Wine Grape Production: A Promising Enterprise for Small Scale Enterprises in North Carolina?

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Introduction

Traditionally, the leading agricultural commodities in the state of North Carolina have been hogs, poultry, and tobacco (USDA – NASS, 2002); however, recent changes in the tobacco industry have changed the state's staple products. The hog and poultry industries have primarily operated under tournament structures where producers have held production contracts as a method of reducing risks associated with such operations. Typically within the contractual arrangement between producer and integrator, the volume and quality of the products have been heavily dependent on market prices and future contractual privileges received (McBride and Key, 2001).

Many small scale enterprises have relied on other established commercial channels such as smaller contractual agreements than those required of the large operations with integrators. Smaller enterprises have also relied heavily on the open market, farmers market, and direct market opportunities to compete in the marketplace. These opportunities have worked well for smaller operations that have been more adaptable to technological and environmental changes.

In recent years due to global competition and other U.S. public health concerns, the total number of North Carolina farms growing tobacco fell from 30,000 in 1982 to approximately 8,000 in 2002 (USDA – NASS, 2002). As a result of the multi-billion dollar tobacco settlement in the late 1990s, a few former tobacco growers and owners of quotas were expected to locate alternative enterprises suitable for adoption (NC and the Global Economy, 2007). Achieving economics of scale in production for the small scale producer has not been as successful as the

large scale operation. The underlying result is that only large-scale operations are expected to survive in the future due to their access to the necessary resources in order to operate efficiently and to compete in the global marketplace.

Definition of Small Scale Enterprises

Numerous terms have been used in the literature to describe small-scale enterprises, such as, limited resource farmers (USDA – NASS, 2002), small farmers/producers (Duffy, 2007), underserved (Duffy, 2007), and socially disadvantaged (Dismukes, et al.,1997). The USDA highlights major definitions of the 2002 Farm Bill for the limited resource farmer or rancher or forest owner. The limited resource producer is defined as *a person with direct or indirect gross farm sales not more than $100,000 in each of the previous two years and a person with a total household income at or below the national poverty level for a family of four or less than 50 percent of county median household income in each of the previous two years*[1] (USDA – NRCS, 2007).

The preservation and sustainability of the small-scale production sector has been of increasing concern to U.S. policymakers. Proposals for the 2007 Farm Bill are to continue to support beginning producers and socially disadvantaged producers (USDA, 2007). Unfortunately, many small scale enterprises lack the knowledge, skills and abilities necessary to compete in the ever-changing marketplace. Therefore, it is paramount that producers diversify themselves in an effort to increase farm incomes (Brown, et. al., 1992). Several research and outreach projects have been conducted in order to assist those traditional farmers who are searching for alternative sources of farm income. If the newly adopted efforts of small scale

[1] The limitation of gross farm sales is subject to increase each fiscal year to adjust for inflation using the "Prices Paid by Farmer Index" compiled by the USDA – National Agricultural Statistical Service. Household income is also subject to inflation adjustments using U.S. Department of Commerce data.

producers are not successful, many of these producers will be forced to leave the farm and seek employment elsewhere or retire from production agriculture. According to the 2002 *Census of Agriculture*, the total number of farms in the state of North Carolina was 53,930. Of the total number of farms, the total number of farms with sales less than $100,000 (limited resource as defined by the USDA) was 45,139, approximately 84 percent of the total number of farms in the state.

Wine Grape Production in North Carolina

Although the state of North Carolina has experienced economic devastation in the tobacco industry, wine grape production appears to be a promising enterprise for small scale enterprises. Wine grape production and the establishment of wineries have gained momentum throughout the state contributing to an influx of wine-related tourists to the area. Based on 2005 rankings, North Carolina appeared 10^{th} in the nation for grape production. In addition, at least 55 wineries and as many as 350 wine grape producers were established in North Carolina as of that year. Although wine grape production is sensitive to the climate, soil and terrain, economic development regions with commercial production include the Northeast, Advantage West and Piedmont Triad regions. Table 1 shows the price and value of wine and fresh grape production in North Carolina from years 2002 to 2005. Wine grape production has steadily increased from 2002 to 2005 from 2 million tons to 3.7 million tons, respectively, whereas the price has reduced due to additional growers entering the market. In addition, the crop value of wine grapes has increased by approximately $900,000 over the three to four year period.

Table 1 - North Carolina Fresh Grape Production, Price and Value (2002 – 2005)				
	2002	2003	2004	2005
Wine Grapes				
Tons '000	2,000	2,500	3,300	3,700
Price per Ton $	1,200	1,000	920	890
Crop Value $'000	2,400	2,500	3,036	3,293
Fresh Grapes				
Tons '000	300	300	200	200
Price per Ton $	1,780	1,630	1,650	1,800
Crop Value $'000	534	489	330	360

Source: MKR Research LLC, 2007 and USDA – NASS

In an effort to remedy the economical setbacks that have overwhelmed the tobacco industry, North Carolina's Golden LEAF Foundation has supported the shift of tobacco farms to vineyards since 1999. Although large-scale farmers are expected to survive, wine grape production might serve as an alternative enterprise for small scale producers in North Carolina. Many small-scale producers have been exploring various possibilities of investing in enterprises that will generate more farm income and enable them to preserve and increase their farm values. Alternative choices are needed in order for these producers to deviate from traditional or conventional agriculture.

The Use of Net Present Value in Grape Analyses

The Net Present Value (NPV) method is a well recognized effective tool in investment analysis and is commonly used to select the most profitable investment from among several alternatives or simply determine the profitability of single investment projects. The NPV approach has been used to evaluate the profitability of investments in fruits and vegetables. A

case study by a Task Force of the Southern Rural Development Center (1990) involving a system of muscadine grapes was conducted in order to "formulate alternative approaches for maintaining and enhancing small scale producers' roles in southern agriculture through on- and off-farm initiatives." The force suggested that farmers who were interested in investing in muscadine grape production should be aware of the relatively large inputs of initial capital besides the land required. In addition, amortization for the investment costs in year five was suggested because expected returns were high enough in that year. It concluded that the major factors involved in producers investing in muscadine production were available capital from the private sector and the willingness to assume risk.

Several agricultural research experimental stations throughout the U.S.[2] have evaluated the economic feasibility of wine, wine grape, and/or grape juice production. In particular, the state of New York has consistently provided economic, production, marketing, management, and technical guidance to existing and promising wine, wine grape, and/or winery investors. Studies using the NPV method of analysis are highlighted. Key (1982) conducted a study involving the profitability of investing in the grape industry utilizing the net present value of analysis to evaluate vineyard and winery investments. Investments were accessed in the form of two projects: a vineyard to produce wine grapes and a small scale winery. Key found a positive NPV concluding that an investment in the winery appeared profitable. Another study by White (1988) evaluated the need for economic information on growth potential for *vinifera* grapes in Long Island, New York using the Net Present Value analysis and found it to be highly profitable.

Although several studies have explored the economic feasibility of wine grape production, there is little information pertaining to the small scale producer. Therefore, this study's purpose will be to evaluate wine grape production as an alternative or supplementary

[2] States reviewed in this study were Arkansas, Illinois, New York and Virginia.

enterprise for small scale producers in North Carolina. The objective is to evaluate the profitability of small scale wine production in North Carolina using Net Present Value (NPV) and the Modified Internal Rate of Return (MIRR) method of analyses.

Conceptual Model

Wealth Maximization

The conceptual model for this study is structured upon wealth maximization with wine grape production as a case study. The model is developed using the current structure of the wine grape industry in the U.S. It is assumed that wine grape growers develop goals when strategically planning for the production of wine grapes. However, the total farm operation may range from providing food for the family farm to investing in new wealth generating enterprises. In understanding wealth maximization, it is assumed that the investor exhibits rational behavior. That is, the investor's behavior reflects the goal of maximizing the present value of the investment. This is achieved when all investments under consideration demonstrate positive discounted present values at the investor's rate of time preference.

Here, the objective of the investor (grower) is to maximize wealth in some discrete time period with a multiperiod horizon model. For simplicity, demand is assumed to be constant for the products through time. However, it is important to mention here that generally (but not always) the wine grape market depends heavily on the quality of the grapes produced. The quality of the product is assumed to carry a higher market price than that of a lesser quality. Typically, in a market structure that is dependent upon the quality of the product, there is a direct relationship between the quality of the product and the selling price per unit of output. The current market structure within the wine grape industry exhibits that of a monopolistically

competitive structure with the assumption that the wine grape production enterprise is separate from that of the winery. With this being so, as the demand becomes more inelastic due to the quality of the product, the producers are able to receive a higher price for output, all other things held constant.

In this study, quantities sold of the product in any time period are assumed to remain constant. This assumption is based on the investor's inability to see into the future and predict all other factors that may disrupt the production of the product. Therefore, a single price is assumed to be charged to all buyers. Also, all cash flows are assumed to be received at the time of harvest and all factor prices are held constant.

Net Present Value (NPV) Method

The Net Present Value (NPV) method of analysis is used to evaluate new investments based on discounted cash flows. As summarized by Barry (1996), the method is one of the more safe, sound, and realistic methods to use. In addition, it is directly consistent with the goals of the investor in wealth maximization. As Barry (1996) highlights, the NPV method indicates the "value-added" to wealth expected from a new investment. However, the disadvantages of using the NPV method are assumptions of perfect financial markets, inability to handle goals other than wealth maximization for consumption, and cumbersome handling of reinvestment and replacement of worn out capital items.

In evaluating the present value of the proposed investment, an adjustment should be made to the value of the investment's cash flow to reflect the impact of time. In making this adjustment, the investor must determine what a dollar to be received in the future is worth at the

present time. In other words, there is a cost of capital realized, given the best alternative investment opportunity.

Equation (1) expresses the Net Present Value (NPV) method mathematically as the sum of annual cash flows at their present value less the initial outlay amount. If the NPV is greater than or equal to zero, then the investment may be accepted. In the case of the NPV being equal to zero, there would be indifference in the decision. This implies that a producer would be advised to invest with a great degree of caution. If the NPV is less than zero, the investment should be rejected.

$$NPV = \left[\sum P_n / (1+i)^n\right] - C \qquad (1)$$

where:

$NPV =$ net present value

$C =$ cost of initial investment

$P_n =$ net cash inflows in time period n

$i =$ discount rate (cost of capital) in time period n

$n =$ the length of the horizon

As Barry (1996) points out, more professionals share a preference for the use of rate-of-return measures in analyzing wealth-increasing investments.

Modified Internal Rate of Return

The internal rate-of-return method of analysis is also used to evaluate new investment and is found by calculating a rate of return of future cash flows, where NPV is equal to zero.

The difficulties with using this procedure involve its inability to yield consistent rankings of mutually exclusive investments relative to NPV rankings. Varying solutions for given investments and complex solution procedures may lead to imprecise interpretations. In an effort to remedy these inconsistencies, McDaniel et al. (1988) indicates a seven-step criterion that a yield-based capital budgeting method must meet in order for it to yield results consistent with the NPV method. McDaniel et al. (1988) found consistencies with all, with the exception of projects of unequal size. The methods call for solving for the discount rate (also assumed to be the reinvestment rate) that equates present and future values of the proposed investment. It can be referred to as the Modified Internal Rate-of-Return (MIRR) or a Marginal Return on Invested Capital. The MIRR finds the present value of the cash *outflows*.

$$PV_{CO} = -C_0 + \frac{-C_1}{(1+i)^1} + \frac{-C_2}{(1+i)^2} \qquad (2)$$

where:

$PV =$ present value

$CO =$ cash outflows

$C_n =$ cash outflows in time period n

$i =$ discount rate (cost of capital)

After the present value of cash outflows are calculated, the future value of the net cash inflows is calculated.

$$FV_{CI} = P_3(1+i)^{n+1} + ... + P_{19}(1+i)^{n+1} \qquad (3)$$

where:

$FV =$ future value of cash inflows

$P_n =$ net cash inflows in time period

i = discount rate (cost of capital) in time period n

After future values of net cash inflows, the next stage is to solve for the rate of discount (i_m) that satisfies the following equation:

$$PV_{CO} = -\frac{FV_{CI}}{(1+i_m)^n} \qquad (4)$$

where:

PV_{CO} = the present value of cash outflows

FV_{CI} = future values of cash inflows

i_m = discount rate (modified)

n = the length of the planning horizon

Barry (1996) then outlines the derivation of an explicit expression for (i_m), multiply both sides of Equation 4 by $(1 + i_m)^n$ and divide both sides by PV_{CO}. The result is

$$(1+i_m)^n = \frac{FV_{CI}}{PV_{CO}} \qquad (5)$$

taking the nth root of both sides and subtracting 1 yields

$$r_m = \left[\frac{FV_{CI}}{PV_{CO}}\right]^{1/n} - 1 \qquad (6)$$

where:

r_m = modified internal rate of return

The decision criterion for the MIRR is similar to that of the internal rate of return. This study assumes that the required rate of return is equivalent to the total cost of capital for the investor. If the MIRR exceeds the required rate of return (the opportunity cost of capital), then it is recommended that the investor/farmer accepts the investment. If the MIRR equals the required

rate of return then the recommendation would be supportive of an indifferent decision to invest in the proposed enterprise. Lastly, if the MIRR is less than the required rate of return, then the investor/farmer should be advised to reject the investment.

Data and Methods

Table 2 illustrates vineyard costs and returns by year based on a 1-acre operation. Data were used for the study included resource requirements for initial investment, gross receipts, total cost of production, operation size, planning horizon, discount rate, and marginal tax rates. Assumptions of the analysis are based on an expansion of the 1-acre operation described in table 2 to a 50–acre vineyard with no expected yield until the 3rd year. All production is sold at fixed market prices through the planning horizon. Full production begins in the 4th year and continues until the 20th year with ignoring machinery reinvestment. In addition, depreciation is assumed to be zero due to non-determinable useful life of machinery. The discount rate is assumed to be equivalent to the rate of return to assets for farm operations with sales of $100,000 and less based on the USDA – 2005 Farm Financial Management Report. The method of analysis is based on the Net Present Value (NPV) Criterion, which calculates the net discounted value of investment options.

Results

The results of the investment analysis using the Net Present Value (NPV) method of analysis and the Modified Internal Rate of Return (MIRR) are shown in table 3. The before-tax values are as follow: depreciation - $0, discount rate – 1.11%, and marginal tax rate – 19% result in a NPV of approximately $641,050. The after-tax values are as follow:

Table 2 - Vineyard Costs and Returns by Year: One Acre				
	Year 1	Year 2	Year 3	Year 4 – 20
Variable Cost Description				
Site Preparation	$3,483	$272	$272	$272
Machinery Expenses	$175	$198	$198	$198
Dormant Pruning	$140	$149	$299	$299
Weed Control	$89	$207	$207	$207
Canopy Management	$0	$390	$390	$530
Disease and Insect Control	$596	$434	$629	$629
Harvest Costs	$0	$0	$585	$210
Fixed Costs	$136	$136	$136	$136
Total of All Costs	$4,619	$1,786	$2,715	$2,480
Gross Income Description				
Total Revenue	$0	$0	$1,800	$3,600
Net Projected Returns	($4,619)	($1,786)	($915)	($1,120)

Source: Bean, et al. (2007)

depreciation - $0, discount rate – 1.11%, and marginal tax rate – 19% result in a NPV of over $342,916. Both options for the 50-acre operation reveal positive net present values implying a profitable investment over a 20 year planning horizon. The MIRR calculations in the analysis reveal returns higher than the cost of capital to the grower, 5.72% and 4.54% before taxes and after taxes, respectively, which also imply profitable returns for the investment.

Findings/Recommendations

In evaluating wine grape production as a promising enterprise for small scale enterprises in North Carolina, the findings are favorable for profitable investments over a 20 year planning horizon. Assuming an economic life of 20 years and a discount rate of 0.011 (average rate of

Table 3 - Investment Analysis of Wine Grape Production – Net Present Value (NPV) and Modified Internal Rate-of-Return (MIRR)		
Cash Flows – Year	50-Acre Wine Grape Operation (Before Taxes)	50-Acre Wine Grape Operation (After Taxes)
0	($230,950)	($230,950)
1	($89,300)	($89,300)
2	($45,000)	($45,000)
3 – 20	$55,950	$44,760
NPV *i = 0.011*	$641,050	$342,916
MIRR	5.72%	4.54%

Source: Authors' calculations.

return for farm businesses and operations with values of sales $100,000 and less), the NPV of producing wine grapes on a 50-acre operation reflects a gain of $641,050 before taxes. The after-tax (using a 19% tax rate) net present value of a 20-year investment in wine grape production is $342,916, which may vary from investor to investor.

Using the decision criterion for NPV, an investment in wine grape production would be acceptable both before and after taxes. The MIRR calculations exhibit slightly higher returns than the assumed cost of capital for the investment, thus, implying that wine grape production is a profitable investment. Therefore, existing small scale operations of hogs and poultry in addition to former tobacco growers or small scale tobacco producers should invest with caution due to varying operation size, tax rates, machinery usage, insurance, investment capital, cost of capital, education transition and other external factors.

Conclusion

It appears as if wine grape production is an ideal alternative enterprise for small scale producers in North Carolina. However, results can be misleading. Although the initial investment is estimated to be $230,950 and the return on investment is greater, small scale growers should pay closer attention to the 20-year economic life of the investment. Growers will have to wait at least 15 years to receive a complete return on the initial investment. In addition, growers should consider forming cooperatives of small farms with interests in wine grape production. It is recommended that growers should conduct a sensitivity analysis considering factors, such as, operation size, tax rates, machinery usage, insurance, investment capital, cost of capital, education transition, and other opportunity costs of the investment selection.

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