

EFFECTS OF GRAPE AND OTHER RAW MATERIAL PRICES ON WINERY PROFITABILITY

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INTRODUCTION

Managers of wineries are constantly faced with difficulties associated with changing prices of grapes and other raw materials. Whether price variations come explicitly from direct purchase of grapes or implicitly through fluctuating yields in the winery's vineyards, the underlying economic cost per bottle is affected. In addition to grape prices, changes in the other input costs (e.g. - corks, labels, bottles) can have a significant effect on underlying cost of production. The purpose of this research study is to provide information to managers of wineries regarding the effects of alterations in grape and other raw material prices upon average costs per bottle and overall net returns. Growers of wine grapes may also find the information in this research to be helpful in marketing their products.

DATA AND PROCEDURES In this study, the decision-making environment facing the manager of a small winery is represented within an economic model. Mathematical programming techniques common to agricultural economic analysis are used to develop the computer model which projects realistic alternatives. The model's objective is to maximize net returns above total cost by choosing the optimal levels of management decisions. Readers interested in more detailed discussion beyond what is provided herein may contact the authors or refer to previously published, related articles (Dillon, Price, and Morris; Dillon, Morris, and Price).

Optimal levels of various production and marketing decisions are chosen by the mathematical programming model. The majority of the relevant decision-making activities within the model are: (1) the quantity and timing of the purchase of the various grape cultivars, (2) the quantity and timing of production of the various wine varieties, and (3) other input purchases and (4) wine sales. Several technological and marketing limitations are also imposed upon the model. These constraints included in the model are: (1) juice yield from grape crush, (2) maximum and minimum percentages of sales volumes, (3) maximum retail sales usage, (4) appropriate wine-aging requirements and (5) the need for adequate equipment capacity, labor and supplies.

Four different white wine varieties (i.e. - Chardonnay, Vignoles, Riesling, and Vidal or Seyval) and two different varieties of red wine (i.e. - Cabernet Sauvignon and Cynthiana) are reflected within the model. This study includes case scenarios for four winery sizes with annual fermenting capacities of 40,000; 20,000; 10,000 and 5,000 gallons. The model projections include the economic effects of individual price variations from both red wine grapes, white wine grapes, then for all grape prices plus variations in other raw material product prices are discussed.

RESULTS The base case scenario projected winery sales of 60% in white wine and 40% in red wine. The most popular varietal wine, Cabernet Sauvignon, accounted for 30% of total sales volume for all winery sizes. Net returns above annual costs were forecast to range from 84,491 for the 5,000 gallon winery to 859,906 for the 40,000 gallon winery for the base case (Table 1 and Table 2). These results highlight the potential profitability of a winery because the objective function considers all expenses including personal labor and capital and excludes only taxes on inventory and income. The returns to capital were also quite favorable at 2.95%, 7.05%, 5.77% and 6.13% for the 5,000 to the 40,000 gallon winery sizes respectively. With sales projected to be 100% retail and a relatively labor intensive operation, the 10,000 gallon winery model results were the highest return to capital.

All winery size models were entered into a computer rerun to determine the effects of both price increases and decreases of 5%, 10% and 25% for 1) white, 2) red and 3) all grapes. Table 1 displays the model results for annual winery net returns and average production costs from the base case when there were changes in white wine grape prices only while red wine grape prices remained constant. The substantial effect on net returns from these changes can be seen from the example of a 25% decrease in white wine grape prices for the 40,000 gallon winery. The result was an addition of nearly \$34,000, increasing total profits to \$83,821 annually. However, the results are not symmetric, as can be seen from the example of a 25% increase in white wine grape prices for the 40,000 gallon winery and the resulting approximate \$22,000 decline in profits to a level of \$38,029. A decrease in grape price resulted in a greater gain than the loss from an equivalent grape price increase because the winery manager would be expected to alter the mix of wines sold to retain the greatest profit.

Table 2 reflects the effects of alterations from the base case as red wine grape prices are changed. Table 3 illustrates the effects for changes in all grape prices. Given the optimal base case scenario of 40% red wine production, the effects of red wine grape price changes were not as severe as when white wine grape prices were changed. Net returns and average production cost per bottle tended to be more stable. In the model projections, nonetheless, the 40,000 gallon winery still displayed a range of \$3.55-\$3.75 in average production cost per bottle. Naturally, the most substantial effects are displayed for the situation in which all wine grape prices were changed.

Table 1. The Effects of Alterations in White Wine Grape Prices on Net Returns and Average Production Cost Per Bottle

Winery Size	-25%	-10%	-5%	BASE	+ 5%	+10%	+25%
----- Annual Winery Net Returns (\$) -----							
40000	83821	89156	84531	59906	55281	50655	38029
20000	46382	39303	36990	34678	32385	30053	23115
10000	26122	22653	21497	20341	19184	18028	14559
5000	7382	5648	5089	4491	3913	3335	1601
----- Average Production Cost (\$ Per Bottle) -----							
40000	3.51	3.60	3.62	3.65	3.67	3.69	3.69
20000	4.17	4.26	4.28	4.31	4.33	4.35	4.42
10000	4.83	4.90	4.93	4.95	4.97	5.00	5.07
5000	5.34	5.41	5.44	5.46	5.48	5.51	5.58

Table 2. The Effects of Alterations in Red Wine Grape Prices on Net Returns and Average Production Cost Per Bottle

Winery Size	-25%	-10%	-5%	BASE	+ 5%	+10%	+25%
----- Annual Winery Net Returns (\$) -----							
40000	80485	88129	84017	59906	55794	51682	39346
20000	44957	38790	36734	34678	32622	30566	24398
10000	25480	22397	21389	20341	19313	18285	15201
5000	7061	5519	5005	4491	3977	3463	1621
----- Average Production Cost (\$ Per Bottle) -----							
40000	3.55	3.61	3.63	3.65	3.67	3.69	3.75
20000	4.20	4.26	4.28	4.31	4.33	4.35	4.41
10000	4.85	4.91	4.93	4.95	4.97	4.99	5.05
5000	5.36	5.42	5.44	5.46	5.48	5.50	5.56

Table 3. The Effects of Alterations in All Wine Grape Prices on Net Returns and Average Production Cost Per Bottle

Winery Size	-25%	-10%	-5%	BASE	+ 5%	+10%	+25%
----- Annual Winery Net Returns (\$) -----							
40000	103590	77379	68543	59906	51169	42432	17470
20000	56520	43415	39046	34678	30308	25941	12835
10000	31262	24709	22525	20341	18156	15972	9419
5000	9952	6676	5583	4491	3399	2307	-969
----- Average Production Cost (\$ Per Bottle) -----							
40000	3.43	3.56	3.60	3.65	3.69	3.74	3.80
20000	4.08	4.22	4.26	4.31	4.35	4.39	4.52
10000	4.73	4.86	4.91	4.95	4.99	5.04	5.17
5000	5.24	5.37	5.42	5.46	5.50	5.55	5.68

Table 4. The Effects of Alterations in Input Prices per Bottle on Net Returns and Average Production Cost Per Bottle

Winery Size	-\$0.25	-\$0.10	-\$0.05	BASE	+\$0.05	+\$0.10	+\$0.25
----- Annual Winery Net Returns (\$) -----							
40000	112908	81106	70506	59906	49306	38706	6806
20000	61178	45278	39978	34678	29378	24078	8178
10000	33591	25641	22991	20341	17891	15041	7091
5000	11116	7141	5166	4491	3166	1841	-2134
----- Average Production Cost (\$ Per Bottle) -----							
40000	3.36	3.54	3.59	3.65	3.70	3.75	3.91
20000	4.04	4.20	4.25	4.31	4.36	4.41	4.57
10000	4.69	4.84	4.89	4.95	5.00	5.06	5.22
5000	5.19	5.35	5.41	5.46	5.51	5.57	5.72

All grape price experimental situations remain profitable except the 5,000 gallon winery with a 25% increase in all grape prices. Average production costs tended to shift approximately \$0.22 per bottle due to a 25% change in the price of all wine grapes regardless of winery size. Thus, in this range the models projected an approximate rate of a \$0.01 change in average production costs per bottle for every 1% change in all wine grape prices.

Table 4 illustrates the effects of changes in variable production costs of \$.05, \$.10 or \$.25 per bottle. Notably, these results, reporting both increases and decreases in average costs, can provide insight to many different inputs: corks, labels, glass bottles, certain wine taxes, capsules, etc. As should be expected, the effects on net returns and average production costs per bottle are extremely substantial. At the 40,000 gallon winery size, even a \$.05 per bottle increase in

costs resulted in \$10,600 lower net returns. Because changes in other expenses (e.g. - interest on operating capital) were also occurring in relation to the changes in variable cost of production per bottle, the average production cost per bottle increased or decreased by more than the amount specified in the experiment. This brings up the important point that winery managers should not only consider the direct influences of an increase or decrease in costs but also the indirect effects that this may have on capital requirements, interest expenses and the like.

CONCLUSIONS

Managers should pay special attention to changes in the prices paid for grapes and other input costs. As illustrated in this research, these will have substantial effect on the annual net returns of a winery as well as the average production cost per bottle. With 60% of wine sales volume in white wine, the effects of white wine grape price changes were more severe than for red wine grape price alterations. In the event of a change in all grape prices, winery profits could fluctuate more than 60% for a 25% grape price change. For every 1 % change in all grape prices, average production cost per bottle shifted about \$0.01. The winery owner, however, by making adjustments in production management decisions, can minimize the problems of increasing prices as well as reap the benefits of decreasing prices. Therefore, one should be careful to consider price changes and all affected expenses. For instance, an increase in the production costs brings with it the need for greater capital requirements and higher interest expenses.

REFERENCES

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