

**Title:**

Evaluating Cultivar Selection and Integrated Pest Management Practices Economically to Support Blueberry Growers in the Mid-South

**Name, Mailing and Email Address of Principal Investigator(s):**

Investigator
Zachariah Hansen, Asst. Prof., Extension Specialist, Dept. Ento. & Plant Path. G059 McCord Hall, 2640 Morgan Cir. Dr. Knoxville, TN 37996 <a href="mailto:zhansen1@utk.edu">zhansen1@utk.edu</a>
Natalie Bumgarner, Asst. Prof., Extension Specialist, Dept. Plant Sciences 252 Ellington Plant Sciences, 2431 Joe Johnson Dr. Knoxville, TN 37996 <a href="mailto:nbumgarn@utk.edu">nbumgarn@utk.edu</a>
David Lockwood, Prof., Extension Specialist, Dept. of Plant Sciences 252 Ellington Plant Sciences, 2431 Joe Johnson Dr. Knoxville, TN 37996 <a href="mailto:lockwood@utk.edu">lockwood@utk.edu</a>
Melody Rose, Extension Agent III, UT Greene County Extension 204 North Cutler Street Greeneville, TN 37745 <a href="mailto:mteague@utk.edu">mteague@utk.edu</a>
Virginia Sykes, Asst. Prof., Extension Specialist, Dept. Plant Sciences 252 Ellington Plant Sciences, 2431 Joe Johnson Dr. Knoxville, TN 37996 <a href="mailto:vsykes@utk.edu">vsykes@utk.edu</a>
Margarita Velandia, Assoc. Prof., Dept. Agric. & Resource Econ. 314C Morgan Hall, 2621 Morgan Cir. Dr. Knoxville, TN 37931 <a href="mailto:mvelandia@utk.edu">mvelandia@utk.edu</a>

**Public Abstract:**

In Tennessee, the average blueberry operation is just over one acre (USDA-NASS), so support needs to be targeted to these small to medium-scale and often diverse operations. Common challenges for existing and new growers include decisions about the size of the operation (initial or expansion), cultivars to grow, and crop management methods. The objective of this outreach project was to address common horticultural issues, including selecting blueberry type (highbush, rabbiteye) and cultivar, pest and disease management, and production economics for the development of Extension education materials to support new and existing blueberry growers in the Mid-South. Two blueberry demonstration sites were established to evaluate nine blueberry cultivars under low- and moderate-input integrated pest management (IPM) programs. In addition, acre-based budgets were developed for blueberry establishment and production using information from demonstration sites as well as grower

interviews. Finally, training modules were developed to support Extension personnel in assisting early-stage blueberry producers in decision making in the three key areas of cultivar selection, pest and disease management plans and practices, and marketing. Budgets and training modules are currently being finalized and prepared for publication through UT Extension.

### **Introduction:**

This outreach project was designed to provide timely and accurate economic and production information to Extension personnel supporting early-stage small and mid-scale blueberry growers in the mid-south. This information will be used to develop training resources, including enterprise budgets, that will equip Extension personnel with the necessary tools to better assist small and medium-scale growers in their decision-making processes associated with planning for and installing a blueberry production operation.

In Tennessee, the average blueberry operation is just over one acre (USDA-NASS), so support needs to be targeted to these small to medium-scale and often diverse operations. Common challenges for existing and new growers include decisions about the size of the operation (initial or expansion), cultivars to grow, and crop management methods. These decisions all hinge on an understanding of the economics of blueberry production and marketing. Therefore, this outreach project was designed to address common horticultural issues, including selecting blueberry type (highbush, rabbiteye) and cultivar, pest and disease management, and production economics. These issues were addressed by combining horticultural information generated from demonstration sites and enterprise budgets.

This project targets producers both planning to install new fruit plantings as well as those seeking to diversify or rejuvenate their current operations. Both groups are important stakeholders because Tennessee has seen increases in the number of blueberry farms (up 27%) and acreage in blueberry production (up 34%) over the last USDA agriculture census reporting period (2007- 2012). Increases in both blueberry farm number and acreage have also been seen in surrounding states (NC, GA, KY, VA) over this time period. Interestingly, most of those states (NC, KY, VA) have seen similar or higher increases (USDA-NASS) in the number of blueberry farms versus acreage suggesting an increasing need for outreach supporting small to mid-scale growers. By linking management and marketing techniques with operation planning and budgeting, this project seeks to prepare Extension personnel to assist growers with horticultural, as well as business aspects of blueberry ventures.

### **Description of Outreach Activity:**

Objective 1. Establish demonstration sites to generate information that will help early-stage blueberry producers (i.e., producers planning to install new fruit plantings and operations or those seeking to diversify or rejuvenate their current operations) select cultivars and IPM practices best supporting their farm business characteristics and their operational goals.

Objective 2. Evaluate low- and moderate-input IPM systems for small and medium-scale blueberry producers in terms of plant health and crop marketability for fruit produced under different management systems.

Objective 3. Generate enterprise budgets to help small- and medium-scale producers estimate: 1) costs of production for the various cultivars and IPM practices evaluated in the established demonstration sites; and 2) the breakeven returns at which the production of the various blueberry cultivars would be

profitable when marketing them through various market outlets (e.g., farmers market, pick-your-own, wholesale).

Objective 4. Develop Extension education and program materials to help agents assist small- and medium-scale growers in making informed decisions about cultivar selection and IPM practices within the context of planning, installing, managing, and marketing blueberries.

### **Results or Outcome:**

*Objective 1.* Demonstration plantings were established at UT AgResearch and Education Centers in Greeneville (GREC) and Spring Hill (MTREC) Tennessee (Figures 1 and 2). The GREC demonstration site was transplanted on 18 Apr, and MTREC was transplanted on 9 Apr. Prior to planting, soils were tested and sites were prepared according to recommendations found in the Southeast Regional Blueberry Horticulture and Growth Regulator Guide. Soil was amended with elemental sulfur to achieve appropriate soil pH for blueberry production. Each trial site contained three cultivars of each northern highbush (Duke, Bluejay, and Toro), southern highbush (Legacy, New Hanover, and Reveille) and rabbiteye (Premier, Titan, and Ochlockonee). Within each blueberry type, an older standard was planted along with two newer or less often planted cultivars in Tennessee.



Figure 1. Blueberry demonstration site in Greeneville, TN (GREC) on 26 Apr, 2019, 8 days after transplanting.



Figure 2. Blueberry demonstration site in Spring Hill, TN (MTREC) on 10 May, 2019, one month after transplanting.

*Objective 2.* Two different levels of Integrated Pest Management (IPM), termed low-input and moderate-input, were implemented across all experimental cultivars at each demonstration site (Table 1) and compared to non-treated controls. The low-input treatment consisted of two applications of OMRI-approved organic products, applied at approximately bloom and pre-harvest (different cultivars varied in growth stage at each pesticide application). The moderate-input treatment consisted of one application of conventional pesticides occurring at approximately each of four growth stages: bloom; 10-14 days after petal fall; pre-harvest; and post-harvest. The low-input and moderate-input treatment products and target diseases and pests are listed in Table 1. Following implementation of the two IPM programs in demonstration plots, plant health was evaluated to observe differences between input-level treatments, differences among cultivar treatments, and potential interactions between input-level and cultivar. Pest and disease pressure were very low during the 2019 trial period, and no differences among cultivars or IPM treatments were observed compared to non-treated control plants.

Table 1. Low-input and moderate-input IPM programs implemented at the GREC and MTREC blueberry demonstrations sites in 2019.

Crop growth stage	Application date		Fungicide product (active ingredient)	Target diseases	Insecticide product (active ingredient)	Target insect pests
	GREC	MTREC	Low-input treatment			
Bloom	26 Apr	9 Apr	Serenade Max (QST strain of <i>Bacillus subtilis</i> )	Mummy berry, Phomopsis twig blight, botrytis, Alternaria ripe rot, Exobasidium leaf and fruit spot	Entrust (spinosad)	Thrips

Pre-harvest	5 Jun	6 Jun	Serenade Max (QST strain of <i>Bacillus subtilis</i> )	Alternaria ripe rot, Septoria leaf spot	Entrust (spinosad)	Spotted wing drosophila, blueberry maggot
			<b>Moderate-input treatment</b>			
Bloom	26 Apr	9 Apr	Pristine (pyraclostrobin + boscalid)	Mummy berry, Phomopsis twig blight, botrytis, Alternaria ripe rot, Exobasidium leaf and fruit spot	Entrust (spinosad)	Thrips
10-14 days after petal fall	15 May	10 May	Switch (cyprodinil + fludioxonil)	Alternaria ripe rot, Exobasidium leaf and fruit spot	Assail 30SG (acetamiprid)	Cranberry and cherry fruitworms, leafhoppers, plum curculio, flew beetle, Japanese beetle, leaf hopper, sharpshooter, blueberry maggot
Pre-harvest	14 Jun	6 Jun	Pristine (pyraclostrobin + boscalid)	Alternaria ripe rot, Septoria leaf spot	Entrust (spinosad)	Spotted wing drosophila, blueberry maggot
Post-harvest	1 Aug	23 Jul	Switch (cyprodinil + fludioxonil)	Septoria leaf spot, anthracnose, rust	Assail 30SG (acetamiprid)	Leafhoppers, scale

*Objective 3.* Enterprise budgets were developed and are currently being finalized and prepared for publication through UT Extension. Acre-based budgets were developed for blueberry establishment and production based on cultivars currently grown in Tennessee using information from our demonstration sites as well as grower interviews. Currently, Tennessee blueberry budgets are not available for Extension personnel or producers. The projected publication date for the budget is February 1, 2020.

*Objective 4.* Training modules were developed to support Extension personnel in assisting early-stage blueberry producers in decision making in the three key areas of site preparation and cultivar selection, pest and disease management plans and practices, and marketing. These modules were designed to prepare Extension personnel to assist growers one-on-one or deliver training programs in their area. Each of these areas are the focus of a training module consisting of: 1) audio ‘train the trainer’ recorded presentation for Extension personnel to provide a user friendly and practical foundation for answering frequently asked blueberry questions , 2) base presentation for Extension personnel to deliver to stakeholders, 2) handouts and print materials to supplement the presentation. Modules are currently being finalized and submitted for publication through UT Extension with projected publication in early-spring 2020.

Module	Topic	Frequently Asked Questions Covered
One	Site selection and preparation; cultivar selection	What are the main differences between highbush and rabbiteye blueberries? How does the selection of blueberry type connect with site and grower location? What are the non-negotiables for blueberry sites? When should preparation begin? How should a site be prepared in terms of pH and organic matter?

		What are some cultivars to consider for growing in TN and similar mid-south locations?
Two	Economic decisions, budgets and marketing	<p>What does the economics for a small-scale blueberry operation look like?</p> <p>How large should my blueberry growing area be?</p> <p>How well do blueberries fit with a current diverse operation?</p> <p>Where can I sell blueberries?</p> <p>How does selection of blueberry type and cultivar affect my marketing?</p>
Three	Disease and pest management practices and principles	<p>How does blueberry type and cultivar selection influence disease and pest management?</p> <p>What are the common diseases and pests of blueberries in the mid-south?</p> <p>What are the most important cultural practices to provide a foundation for blueberry pest and disease management?</p> <p>How do I scout for blueberry pests and diseases? What do I look for and when?</p> <p>What are the most effective conventional and organic products for managing blueberry pests and diseases?</p>