

# PRODUCTION AND ECONOMICS OF WINE GRAPES IN ARKANSAS

Proc. FL Grape Conf 1991 p156-66

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**Introduction** In Arkansas the acreage of wine grapes tends to be in concentrated locations. A fruit survey reported that there were at least 720 acres of wine grape cultivars planted in Arkansas' Altus Viticultural Appellation (Franklin county). About 300 acres of wine type grapes are grown in the Washington-Benton county area (Ozark Mountain Appellation). Some grapes for wine are produced in fourteen other Arkansas counties.

TABLE 1: Irrigated Wine-Grape Cultivars: Estimated Total Cumulative Investment Costs and Annual Establishment Charges per Acre (20 acre unit), 1987.

	Cumulative Investment Per Acre (Years 1 and 2)	Establishment (Through Year 4) <sup>1</sup>	Annual Charge <sup>2</sup> (Years 5-30)
----- Dollars per Acre -----			
<b>GROUP 1</b>			
<i>Vitis Vinifera</i> Cultivars			
a. Chardonnay	4375.79 <sup>3</sup>	2663.43	279.49
b. Cabernet Sauvignon	4375.79 <sup>3</sup>	3499.08	367.09
c. White Riesling	4375.79 <sup>3</sup>	4662.33	489.12
<b>GROUP 2</b>			
French-American Hybrid Cultivars			
a. Vignoles	3009.17 <sup>4</sup>	3115.45	326.84
b. Chamborcin	3009.17 <sup>4</sup>	2888.45	303.03
c. Vidal and Seyval	3009.17 <sup>4</sup>	3207.95	336.54
d. Chancellor	3009.17 <sup>4</sup>	3306.28	346.86
e. Villard noir	3009.17 <sup>4</sup>	3767.19	395.21
f. Villard blanc	3009.17 <sup>4</sup>	4392.62	460.83
<b>GROUP 3</b>			
<i>Vitis labrusca</i> and <i>Vitis aestivalis</i> Cultivars			
a. Cynthiana	3009.17 <sup>4</sup>	2830.67	296.96
b. Niagara	2431.93 <sup>5</sup>	2986.42	313.30
c. Catawba	2431.93 <sup>5</sup>	3170.92	332.66
d. Concord	2239.45 <sup>6</sup>	3147.33	330.18
e. Delaware	2431.93 <sup>5</sup>	3278.90	343.99

<sup>1</sup>Details on equipment operation, spray schedules, costs and revenues for both the Establishment Period (years 1 and 4) and mature vineyards (years 5 through 30) are in Special Report No. 130.

<sup>2</sup>The Annual Establishment charge is the payment required to retire the cumulative costs balance at the end of year 4 using the 9.5% annuity rate for the remaining 26 seasons.

<sup>3</sup>Plant costs were \$3.00 each, \$1869 per acre.

<sup>4</sup>Plant costs were \$1.50 each, \$934.50 per acre.

<sup>5</sup>Plant costs were \$0.75 each, \$467.25 per acre.

<sup>6</sup>Plant costs were \$0.50 each, \$311.50 per acre.

## Economic Analysis of Wine Grape Production.

To provide reference points for continuing or expanding vineyards, enterprise budgets were presented on a series showing production costs for the following cultivars and species of grapes utilized for wine production in Arkansas: (1) *Vitis vinifera* L.; (2) French-American Hybrids; (3) *Vitis labrusca* L.; and *Vitis aestivalis*. (For cost analysis, cultivars and species were grouped by similarity of cultural practices and resource requirements; therefore, *Vitis labrusca* and *Vitis aestivalis* are considered together because they have similar production requirements). When the market price changed between different cultivars, the estimates illustrated the contrast in returns.

Table 1 is a summary of the cumulative investment and establishment cost per acre utilizing a 20 acre vineyard unit. The fourteen cultivars which are considered are the most adaptable to Arkansas conditions. The calculations were made by a computer-driven budget generator program using 1987 resource years 1 and 2. This variation in costs extended through the end of the year 4 and was translated into the amortized establishment costs (Table 1). Variation among groups was due primarily to differences in the first year's costs of grape plants. Most of the variation within groups could be traced to the market value of the grapes harvested in Years 3 and 4 1.

Within the groupings of (1) *Vitis vinifera*, (2) French-American Hybrids, and (3) *Vitis labrusca* and *Vitis aestivalis*, the cost of production, i.e. the cultural practices and resource requirements, are the same. In other words, the materials and structures, field operations, hours of nonharvest labor, and applications of chemicals and fertilizers would be identical among cultivars within each of the three groups.

<sup>1</sup>Krichner, D. A., C. Price and J. R. Morris. Economic Analysis of Wine Grape Production in Arkansas - 1987, Arkansas Agricultural Experiment Station Special Report No. 130. (March, 1988). Individuals may request a copy off Special Report No. 130 by writing: Arkansas Agricultural Experiment Station Publications, Agriculture Bldg. Room 110, University of Arkansas, Fayetteville, AR 72701.

This results in an equality in all nonplant costs for Years 1 and 2 within each of the three divisions. Also, operational costs would be equal for preharvest variable costs (Years 1, 2, 3, and 5) and fixed costs (Years 1, 2, 3, and 4). In this way, the budgets reflect many costs that are equal for cultivars within a group, especially the uniformity of totals including cumulative costs for Years 1 and 2. Exceptions to equal operations/equal costs are explained as follows:

Year 3 is in the establishment period and is also the first harvest season. Due to differences in either market prices, yields (and harvest costs) or both, total cumulative costs at the end of Year 3 may vary among cultivars within a group. Pre-harvest variable costs for Year 4 will vary because this total includes the interest charge on different balances from the previous year's cumulative costs. This balance must be carried forward to the end of the establishment period, Year 4. In this way, even though cultural operations are the same for cultivars within a species or group, preharvest costs may differ for Year 4.

At the end of the Year 4-year "establishment" stage, the accumulated per acre annual costs or investments which had exceeded revenues were amortized as an annual establishment charge for the remaining 26-year expected life of the vineyard. This charge was added as a fixed cost in each budget for the remaining productive life of the vineyard, Year 4, the fixed cost in Year 5 varied among cultivars within groups although operations and nonharvest costs were the same. Differences in the cost and revenue structure for the cultivars are summarized in Table 1.

Table 2 gives the projected market prices, yields, costs, and returns. Table 3 gives the projected break even points for all cultivars. For example, Chardonnay must produce a yield at least \$1.71 tons per acre and receive the projected price of \$1,000 per ton to break even. Also, if Chardonnay yields are the projected 4.5 tons per acre, the price received must be at least \$437 per ton to break even. Many of the greatest income potentials outlined for Group 1 must be viewed as being applicable for only a limited number of vineyard sites because of climate risks. For example, the major differences in topography and climate across Arkansas can cause temperatures to fluctuate from mild to extremely cold resulting in serious injury to Group 1 (*Vitis vinifera*) cultivars. The relatively high revenue potentials for this group must be viewed with the awareness that only the hardiest of these vinifera cultivars can be successfully grown in even the best microclimates. The majority of the suitable microclimates are located in foothills of the Ozarks and other similarly protected areas in the state.

### **Management for Optimum Returns**

Vineyard management was assumed to be near the optimum level because the number and type of operations outlined in the budgets included all recommended practices. These recommendations were drawn from those individuals with expertise in grape production and research at the Agricultural Experiment Stations and in wine industry management. The assumption was that all recommended activities would include in vineyard operations. The costs were calculated as if the farmer started with a bare field and followed the budgeted pattern.

Grapes are planted in the spring. The first harvest is usually in the third year (Year 3) after planting, and maximum production is reached about the fifth year (5). With proper care, a vineyard should remain productive for 30 years or longer. Harvest mechanization is projected for most wine-type vineyards. However, because of industry practice and relative value, hand harvest costs are included in the budgets for *Vitis vinifera* cultivars. Land preparation, planting, cultivation and spraying through 30 years of production were included in the budget requirements, resource inputs and resulting costs and revenue. Experiences of growers and research specialists were used to project the yield obtainable with each cultivar. The estimated quantities represented an average of the marketable product that some growers currently attain.

The whole analysis assumed good management in terms of production technology and disease and insect control measures. The projected yield for each variety, although relatively high in some respects, was felt to be attainable if growers followed recommended practices. Average yields were reduced by 10% to reflect potential losses due to natural disasters, adverse weather such as hail and other unavoidable environment variations. The 10% reduction in yield potential was applied to all cultivars even though it was recognized that each would not necessarily be at equal risk to hazards. In general, improved management should increase the yield of grapes to the level estimated while reducing the variability of yield and quality.

**Disease Insect Considerations** Losses of wine grapes from disease and insect pests are no more of a problem in Arkansas than in other states with similar environmental conditions. Control programs that are practical and technologically sound have been devised for most pests.

Black rot, downy mildew, powdery mildew, bunch rots and anthracnose are the most serious diseases of wine grapes in Arkansas. Black rot is prevalent will cause complete destruction of the crop is not controlled. Downy mildew and powdery mildew are primarily foliar diseases, although significant fruit damage can result infection during or near bloom period. Loss of plant vigor from premature defoliation is usually the most significant factor in failure to control downy and powdery mildew. Also, anthracnose is a problem on wine grapes. Other disease problems may also be significant factors in a specific year and or vineyard.

TABLE 2: Irrigated Wine Grape Cultivars: Expected Market Prices, Yields (Tons/Acre), Costs, and Returns, 1987.

	Market	Yields	Costs	Returns
<b>GROUP 1</b>				
<i>Vitis Vinifera</i>				
Cultivars				
a. Pinot				
Chardonnay	\$1000	4.5	\$1964.52	\$2535.48
b. Cabernet				
Sauvignon	850	4.5	2052.19	1772.81
c. White Riesling	600	5.4	2255.22	984.79
<b>GROUP 2</b>				
French-American				
Hybrid Cultivars				
a. Vignoles	\$ 500	5.0	\$1710.47	\$ 789.53
b. Chambourcin	400	6.3	1745.16	774.84
c. Vidal and				
Seyval	400	5.4	1738.17	421.83
d. Chancellor	350	6.3	1788.99	416.01
e. Villard noir	325	5.4	1796.84	-41.84
f. Villard blanc	220	9.0	2024.46	-44.46
<b>GROUP 3</b>				
<i>Vitis aestivalis</i>				
Cultivars				
a. Cynthiana	\$ 650	4.05	\$1384.31	\$1248.19
b. Niagara	250	7.2	1542.40	257.60
c. Delaware	300	5.4	1492.09	127.91
d. Catawba	250	6.3	1521.26	53.74
e. Concord	200	6.65	1518.78	-188.78

The grape berry moth attacks the fruit. The actual yield loss generally is small, but if not controlled, damage from those pest may result in unacceptable crop quality to the processor. Climbing cutworms may reduce yields by destroying the buds. While this insect is often present, infestation levels are not always high, and can be controlled with insecticides. Grape scale has been a major insect problem in the past, but it has not been a problem since the drought of 1980. However, grape scale should be monitored, and of the population builds up in the vineyard, control measures should be implemented. Grape root borer can attack the root system and vine and, if not controlled, reduce vigor and stand to the point that the vineyard is no longer and economic enterprise.

The means for effectively controlled grape diseases are provided by fungicides. Cooperative Extension leaflets provide recommendations for selection of materials and timing of application. County Extension agents can help in developing a spray schedule if the one printed along with each year's budget is not applicable to an individual situation. The sequence and timing of pesticide application that are given in this

report were suggested by Agricultural Experiment Station and Wine industry representatives and should apply to a broad range of grape growers.

There are many possible combinations available from the figures in Table 1, 2, and 3. The data should serve to point out that returns from good management are often in proportion to the hazards in production. Chardonnay and Cabernet Sauvignon produce the greatest net returns, but, of the cultivars examined in this study, are the most difficult to produce. Increased risks on investment may be reflected in the potentially high but variable returns from a specific wine grape vineyard enterprise. Severe pest damage could lower returns disastrously, as quality standards are critical. Weather conditions could reduce the value of an otherwise excellent crop through prohibiting harvest during the optimum stages or physical damage to the fruit.

Variety selection is a critical management decision when establishing a new wine-grape vineyard. Once establishment costs have been incurred, the manager will be locked into producing the chosen variety as long as the vineyard is productive. This will usually span 26 seasons or Years 5 through 30 of vineyard life.

Based on the 1987 price structure for wine grapes (Table 2), those varieties with the lowest returns per acre would seem to be the least likely to be selected for a new wine-grape vineyard. for example, Concord, Villard blanc, Villard noir, and Catawba showed the lowest revenue in terms of 1987 costs and market prices. However, some evaluation of trends in supply, demand and prices should considered. As a case in point, the competing demand for concord grapes (for juice) has a direct influence on wine-grape prices. With the juice price increasing to approximately \$240 per ton in the 1987 season, some wineries reported they were forced to pay more than \$200 per ton for concord grapes purchased for wine. Other wineries reported that they had to pay in excess of \$250/ton for Catawba, another increase from the prices quoted in Table 2. Because the price structure estimates were made while the study was in preparation, similar variations are possible for individual situations where actual supply/demand conditions were changed from those which were expected.

Selling prices that growers receive for wine type grapes will depend on the demand and supply of the final product. Grower prices used in the budgets listed in Table 2 reflected what had most recently been offered by Arkansas wineries. However, these prices are illustrative only and are not projections of future prices. Returns such as those in Table 2 would be maintained as long as resource costs and market prices are either constant or continue in the same relationship as in this report. If prices received by growers are lower than estimated or if costs increase, the structure of net returns would change.

**Factors Influencing Production** The Concord *Vitis labrusca* L. cultivar has proven to be best adapted to the climatic region of Northwest Arkansas. Concord grapes will not ripen properly or uniformly in the warmer regions of the state.

The French-American Hybrid cultivars fit somewhere in between the *Vitis vinifera* and the *Vitis labrusca* species in terms of their susceptibility to winter injury and ability to adapt to the various climatic regions of Arkansas. At the present time, the majority of the wine-grape acreage in Arkansas is planted to the French-American Hybrids.

Cynthiana, *Vitis aestivalis*, is native to Arkansas and is adapted to most regions of the state. One of the major limiting factors of the production of this species has been extremely low yields (around 2 tons/acre). However, recent research on Cynthiana at the Agricultural Experiment Station has shown that yields can be obtained in the 4 to 6 ton range. These new findings make the production of this grape more attractive to the grower.

Major differences in topography and climate exist across Arkansas. The winter weather in Arkansas can change from mild to extremely cold. The fluctuations in temperature can result in serious injury to wine-grape cultivars of the *Vitis vinifera* species and tender French-American Hybrids. The hardiest of these cultivars can be successfully grown only in the best microclimates. While the greatest returns per acre were projected for the *Vitis vinifera* species, the limitations of adaptability restricts the potential for production of this species.

Independent growers who are considering establishing new wine-grape vineyards may want to consider negotiating long term marketing contracts with local wineries. If a contract agreement can be made to establish a range in prices and quantities of acceptable quality, some degree of insurance can be provided to the grower for recovering vineyard investments and making a profitable return. Contracting may be one way of minimizing the mutual dependency risks of the grower looking for a profitable market and the winery processor looking for a stable supply of quality wine grapes.

**Summary** Consideration of the risks involved must precede an investment in wine grape vineyards. As it can be readily determined from Table 1, there are substantial establishment costs for wine-grape vineyards. When selecting a cultivar, expecting returns, breakeven yields and prices must certainly be weighed against establishment costs. When all influencing factors have been carefully considered, data in this study will be a useful aid in evaluating returns from the various wine grape cultivars when planted in their recommended viticultural areas.

TABLE 3: Irrigated Wine Grape Cultivars: Breakeven Points, 1987.

	Breakeven Points*	
	Price	Yield
<b>GROUP 1</b>		
<i>Vitis Vinifera</i>		
Cultivars		
a. Pinot		
Chardonnay	\$437.00	1.71
b. Cabernet		
Sauvignon	456.00	2.17
c. White Riesling	415.00	3.47
<b>GROUP 2</b>		
French-American		
Hybrid Cultivars		
a. Vignoles	\$343.00	3.27
b. Chambourcin	277.00	4.12
c. Vidal and Seyval	322.00	4.22
d. Chancellor	284.00	4.94
e. Villard noir	333.00	5.55
f. Villard blanc	225.00	9.25
<b>GROUP 3</b>		
<i>Vitis labrusca</i> and		
<i>Vitis aestivalis</i>		
Cultivars		
a. Cynthiana	\$342.00	1.99
b. Niagara	215.00	5.95
c. Delaware	277.00	4.90
d. Catawba	242.00	6.04
e. Concord	229.00	7.99
*Breakeven formula:		
Yield = $\frac{\text{Costs (pro rata for harvesting)}}{\text{selling price per unit harvest cost}}$		
Price = $\frac{\text{total cost}}{\text{yield}}$		