## The Ohio State University

The **Vegetable Production Systems Laboratory** conducts research in fields managed by The OSU and Laboratory personnel in Wooster, Celeryville, and Fremont, OH. Other studies are conducted on the farms of grower-cooperators located throughout the state. These fields are managed using conventional, sustainable and certifiable-organic approaches.

The Vegetable Production Systems Laboratory employs nine high tunnels in its work. All of the high tunnels are located at the OARDC in Wooster, OH. Six of the high tunnels measure 21 ft wide x 48 ft long and three measure 30 ft wide x 80 ft long. Four of the six small high tunnels were built by Laboratory personnel in Spring 2003, the remaining two were built by a local contractor in Fall 2009 and all six are managed using certifiable-organic methods. All three large high tunnels were raised by a local contractor in Fall 2009 and one is managed using certifiable-organic methods. All high tunnels have been indispensable in related research and extension activities.

The Vegetable Production Systems Laboratory regularly employs up to two thousand square feet of climate-controlled greenhouse space (all located at the OARDC in Wooster, OH) in its work. Greenhouse space is used in routine activities such as seed, cutting and transplant production and in research requiring the unique combination of scale and environmental control available only in a greenhouse. Conventional and certifiable-organic methods are used in the management of these greenhouse spaces.

The Vegetable Production Systems Laboratory employs reach- or walk-in Conviron Growth Chambers located at the OARDC in Wooster, OH when required. The scale of growth chamber studies is typically small but much can be learned through them. In our experience, growth chamber activities spark follow-up work completed in greenhouses, high tunnels, and open fields (including on farms). Growth chamber studies also help answer questions left open in research conducted in less-controlled settings.

Laboratory-based, benchtop analysis of samples collected in all other research settings is key to the Vegetable Production Systems Laboratory. This analysis allows us to describe the influence of pre-harvest management on crop physiology and quality, especially chemical makeup. A wide range of standard and advanced equipment and instrumentation is available in the home laboratory and at other facilities at the OARDC in Wooster, OH.

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The **Waterman Agricultural and Natural Resources Laboratory**, commonly referred to as the **Waterman Farm**, includes 261 acres and is located on the campus of The Ohio State University in Columbus. It includes the Turfgrass Foundation Research &

Education Facility, the Waterman Dairy Facility, the Rothenbuhler Honey Bee Research Lab, the Waterman Headquarters Building (including the Wittmeyer Conference Room), the SENRL Woodlot and acres of irrigated and non-irrigated plots. Collectively, these facilities provide comprehensive research, teaching and outreach opportunities in the areas of turf science, dairy management and research, entomology, ecological engineering, agricultural systems management, sustainable agriculture, food science, agronomic and horticultural production practices.

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The new **Williams Hall greenhouse complex** on the Ohio Agricultural Research and Development Center's Wooster campus is a state-of-the-art facility that will help advance plant research and strengthen Ohio agriculture. The new greenhouses became operational in November 2014. The complex includes 14,400 square feet of space for conducting greenhouse research and growing plants for laboratory-based research projects — with more than 20,000 square feet of total space. The facility is divided into 14 bays that are 24 feet by 40 feet each and two smaller bays, 24 feet by 20 feet each.

The greenhouses are controlled by an Argus Titan 2 environmental control system, which allows each researcher to independently control the environmental parameters for his or her experiments and plants. The facility also features individual fertilizer injectors in each greenhouse instead of a centralized system that would provide only a few fertilizer options to the entire complex.

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The **North Central Agricultural Research Station** was established in 1978 and consists of 105 acres. Initially focused on the Lake Erie region's processing tomato industry, the Station's activities have expanded over the past two decades to include research on other vegetable crops, both for processing and fresh-market uses. The facility is equipped with modern buildings, two greenhouses, and a deep well for irrigation. Research at North Central is greatly influenced by local and regional stakeholders, processors, and university faculty and by the Station's Advisory Committee.

The North Central Agricultural Research Station maintains an intensive research program that addresses the profitability and sustainability of northern Ohio's specialty crop industry: vegetable crops (tomatoes, cabbage, cucumbers, peppers, pumpkins, and sweet corn); small fruit (strawberries); and field crops (soybeans, wheat, and others). The Station serves as a key regional location for breeding research; fungicide, insecticide and herbicide evaluations; and studies of new and evolving production practices. Scientists at

North Central work to develop value-added products while incorporating integrated solutions to safeguard the environment.

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**OSU South Centers**
As a unit of The Ohio State University, the OSU South Centers houses forty-six staff members within seven buildings with a combined 69,707 square feet on 135 acres of farmland dedicated to providing applied research, enterprise development, extension, training and technical assistance. The seven buildings include: the five Research and Extension facilities at Piketon and two incubator sites: the Endeavor Center at South Centers, Piketon, and the OSU Jackson research and extension facility. Total acreage owned and operated by the Ohio State University South Centers between the Piketon and Jackson facilities is approximately 190 acres.

The South Centers has a strong agriculture and business development focus which provides teams of staff providing research and Extension to support informed decision-making throughout rural regions of Ohio. Listed below are the programs focused on by OSU South Centers' faculty and staff:

- Aquaculture Research and Development
- Agriculture Management and Marketing
- Community Development
- Direct Marketing and Rural Tourism
- Endeavor Center Business Incubator
- Entrepreneurial Signature Program – Technology Commercialization
- Horticulture and Viticulture Crops
- Manufacturing and Technology Small Business Development Center
- Ohio Cooperative Development Center
- Ohio State University South Learning Center
- Small Business Development Center
- Small Fruits – Emphasis on Berries, Grapes and Wine
- Hops and Malting Barley Research
- Bio Energy feedstocks research and education
- Soil and Water Quality

The OSU South Centers is home to research on fruit, vegetables, and hops. Applied research and extension programs are conducted in the areas of blackberries and raspberries, blueberries, currants and gooseberries, wine grapes, pumpkins, tomatoes, cucumbers, ornamental corn, squash and peppers, including high tunnel production. OSU is committed to developing a well-respected hop research program focused on both production and marketing. This will allow us to develop sustainable production practices directly related to Ohio growing conditions.

Data collected from applied research trials will allow OSU to educate growers about production, pest management practices and phenology data. Hop growers will also learn how to develop good marketing and production plans for their hops production.

**Crops, Soil, and Water Analytical Laboratory**
The crops, soil and water resources laboratory at the OSU South Centers includes more than 1,500 square feet of analytical space with an additional space of two preparation room (250 square feet) for grinding and processing of soil and plant materials, a room (100 square feet) for digestion of soil, plant and water samples, a walk-in environmental chamber, two cold rooms, and a microbial prep room equipped with a sterile hood.

Equipment includes a fully automatic C, N, O, H and S analyzer, 4- and 5-digit electronic balances, drying ovens, muffle furnace, orbital and reciprocating shakers, controlled-temperature incubators, refrigerators, freezers, chlorophyll meters, GPS system, spectrophotometers, Hewlett-Packard gas chromatography, a flow-injection autoanalyzer, high-powered microwave digestion systems, Aluminum-block hotplate, centrifuge, soil penetrometer, pressure plate membrane apparatus, tensiometers and infiltration rings, water-bath, pH and Ec meters, ion analyzers, high gradient extractors for soil fauna extraction, flow hood, fume hoods, vacuum desiccators, Gadding soil sampling equipment, other field equipment, soil and plant samples grinder, glassware, and microcomputers with large storage capacities for spreadsheets, data management and statistical analysis (SAS) software). Additionally, OSU South Centers is in the process of buying a Perkin-Elmer atomic absorption spectrophotometer.

**Fruit Quality Lab**
A new Fruit Quality lab has been established at the South Centers. It is fully equipped but is awaiting final approval for use by OSU. This lab includes a high-performance liquid chromatography meter (HPLC) where we can conduct analytical chemistry techniques to separate, identify, and quantify each flavonoid and component from hops, fruits and vegetables, and fish.

**Endeavor Center**
The Endeavor Center business incubator has approximately 27,000 square feet, including: approximately 8,000 square feet of training room space and approximately 18,000 square feet of rentable office space. Its mission is to provide new and emerging businesses with the resources and expertise they need to grow in a rapid and sustainable way so as to increase the economic vitality of the region.
The Endeavor Center offers:

- Access to professional, flexible office space
- Access to expert, free business counseling (Small Business Development Center)
- Access to advanced technology and professional office equipment
- Opportunities to network and learn from other successful small businesses

The Endeavor Center has classroom and conference spaces available to host meetings, workshops and seminars.

**Aquaculture facilities**

*Aquaculture Hatchery*: 3,000 sq. ft. hatchery is supplied with ground well water, and has additional pond water supply lines to control temperatures. The hatchery houses a recirculating aquaculture system (RAS) with ten tanks (200 × 120 cm) that can be used for RAS training and practice for this project. There are thirty 3-ft tank systems, twenty four 20" tanks and sixty-four 12" small tank research systems with flow-through well, pond water and temperature controlling system in the hatchery.

*Greenhouse and outdoor tanks*: A 90-foot greenhouse, supplied with well water, holds twelve 10'-diameter tanks, with total gallon capacity of over 30,000 gallons. A new outdoor tank system with seventy-five 6-7' -diameter tanks can be used for fingerling training and grow-out.

*Ponds facility*: OCARD has three 0.5-1 acre ponds, 12 quarter-acre ponds, and a 5-acre reservoir. All ponds are equipped with electrical service, and have ½ to 1 horsepower aerators. The pond facility can be used for fertilization, fry nursery, grow-out and harvest.

*Aquaculture Genetics and Breeding Laboratory (AGBL):* The Aquaculture Genetics and Breeding Laboratory consists of 1,250 square feet of lab space located in rooms 116 and 161 in OSU South Center main building. Instrumentation for sample preparation and genetic and breeding analysis is available. The facility performs gonadal development determination, sex identification, zooplankton identification, tissue culture, all standard genotyping and sequencing analyses, documentation, and statistical analysis.

**Jackson Facility**

The Jackson facility has approximately 12,000 square feet of space used for office and meeting rooms.

Square footage of Research and Extension Building – 16,456
Bob – 2,400
Shop – 2,820
Square footage of Endeavor Center – 27,000
Square footage of Aquaculture Building – 4,715
Square footage of Greenhouses – 4,316
Square footage of the Jackson Building – 12,000

Number of acres owned/operated by OSU South Centers – 190

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