

FEATURE ARTICLE

# Micropropagation Breeds Jobs and Entrepreneurs

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– Leslie Lowry, BioNetwork BioAg Center Manager

About one in every five North Carolinians works in a job related to agriculture. Agriculture accounts for one-fifth of North Carolina’s economy. BioNetwork’s BioAgricultural Center in Lumberton, NC plays a significant role in the provision of economic and employment opportunities in the agricultural sector, especially in rural areas.

“Agriculture is the largest industry in North Carolina, while biotechnology is the fastest growing industry,” said *Leslie Lowry*, BioNetwork BioAg Center Manager. “North Carolina is ranked number two in the nation for agricultural biotechnology research and development. The BioNetwork BioAgricultural Center is focused on advancing and strengthening the agriculture sector of the biotechnology industry in North Carolina.”

One of its initiatives is promoting and teaching the micropropagation of plants and crops through a statewide consortium of four community colleges. The effort is breeding not only plants with larger yields but new jobs and entrepreneurs. *Becky Westbrook*, lead instructor of Environmental Science Technology and the developer of the Agricultural Biotechnology Program at Southeastern Community College (SCC) in Whiteville,

NC, has led a four-year effort to establish the bioagriculture program at her college.

SCC was the first community college in the nation to offer a two-year program in Agricultural Biotechnology and to initiate a course on BioEthics within the North Carolina Community College System (NCCCS).

*“The beauty of micropropagation is that you can take a very small piece of a plant and learn techniques to clean it in a sterile environment and make small slices. From each piece, you get thousands of plants.”*

– *Becky Westbrook*, lead instructor of Environmental Science Technology at Southeastern Community College

Located in Columbus County along Highway 74, roughly an hour west of Wilmington and an hour north of Myrtle Beach, SC, SCC is nestled among family farms, woodlands and neighboring industry. The picturesque setting hides the hard facts that the number of industries and farms have dwindled.

“We’re a rural county with approximately 52,000 people. We haven’t grown a lot since the textile industry moved overseas taking valuable jobs away from our local economy. Like most small rural communities there is a lack of industry to replace those needed jobs,” *Westbrook* said.

She feels the county has several advantages: its proximity to the beach, approximately 23 minutes from I-95, the growth in neighboring Brunswick and New Hanover counties, and a strategic geographic location along the Eastern seaboard. Agriculture is the heart of the county’s economy.

“There are a lot of tobacco farms that people are wanting to change into new potential agricultural



Venus Flytraps micropropagated at Southeastern Community College are replenishing the species around Wilmington, NC.

opportunities. There are people seeking niche farming ideas,” she said. “So it made sense to me that if we’re going to have a biotech program at Southeastern Community College, we should focus it on plants and agriculture.”

In particular, plant micropropagation or tissue culturing is an attractive option, especially for rural North Carolina. It allows a technician to produce large quantities of plants from a very small amount of mother stock resulting in plants that can be pest and disease-free.

“The beauty of micropropagation is that you can take a small piece of plant material, put it through a sterilization process, then under sterile conditions using aseptic techniques place it into a nutrient agar mixture in culture vessels. From each piece you have the ability to produce thousands of plants – that is the beauty of micropropagation,” said Westbrook. “If you plant seeds outside like a farmer, you get one plant per seed, and they are subjected to diseases and pests. We monitor these plants under controlled conditions.”

Students learn the correct techniques to be successful in a lab setting, from proper gowning techniques to how to operate modern lab equipment. They also have extensive training on media preparation. Once growth begins, the plants are then subcultured and monitored in an indoor grow room facility. After the final subculture stage, the plants are planted in their appropriate soil and moved to a step down unit for hardening of the plant. From the greenhouse, the plants are ready to be sold, used for research or a portion reserved to create stock to continue the micropropagation process.

One particular plant that Westbrook focuses on is the Venus Flytrap (currently on the High Concern List for the State of North Carolina). The only place that Venus Flytraps grow natively is within a 75-mile radius around Wilmington. “Micropropagation of this plant has resulted in a faster and earlier return; almost 10,000 Venus Flytraps within nine months of setting up our laboratory,” Westbrook said. The potential of restoration of this plant in highly poached areas is a possibility but also fulfills a demand from some overseas markets such as Germany, where scientists have been extracting a particular enzyme from this plant to use in polyp cancer research.

Supporting research is only one goal of Westbrook’s program. Economic development is the other. “You drive along and see the farmers’ greenhouses that are just sitting there. There are potential businesses that can be

## THE BIOAG CENTER: GOING GREEN IS THE WAY OF THE FUTURE



In addition to the Micropropagation Project, BioNetwork’s BioAgricultural Center works in partnership with several community colleges on a variety of projects:

**Biofuels** research, including the use of alternative crops which leave no carbon return (such as ethanol from plants).

**Bioremediation**, such as the growing of plants which absorb heavy metals and other pollutants both in soil as well as in rivers, or the propagation of special crops such as mushrooms that absorb e-coli (an infectious bacterium).

**Biopharma** research as it relates to medicinals. Although the healing power of native plants has long been studied, an enormous growing market for herbs such as Echinacea, golden seal and ginseng are fueling this leg of bioagricultural research. Pharmaceuticals can also benefit by pulling plants from controlled greenhouses where micropropagated plants are flourishing, instead of pulling them from the local environment.

**Restoration** efforts geared at protecting the environment by saving endangered and/or highly hunted plants and animals.

started from micropropagation of mushrooms, to other alternative crop plants” she said. “We are trying to bring back viable industries into this area. There are great possibilities. There really are.”

Nurseries and the flower industry can also reap great rewards. Orchid propagation via tissue culture is big business and specialty ornamentals, such as certain hosta cultivars, regularly sell for anywhere from \$40 to \$50 each. Plants that are high in demand by gardeners and plant collectors such as daylilies and other herbaceous perennials are also very profitable; most of the newly developed herbaceous ornamentals regularly sell for \$10 per plant. Micropropagation can be used to generate plants to restore native species and for bioremediation to remove pollution and heavy metals or to amend soils. Micropropagation has far-reaching implications for

marine science, animal science and forestry. Micropropagation can even support tourism. Westbrook has been contacted about micropropagating sweetgrass used to make the famous Charleston, SC baskets.

Another industry to tap into is horticulture and green goods manufacturing. North Carolina currently ranks fourth in the nation in this billion-dollar industry. "Micropropagated plant material is often shipped from the West Coast to other parts of the U.S.; however, with the work we are doing in this field, North Carolina has the potential to become the distributional center of the mid-Atlantic region," states *Ronald Dollybite*, Lead Horticulture Instructor at Wilkes Community College in Wilkesboro, NC.

"Any individual can set up a small lab, yet produce an extraordinary amount of plant material and distribute this product wholesale by utilizing phone and internet sales," said *Donna Riddle*, Horticulture Instructor at Wilkes CC. "Many commercial micropropagation companies are large, have several greenhouses, and a broad range of plant material; however there are also many 'mom and pop' type companies that specialize on one type or genus of plant, but with lots of room for financial growth."

Both Wilkes and SCC are part of the Plant Micropropagation Collaborative led by BioNetwork's BioAgricultural Center along with Mayland CC in Spruce Pine and Haywood CC in Clyde. "All four colleges have a synergetic and collaborative approach in the development and delivery of specialized micropropagation training and of a database of protocols that stimulates existing and start-up Nursery/Greenhouse operations across the state," said *Susan Seymour*, consultant for the BioAg Center. "This innovative BioNetwork project provides opportunities for increased production, operating efficiencies and profitability of North Carolina's Nursery/Greenhouse industry while providing employment for our citizens." The database has been developed as a teaching tool, but it has tremendous economic potential for students and growers in North Carolina.

"Anyone from field workers to industry employees can come to a community college and learn how to use micropropagation equipment in modernized tissue culture labs with hands-on instruction by leading faculty members. Growers in the industry can utilize our database and find out how to propagate a plant of special interest, essentially starting up a new industry,"



**Southeastern Community College's micropropagation growth lab.**

said *John Sherman*, Horticulture Instructor at Haywood CC. One AgBiotech student built her own tissue culture lab at home, micropropagated ferns, and now heads up her own thriving business.

"We aim to produce workers who possess a specific decision-making skill set," said *Phillip Johnson*, Horticulture Instructor at Mayland CC. This can equip the traditional rural farmer with a new base of expertise, which can translate into new roles, such as plant manager, technician, quality control supervisor or entrepreneur in various settings like a nursery, industry, biotech-related research or in a new business start-up.

At SCC *Teresa Lengner* is an example. In textiles for nine years, she took advantage of federal trade assistance to go back to school after Whiteville Apparel, a manufacturer of men's suits, moved to Central America in 1999. Teresa graduated from SCC with an associate degree in environmental science and is working toward her B.S. degree in the same field at UNC at Wilmington. She started with one of Westbrook's tissue culture labs learning how to micropropagate Venus Flytraps and is now employed at SCC as a lab assistant/tissue culturalist. Lengner and Westbrook will be offering a continuing education class this fall semester to help increase awareness for the general public.

"Getting up in the morning those nine years (in textiles) is a lot different then arriving at SCC today," Lengner said. "It doesn't seem like work. I have always loved the environment, and working with plants. Do what you love and love what you do." **i**

– Fatima Khan contributed to this article.