

Title:

Demonstrating the Impact of Brassica Cover Crops on Soil Management and Plant Health and Quality in Small Fruit Plantings in the Mid-South

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Public Abstract:

In Tennessee and many areas of the mid-south, small to mid-scale small fruit production may be only a portion of the farm operation. These farms are often diverse in terms of crops, marketing methods, and sales niches. So, it is not uncommon for new or diversifying growers to install plantings without being able to invest in optimum soil preparation on the site. In some cases, site limitations such as sloping fields and highly erodable soil may preclude utilization of established practices such as deep plowing to incorporate lime or sulfur, organic amendments, and nutrients to desired depths. Likewise, older or previously unmanaged plantings may be salvaged if pH levels higher than optimum or organic matter levels lower than optimum are able to be addressed. Currently, post-planting adjustment of pH, soil nutrients, and organic matter levels can be a significant challenge in perennial cropping systems. One potential option for addressing these soil management needs of fruit growers could be the use of winter cover crops. To address these questions and provide

demonstration areas to implement and evaluate these cover crop practices, this project will demonstrate the potential impact of a brassica and a cereal cover crop on soil and plants in a young blueberry planting.

Introduction:

Many small fruit growers in Tennessee and other states in the mid-south are small to moderate in scale. For example, according to USDA-NASS, the average blueberry grower in Tennessee has around 1 acre of production. These smaller operations are often diverse in terms of crops, marketing methods, and sales niches. So, it is not uncommon for new or diversifying growers to install plantings without being able to invest in optimum soil preparation on the site. In some cases, site limitations such as sloping fields and highly erodible soil may preclude utilization of established practices such as deep plowing to incorporate lime, organic amendments, and nutrients to desired depths. Likewise, older or previously unmanaged plantings may be salvaged if pH levels higher than optimum or organic matter levels lower than optimum are able to be addressed. Currently, post-planting adjustment of pH, soil nutrients, and organic matter levels can be a significant challenge in perennial cropping systems.

One potential option for addressing these soil management needs of fruit growers could be the use of winter cover crops. Appropriately selected, winter cover crops can add organic matter while increasing soil porosity. However, root systems vary considerably among cover crop species, potentially leading to differences in how these species impact soil management. Tillage radishes develop a large taproot, leaving larger pores or soil channels as the plant decomposes. In contrast, cereals have a fibrous root system, creating a multitude of smaller soil channels. Either system may provide a route for elemental sulfur or other pH or nutrient management materials to move deeper in the soil profile in an established planting. However, this has not been evaluated in blueberry or small fruit systems in the mid-south.

To address these questions and provide demonstration areas to implement and evaluate these cover crop practices, this project will demonstrate the use of a tillage radish cover crop, an oat cover crop, and a negative control without over crops to observe their potential impact on soil and plants in a young blueberry planting. In-person Extension trainings will be conducted and recorded to demonstrate the use of varied cover crop species along with important soil and plant nutrient management techniques. Digital and print training resources will then be developed as the demonstration proceeds to illustrate impacts on plant health, growth, and productivity. This hybrid approach will enable real-time outreach that supports Extension personnel in attendance while creating a suite of training resources for future use that will enable agents to aid blueberry and other small fruit growers in best management practices for health and productivity in their plantings.

Description of Outreach Activity:

- 1) Establish demonstration plots to generate information that will help blueberry growers better understand and potentially utilize cover crops to support soil and pH management.
- 2) Evaluate soil parameters, plant nutrition, and crop productivity under different cover crops in blueberry plantings to provide information applicable to many other small fruit crops (caneberries, vineyards).
- 3) Develop Extension publications to support small fruit growers and Extension agents who support growers in appropriately selecting and utilizing cover crops to aid soil management and crop productivity.

Results or Outcome:

Objective 1. Establish demonstration plots to generate information that will help blueberry growers better understand and potentially utilize cover crops to support soil and pH management.

Demonstration plots of cover crops integrated with current or future small fruit plantings were established in fall 2020. At UT AgResearch and Education Centers in Greeneville (GREC), a new blueberry planting will be installed in spring 2021, so the cover crop demonstration will be used to show site preparation techniques. Oats and tillage radish cover crop plots were established in approximately 4' x 35' plots at a rate of 150 lb ac⁻¹ and 12 lbs ac⁻¹, respectively, on September 27, 2020.

In Spring Hill (MTREC), young blueberry plantings were already established (spring 2019 planted), so cover crops were integrated with planting beds. Plots were 3' x 50' and were seeded at the same rates described above on September 1, 2020.



Figure 1. Blueberry demonstration site in Spring Hill, TN (MTREC) with 18 month-old plants on Sept. 1, 2020 prior to establishing cover crops.



Figure 2. Blueberry demonstration sites with oats (L row) and tillage radish (R row) cover crops about 8 weeks after planting in Spring Hill, TN (MTREC). Photo taken on Nov. 5, 2020.



Figure 3. Freshly prepared plot in Greenville, TN (GREC) that was seeded in cover crop treatments in fall 2020 in preparation for a new blueberry planting in Spring 2021.

Objective 2. Evaluate soil parameters, plant nutrition, and crop productivity under different cover crops in blueberry plantings to provide information applicable to many other small fruit crops (caneberries, vineyards).

Initial soil tests were taken in late summer/early fall 2020 prior to cover crop establishment. In Spring Hill, no soil pH management was needed. In Greenville, elemental sulfur was applied and incorporated prior to cover crop seeding. Additional soil tests will be taken in late winter prior to planting in Greenville in spring of 2021. Additionally, soil tests as well as leaf tissue samples will be taken in late spring and mid-summer respectively to describe the impact of cover crops on soil pH and available nutrients at different depths as well as impact on plant nutrition.

Objective 3. Develop Extension publications to support small fruit growers and Extension agents who support growers in appropriately selecting and utilizing cover crops to aid soil management and crop productivity.

Training modules will be developed to support Extension personnel in assisting early-stage small fruit producers prepare and maintain soil and sites to support productive and sustainable plantings in Tennessee and the mid-south. These training modules will be 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) short videos from demonstration sites that will enable practical real-world connection to the topics, 3) handouts and print materials to supplement the presentation. Modules will be developed in spring and summer 2021.

Module 1: An introduction to cover crop species and uses in specialty crops plantings

Module 2: Practical uses, benefits and considerations for cover crop use to support establishment and management of small to mid-scale small fruit plantings

Additionally, in person agent in-services will be held at both sites in 2021 to deliver information and show plantings to agents. These will be held on June 15th (MTREC) and June 17th (GREC).