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Cost Estimates and Investment Analysis for Muscadine Grapes Production in Georgia

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Abstract

Muscadine (*Vitis rotundifolia*), also known as wild grapes are native to the Southeastern United States and well adapted to the warm and humid conditions of the region. Georgia is the largest producer of muscadine grapes in the United States and has enjoyed a market niche for decades consisting of fresh fruit processed for jams, juice and wine. In recent years, precision breeding using cisgenic technology has allow the development of new disease-resistant and seedless cultivars with potentials to serve different end-use market segments. However, the profitability of muscadine grapes cultivars newly developed with cisgenic technology relative to those developed with traditional transgenic technology is still questionable. This study takes a first step in bridging the gap in the literature with the objective to estimate the cost, revenue and profitability of producing transgenic-bred muscadine grapes in Georgia using a Single Trellis System with drip irrigation. Subsequently, we plan to derive similar estimates for a new cisgenic-bred rot resistant and seedless counterpart, currently in field trials, and compare both estimates to determine which of the two has the highest economic potentials in term of profitability and or net returns to the growers.

Keywords: muscadine grapes, budgets, production costs, net returns, biotechnology

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Introduction

Muscadine (*Vitis rotundifolia*), also known as wild grapes are native to the Southeastern United States and well adapted to the warm and humid conditions of the region. Georgia is currently the largest producer of muscadine in the United States and also houses a pioneer Land Grant Institution (the University of Georgia) in muscadine breeding stemming as far back as 1909 (Connor 2005; Connor 2015) . During the last decades significant advances in biotechnology through transgenic process have enabled scientists to develop improved and disease-resistant cultivars more adapted to specific local climates. In response to the consumer's growing preferences for bio-engineering food, more recently, breeding programs are shifting towards "green genetic engineering" or "precision breeding (PB)". According to Gray et al. (2014) and Gray et al. (2015), precision breeding (PB) is a newly-enabled approach to plant genetic improvement that transfers only specific desirable traits among sexually-compatible relatives via the mitotic cell division pathway in order to avoid the significant genetic disruption imposed upon conventional breeding by meiosis (sexual reproduction). This technology has allow for the development of new disease-resistant and seedless muscadine grapes cultivars with potentials to serve the growing and increasingly diverse end-use market segments for muscadine.

Muscadine has enjoyed a market niche for decades, marketed as fresh fruits and also processed for jams, juice and wine. The growing popularity of muscadine in Georgia and the southeast region partly attributed to the medicinal, nutritional and therapeutic attributes (Pashrana-Bonilla et al. 2003; Poling et al. 2003) due to high levels of antioxidants present in the grapes.

While precision-bred muscadine cultivars could offer significant advantages over transgenic grapes in terms of consumer's acceptability, little is known how their production will be profitable to growers relative to transgenic-bred grapes.

This study takes a first step in bridging the gap in the literature with the objective to estimate the cost, revenue and profitability of producing a transgenic-bred muscadine grapes in Georgia using a Single Trellis System with drip irrigation, planted 20 x 6 feet (within row and between rows spacing respectively). Subsequently, we plan to derive similar estimates for precision-bred rot resistant and seedless counterpart, currently in field trials, and compare both estimates to determine which of the two has the highest economic potentials in term of profitability and or net returns to the growers.

Methods

Economic farm enterprise budgets remain the primary approach utilized by extension professionals to determine the financial lucrativeness in terms of profitability margins of a particular enterprise such as muscadine. This information serves as a guide to growers, ag-students, specialists, county agents, ag-policy makers and financial institutions such as ag-lenders and banker. These budgets are based on traditional input costs, yield and price estimates (Fonsah et al. 2012; Fonsah et al. 2008; Fonsah and Hudgins 2007; Fonsah et al. 2007; Krewer et al. 2000). In this study we also explored the sensitivity net present Value (NPV) analysis which involves calculating revenue trends under different price and yield scenarios. The use of secondary data source mainly from Mississippi State University (MSU) and North Carolina State

University were very useful in developing certain sections of this enterprise budget (Mississippi State University 2010; Carlos-Carpio et al. 2006). However, because of the differences in climatic and ecological conditions and the fact that there are similarities and dissimilarities in agricultural practices across states lines, our source of primary data was obtained from Paulk Vineyards, (1788 Satilla Rd., Wray, GA 31798) the largest muscadine producer and marketer in the state of Georgia. Our farm and office visit was important as Paulk Vineyards shared its input costs information with us and explained the rational and importance of certain field operations captured in the budget.

Assumptions

Muscadine yields can vary from five to ten tons (MT) per acre depending on how well the grower adheres to recommended good agricultural practices (GAP) and recommendations from the different University of Georgia Extension specialists. In this study however, we assumed 8 MT/Ac during full production. We also assumed 5% interest rate in both short and long-term. We also assumed the price of $450/ton. of fresh muscadine.

Result

The 1st year estimated cost of growing muscadine using single curtain trellis and drip irrigation was $5060.71. In the 2nd years, the costs were reduced to $982.38. In the 3rd and 4th years, the cost increased to $2,137.19 and $3,027.59 respectively (see Table 1). A sensitivity NPV analysis using different yields (from 7– 9.5 tons/acre and different prices (from $350–$600/ton) was conducted. Results depicted that with a yield of 7.5 tons/acre and price of $500/ton, the NPV was $376.12. With a yield of 8 tons/acre and $500/ton, the NPV was $2,810.86/acre (see Table 2).

Table 1. Summary of Estimated Cost of Producing Muscadine Grapes

Year	Total Costs
1st	$5,060.71
2nd	$982.38
3rd	$2,137.19
4th	$3,027.59

Note. Using a Single Trellis System and Irrigation in Georgia, 2015.

Table 2. Sensitivity Net Present Value (NPV) of Producing Muscadine Grapes

	Yield (Tons/acre)					
Prices ($)	**7.00**	**7.50**	**8.00**	**8.50**	**9.00**	**9.50**
350.00	(12614.95)	(10910.63)	(9206.31)	(7501.99)	(5797.67)	(4093.35)
400.00	(9096.17)	(7148.38)	(5200.59)	(3252.79)	(1305.00)	**642.79**
450.00	(5577.39)	(3386.13)	(1194.86)	**996.40**	**3,187.67**	**5,378.94**
500.00	(2058.62)	**376.12**	**2,810.86**	**5,245.60**	**7,680.34**	**10,115.08**
550.00	**1,460.16**	**4,138.37**	**6,816.59**	**9,494.80**	**12,173.02**	**14,851.23**
600.00	**4,978.93**	**7,900.62**	**10,822.31**	**13,744.00**	**16,665.69**	**19,587.38**

Note. Using Single Curtain Trellis and Irrigation in Georgia, 2015.

Conclusion

Muscadine is a doable but risky business. Establishment cost was highest in year 1 ($5,061/ac) compared to subsequent years. Sensitivity Analysis show that with a yield of 8 ton/ac and price of $450, NPV is negative (-$1195). However NPV was $996.40 with a yield of 8.5 tons/ac at the price $450/ton. Also, net return was $2,810.86 with a price of $500/ton and yield of 8 tons/ac. Muscadine production has potential in Georgia and profit margins can be extremely significant if the grower adheres to good agricultural practices (GAP), and have sufficient start-up capital. There is a growing interest in muscadine production in Georgia as shown by the increase in acreages and continuous research by UGA Scientists and specialists. The crop is attracting more and more consumers due to its medicinal properties and multifaceted uses (fresh, jam and wine production) and recent report shows that Georgia has position herself as the largest producer of muscadine in the United States.

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