Motorcycle	110 cc	Season	.25	.28	.41		.27	1.12			1.39	1.80
Miscellaneous	Utilities, phone, postage, etc.	Season							79.78		79.78	79.78
Irrigate	Solid-set, 30 ac-in	Season		3.69	148.20		6.00	14.76	36.00	10.00	66.76	214.96
Interest	Interest on operating capital	Season							82.63		82.63	82.63
Taxes	Real estate taxes	Annual				28.45						28.45
Land[a/]	Net land rent	Season				110.00						110.00
Investment	Interest on accumulated investment	Season				258.25						258.25
TOTAL COST PER ACRE			21.47	39.28	246.84	396.70	82.91	157.12	606.41	645.55	1,491.99	2,135.53

[a/] Income, rent minus real estate taxes, that is foregone during the establishment years due to investing in a wine grape vineyard.

trellis system. The spreading of the posts, setting the line posts, and installing the wire amount to a cash cost of $716 per acre. The next largest cash expense during the second year is for pruning and training. The pruning, stringing, and tying, along with the summer training, is by hand labor. Together these two operations cost $334 per acre.

Total variable cost per acre for the second year of establishment is $1,492 (Table 4). Fixed costs, which include all overhead costs for machinery, tractors, taxes, net land rent, and interest on accumulated investment, amount to $644 per acre. The first year investment monies could have been invested elsewhere and it was assumed they could have earned 10%. Therefore, total cost per acre for establishment during the second year is $2,136.

Third Year

During the third year, the largest cash expenses occur during February with the installation of the catch-wire and the pruning and tying of the vines. The second largest cash cost is due to harvest (Table 5). It is assumed that a 2-ton crop would be harvested during the third year which would result in a picking cost of $120 per acre. Total preharvest variable cost per acre is $576 per acre (Table 6). The harvesting cost, including not only labor but also the overhead cost for machinery and tractors, amounts to $150 per acre. Total variable cost is $726 per acre. Assuming a 2-ton yield, the break-even price is approximately $363 per ton to cover total variable costs.

Fixed costs, including all opportunity costs, amount to $845 per acre. The 10% interest charge on the accumulated investment from the first two years of establishment amounts to $472 per acre. Thus, the total costs during the third year of establishment are $1,571 per acre.

Fourth Year

The largest cost item during the fourth year is custom hand harvesting during October. This cost is $240 per acre (Table 7). The second largest cost, $122 per acre, relates to the custom pruning and tying operation in February. The only other cash cost of significant size is $67 per acre for irrigation during the growing season and the post-harvest season.

The variable cost during the fourth year for preharvest amounts to $414 per acre (Table 8). The harvest costs are $281 per acre which brings the total variable costs during the fourth year of establishment to $695 per year. Assuming a 4-ton yield per acre, the break-even price in terms of variable costs amounts to $174 per ton.

The total fixed costs during the fourth year of establishment amount to

Table 4. Summary of production costs per acre for second-year of establishment of a 50-acre wine grape vineyard, 1981

	Unit	Price or Cost/Unit	Quantity	Value or Cost	YOUR FARM
		($)		($)	($)
VARIABLE COSTS:					
Line posts	post	2.25	210.00	472.50	
Labor--string wire	hour	4.00	12.00	48.00	
#11 wire	feet	.014	4,000.00	55.20	
#4 staples	pounds	.625	10.00	6.25	
Pruning labor	hour	4.00	16.00	64.00	
Pruning tools	year	22.46	1.00	22.46	
Labor--string vines	hour	4.00	12.00	48.00	
Twine	yards	.01	600.00	6.00	
Hand plant	hour	4.00	8.00	32.00	
Grape plant	plant	.40	66.00	26.40	
Devrinol	pounds	5.46	8.00	43.68	
Summer training (May)	hour	4.00	16.00	64.00	
Plastic ribbon	roll	.90	2.00	1.80	
Summer training (June)	hour	4.00	16.00	64.00	
Summer training (July)	hour	4.00	16.00	64.00	
Hand hoeing	hour	4.00	6.00	24.00	
Sulfur dust	pounds	.158	8.00	1.26	
Miscellaneous	dollars	.06	1,329.59	79.78	
Irrigation water charge	acre	36.00	1.00	36.00	
Electricity (irrigation)	acre	10.00	1.00	10.00	
Machinery	acre	7.81	1.00	7.81	
Tractors	acre	69.10	1.00	69.10	
Irrigation machinery	acre	6.00	1.00	6.00	
Labor (tractor & machinery)	hour	4.00	35.59	142.36	
Labor (irrigation)	hour	4.00	3.69	14.76	
Interest on operating capital	dollars	.10	826.34	82.63	
TOTAL VARIABLE COSTS				1,491.99	
FIXED COSTS:					
Machinery	acre	15.52	1.00	15.52	
Tractors	acre	83.12	1.00	83.12	
Irrigation machinery	acre	148.20	1.00	148.20	
Real estate taxes	acre	28.45	1.00	28.45	
Net land rent[a/]	acre	110.00	1.00	110.00	
Interest on accumulated invest.	dollars	.10	2,582.45	258.25	
TOTAL FIXED COSTS				643.54	
TOTAL COSTS				2,135.53	

[a/] Income, rent minus real estate taxes, that is foregone during the establishment years due to investing in a wine grape vineyard.

Table 5. Estimated third-year costs for a 50-acre wine grape vineyard, 1981

Operation	Tooling	Month	Machinery Hours	Machinery Labor Hours	Fixed Costs Mach.	Fixed Costs Other	Variable Costs Fuel, Oil, Lube & Repairs	Variable Costs Mach. Labor	Variable Costs Service	Variable Costs Materials	Total Variable Costs	Total Cost
									$			
Prune & tie	Pruning labor; 6 set of shears	Feb							100.00	22.46	122.46	122.46
Catch-wire installation	40 HP, trailer & hand labor	Feb	.92	1.11	4.31		3.15	4.44	48.00	61.85	117.44	121.75
Mow prunings	50 HP, 6' rotary mower	Feb	.57	.69	3.97		2.96	2.76			5.72	9.69
Remove hill	40 HP, grape hoe (3 mph)	Mar	.92	1.11	5.05		3.36	4.44			7.80	12.85
Remove hill	40 HP, grape hoe (1 mph)	Mar	2.75	3.33	15.16		10.10	13.32			23.42	38.58
Replant (5%)	40 HP w/auger	Apr	4.00	4.40	14.69		12.41	17.60		13.20	43.21	57.90
Weed control	40 HP, 100 gal. sprayer	Apr	.79	.95	4.42		2.78	3.80		43.68	50.26	54.68
Summer training	Hand labor	May							16.00		16.00	16.00
Mow cover crop	50 HP, 6' rotary mower	May	.57	.69	3.97		2.96	2.76			5.72	9.69
Dusting	40 HP, duster	June	.79	.95	3.93		2.98	3.80		1.26	8.04	11.97
Mow cover crop	50 HP, 6' rotary mower	June	.57	.69	3.97		2.96	2.76			5.72	9.69
Mow cover crop	50 HP, 6' rotary mower	July	.57	.69	3.97		2.96	2.76			5.72	9.69
Dusting (2x)	40 HP, duster	July	1.58	1.91	7.86		5.96	7.64		2.52	16.12	23.98
Insect control	40 HP, 100 gal. sprayer	July	.79	.95	4.42		2.78	3.80		1.99	8.57	12.99
Harvest	Custom hand picking	Oct							120.00		120.00	120.00
Swamping	40 HP, trailer	Oct	.92	1.11	4.31		3.15	4.44			7.59	11.90
Hauling	Custom hauling (see explanation)	Oct							10.00		10.00	10.00
Hill vines	40 HP, hiller disk	Oct	.92	1.11	4.01		3.18	4.44			7.62	11.63
Pick-up	3/4 ton	Season	.50	.55	2.48		3.89	2.20			6.09	8.57
Motorcycle	110 cc	Season	.25	.28	.41		.27	1.12			1.39	1.80
Miscellaneous	Utilities, phone, postage, etc.	Season							39.34		39.34	39.34
Irrigate	Solid-set, 30 ac-in	Season		3.69	148.20		6.00	14.76	36.00	10.00	66.76	214.96
Interest	Interest on operating capital	Season							30.79		30.79	30.79
Taxes	Real estate taxes	Annual				28.45						28.45
Land[a/]	Net land rent	Season				110.00						110.00
Investment	Interest on accumulated investment	Season				471.80						471.80
TOTAL COST PER ACRE			17.41	24.21	235.13	610.25	71.85	96.84	400.13	156.96	725.78	1,571.16

[a/] Income, rent minus real estate taxes, that is foregone during the establishment years due to investing in a wine grape vineyard.

Table 6. Summary of production costs per acre for third-year of establishment of a 50-acre wine grape vineyard, 1981

	Unit	Price or Cost/Unit	Quantity	Value or Cost	YOUR FARM
		($)		($)	($)
VARIABLE COSTS:					
Preharvest:					
Pruning labor	hour	4.00	25.00	100.00	
Pruning tools	year	22.46	1.00	22.46	
Labor--catch wire install.	hour	4.00	12.00	48.00	
#12 wire	feet	.014	4,000.00	55.60	
#4 staples	pounds	.625	10.00	6.25	
Grape plant	plant	.40	33.00	13.20	
Devrinol	pounds	5.46	8.00	43.68	
Summer training	hour	4.00	4.00	16.00	
Sulfur dust (June)	pounds	.158	8.00	1.26	
Sulfur dust (July)	pounds	.158	16.00	2.52	
Parathion	pint	.663	3.00	1.99	
Irrigation water charge	acre	36.00	1.00	36.00	
Electricity (irrigation)	acre	10.00	1.00	10.00	
Miscellaneous	dollars	.06	655.65	39.34	
Machinery	acre	4.25	1.00	4.25	
Tractors	acre	54.21	1.00	54.21	
Irrigation machinery	acre	6.00	1.00	6.00	
Labor (tractor & machinery)	hour	4.00	17.47	69.88	
Labor (irrigation)	hour	4.00	3.69	14.76	
Interest on operating capital	dollars	.10	307.85	30.79	
Subtotal, preharvest				576.19	
Harvest costs:					
Hand harvest	tons	60.00	2.00	120.00	
Custom hauling	tons	5.00	2.00	10.00	
Machinery	acre	4.25	1.00	4.25	
Tractors	acre	3.14	1.00	3.14	
Labor (tractor & machinery)	hour	4.00	3.05	12.20	
Subtotal, harvest				149.59	
TOTAL VARIABLE COSTS				725.78	
FIXED COSTS:					
Machinery	acre	34.22	1.00	34.22	
Tractors	acre	52.71	1.00	52.71	
Irrigation machinery	acre	148.20	1.00	148.20	
Real estate taxes	acre	28.45	1.00	28.45	
Net land rent[a/]	acre	110.00	1.00	110.00	
Interest on accumulated invest.	dollars	.10	4,717.98	471.80	
TOTAL FIXED COSTS				845.38	
TOTAL COSTS				1,571.16	

[a/] Income, rent minus real estate taxes, that is foregone during the establishment years due to investing a wine grape vineyard.

Table 7. Estimated fourth-year costs for a 50-acre wine grape vineyard, 1981

Operation	Tooling	Month	Machinery Hours	Machinery Labor Hours	Fixed Costs Mach.	Fixed Costs Other	Variable Costs Fuel, Oil, Lube & Repairs	Variable Costs Mach. Labor	Variable Costs Service	Variable Costs Materials	Total Variable Costs	Total Cost
									$			
Prune & tie	Pruning labor; 6 sets of shears	Feb							100.00	22.46	122.46	122.46
Mow prunings	50 HP, 6' rotary mower	Feb	.57	.69	3.97		2.96	2.76			5.72	9.69
Fertilize	40 HP, fertilizer spreader	Feb	.76	.92	5.23		2.65	3.68		12.00	18.33	23.56
Remove hill	40 HP, grape hoe (3 mph)	Mar	.92	1.11	5.05		3.36	4.44			7.80	12.85
Remove hill	40 HP, grape hoe (1 mph)	Mar	2.75	3.33	15.16		10.10	13.32			23.42	38.58
Weed control	40 HP, 100 gal. sprayer	Apr	.79	.95	4.42		2.78	3.80		43.68	50.26	54.68
Mow cover crop	50 HP, 6' rotary mower	May	.57	.69	3.97		2.96	2.76			5.72	9.69
Mow cover crop	50 HP, 6' rotary mower	June	.57	.69	3.97		2.96	2.76			5.72	9.69
Dusting (2x)	40 HP, duster	June	1.58	1.91	7.86		5.96	7.64		2.52	16.12	23.98
Mow cover crop	50 HP, 6' rotary mower	July	.57	.69	3.97		2.96	2.76			5.72	9.69
Dusting (2x)	40 HP, duster	July	1.58	1.91	7.86		5.96	7.64		2.52	16.12	23.98
Insect control	40 HP, 100 gal. sprayer	July	.79	.95	4.42		2.78	3.80		1.99	8.57	12.99
Harvest	Custom hand picking	Oct							240.00		240.00	240.00
Swamping	40 HP, trailer	Oct	.92	1.11	4.31		3.15	4.44			7.59	11.90
Hauling	Custom hauling (see explanation)	Oct							20.00		20.00	20.00
Hill vines	40 HP, hiller disk	Oct	.92	1.11	4.01		3.18	4.44			7.62	11.63
Pick-up	3/4 ton	Season	.50	.55	2.48		3.89	2.20			6.09	8.57
Motorcycle	110 cc	Season	.25	.28	.41		.27	1.12			1.39	1.80
Miscellaneous	Utilities, phone, postage, etc.	Season							38.13		38.13	38.13
Irrigate	Solid-set system, 30 ac-in	Season		3.69	148.20		6.00	14.76	36.00	10.00	66.76	214.96
Interest	Interest on operating capital	Season							21.44		21.44	21.44
Taxes	Real estate taxes	Annual				51.95						51.95
Land[a/]	Net land rent	Season				110.00						110.00
Investment	Interest on accumulated investment	Season				510.32						510.32
TOTAL COST PER ACRE			14.04	20.58	225.29	672.27	61.92	82.32	455.57	95.17	694.98	1,592.54

[a/] Income, rent minus real estate taxes, that is foregone during the establishment years due to investing in a wine grape vineyard.

Table 8. Summary of production costs per acre for fourth-year of establishment of a 50-acre wine grape vineyard, 1981

	Unit	Price or Cost/Unit	Quantity	Value or Cost	YOUR FARM
		($)		($)	($)
VARIABLE COSTS:					
Preharvest:					
Pruning labor	hour	4.00	25.00	100.00	
Pruning tools	year	22.46	1.00	22.46	
Nitrogen	pounds	.30	40.00	12.00	
Devrinol	pounds	5.46	8.00	43.68	
Parathion	pint	.663	3.00	1.99	
Sulfur dust (June)	pounds	.158	16.00	2.52	
Sulfur dust (July)	pounds	.158	16.00	2.52	
Irrigation charge	acre	36.00	1.00	36.00	
Electricity (irrigation)	acre	10.00	1.00	10.00	
Miscellaneous	dollars	.06	635.42	38.13	
Machinery	acre	4.56	1.00	4.56	
Tractors	acre	40.85	1.00	40.85	
Irrigation machinery	acre	6.00	1.00	6.00	
Labor (tractor & machinery)	hour	4.00	14.30	57.20	
Labor (irrigation)	hour	4.00	3.69	14.76	
Interest on operating capital	dollars	.10	214.41	21.44	
Subtotal, preharvest				414.11	
Harvest costs:					
Hand harvest	tons	60.00	4.00	240.00	
Custom hauling	tons	5.00	4.00	20.00	
Machinery	acre	4.25	1.00	4.25	
Tractors	acre	6.26	1.00	6.26	
Labor (tractor & machinery)	hour	4.00	2.59	10.36	
Subtotal, harvest				280.87	
TOTAL VARIABLE COSTS				694.98	
FIXED COSTS:					
Machinery	acre	21.79	1.00	21.79	
Tractors	acre	55.30	1.00	55.30	
Irrigation machinery	acre	148.20	1.00	148.20	
Real estate taxes	acre	51.95	1.00	51.95	
Net land rent[a/]	acre	110.00	1.00	110.00	
Interest on accumulated invest.	dollars	.10	5,103.14	510.32	
TOTAL FIXED COSTS				897.56	
TOTAL COSTS				1,592.54	

a/ Income, rent minus real estate taxes, that is foregone during the establishment years due to investing in a wine grape vineyard.

$898 per acre. The fixed costs include the ownership costs associated with the machinery, tractors, taxes, and all opportunity costs. The interest on the accumulated investment during the first three years of establishment at 10% amounts to $510 per acre. Thus, the total cash and noncash costs during the fourth year are $1,593 per acre.

In summary, total costs of establishment and the gross revenues realized during the four years of establishment of a wine grape vineyard are:

Year	Total Cost	-	Revenue	=	Net Investment
1	$2582.45	-	$ 0	=	$2582.45
2	2135.53	-	0	=	2135.53
3	1571.16	-	1186 a/	=	385.16
4	1592.54	-	2472 b/	=	(879.46)
			Net Investment	=	$4223.68

a/

Cab. Sauv.	2 ton x $525	= $1050/acre
Chard.	2 ton x 700	= 1400
Semillon	2 ton x 500	= 1000
W. Riesling	2 ton x 590	= 1180
Gewurz.	2 ton x 650	= 1300

Average revenue = 5930 ÷ 5 = $1186

b/

Cab. Sauv.	4 ton x $525	= $2100/acre
Chard.	4 ton x 700	= 2800
Semillon	5 ton x 500	= 2500
W. Riesling	4 ton x 590	= 2360
Gewurz.	4 ton x 650	= 2600

Average revenue = 12,360 ÷ 5 = $2472

MATURE WINE GRAPE VINEYARD

Per acre costs by type of operation for the 50-acre mature wine grape vineyard are shown in Table 9. The single largest cash cost is custom hand picking of the crop. The harvesting cost is estimated to be $60 per ton, and the hauling cost is estimated to be $5 per ton. Table 9 is based upon an average yield of 4.5 tons per acre. To represent the wine grapes with different yields, the average quantity harvested

Table 9. Estimated per acre production costs for a 50-acre mature wine grape vineyard, 1981

Operation	Tooling	Month	Machinery Hours	Machinery Labor Hours	Fixed Costs Mach.	Fixed Costs Other	Variable Costs Fuel, Oil, Lube & Repairs	Variable Costs Mach. Labor	Variable Costs Service	Variable Costs Materials	Total Variable Costs	Total Cost
									$			
Prune & tie	Pruning labor; 6 sets of shears	Feb							100.00	22.46	122.46	122.46
Mow prunings	50 HP, 6' rotary mower	Feb	.57	.69	3.97		2.96	2.76			5.72	9.69
Fertilize	40 HP, fertilizer spreader	Feb	.76	.92	5.23		2.65	3.68		1.20	7.53	12.76
Remove hill	40 HP, grape hoe (1 mph)	Mar	2.75	3.33	15.16		10.10	13.32			23.42	38.58
Weed control	40 HP, 100 gal. sprayer	Apr	.79	.95	4.42		2.78	3.80		43.68	50.26	54.68
Mow cover crop	50 HP, 6' rotary mower	May	.57	.69	3.97		2.96	2.76			5.72	9.69
Mow cover crop	50 HP, 6' rotary mower	June	.57	.69	3.97		2.96	2.76			5.72	9.69
Dusting (2x)	40 HP, duster	June	1.58	1.91	7.86		5.96	7.64		2.52	16.12	23.98
Mow cover crop	50 HP, 6' rotary mower	July	.57	.69	3.97		2.96	2.76			5.72	9.69
Insect control	40 HP, 100 gal. sprayer	July	.79	.95	4.42		2.78	3.80		1.99	8.57	12.99
Dusting (2x)	40 HP, duster	July	1.58	1.91	7.86		5.96	7.64		2.52	16.12	23.98
Harvest	Custom hand picking	Oct							270.00		270.00	270.00
Swamping	40 HP, trailer	Oct	.92	1.11	4.31		3.15	4.44			7.59	11.90
Hauling	Custom hauling (see explanation)	Oct							22.50		22.50	22.50
Hill vines	40 HP, hiller disk	Oct	.92	1.11	4.01		3.18	4.44			7.62	11.63
Pick-up	3/4 ton	Season	.50	.55	2.48		3.89	2.20			6.09	8.57
Motorcycle	110 cc	Season	.25	.28	.41		.27	1.12			1.39	1.80
Miscellaneous	Utilities, phone, postage, etc.	Season							38.96		38.96	38.96
Irrigate	Solid-set system, 30 ac-in	Season		3.69	148.20		6.00	14.76	36.00	10.00	66.76	214.96
Interest	Interest on operating capital	Season							20.39		20.39	20.39
Taxes	Real estate taxes	Annual				51.95						51.95
Investment	Amortized establishment cost	Annual				465.45						465.45
TOTAL COST PER ACRE			13.12	19.47	220.24	517.40	58.56	77.88	487.85	84.37	708.66	1,446.30

over all varieties was used to calculate costs.

The months of February and October have the highest requirements in terms of cash expenses. This results from the pruning and tying, irrigation, and harvesting. Irrigation water use would occur from April through August, as well as in October for postharvest irrigation. The irrigation charges are based upon the Roza Irrigation district at a rate of $36 per acre for the water. The electric power cost for the irrigation system is based on rates charged by the Benton Rural Electric Association. The electric power cost is $10.00 per acre.

A summary of the cash and noncash production costs for a mature wine grape vineyard are shown in Table 10. The preharvest cash expenses amount to $395 per acre. When added to the $313 harvesting cash cost, the total variable cash costs are $709 per acre.

Fixed costs for machinery, taxes and the amortized establishment costs are shown in the lower part of Table 10. They amount to $738 per acre. These machinery and equipment costs are based upon the equipment list shown in Appendix Table B.

The taxes during this year are based upon: 1) an assessed land value of $900 per acre (open space classification); 2) the trellis and plants assessed at $2,500 per acre; and 3) the irrigation system assessed at $800 per acre. The total assessed value is $4,200 per acre.

The net investment per acre for the 50-acre wine grape vineyard with a solid-set irrigation system during the establishment years is $4,224 per acre. This establishment cost figure is amortized over the useful life of the vineyard, which was assumed to be 25 years. Applying a 10% interest rate on the net investment results in an opportunity cost of $465 per acre per year (Table 10).

A summary of receipts, costs, profitability per acre, and the returns to land and management for the wine grape vineyard is shown in Table 11. The table is based upon the cost structure developed in Tables 9 and 10. Five different wine grape varieties are individually analyzed. They are Cabernet Sauvignon, Chardonnay, Semillon, White Riesling, and Gewurztraminer. The total gross receipt of each variety is based upon different yields and market prices. Total variable costs also vary due to the different harvest cost associated with each variety. The machinery costs, amortized establishment costs, and taxes are subtracted from the returns over variable costs. This difference is the dollar return to land and management. A percentage return to land and management is calculated by dividing the dollar return by the per acre investment value which is $6,000.

The returns to land and management vary by variety. Gewurztraminer had the highest return at 29.5% using the 1980 price of $650 and a yield of 5 tons per acre. Chardonnay, despite its lower assumed yield of 4.5 tons per acre, generated a return of 28.4% because of the market price

Table 10. Summary of production costs per acre for a 50-acre mature wine grape vineyard, 1981

	Unit	Price or Cost/Unit	Quantity	Value or Cost	YOUR FARM
		($)		($)	($)
VARIABLE COSTS:					
Preharvest:					
Pruning labor	hour	4.00	25.00	100.00	
Pruning tools	year	22.46	1.00	22.46	
Nitrogen	pounds	.30	4.00	1.20	
Devrinol	pounds	5.46	8.00	43.68	
Parathion	pint	.663	3.00	1.99	
Sulfur dust (June)	pounds	.158	16.00	2.52	
Sulfur dust (July)	pounds	.158	16.00	2.52	
Irrigation charge	acre	36.00	1.00	36.00	
Electricity (irrigation)	acre	10.00	1.00	10.00	
Miscellaneous	dollars	.06	649.29	38.96	
Machinery	acre	4.32	1.00	4.32	
Tractors	acre	37.73	1.00	37.73	
Irrigation machinery	acre	6.00	1.00	6.00	
Labor (tractor & machinery)	hour	4.00	13.19	52.76	
Labor (irrigation)	hour	4.00	3.69	14.76	
Interest on operating capital	dollars	.10	203.89	20.39	
Subtotal, preharvest				395.29	
Harvest costs:					
Hand harvest	tons	60.00	4.50	270.00	
Custom hauling	tons	5.00	4.50	22.50	
Machinery	acre	4.25	1.00	4.25	
Tractors	acre	6.26	1.00	6.26	
Labor (tractor & machinery)	hour	4.00	2.59	10.36	
Subtotal, harvest				313.37	
TOTAL VARIABLE COSTS				708.66	
FIXED COSTS:					
Machinery	acre	20.42	1.00	20.42	
Tractors	acre	51.62	1.00	51.62	
Irrigation machinery	acre	148.20	1.00	148.20	
Real estate taxes	acre	51.95	1.00	51.95	
Amortized establishment cost	dollars	.1102	4,223.68	465.45	
TOTAL FIXED COSTS				737.64	
TOTAL COSTS				1,446.30	

Table 11. Summary of receipts, costs, and profitability per acre for five varieties of wine grapes

	Cabernet Sauvignon	Chardonnay	Semillon	White Riesling	Gewurztraminer
Yield (ton)	4.5	4.5	6.0	5.0	5.0
Price per ton	$ 525.00	$ 700.00	$ 500.00	$ 590.00	$ 650.00
1. Total receipts	$2,362.50	$3,150.00	$3,000.00	$2,950.00	$3,250.00
Less: total variable costs	708.66	708.66	806.16	741.16	741.16
2. Returns over variable costs	$1,653.84	$2,441.34	$2,193.84	$2,208.84	$2,508.84
Less: machinery fixed cost	220.24	220.24	220.24	220.24	220.24
amortized investment cost	465.45	465.45	465.45	465.45	465.45
real estate tax	51.95	51.95	51.95	51.95	51.95
3. Returns to land & management	$ 916.20	$1,703.70	$1,456.20	$1,471.20	$1,771.20
4. % return to land & management[a]	15.27%	28.40%	24.27%	24.52%	29.52%

[a]Return to land and management divided by $6,000 per acre base.

of $700 per ton. The varietal mix, in conjunction with the cost structures and expected market prices, will impact the overall return to a given vineyard.

To demonstrate how returns vary as prices and yields change, the rates of return to land and management were calculated for various price levels ($350-$850) and yield levels (1-10 tons). Table 12 indicates that with prices in excess of $600 per ton, a positive return is made even with a 2-ton yield. With prices in the $450-$600 range, a yield of 3 tons per acre would be needed to generate positive returns to land and management. Given that the average 1980 prices for the varieties used in this study were approximately $600 per ton and the average yield was 5 tons per acre, the returns to land and management are 25.4%.

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3. "1980 Spray Guide for Grapes in Washington." EM 3669, Coop. Ext. Service.

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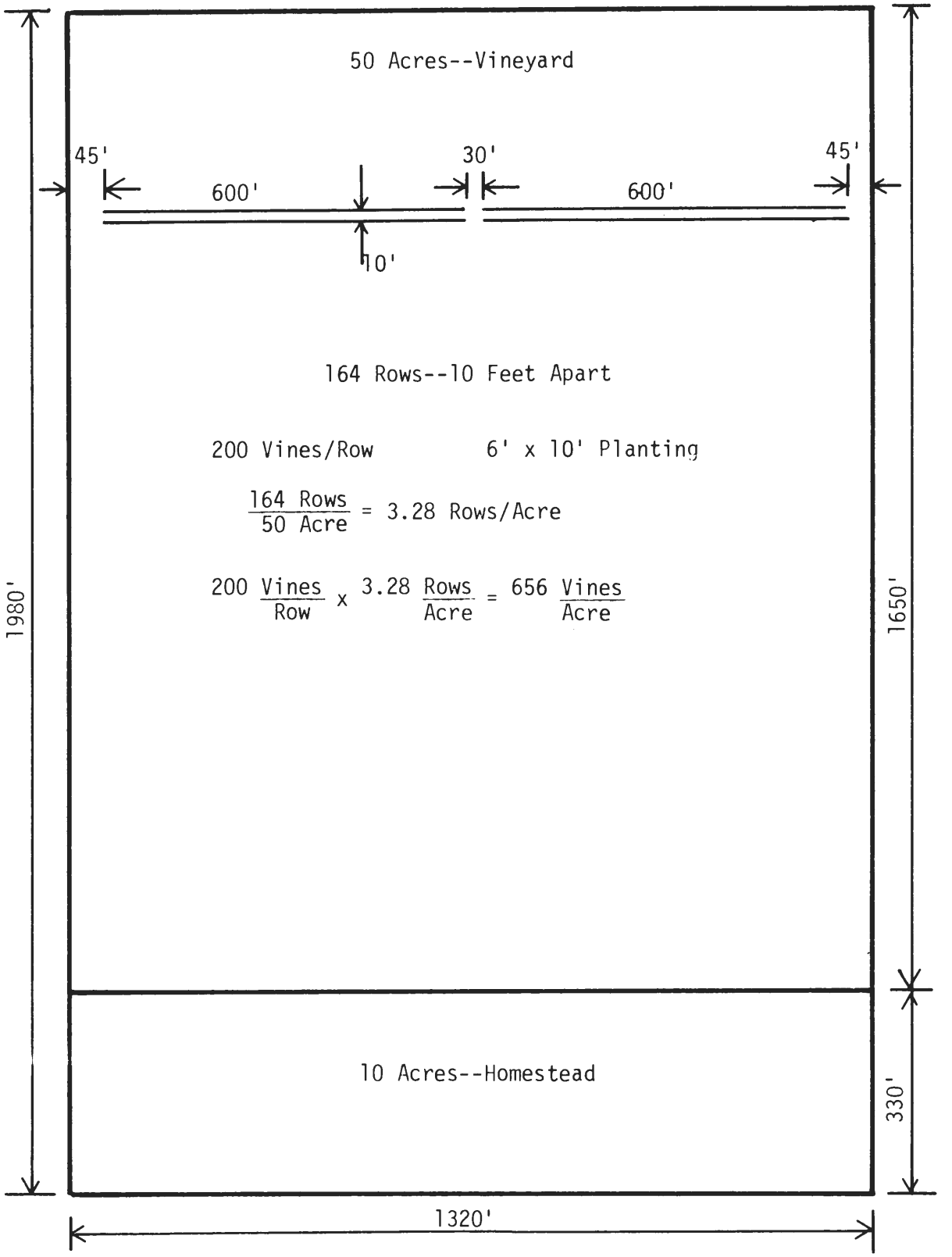
Table 12. Rate of return (%) to land ($6,000 per acre) and management for a 50-acre wine grape vineyard in Washington, 1981

YIELD TONS/ACRE	PRICE PER TON $350	$400	$450	$500	$550	$600	$650	$700	$750	$800	$850
1	-14.48	-13.65	-12.81	-11.98	-11.15	-10.31	-9.48	-8.65	-7.81	-6.98	-6.15
2	-9.73	-8.06	-6.40	-4.73	-3.06	-1.40	0.27	1.94	3.60	5.27	6.94
3	-4.98	-2.48	0.02	2.52	5.02	7.52	10.02	12.52	15.02	17.52	20.02
4	-0.23	3.10	6.44	9.77	13.10	16.44	19.77	23.10	26.44	29.77	33.10
5	4.52	8.69	12.85	17.02	21.19	25.35	29.52	33.69	37.85	42.02	46.19
6	9.27	14.27	19.27	24.27	29.27	34.27	39.27	44.27	49.27	54.27	59.27
7	14.02	19.85	25.69	31.52	37.35	43.19	49.02	54.85	60.69	66.52	72.35
8	18.77	25.44	32.10	38.77	45.44	52.10	58.77	65.44	72.10	78.77	85.44
9	23.52	31.02	38.52	46.02	53.52	61.02	68.52	76.02	83.52	91.02	98.52
10	28.27	36.60	44.94	53.27	61.60	69.94	78.27	86.60	94.94	103.27	111.60

Appendix Table A. Layout of the 50-acre wine grape vineyard



Appendix Table B. Hourly cost summary for implements and power units on a 50-acre irrigated wine grape vineyard in Washington, 1981

Machine	Size	Hours of Annual Use	Purchase Price	Depr./hr	Intr./hr	Ins./hr	Taxes/hr	Total Fixed Costs/hr	Repair/hr	Fuel/hr	Lub./hr	Total Variable Costs/hr
			($)									
Tractor	40 HP	500	11,400	1.607	1.772	.089	.205	3.672	.67	2.11	.32	3.10
Tractor/post driver	40 HP	500	12,360	1.742	1.921	.096	.222	3.982	.73	2.11	.32	3.16
Tractor	50 HP	500	13,500	1.902	2.099	.105	.243	4.349	.80	2.64	.40	3.83
Pickup	3/4 ton	300	9,000	2.469	2.118	.106	.270	4.964	1.80	5.20	.78	7.78
Motorcycle	110 cc	100	1,000	.823	.706	.035	.090	1.655	.60	.43	.06	1.09
M.B. plow	3-16 in	50	4,200	6.915	5.931	.297	.756	13.898	2.77			2.77
Disk	6 ft	100	960	.790	.678	.034	.086	1.588	.18			.18
Fertilizer spreader	6 ft	40	500	1.029	.883	.044	.112	2.068	.16			.16
Disk-blade marker	10 ft	50	250	.412	.353	.018	.045	.827	.07			.07
Trailer	---	100	400	.329	.282	.014	.036	.662	.07			.07
Sprayer	100 gal	50	480	.790	.678	.034	.086	1.588	.13			.13
Grain drill	6 ft	35	1,000	2.352	2.017	.101	.257	4.727	.28			.28
Rotary mower	6 ft	100	1,300	1.070	.918	.046	.117	2.151	.95			.95
Grape hoe	---	100	890	.733	.628	.031	.080	1.473	.26			.26
Duster	100 lb	120	700	.480	.412	.021	.052	.965	.38			.38
Hiller disk	---	50	100	.165	.141	.007	.018	.331	.06			.06