

Economics of Midwestern Grape Production

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In recent years, the increase in the number of farm wineries and in the public's acceptance of locally produced wines has brought about a renewed interest in winegrape production in the Midwest. This interest is being fed by a number of factors. Wineries are purchasing locally produced fruit more frequently, providing grape growers with good marketing opportunities. Also, grapes can be a viable alternative when some other fruit crops become uneconomical due to low prices and high costs of production, and provide diversification to existing farm operations. Additionally, some states restrict the importation of out-of-state fruit for winemaking. Although this means that wine production is limited by the availability of grapes produced in the state, it can improve the market for in-state growers.

The renewed interest in grape production has generated many questions about the economics of vineyard establishment and grape production. While winegrape production can be economically viable in the Midwest, to be successful, grape growers must make sound decisions from initial planning through harvest and sale of fruit. The establishment of a commercial vineyard requires a substantial capital investment. Normally, seven to 10 years are required to recover the cost of this investment. Thus, only serious growers who operate the vineyard as a business enterprise can expect financial success.

This publication provides enterprise budgets for a typical 10-acre vineyard. The budgets are based on costs experienced by growers using standard production practices, but many factors can affect actual costs. The values given should be considered averages. The budgets were adapted from *The Cost of Growing Winegrapes in Virginia*, by D.H. Vaden and T.K. Wolf, publication 463-006, Virginia Cooperative Extension Service, 1994. Adjustments have been made to vine costs, trellis design, crop value, and cultural practices to reflect the cost of producing French hybrid rather than vinifera cultivars.

Economic Overview

Vineyard establishment and operating costs can vary significantly within a region due to differences in cost for land, labor, machinery, and materials. The costs will also be affected by the vineyard site, grape cultivar, vine spacing, training system, pest management, and other cultural practices. The main costs during vineyard establishment are land, land preparation, labor, grapevines, trellis materials, pest management materials, and debt on loans. Additionally, irrigation, deer fencing, and major land preparation such as clearing, leveling, terracing, and drainage tiling can greatly increase the cost of establishment. The added expenses of land improvement, however, will

usually result in earlier and more consistent fruit production, bringing an earlier return on the investment.

Production costs must be considered in addition to establishment costs. Production costs can vary according to cultivar, training system, yield, fruit quality, etc. A new grower should carefully consider the advantages and disadvantages of site selection and cultivar selection because of the impact these decisions have on the profitability of the planting.

Knowing the establishment and production costs is not enough to make an educated decision to undertake grape production. The potential profitability must also be considered. Vineyard profitability is directly related to grape prices and yield. Yield is a function of site, soils, cultivar, vineyard management, and so on. Grape price is not only a function of the current market, but also reflects the grower's ability to market the grapes. Proper vineyard management and site characteristics that improve fruit quality can enhance the value of the grapes, as most midwestern wineries are interested in producing premium wine rather than bulk wine. Appellation of production is also an important characteristic for some wineries and can increase the value of the grapes. Growers must aggressively market their crop for maximum profitability.

Establishment and production budgets

A number of general assumptions were made in developing the following budgets.

- 1) The costs are based on a 10-acre vineyard planted on a good-to-excellent site to own-rooted French hybrid grapevines that are adapted to the region.
- 2) Vines are planted 8 feet apart in rows 10 feet wide, for a total of 545 vines per acre.
- 3) Row length is approximately 400 feet. Shorter rows would result in slightly greater costs, while longer rows would result in slightly reduced costs.
- 4) The trellis is a standard two-wire system for bi-lateral cordon training. Line posts are spaced 24 feet apart in the row, and end posts are anchored at each end with screw-in anchors. Line posts are 3 inches x 8 feet, and end posts are 6 inches x 9 feet. All posts are CCA treated timber. Wire is 12-1/2 gauge high-tensile wire.
- 5) The vineyard floor is managed as grass row middles and herbicide strips under the row.
- 6) Labor cost is calculated at \$7.50 per hour. Time required to complete the tasks will vary and the times listed are considered averages.
- 7) All machinery and equipment expenses reflect *operating costs only*; no charges have been included for ownership items such as insurance, taxes, or depreciation/capital recovery.
- 8) Fixed costs for ownership of land are *not included* in this budget.
- 9) Accumulated costs are financed at 8% annual percentage rate. Interest on annual operating costs is computed at 8% APR for six months.
- 10) Fruit production begins in year 3 at approximately 1/2 the full crop potential, and reaches full production in year 4. Fruit is hand harvested at a cost of \$100/ton.

Table 1: Cost of vineyard establishment per acre.

| Establishment (Year 1) | | | | | |
|--|------------------------|----------------------|------------------------|-----------------------|--------------------------|
| Operation | Hours/ acre | Unit Cost | Units/ acre | Cost/ acre | Your Estimate |
| Site Preparation | | | | | |
| Liming - 3 tons/acre | | 16.00 | 3 | 48 | _____ |
| Plow & disk - labor | 3.0 | 7.50 | | 23 | _____ |
| Sow cover crop - labor | 1.0 | 7.50 | | 8 | _____ |
| Cover crop seed | | 0.68 | 50 | 34 | _____ |
| Vineyard Layout | | | | | |
| Mark vine & post locations | 5.0 | 7.50 | | 38 | _____ |
| Planting | | | | | |
| Vines | | 2.00 | 545 | 1090 | _____ |
| Auger vine holes (two men @ 3 min/hole) | 54.5 | 7.50 | | 409 | _____ |
| Planting (2 min/vine) | 18.2 | 7.50 | | 136 | _____ |
| Trellising Materials | | | | | |
| 3 in x 8 ft CCA-treated line-posts | | 3.50 | 187 | 654 | _____ |
| 6 in x 9 ft CCA-treated end-post | | 10.00 | 22 | 220 | _____ |
| 12.5 ga. HT wire (4,000 ft per roll) | | 60.00 | 2.5 | 150 | _____ |
| End-post anchors (5/8 in x 40 in helical end) | | 4.00 | 22 | 88 | _____ |
| In-line ratchet wire strainers for cordon wires | | 2.00 | 11 | 22 | _____ |
| Wirewise wire strainers for trunk support wires | | 1.50 | 11 | 17 | _____ |
| Staples (28 lb.) and wire crimping sleeves (44) | | | | 31 | _____ |
| Trellising Labor | | | | | |
| Distribute & drive line posts (2 men @ 3 min/post) | 18.7 | 7.50 | | 140 | _____ |
| Auger & set end-posts | 6.0 | 7.50 | | 45 | _____ |
| Mark & drill end-posts for wirevises | 3.0 | 7.50 | | 23 | _____ |
| Mark post for wires | 2.0 | 7.50 | | 15 | _____ |
| Install end-post anchors | 5.0 | 7.50 | | 38 | _____ |
| String wire, staple to posts, & tighten | 15.0 | 7.50 | | 113 | _____ |
| Weed Control | | | | | |
| Post-emergent application prior to planting | | 44.04 | 0.17 | 7 | _____ |
| Pre-emergent application after planting | | 64.00 | 0.33 | 21 | _____ |
| Herbicide application labor | 2.0 | 7.50 | | 15 | _____ |
| Mowing row middles (6 times) | 4.0 | 7.50 | | 30 | _____ |
| Hoing/weeding labor (2 times) | 30.0 | 7.50 | | 225 | _____ |
| Fertilization | | | | | |
| Ammonium nitrate(0.25 lb. per vine) | | 0.14 | 136 | 19 | _____ |
| Hand application of fertilizer | 2.0 | 7.50 | | 15 | _____ |
| Canopy Management (training) | | | | | |
| Bamboo/wood stakes for trunk support | | 0.25 | 545 | 136 | _____ |
| Shoot thinning & tying to stakes (twice) | 20.0 | 7.50 | | 150 | _____ |
| Tie materials | | | | 5 | _____ |
| Flower cluster removal | 2.0 | | | 15 | _____ |
| Disease & Insect Control | | | | | |
| Spray materials (Table 5) | | | | 109 | _____ |
| Spray labor (6 sprays @ 0.5 hr/spray) | 3.0 | 7.50 | | 23 | _____ |
| Machinery | | | | | |
| Cash operating expenses only (Table 3) | | | | 578 | _____ |
| Operating Interest | | | | | |
| Interest charged on yearly cash expenses for 1/2 yr. | | 1/2 yr. @ 8.00% | 4690 | 188 | _____ |
| Annual Cash Expenses - Year 1 | | | | 4878 | _____ |

Table 1. (con't) Cost of vineyard establishment per acre.

| Establishment (Year 2) | | | | | |
|---|------------------------|----------------------|------------------------|-----------------------|--------------------------|
| Operation | Hours/ acre | Unit Cost | Units/ acre | Cost/ acre | Your Estimate |
| Dormant Pruning | | | | | |
| Pruning & tying canes for trunks | 10.0 | 7.50 | | 75 | _____ |
| Weed Control | | | | | |
| Pre-emergent application in spring | | 64.00 | 0.33 | 21 | _____ |
| Spot treatment with post-emergent | | 44.04 | 0.08 | 4 | _____ |
| Total herbicide application labor | 2.0 | 7.50 | | 15 | _____ |
| Mowing row middles (6 times) | 4.0 | 7.50 | | 30 | _____ |
| Fertilization | | | | | |
| Ammonium nitrate(0.5 lb. per vine) | | 0.14 | 250 | 35 | _____ |
| Hand application of fertilizer | 2.0 | 7.50 | | 15 | _____ |
| Replanting | | | | | |
| Plants (2% of initial planting) | | 2.00 | 11 | 22 | _____ |
| Replanting labor | 1.0 | 7.50 | | 8 | _____ |
| Canopy Management (training) | | | | | |
| Shoot thinning & tying to stakes (twice) | 30.0 | 7.50 | | 225 | _____ |
| Flower cluster removal | 8.0 | 7.50 | | 60 | _____ |
| Tie materials | | | | 5 | _____ |
| Disease & Insect Control | | | | | |
| Spray materials (Table 5) | | | | 200 | _____ |
| Spray labor (10 sprays @ 0.5 hr./spray) | 5.0 | 7.50 | | 38 | _____ |
| Machinery | | | | | |
| Cash operating expenses only (Table 3) | | | | 217 | _____ |
| Operating Interest | | | | | |
| Interest charged on yearly cash expenses for 1/2 yr. | | 1/2 yr. @ 8.00% | 970 | 39 | _____ |
| Interest on Year 1 Accrued Cash Expense | | 8.00% | 4878 | 390 | _____ |
| Annual Cash Expenses - Year 2 | | | | 1399 | _____ |
| Total Accumulated Cash Expense (Years 1 & 2) | | | | 6277 | _____ |

Table 1. (con't) Cost of vineyard establishment per acre.

| Establishment (Year 3) | | | | | |
|--|------------------------|----------------------|------------------------|-----------------------|--------------------------|
| Operation | Hours/ Acre | Unit Cost | Units/ Acre | Cost/ Acre | Your Estimate |
| Dormant Pruning | | | | | |
| Spur pruning and brush pulling | 20.0 | 7.50 | | 150 | _____ |
| Cordon training/tying | 20.0 | 7.50 | | 150 | _____ |
| Weed Control | | | | | |
| Pre-emergent application in spring ¹ (oryzalin) | | 64.00 | 0.33 | 21 | _____ |
| (simazine) | | 2.85 | 1.0 | 3 | _____ |
| Spot treatment with post-emergence herbicide | 2.0 | 44.04 | 0.08 | 4 | _____ |
| Total herbicide application labor | 4.0 | 7.50 | | 15 | _____ |
| Mowing row middles (6 mowings) | | 7.50 | | 30 | _____ |
| Fertilization² | | | | | |
| Ammonium nitrate(0.5 lb. per vine) | | 0.14 | 250 | 35 | _____ |
| Spreading fertilizer | 0.5 | 7.50 | | 4 | _____ |
| Leaf petiole sampling | 0.3 | 7.50 | | 2 | _____ |
| Tissue analysis | | | | 20 | _____ |
| Canopy Management (training) | | | | | |
| Shoot and cluster thinning | 15.0 | 7.50 | | 113 | _____ |
| Shoot positioning | 10.0 | 7.50 | | 75 | _____ |
| Tie materials | | | | 5 | _____ |
| Disease & Insect Control | | | | | |
| Spray materials (Table 5) | | | | 287 | _____ |
| Spray Labor (12 sprays @ 0.5 hr.. per spray) | 6.0 | 7.50 | | 45 | _____ |
| Harvest Costs³ | | | | | |
| Picking costs (\$1.25 / 25 lb. lug for 2.5 tons/acre) | | 1.25 | 200 | 250 | _____ |
| Grape lugs | | 4.00 | 200 | 800 | _____ |
| Machinery | | | | | |
| Cash operating expenses only (Table 3) | | | | 254 | _____ |
| Operating Interest | | | | | |
| Interest charged on yearly cash expenses for 1/2 yr. | | 1/2 year @ 8.00% | 2263 | 91 | _____ |
| Interest on Year 2 Accrued Cash Expense | | 8.00% | 6277 | 502 | _____ |
| Annual Cash Expense - Year 3 | | | | 2856 | _____ |
| Total Accumulated Cash Expense (Years 1 - 3) | | | | 9133 | _____ |
| Income⁴ | | 500 | 2.5 | 1250 | _____ |
| Net Investment at End of Year 3 | | | | 7883 | _____ |

¹ Oryzalin and simazine may be used separately or in combination from year 3 on. Costs shown are for combination.

² The need for a particular nutrient fertilizer is best determined through visual assessment of vines and by routine leaf petiole sampling for nutrient analysis. Fertilizer costs will vary depending upon the particular needs of your vines. A single tissue sample may suffice for an entire 10-acre planting.

³ Harvest costs include purchase of 1/2 the total number of lugs needed to harvest the expected full crop yield of 5 tons/acre, and harvest costs of \$1.25 per 25 lb. lug, or \$100 per ton. Expected yield in year 3 is 1/2 expected full crop yield.

⁴ Income based on harvest of 2.5 tons of grapes and a price of \$500/ton.

Table 2. Cost of vineyard production per acre.

| Production (Year 4) | | | | | |
|--|------------------------|----------------------|------------------------|-----------------------|--------------------------|
| Operation | Hours/ Acre | Unit Cost | Units/ Acre | Cost/ Acre | Your Estimate |
| Dormant Pruning | | | | | |
| Spur pruning and brush pulling | 20.0 | 7.50 | | 150 | _____ |
| Cordon training/tying | 5.0 | 7.50 | | 38 | _____ |
| Weed Control | | | | | |
| Pre-emergent application in spring ¹ (oryzalin) | | 64.00 | 0.33 | 21 | _____ |
| (simazine) | | 2.85 | 1.0 | 3 | _____ |
| Spot treatment with post-emergence herbicide | 2.0 | 44.04 | 0.08 | 4 | _____ |
| Total herbicide application labor | 4.0 | 7.50 | | 15 | _____ |
| Mowing row middles (6 mowings) | | 7.50 | | 30 | _____ |
| Fertilization² | | | | | |
| Ammonium nitrate(0.5 lb. per vine) | | 0.14 | 250 | 35 | _____ |
| Spreading fertilizer | 0.5 | 7.50 | | 4 | _____ |
| Leaf petiole sampling | 0.3 | 7.50 | | 2 | _____ |
| Tissue analysis | | | | 20 | _____ |
| Canopy Management (training) | | | | | |
| Shoot and cluster thinning | 15.0 | 7.50 | | 113 | _____ |
| Shoot positioning | 10.0 | 7.50 | | 75 | _____ |
| Tie materials | | | | 5 | _____ |
| Disease & Insect Control | | | | | |
| Spray materials (Table 5) | | | | 287 | _____ |
| Spray Labor (12 sprays @ 0.5 hr.. per spray) | 6.0 | 7.50 | | 45 | _____ |
| Harvest Costs³ | | | | | |
| Picking costs (\$1.25 / 25 lb. lug for 5 tons/acre) | | 1.25 | 400 | 500 | _____ |
| Machinery | | | | | |
| Cash operating expenses only (Table 3) | | | | 279 | _____ |
| Operating Interest | | | | | |
| Interest charged on yearly cash expenses for 1/2 yr. | | 1/2 yr. @ 8.00% | 1626 | 65 | _____ |
| Interest on Year 2 Accrued Cash Expense | | 8.00% | 7883 | 631 | _____ |
| Annual Cash Expense - Year 4 | | | | 2322 | _____ |
| Total Accumulated Cash Expense (Years 1 - 4) | | | | 10205 | _____ |
| Income⁴ | | 500 | 5 | 2500 | _____ |
| Net Investment at End of Year 4 | | | | 7705 | _____ |

¹ Oryzalin and simazine may be used separately or in combination from year 3 on. Costs shown are for combination.

² The need for a particular nutrient fertilizer is best determined through visual assessment of vines and by routine leaf petiole sampling for nutrient analysis. Fertilizer costs will vary depending upon the particular needs of your vines. A single tissue sample may suffice for an entire 10-acre planting.

³ Harvest costs of \$1.25 per 25 lb. lug, or \$100 per ton. Expected yield in year 4 and beyond is 5 tons/acre.

⁴ Income based on harvest of 5 tons of grapes and a price of \$500/ton.

Table 2. (con't) Cost of vineyard production per acre.**Production (Year 5)**

| Operation | Unit Cost | Units/Acre | Cost/Acre | Your Estimate |
|---|------------------|-------------------|------------------|----------------------|
| Management Expense - (Similar to Year 4, including interest on yearly cash expenses for 1/2 yr.) | | | 1691 | _____ |
| Interest on Accrued Investment | 8.00% | 7705 | 616 | _____ |
| Annual Cash Expense - Year 5 | | | 2307 | _____ |
| Total Accumulated Cash Expense | | | 10012 | _____ |
| Harvest Income 5 ton/A yield | 500 | 5 | 2500 | _____ |
| Net Investment at End of Year 5 | | | 7512 | _____ |

Production (Year 6)

| Operation | Unit Cost | Units/Acre | Cost/Acre | Your Estimate |
|---|------------------|-------------------|------------------|----------------------|
| Management Expense Similar to Year 4 | | | 1691 | _____ |
| Interest on Accrued Investment | 8.00% | 7512 | 601 | _____ |
| Annual Cash Expense - Year 6 | | | 2292 | _____ |
| Total Accumulated Cash Expense | | | 9804 | _____ |
| Harvest Income 5 ton/A yield | 500 | 5 | 2500 | _____ |
| Net Investment at End of Year 6 | | | 7304 | _____ |

Production (Year 7)

| Operation | Unit Cost | Units/Acre | Cost/Acre | Your Estimate |
|--|------------------|-------------------|------------------|----------------------|
| Management Expense Similar to Year 4 | | | 1691 | _____ |
| Interest on Accrued Investment Minus Year 6 Crop Sale | 8.00% | 7304 | 584 | _____ |
| Annual Cash Expense - Year 7 | | | 2275 | _____ |
| Total Accumulated Cash Expense | | | 9579 | _____ |
| Harvest Income 5 ton/A yield | 500 | 5 | 2500 | _____ |
| Net Investment at End of Year 7 | | | 7079 | _____ |

Cost analysis can be continued in this manner each year. According to this budget, the costs of establishment would not be fully recovered until year 23. See Tables 7a and 7b for comparisons of different prices and yields.

Economics of vineyard establishment

Variable Costs

Variable costs are those that change directly with increases or decreases in acreage. Examples are grapevines, trellis material, pesticides, fertilizer, labor, and machinery operating expenses. Enterprising growers can reduce establishment costs by finding alternative sources of trellis materials, producing their own plants, and planning carefully to increase labor efficiency.

Labor represents 30% or more of the cost of vineyard establishment, depending on the amount of mechanization available, management skills, and quality of the labor pool (Table 6). The lack of skilled labor or specialized equipment often discourages the average grower. In less traditional grape growing areas such as the Midwest, skilled labor and knowledgeable consultants are sometimes difficult to find. Materials (vines, trellis materials, etc.) represent 45% of the cost of vineyard establishment. Equipment operating expenses, which include fuel, oil, and repairs for each piece of equipment represent about 11% of the cost of vineyard establishment.

Fixed Costs

Fixed, or overhead costs are those that do not change directly with increases or decreases in acreage. Fixed costs include machinery overhead, interest on land investment, and taxes. This enterprise budget does not include overhead costs for land and machinery ownership because these costs can be highly variable. Growers should evaluate their farm situations and decide whether to consider fixed costs as part of the total costs for decision-making purposes.

Interest on land investment and taxes would be about \$200 per acre per year based on 8 to 10% interest on investment of \$1,000 per acre. Overhead costs on machinery include depreciation, interest on investment, and insurance and housing costs. Major factors considered in figuring equipment costs are initial cost, salvage value, years of life, annual use, repair costs, insurance, interest, and operating expenses such as for fuel and oil. Interest, insurance, and housing equal 12.7% of average value. Machinery ownership costs could be approximately \$1,000 per acre per year for a 10-acre vineyard (Table 4).

Equipment ownership costs can vary greatly depending on the particular circumstances of the operation. A diversified fruit farm that has all necessary equipment available will have low equipment costs for vineyard establishment. However, a grower who is starting from scratch will need, at the least, a tractor, mower, and sprayer(s), which will require a significant investment in equipment. Because equipment costs are relatively high, it may be uneconomical to start a vineyard of fewer than five acres unless other crops are grown on the farm.

Economics of vineyard production

Allocation of yearly operating expenses

Labor costs represent about 60% of the annual cost of producing grapes once grapes are in

production and the costs of establishment are recovered. Until costs of establishment are recovered, interest on accumulated expenses represents about 30% of the annual cost of production. After costs of establishment are recovered interest on annual operating expenses represent only 2% of the annual production budget. Equipment operating expenses represent about 17% of the annual production budget. Materials (fertilizer and pest control materials) represent about 23% of the annual production costs. (Table 6).

Table 3. Cost of machinery operation per hour and per acre.

| Machine | Cost/ hour | Cost/acre for first 8 years | | | |
|-------------------------------------|---------------|-----------------------------|-------|-------|-------|
| | | 1 | 2 | 3 | 4-8 |
| Tractor, 35-50 hp | 4.05 | 345.1 | 56.7 | 87.9 | 108.1 |
| Pickup truck (cost/mile) | 0.29 | 145.0 | 145.0 | 145.0 | 145.0 |
| Herbicide sprayer, 50 gal | 1.27 | 2.5 | 2.5 | 1.3 | 1.3 |
| Post driver | 1.20 | 13.4 | | | |
| Airblast sprayer, 100 gal | 2.82 | 8.5 | 11.3 | 16.1 | 16.1 |
| Mower/brush chopper, 6 ft | 0.63 | 1.3 | 1.3 | 1.3 | 1.3 |
| Fertilizer & seed spreader | 1.44 | 0.7 | | | |
| Auger, 12 inch | 1.12 | 52.6 | | | |
| Wagon/trailer, 5 ft x 12 ft flatbed | 0.58 | 8.7 | | 2.9 | 7.0 |
| Total machinery cash expense: | | 577.8 | 216.8 | 254.4 | 278.7 |

Table 4. Machinery purchase cost, cost of operation, and anticipated annual hourly use.

| Machine | Initial cost | Cost/ hour | Hours /year | | | |
|--------------------------------------|-----------------|---------------|-------------|-------|-------|-------|
| | | | 1 | 2 | 3 | ≥4 |
| Tractor, 35-50 hp | 20,000 | 4.05 | 85.2 | 14.0 | 21.7 | 26.7 |
| Pickup truck (cost/mile & miles/yr.) | 18,500 | 0.29 | 500.0 | 500.0 | 500.0 | 500.0 |
| Herbicide sprayer, 50 gal | 2,125 | 1.27 | 2.0 | 2.0 | 1.0 | 1.0 |
| Post driver | 1,500 | 1.20 | 11.2 | | | |
| Airblast sprayer, 100 gal | 6,000 | 2.82 | 3.0 | 4.0 | 5.7 | 5.7 |
| Mower/brush chopper, 6 ft | 1,700 | 0.63 | 2.0 | 2.0 | 2.0 | 2.0 |
| Fertilizer & seed spreader | 1,800 | 1.44 | 0.5 | | | |
| Auger, 12 inch | 1,400 | 1.12 | 47.0 | | | |
| Wagon/trailer, 5 ft x 12 ft flatbed | 1,575 | 0.58 | 15.0 | | 2.9 | 7.0 |
| Total machinery purchase expense: | \$54,600 | | | | | |

Machinery capital recovery:

Machinery investment is financed at 8% for seven years: $\$54,600 \times 0.1921^Z = \$10,489$

Annual cost per acre (10 acre vineyard): $\$10,489/10 \text{ acres} = \$1,049$

^Z 0.1921 is the Capital Recovery Factor for the financing terms specified above.

Table 5. Cost of pesticide program by year.

| Spray material | Units | Cost/ unit | Units sprayed/ acre | Year 1 | | Year 2 | | Year >3 | |
|-----------------------------------|-------|---------------|---------------------------|-----------------|---------------|-----------------|---------------|-----------------|---------------|
| | | | | Sprays/ year | Cost/ acre | Sprays/ year | Cost/ acre | Sprays/ year | Cost/ acre |
| Fungicides | | | | | | | | | |
| mancozeb | lb. | 2.35 | 3.0 | 2.0 | 14.10 | 5.0 | 35.25 | 5.0 | 35.25 |
| captan | lb. | 2.10 | 4.0 | 2.0 | 16.80 | 4.0 | 33.60 | 4.0 | 33.60 |
| sulfur | lb. | 0.19 | 3.0 | 2.0 | 1.14 | 5.0 | 2.85 | 5.0 | 2.85 |
| copper | lb. | 2.50 | 2.0 | 2.0 | 5.00 | 2.0 | 5.00 | 2.0 | 5.00 |
| triadimefon | oz. | 3.09 | 4.0 | 2.0 | 24.75 | 3.0 | 37.13 | 3.0 | 37.13 |
| ferbam | lb. | 1.90 | 3.0 | 1.0 | 5.70 | 2.0 | 19.62 | 2.0 | 19.62 |
| iprodione | lb. | 20.00 | 1.0 | | | | | 3.0 | 60.00 |
| myclobutanil | oz. | 3.50 | 4.0 | | | 2.0 | 28.00 | 2.0 | 28.00 |
| Insecticides | | | | | | | | | |
| phosmet | lb. | 3.95 | 2.0 | 2.0 | 15.80 | 2.0 | 15.80 | 2.0 | 15.80 |
| carbaryl | lb. | 3.15 | 4.0 | 2.0 | 25.20 | 2.0 | 25.20 | 2.0 | 25.20 |
| azinphosmethyl | lb. | 6.80 | 2.0 | | | | | 2.0 | 27.20 |
| Fungicide / Insecticide Sub Total | | | | | 108.49 | | 199.45 | | 286.65 |
| Herbicides | | | | | | | | | |
| glyphosate | gal | 44.04 | 0.17 | 1.0 | 7.34 | 0.08 | 3.67 | 0.08 | 3.67 |
| simazine | lb. | 2.85 | 0.9 | | | | | 1.0 | 2.85 |
| oryzalin | gal | 64.00 | 0.3 | 1.0 | 21.33 | 1.0 | 21.33 | 1.0 | 21.33 |
| Herbicide Sub Total | | | | | 28.67 | | 25.00 | | 27.85 |
| Total per year | | | | | 137.16 | | 224.45 | | 314.50 |

The fungicide and insecticide spray program is based on a 7- to 10-day spray interval which begins at 3 inch shoot growth and continues until 2 weeks after bloom, then extends to 14 days for the rest of the growing season. The actual number of sprays needed will vary according to the relative susceptibility of the cultivar and the climatic conditions from year to year. Spray intervals are extended in the first two years due to the absence of fruit. The grower must be able to identify disease and insect pests and thoroughly understand pest management principles to efficiently use pesticides.

Table 6. Allocation of yearly operating expenses.

| Year | Labor Hours | Labor Cost | Materials | Equipment operation | Interest on expenses | Total |
|------------------|--|---------------|-----------|------------------------|-------------------------|-------|
| 1 | 194 hr. | 1455 | 2651 | 578 | 194 | 4878 |
| 2 | 62 hr. | 465 | 287 | 217 | 430 | 1399 |
| 3 | 78 hr. + \$250 harvest costs | 835 | 1172 | 254 | 593 | 2856 |
| | % during establishment | 30% | 45% | 11% | 13% | |
| 4 | 63 hr. + \$500 harvest costs | 988 | 384 | 279 | 696 | 2322 |
| 5 | 63 hr. + \$500 harvest costs | 988 | 384 | 279 | 656 | 2307 |
| 6 | 63 hr. + \$500 harvest costs | 988 | 384 | 279 | 641 | 2292 |
| . | . | . | . | . | . | . |
| . | . | . | . | . | . | . |
| . | . | . | . | . | . | . |
| Yr. ^Z | % after establishment costs are recovered | 58% | 23% | 17% | 2% | 1691 |

^Z Year of establishment costs recovery depends on yield and price per ton. (Tables 7a & 7b)

Budget summary and discussion

Based on the budget presented, the costs of establishment for French hybrid wine grapes is about \$8,000 per acre accumulated over a 3 year period (Table 1). Costs of establishment for *V. vinifera* grapes is about \$10,000 per acre accumulated over a 3 year period because of the increased cost of vines and trellis materials.

In this budget, the establishment costs do not include fixed costs for land investment, interest and taxes on land, or the cost of machinery ownership. However, these costs should be considered by the potential grower. Many factors can influence the impact of land and equipment costs, depending on the particular circumstances of the grower. Each situation should be evaluated to determine whether to consider these fixed costs in the decision-making process. For instance, a grower with an 80 acre diversified fruit farm might consider machinery ownership costs a minor concern, in that most or all of the equipment necessary for grape production is already owned. The cost of ownership and operation are spread across all crops on the farm, having minimal impact on any one crop. On the other hand, a new grower interested in purchasing land and equipment for the sole purpose of growing grapes would need to consider land costs and machinery ownership costs in order to determine the economic feasibility of the operation.

Labor is one of the most variable of costs. A well-organized, trained, and managed crew can efficiently plant vines, install trellis, prune vines, and harvest fruit. Use of a transplanter can greatly reduce establishment labor costs compared to hand planting in augured holes. Use of mechanical pruning, shoot positioning, and harvest greatly reduce labor costs. Overall, careful planning and use of as much mechanization as possible can improve efficiency and reduce labor costs during establishment and production. Growers of other fruit or vegetable crops may find that peak labor demands for grapes occur when other crops do not need the labor, increasing the efficiency of the labor pool on a diversified farm.

There are several decisions that can affect establishment costs. For instance, grafted vines cost 2-3 times more than own-rooted vines, increasing cash expenses by \$800-1000 per acre. Wire and trellis hardware costs for a simple two-wire trellis are approximately \$500 less per acre than for a seven-wire trellis for vertically shoot-positioned vines. Poor site preparation will increase management costs and delay the onset of production, leading to higher interest expenses and a longer cost recovery period.

Cultivar selection can have a significant impact on establishment and production costs. Relative susceptibility to diseases can greatly influence the cost of disease management, yield, and fruit quality. Cultivars that require shoot and cluster thinning, shoot positioning, and leaf removal are much more expensive to produce because of the extra labor needed to perform these operations. Consistency of production is another important aspect of cultivars. In the Midwest, severe winters occasionally reduce the crop on all but the hardiest cultivars. Some cultivars, especially *vinifera*, are cold tender and will have reduced crops frequently, even if special measures are taken to protect the

vines from damage. These measures, such as hilling up in fall to protect the graft union and taking out in spring, are labor intensive and require special equipment. These additional costs must be figured into the cost of production. Years of reduced crops should be figured into the cost of production so that the prices received for the grapes accurately reflect the overall profitability on a sustainable basis.

Rate of return on investment is an important consideration. It can take from 7 to 23 years to recover the costs of establishment and begin making a profit on the vineyard (Tables 7a & 7b). Cash returns during production are based on grape yield and price received. A well-managed vineyard will come into production in year 3, and will reach full production beginning in year 4. When yields and prices are high, establishment cost recovery is relatively quick. However, when yields and/or prices are low, cost recovery can be beyond reasonable expectations.

The effects of increasing yield or price of grapes can be seen in Tables 7a and 7b. It takes 23 years to recover the costs of establishment and begin making a profit from a vineyard that yields 5 tons/acre when grapes are \$500/ton. In this scenario grape production is not economically viable. However, if prices are \$600/ton, costs of establishment are recovered in 12 years, and at \$700/ton costs are recovered in 9 years. Likewise as yield increases, time of cost recovery decreases. The main reason for the wide range in time to recover establishment costs is that, at the lower prices and yields, income barely covers the cost of production and interest on accumulated expenses, so principle on the loan is reduced very slowly.

If establishment costs are reduced by \$1,000 per acre, cost recovery will occur several years sooner than in the budget listed in Tables 7a and 7b. Likewise, if establishment costs are increased, cost recovery will take longer. When growers calculate production costs they must include the interest on accumulated expenses in order to determine the actual cost of production.

Table 7a. Economics of grape production at various prices per ton.

| Total Accumulated Cash Expense | | | | | |
|--|------------------|-------------------|-------------------|-------------------|---|
| French hybrids ¹ @ 5 t/a ¹ | | | | | <i>V. vinifera</i> ² @ 4 t/a |
| Year | \$500/ton | \$600/ton | \$700/ton | \$800/ton | \$1,250/ton |
| 1 | 4878 | 4878 | 4878 | 4878 | 7773 |
| 2 | 6277 | 6277 | 6277 | 6277 | 9651 |
| 3 | 7883 | 7629 | 7379 | 7129 | 10002 |
| 4 | 7705 | 6930 | 6160 | 5390 | 7701 |
| 5 | 7512 | 6175 | 4844 | 3512 | 5216 |
| 6 | 7304 | 5360 | 3423 | 1484 | 2532 |
| 7 | 7079 | 4480 | 1888 | (706) 1st net | (366) 1st net |
| 8 | 6836 | 3529 | 230 | (2309) yearly net | (3101) yearly net |
| 9 | 6574 | 2502 | (1561) 1st net | | |
| 10 | 6291 | 1393 | (1809) yearly net | | |
| 11 | 5985 | 195 | | | |
| 12 | 5655 | (1098) 1st net | | | |
| 13 | 5298 | (1309) yearly net | | | |
| 14 | 4913 | | | | |
| 15 | 4497 | | | | |
| 16 | 4048 | | | | |
| 17 | 3563 | | | | |
| 18 | 3039 | | | | |
| 19 | 2473 | | | | |
| 20 | 1862 | | | | |
| 21 | 1202 | | | | |
| 22 | 489 | | | | |
| 23 | (281) 1st net | | | | |
| 24 | (809) yearly net | | | | |

¹Yearly cost of production in year 4 and beyond is estimated as \$1691/acre at 5 tons/acre for French hybrids and \$1899/acre at 4 tons/acre for vinifera. Hilling up soil in fall and taking out vines in spring adds to cost of production for vinifera.

²Vinifera establishment costs are higher due to higher prices for grafted plants (\$4), more plants per acre (726), higher wire and hardware costs for trellis (+\$500).

Table 7b. Economics of grape production at various yields when price is \$500/ton.

| Yearly cost of production year 4 and on including harvest costs¹ | | | | |
|--|---------------------------------------|--------------------|--------------------|--------------------|
| | 5 tons/acre | 6 tons/acre | 7 tons/acre | 8 tons/acre |
| | 1691 | 1795 | 1899 | 2003 |
| Year | Total Accumulated Cash Expense | | | |
| 1 | 4878 | 4878 | 4878 | 4878 |
| 2 | 6277 | 6277 | 6277 | 6277 |
| 3 | 7883 | 7681 | 7483 | 7285 |
| 4 | 7705 | 7090 | 6481 | 6374 |
| 5 | 7512 | 6452 | 5398 | 4887 |
| 6 | 7304 | 5763 | 4229 | 3281 |
| 7 | 7079 | 5019 | 2966 | 1546 |
| 8 | 6836 | 4216 | 1602 | (327) 1st net |
| 9 | 6574 | 3348 | 129 | (1997) yearly net |
| 10 | 6291 | 2411 | (1462) 1st net | |
| 11 | 5985 | 1399 | (1601) yearly net | |
| 12 | 5655 | 306 | | |
| 13 | 5298 | (875) 1st net | | |
| 14 | 4913 | (1205) yearly net | | |
| 15 | 4497 | | | |
| 16 | 4048 | | | |
| 17 | 3563 | | | |
| 18 | 3039 | | | |
| 19 | 2473 | | | |
| 20 | 1862 | | | |
| 21 | 1202 | | | |
| 22 | 489 | | | |
| 23 | (281) 1st net | | | |
| 24 | (809) yearly net | | | |

¹Yearly production costs from year 4 and beyond are \$1691/acre at 5 tons/acre, and are adjusted for increased harvest labor as yields increase, based on costs of \$100/ton plus 1/2 year interest at 8% APR.

Marketing and pricing grapes

Commercial wineries are the primary customer for winegrapes produced in the Midwest. Wineries influence the economics of the vineyard they buy grapes from by the prices they offer. Commercial grape growers should establish close working relationships with the wineries for whom they grow.

In order to be economically successful, growers must aggressively market grapes to get the highest price possible. Some wineries are willing to pay a premium for high quality grapes, or grapes grown to their specifications, or in a certain Viticultural Area (appellation). Some wineries may offer only the price quoted in other states or regions. Growers should keep accurate records to determine production costs per ton in order to determine the break even price for their grapes. Utilizing prices received in other states or regions is not a suitable method of estimating production costs and setting prices. Recent fresh grape prices in the region are shown in Table 8. Juice houses offer fresh grapes and juice. Juice prices generally include approximately \$150/ton crush and press charge. Delivery is not included.

Table 8. Approximate grape prices paid by wineries, 1993-1997.

| | Vidal | Seyval | Vignoles | Chambourcin | Foch | Concord |
|----------------------|---------|---------|----------|-------------|----------|---------|
| Indiana | 525-550 | 400-550 | 475-685 | | 450-600 | 400-550 |
| Ohio | 450-610 | 450-675 | | | | 190-230 |
| Pennsylvania | 550-700 | 550-800 | 700-780 | 700-1,000 | 750-1000 | 200-750 |
| Virginia | 500-700 | 500-700 | 500-700 | 500-750 | 500-700 | |
| Michigan | 400-600 | 475-600 | | 575-750 | | |
| New York | 275-500 | 275-450 | 450-575 | 400-800 | 300-400 | 240-275 |
| Ontario ¹ | 510-595 | 510-540 | | 640-750 | 600-705 | 275-415 |

¹Ontario prices in Canadian dollars per metric ton (2,204 lb.)

Grape prices have increased considerably over the past few years. This is primarily due to a shortage of grapes in many states and high demand from wineries. In states that have a long history of grape production, such as New York, grape prices are relatively low. This reflects the competition among a large number of growers, and the reduced cost of production for machine-harvested and machine-pruned vineyards. In addition, the cost of establishment has been recovered on older plantings, so the growers are operating without interest on accumulated expenses.

Determining "Fair" Prices

According to a recent study, production costs for wineries are approximately \$35/case, not including the cost of grapes. Table 9 shows the value of grapes in wine at various prices per ton. The cost of grapes ranges from \$7.99/case at \$500/ton, to \$15.98/case at \$1,000/ton. Increasing the price paid to the grower by \$100/ton increases the cost to the winery about \$1.60/case or \$0.13/bottle.

Increasing the price of grapes from \$500 to \$600 shortens the time it takes to recover the costs of establishment by 11 years (Table 7a).

Table 9. Value of grapes in wine at various prices per ton

| | \$500/ton | \$600/ton | \$700/ton | \$800/ton | \$900/ton | \$1000/ton |
|-----------|-----------|-----------|-----------|-----------|-----------|------------|
| \$/bottle | 0.67 | 0.80 | 0.93 | 1.07 | 1.20 | 1.33 |
| \$/gallon | 3.33 | 4.00 | 4.66 | 5.33 | 6.00 | 6.66 |
| \$/case | 7.99 | 9.60 | 11.18 | 12.79 | 14.40 | 15.98 |

Value based on 165 gallons of juice per ton minus 9% loss in processing for an approximate finished wine volume of 150 gallons per ton of grapes.

*Each \$100 per ton paid for grapes equates to approximately \$0.13 per bottle of wine.

Restriction on importation of grapes

Several states in the Midwest restrict wineries to using in-state-grown grapes for part or all of their wine production except in cases of emergency. Grape prices are generally highest in states with the most restrictive importation laws. The laws are meant to encourage domestic production of grapes and improve agricultural opportunities in the state. However, these laws also restrict wineries' opportunities to produce and sell wine. If wineries reduce production because of a shortage of grapes in a state where importation is restricted or prohibited, the demand for grapes may be reduced, discouraging increased production. On the other hand, these laws protect growers from having to compete with low-priced grapes from other states, where costs of production may be far less. These laws generally favor growers by insuring a steady market for fruit. In general, growers and wineries should strive to make the market profitable for both parties and avoid excessive government regulation.

Contracts

Many wineries will make a contract with growers for a 5 to 10 year period. This relieves growers from having to market the grapes, but it may not assure a profit unless yields are consistent and the contracted price is above the cost of production. Prices should be re-negotiable at the consent of both parties as the need arises.

Buying grapes by the acre

Wineries and growers may opt to purchase/sell grapes by the acre rather than by the ton. This may be appropriate when wineries demand yield reductions to assure high quality grapes for premium wines, or late harvest grapes for dessert wines. Selling by the acre allows the grower to reduce yields without sacrificing profit. It also provides the winery with grapes grown to their specifications.

Grape pricing policies

Sugar standards

Sugar standards are a system of bonuses and penalties adjusting the grape price on the basis of sugar content (°Brix). Growers and processors meet each summer to negotiate the prices to be paid for grapes during the coming harvest. The negotiated prices become the base that are to be paid for each grape cultivar. The base sugar content is determined by the running five year average for each cultivar. Prices can range from 50% to 125% of the base price depending on sugar content. Ontario has expanded its program of sugar standards to 17 cultivars. Other states are considering adopting sugar standards. These programs are intended to reward the grower for being a good vineyard manager and assure the wineries of good quality fruit. However, sugar level alone, is not a good measure of winegrape quality. Many other factors are involved.

Bottle Price Multiplier

In western states, grape prices are often determined by a 'Bottle Price Multiplier'. This formula relates the value of the grapes to the retail price received for the wine. A bottle price multiplier of 100 has been used for a number of years and seems to work well. With a BPM of 100, grape prices per ton are 100 times the average price of a bottle of wine. So, if wine retails for \$7/bottle, grape prices are \$700/ton. A modification of that method has been proposed recently that takes into account the vineyard's cost of producing grapes and the winery's cost of producing and marketing wine. Under this new method, vineyards and wineries negotiate prices based on their costs, and share any profit or loss evenly based on the wine's selling price. (See Lamy, J.L. *Vineyard & Winery Management*, November/December 1995. pg. 20-25.)

Vineyard Incentive Programs

Because of the current situation of low grape supply and high demand, some states in the midwest have initiated incentive programs to encourage grape production. Incentive programs help offset the costs of establishment and reduce interest on accumulated expenses. Missouri has a program that pays growers up to \$1,000 per acre to establish vineyards. Ohio has a tax credit program that provides growers a tax credit on their personal or corporate taxes for 10% of the costs of vineyard establishment. The credit can be carried forward for up to seven years. Ohio also recently established a Vine Grants program that will reimburse growers for the purchase price of vines established. Only vineyards not owned or operated by a bonded winery are eligible. The program will cover up to five acres per grower each year with a target of 15 new acres each year. Incentive programs have led to increased planting of grapes, but, so far, not to the extent needed by the wine industry.

Conclusion

Despite the various programs to encourage grape production, ultimately it is the wineries that are in the best position to provide incentives to growers. If grape acreage is to increase, wineries must be willing to pay a fair price for grapes. And if wineries are expected to pay fair prices, growers should be expected to produce high-quality fruit. The old axiom, “Fine wines are made in the vineyard” is true. The partnership between grower and winery should be based on solid economic and business principles.

An individual seriously considering grape production should look at all aspects of the business including markets, prices, expected yields, production costs, and long-range stability of the industry before making a decision to grow grapes. Because establishment costs are high, it takes several years to realize a profit from grape production. Only serious growers who operate the vineyard as a business enterprise can expect financial success.

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