A Plan for Economic Evaluation of Organic Blueberry Production in Georgia

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Introduction

Blueberries are one of the few fruit crops that are native to North America (Williamson and Lyrene, p. 1) and rabbiteye blueberry (*Vaccinium virgatum*) is native to the southeastern United States. This species is heat and drought-tolerant, and unlike other blueberry species, can grow in many soil types while maintaining satisfactory yields with relatively low pest damage (Austin, p. 1).

In this study, 'Brightwell' rabbiteye blueberries are being grown in south Georgia by organic methods to determine the economic viability of organic production. Blueberry production in Georgia has increased exponentially since the mid-1970s (Scherm and Krewer) to reach a statewide farm gate value of $75 million from 10,278 acres in 2006 (Boatright and McKissick) demonstrating the fruits importance in Georgia. Based on the value of utilized production, Georgia ranks fourth among the nations blueberry growing states. Within Georgia, the value of the blueberry crop now surpasses that of peaches.

Although organic blueberry production is an emerging market where price premiums often exceed conventional production, it is still difficult to determine profit margin simply because the cost of production is not known. Organic food market is increasing at about 15-20% (Krewer and Walker, p. 1). Consumer demand has increased production with organic cropland and pasture increasing to 2.8 million acres in 2003 from 2.35 million acres in 2001 (FMI, p.3). Organics now constitutes over $28 billion in United States retail food and drink sales (FMI, p. 2) and fruits and vegetables account for 44% of organic food purchases (FMI, p. 3). The main drivers behind organic food sales are taste, environmental conservation, and perceived health benefits with 81% of consumers purchasing organics for health benefits (FMI, p. 2).

Organic blueberry production represents a market where producers can capture a higher price premium than conventional blueberries, but until the cost of production is known, it would be difficult to determine the financial viability and lucrativeness of the crop. As a result, current research goals aimed at determining the costs of various production methods, by developing several enterprise budgets for each adopted technique. The result from these enterprise budgets will provide the badly needed information for those interested in transitioning to organic blueberry production. These objectives are being studied in an organic blueberry establishment and management trial in a recently established planting near Alma, Georgia (Bacon County).

Methods

Site Description and Preparation

A ½ acre site located near the city of Alma, Georgia was cleared of timber and planted with 1 trade gallon nursery plants of 'Brightwell' rabbiteye blueberries. Prior to planting, organic bone meal (1-13-0) was applied in a 3-ft band down the center of the raised beds prior at a rate of 200 lb to supply phosphorus. Plant spacing was approximately 5-ft between each plant and 12-ft between rows. After planting, all plants were pruned to a height of 12 in. Plants were watered with overhead irrigation as needed. Nature Safe 8-5-5 organic fertilizer was applied four times during the growing season. The sides of the raised beds were maintained with a hill side cultivator. Experimental design was a randomized complete block with seven treatments, four replications, and seven plants per replication per treatment for a total of 28 plants per treatment. Several rows are also being used for a phosphorus source study. Growth is being measured using the following growth index:

(1) *Growth Index: plant height × width in row × width across row*

Essential plant nutrient levels will be measured in July of each year from each plot.

The main concern during the first three years is maximizing plant growth and minimizing plant loss, while in the later years maximizing yield and minimizing fruit damage become the main management concern (Williamson and Lyrene, p. 4). Blueberries, in general, are susceptible to disease, excessive weed growth, freeze, drought and extreme heat. Many of these factors can be controlled by implementing proper site selection, cultivar choice, pest management and irrigation (Harper and White). Plant loss minimization techniques for organic blueberries will be addressed in the following sections.

Irrigation

Overhead irrigation protects plant loss from freezing and drought. Freezes from February to April pose substantial risk to blueberry crops. In April 2006, a large portion of southeastern blueberry producers lost entire crops over a three-day freeze (verbal communication). Sometimes freeze risk can be eliminated by proper cultivar selection, for example, 'Brightwell', a late-flowering blueberry cultivar less frequently suffers significant crop damage from freezes (Williamson and Lyrene, p. 13). Early-flowering blueberries are at a greater risk and will require freeze protection.

Overhead irrigation systems are the most effective method to reduce freeze damage and crop loss (Williamson and Lyrene, p. 14). Our experimental site has overhead irrigation which can be used during late spring freezes to prevent crop damage. Costs will be determined based on fuel consumed and percentage of irrigation system used on organic blueberries.

Weed Management

Weed control is the primary cost during the establishment phase, usually the first three years of growth (Williamson and Lyrene, p. 2), and is the most difficult challenge in organic production (Klonsky and Tourte).

In November 2006, seven mulches and a hand hoed control were placed on raised blueberry beds in a randomized complete block design with four replications, to evaluate their effects on weed suppression. Each crop row was divided into seven 35-ft plots that consist of seven plants for a total of 28 plants per replication. The five center plants of each mulch replicate will be used for data collection. All mulches selected were based on local availability in south Georgia. The mulches included: pine bark, pine straw, peanut hulls, wheat straw, white-on-black polyethylene, landscape fabric and black polyethylene film. The control is bare exposed soil that was hand hoed, mechanically cut with a weed "wacker" using a steel blade attachment, or sprayed with Matran (clove oil), a non-selective organic post-emergence herbicide for annual grasses and broadleaf weeds. Matran has been applied once and was ineffective on the grasses. The weed "wacker" was used in an emergency situation.

Pine bark mulch was laid down to a depth of 4-6 inches. A Mill Creek side delivery mulcher was used to mechanically spread the pine bark on either side of the raised berry beds. Low decomposition rate, preferred pH range, and availability all make pine bark an ideal organic blueberry mulch. Many blueberry producers use pine bark beds to prevent excessive weed growth (Williamson and Lyrene, p. 18).

Pine straw was manually spread onto the beds. The straw was fluffed and laid down to a depth of 6 in. As the pine straw decomposes, its volume will decrease but will maintain a low pH, necessary for blueberry growth. Biennial mulch replenishment may be required. Pine straw prices are relatively high due to demand for use in landscaping, but many farms have an abundant supply.

Peanut shells were mechanically placed using a Mill Creek Mulcher. This mulch was laid to a depth of 4 inches. The material is readily available in south Georgia. Florida, and Alabama.

Wheat straw was spread by hand to a depth of 6 in. It could also be spread mechanically using a converted cattle feeder to reduce labor costs. This mulch needs to be replaced about every one or two years.

White-on-black polyethylene plastic was lowered over the plants after an 8-12 inch diameter 'X' hole was cut and the plants were placed through the holes. The holes were sealed with coarse pine bark around the base of the plant to allow water and nutrients to filter through. The white-on-black plastic will be removed from the beds after three years.

Woven landscape fabric is a heavier material that was laid down in the same fashion as white-on-black polyethylene. The base of the plant was sealed with pine bark. The expected life is three years at which point it will be removed from the field.

Landscape fabric is a thin black non-woven fabric that was placed on the beds in the same manner as the plastic and woven landscape fabric. Expected life of the product is two years.

The organic mulches will have to be re-applied as needed to maintain a layer about 4 in thick. Weeds that occur in the beds will be hand hoed, cut, or sprayed with organic herbicides such as Matran. Weeds on the shoulder of the bed will be controlled by cultivating with the Hill Side Cultivator. Between the beds, weeds will be controlled by regular mowing. The total cost of weed control will be determined based on manual labor hours, fuel consumption, input costs, and percentage of equipment used for maintenance. Weed coverage and species composition in each plot will be estimated several times during the growing season per plot.

Inputs

Throughout the project organic approved fertilizers, herbicides, insecticides and fungicides will be applied as needed. Costs are dependent on the amount of organic compounds used throughout the establishment phase of blueberry growth. To date, one application of organic herbicide and four applications of organic fertilizer have been made. Nature Safe (8-5-5), a mix of feather, meat, bone, blood and fish meals, langbeinite, yeast, sugars, carbohydrates and humus, is the organic fertilizer utilized. It is considered suitable fertilizer that contains both primary and secondary plant nutrients. Total amounts applied and labor used will be calculated in 2008.

Pest control will utilize organic pesticides (insecticides and fungicides). Plants were treated with organic approved insecticides twice during the growing season. In Georgia some areas do not have the blueberry maggot fly which gives Georgia organic producers an advantage over much of the Southeast (Krewer and Walker, p. 13).

Yield and Harvest

Yield will be collected by hand harvest in 2008 and 2009. Additional data from organically grown blueberries planted at UGA-Alapaha in 2002 will be used to supply data for the fourth and fifth year.

Yield per plant and berry weight will be compared with conventional blueberry yields on similar aged plants in the same region. Fruit amount multiplied by market price will determine the amount of revenue that will be generated. Deducted from the revenue will be all variable and fixed production costs such as labor and machinery. This will determine the economic feasibility of organic blueberries in Georgia. The first three years will most likely result in more costs than revenue, until the plants can produce at maximum yield at about 5 or 6 years of age.

Harvest costs depend on harvest method: mechanical or manual labor. Mechanical harvesting is less costly, but operating and capital costs can add onto total cost, especially with increasing oil prices (Williamson and Lyrene, p. 2). Per pound costs are about $0.15 with high yields for mechanical harvested berries, but more fruit damage is sustained (Williamson and Lyrene, p. 2). Damaged fruit is usually sold for a lower price for processing.

Hand harvesting is relatively expensive, but there is less damage to the fruit with farmers paying about a $0.50 per pound in Georgia in 2007. Labor management is a key to crop profitability. By understanding the labor market and planning for adequate and experienced labor, a high-quality crop that is market ready can be produced (Harper and White). Hand harvest may cost more, but higher quality and fruit quantity will be obtained. Hand harvesting will be the primary method of fruit collection in our trial.

Economic Methods

Exact figures on blueberry production profitability are difficult to determine due to high variability in production costs, price volatility (Fonsah et al., 2006, p. 1), yields per acre and uncertainty about future market prices (Williamson and Lyrene, p. 1). Every farm is different and each farmer chooses different production methods from mulch type to harvesting techniques to capital investments.

The main method of determining the economic viability of organic blueberry production will be an enterprise budget. An enterprise budget is the estimates of receipts (income), costs, and profits associated with production of blueberries. The information provided by the budget can be used by producers, extension agents, financial institutions, and other individuals within the agricultural industry (Harper and White).

A risk-rated enterprise budget technique will be utilized in this research. The risk-rated return assumes five different yields and prices per pound: "Worst", "Pessimistic", "Median", "Optimum", and "Best" (Fonsah et. al., 2005, p.8). The "Best" and "Worst" yields and price levels are assumed to occur at least once every ten years, while "Median" is expected about 63% of the time (Fonsah et.al., 2005, p. 9). "Pessimistic" and "Optimistic" levels will be once every six years.

Costs will be divided into fixed and variable costs. Variable costs are expenses that vary with output. Fixed costs generally remain the same level while output varies (Harper and White). Total costs are the sum of both variable and fixed costs. Revenue must be greater than total costs for a grower to earn a profit, and unfortunately this is not always possible. Yield and marketing conditions are beyond a producers control, thus income does not always cover costs. A grower should continue production if returns are greater than variable costs and it is a short-term condition. If the condition is long-term and fixed costs cannot be covered than production should be stopped (Harper and White).

In 2008, a risk-rated enterprise budget will be created to give a full understanding of the costs, income, and profitability of organic blueberry production. From this point the information provided can be used by producers, extension agents, and professionals to serve as an estimated cost guide for organic production.

Results

So far, the mulch experiments have determined pine bark, pine straw, peanut shells, black polyethylene and white-on-black plastic provided good weed control. Landscape fabric was inadequate in weed control. The peanut hulls are one of the few lower cost mulches that are locally available and held well on the raised beds. The plant growth index (eq. 1) was greatest

for white-on-black plastic, black polyethylene, pine bark, and wheat straw. Many plants reached a height of 3-4 ft by fall of 2007, which are outstanding even under conventional blueberry production standards (Krewer et al., 2007). At the moment, no yield data is available thus we cannot completely develop the various enterprise budgets needed to determine profitability margin of the various production systems under our study.

Conclusions

The organic market is one of the fastest growing sectors of United States agriculture with organic land acreage doubling between 1992 and 1997. Within the organic foods market, fresh produce is the top seller (Dimitri and Greene). The ever-growing demand for organic fruit is providing a niche market for blueberry producers in the Southeast. Fruit crop production has exceptional profit potential and can generate significant income on small acreage with limited farm resources (Harper and White). The ability to harvest early fruiting plants creates a high price premium that is exclusive to Georgia and Florida. In Georgia, the main limiting factors for organic blueberry production are weed management and pest control (Krewer and Walker). The research goal is to overcome the limiting factors of production in an economically viable manner that can be adopted successfully throughout the region.

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