

Connections Newsletter

Ohio State University South Centers, Piketon Ohio

Winter | 2017



Matthew Smith identifies an aquatic weed during the 2016 OSU water quality workshop in Piketon, OH.
(Photo by Sarah Strausbaugh)

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Extension aquaculture highlights

By Matthew A. Smith, Extension Aquaculture Specialist

2016 was a big year for the Extension Aquaculture Program as a new face took the reins. Matthew Smith, who started in March of 2016, is charged with leading all Extension activities related to aquaculture and aquaponics in Ohio. Especially in the world of Extension, a new employer and a new state requires an acclimation period. However, establishing a productive Extension program that will facilitate the expansion of aquaculture in Ohio in a timely manner is priority number one.

Extension and Outreach Activities

Talks were fairly plentiful for the first nine months. Two pond-side talks were given in May to recreational pond owners in Wyandot County at the request of the Soil and Water Conservation District.

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Aquaponics was a popular topic at the 2016 Farm Science Review, with Aquaculture Extension Specialist Matthew Smith using a barrelponics demonstration display to teach FSR visitors. (Photos by Matthew A. Smith)

Extension aquaculture (continued)

The first PowerPoint presentation given in Ohio by the new specialist was to OSU ANR Extension Educators at their annual retreat at the Hueston Woods Lodge and Conference Center in June. As a “one man band”, it’s necessary to coordinate with and teach other Educators in Ohio about the importance of aquaculture in the broad sense, as well as the specific considerations for Ohio. In-service or train-the-trainer workshops are imperative in this type of agriculture to help increase the rate of information dissemination to the general public. In-service trainings on pond management are already in the works for 2017.

Thanks to the coordination and assistance from Teresa Funk, the Aquaculture Extension Program was present with a quality and functioning aquaponics display in the Firebaugh building at Farm Science Review. Lettuce, kale, and goldfish were the center of attention. At least one person who stopped by the aquaponics system ended up becoming a 2017 OSU Aquaculture Boot Camp 2 student. Some much-appreciated assistance from aquaponic farmers allowed our specialist to get away long enough to present three fish related talks on behalf of the Extension program. This will likely become an annual occurrence whenever possible.

Aquaculture Extension Program Leader, Matthew Smith, was present several days during the Ohio State Fair and answered fairgoers’ questions about aquaculture and aquaponics in Ohio for a few days. Additionally, the U.S. Department of Energy holds an annual Science Alliance (all things STEM related) in Piketon, Ohio for over 1,500 high school students from southern Ohio. Fourteen talks were given over three days in October to all of the students present, increasing the outreach arm of the program in southern Ohio.

The Ohio Aquaculture Association also coordinated with the OSU South Centers to offer a fall beginner workshop to those interested in learning about aquaculture in Piketon. Two beginner talks were offered by Matthew Smith and have since been added to the Extension Aquaculture website. Attendees were from Ohio, Indiana, Maryland, and West Virginia.

In addition to presentations, the Extension program has been busy developing and establishing *Buckeye Aquafarming*, an aquaculture newsletter that is released three times a year by the OSU South Centers. Topics have been wide and diverse, although everything is geared towards educating our fish farmers and policy makers on pertinent matters. Some topics include, marketing your aquaculture product, water quality considerations, principles of biofloc systems, the Lacey Act as relevant to aquaculture, and co-ops. Smith’s contributed articles to *Buckeye Aquafarming* include the Lacey Act, water quality considerations, and a solicitation article for farmer participation in an upcoming survey. Other articles written by Smith can be found in *Arkansas Aquafarming*, *Ohio Aquaculture Association Summer Newsletter*, and the *Ohio Aquaculture Association Journal*.

OSU Extension Aquaculture Program Led Workshops

Matthew Smith held his first workshop at the OSU South Centers in August and focused on water quality management for fish farmers in Ohio. Previous research conducted by Dr. Laura Tiu showed knowledge on water quality management is a top priority for fish farmers in Ohio. Since proper management is necessary for a successful operation, it only seemed fitting to have this as the focus of the first workshop. Allen Pattillo, a fisheries/aquaculture specialist with Iowa State University, was brought in for this workshop to offer his expertise on aquaponic systems. Both seasoned and beginner farmers attended the workshop, including two farms from Indiana. Hands-on experience and facility tours were offered in addition to the numerous PowerPoint presentations. (continued on page 3)



Aquaponic student tour at Piketon, OH. (Photo by Sarah Strausbaugh)

Extension aquaculture highlights (continued)

Professional Service

Extension Program Specialist Matthew Smith was nominated to the North Central Regional Aquaculture Center's (NCRAC) Executive Committee and Technical Committee. His roles include general Extension representation, review and recommendation of proposals for funding, development of problem statements, and review annual progress reports. Professional service includes being appointed to the National Aquaculture Association's Aquatic Nuisance Species Committee, presence as an ex-officio member on the Ohio Aquaculture Association's Board of Directors, and an Ohio Fish Health Group member. He was also appointed to the Aquaculture Advisory Board for Hocking College.

Research

A first for the specialist, his master's research entitled Split Ponds Effectively Overwinter Baitfish was accepted for publication by the Journal of the World Aquaculture Society and is currently available online for early viewing. A high summer temperature research publication left over from Arkansas is currently in preparation. Funded research projects include assessing the status of state aquaculture associations in the north central region, as well as updating older NCRAC Extension publications. Other proposals have been submitted and we are waiting on the results to come in early 2017. He has worked diligently to ensure that multiple OSU program areas work together for the better of the aquaculture industry.



Aquaculture Genetics Lab, OSU South Centers all-male bluegill grow significantly faster than regular bluegill. (Photo by Hong Yao)

Aquaculture research achievements and impacts 2016

By Dr. Hanping Wang, Senior Scientist

Summary of Achievements: In 2016, in collaborations with the University of Wisconsin-Stevens Point, Lincoln University of Missouri, the Oregon State University, and several other international institutions, we accomplished goals of ten research studies and projects resulting in several manuscripts being prepared and submitted; published four peer-reviewed journal articles and two proceedings abstracts; received two grants for \$670,000; trained three graduate students and post-doctoral fellows; and submitted nine new grant proposals. An international conference on perch and bass was organized. Two books entitled “Sex-Control in Aquaculture” and “Culture and Breeding of Perch and Bass” which are being edited by Dr. Hanping Wang, have made great progress. A fast-growing all-female perch strain and a fast-growing all-male bluegill strain have been developed.

Yellow Perch Breeding: Funded by Ohio Sea Grant, neo-male populations of yellow perch with a female genotype have been created, and a fast-growing all-female strain has been developed by crossing neo-males with regular females for the aquaculture industry. The all-female population should be able to grow 50% faster than unimproved regular mixed populations, and will be available to industry in 2017. A fifth generation of fast-growing lines of yellow perch was created for the aquaculture industry through marker-assisted cohort selection. So far, more than approximately 2,000,000 genetically improved seeds have been distributed to farms for testing and demonstration.

Bluegill Breeding: A technique for producing all-male Bluegill populations has been developed. Testing all-male or near-all-male bluegill populations at two locations is in progress, and preliminary data showed: 1) Weight gain and growth rate of all-male stock were 2.1 times as that of regular Northern and Coppernose stocks; 2) Growth advantage of all-male group starts as early as 5 grams; 3) All-male groups had significantly more uniform size and lower coefficient of variation; and survival of all-male groups was significantly higher than that of mixed sex groups due to the more uniform size. (continued on page 5)

Aquaculture research achievements and impacts 2016 (continued)

Temperature effects on sex ratio and sex-determination have been found in bluegill populations. The findings were published in the journals, *Aquaculture* and *The Biological Bulletin*. The results from two experiments provide a valuable base for developing all-male broodstocks for bluegill, which could grow 35-50% faster than mixed populations.

Identify the best genetically distinct largemouth bass populations for industry: In 2016, we genotyped 280 additional largemouth bass from 28 wild populations across the United States using eight microsatellite loci, which are standard genetic markers for population genetic analysis. The data are being analyzed together with previous data to confirm the major findings resulting from previous data. The information provides a valuable basis for development of aquaculture genetic breeding programs in largemouth bass.



Partnership between Ohio State University and Huazhong Agricultural University was initiated and promoted by OSU South Centers. (Photo by Beau Ingle, International Programs in Agriculture for CFAES)

An experiment evaluating soybean meal as a protein source for northern and southern largemouth bass was completed. The results indicated that northern subspecies had superior growth compared to Florida subspecies in the current experimental setup. The results provide a valuable base for developing fast-growing largemouth bass broodstocks for the industry.

Genomic sequence and tool development: We have completed whole genome sequencing of yellow perch and bluegill. These are the first Percidae and Centrarchidae (sunfish) that have been fully sequenced. Yellow perch belong to the family Percidae including about 200 species in 10 genera. The perch, darter, and their relatives are in this family and well-known species of great economic value, including the three species of perch, walleye, sauger and ruffe. Knowledge of the whole genome in these two species makes it possible to see how genes interact with each other, and examine the exact gene that governs economically important traits such as fast-growing and disease resistance. The perch and sunfish genome sequence data provide useful genetic resources and lay an important foundation for discovering the molecular mechanism of growth, sex determination and sex control, reproduction related to aquaculture, and conservation of wild stocks for over 100 economically and environmentally important percid and sunfish species. We also completed whole genome sequencing of two strains of bluegill to develop SNPs and investigate the genomic base of sex determination for developing a mono-sex population, and results have been published by the high impact journal, *PLOS ONE*.

Improvement of perch fry survival rate for industry: Six feeding regimes were tested in 2016. An effective marine rotifer production and feeding system was developed. Effective feeding regimes and protocols were identified for improving survival rate of perch fry. We found mouth gape is the key determinant of larvae survival, which can be selected as a quantitative trait, and concluded that developing yellow perch broodstock with larger mouth gape and larger size of egg, using improved fish to increase indoor survival of larvae and fry is critical to the YP industry development.

Promotion of international training and collaborations: Leading research in aquaculture genetics and breeding at OSU South Centers has produced international impacts and attracted about thirty scientists and international scholars to work in the Aquaculture Research Center and Genetics Lab at Piketon over the past ten years. In 2016, the lab trained three visiting Ph.D. students and post-doctoral researchers. They also significantly contributed to the aquaculture program's success at OSU South Centers. In October 2016, we organized an international conference on Perch and Bass in China. We initiated and promoted a partnership between Ohio State University and Huazhong Agricultural University and an MOU between the two universities was signed at OSU in Bricker Hall in May 2016.



New 2017 Aquaculture Boot Camp-2 recruits were welcomed by OSU South Centers Aquaculture and Business staff.
(Photo by Sarah Strausbaugh)

Aquaculture Boot Camp (ABC) Achievements and Impacts 2016

By Dr. Hanping Wang, Senior Scientist and Jordan Maxwell, Program Coordinator

After the successful completion of Aquaculture Boot Camp-1 (ABC-1), the South Centers aquaculture team, in collaboration with the business development and horticulture teams, and in partnership with the Ohio Aquaculture Association and the University of Wisconsin–Stevens Point, submitted an ABC-2 proposal in early 2016 and received an award of ~\$600,000 from the USDA National Institute of Food and Agriculture in August 2016 to continue the ABC program. We are the first aquaculture unit in the U.S. to receive funding for this type of project from USDA. The ABC-2 program will utilize a “3-1” (**Intensive, Intermediate, Introductory**) training and multi-faceted approach, including classroom and hands-on training, paired with industry mentoring to enhance the sustainability of new and beginning aquaculture/aquaponic and next generation farmers in the Midwest. A key addition to ABC-2 is the inclusion of aquaponics. This expansion is a direct result of strong interest from Ohio and the North Central Region. Upon completion, participants will have the knowledge

and hands-on experience to successfully operate a sustainable aquaculture or aquaponics business. The members of the OSU aquaculture team look forward to seeing the expansion of aquaculture and aquaponics in the region as a result of this program.

Jordan Maxwell is the program coordinator for the ABC-2 program. She is coordinating, developing the training materials, and providing one-on-one support for ABC-2 participants. She will also be collecting data and writing project progress reports, publications, and news articles.

Ms. Maxwell received a B.S. in Wildlife and Fish Management from The University of Rio Grande, and also holds an Associate's Degree in Wildlife Resources Management from Hocking College. She has teaching and coordination experience at Hocking College, and has aquaculture/hatchery experience at the West Virginia Division of Natural Resources Applegate fish hatchery and the Hocking College fish hatchery. This experience is beneficial to her as she works to develop the ABC-2 programs and training activities.

This past fall, we selected 33 highly motivated new (less than 5 years of farming experience) and beginning fish farmers and aquaponic producers from across Ohio and the Midwest, out of nearly 70 applicants for the ABC-2 **Intensive** Program. The year-long program consists of twelve monthly informative educational modules and materials in aquaculture production, and twelve monthly educational modules and materials in business and marketing. The ABC-2 kickoff class was successfully held at OSU South Centers on January 14, 2017. The Ohio Aquaculture Association-Aquaculture Boot Camp Annual Aquaculture conference was held in Columbus on January 27-28, 2017. Approximately 140 aquaculture farmers attended the conference including 28 ABC-2 **Intensive** students. The ABC-2 students are being actively involved in aquaculture/aquaponics and are seriously dedicated to developing skills for entry into the industry.



(Photo by Beth Rigsby)

Endeavor Center and SBDC success

By Ryan Mapes, Business Development Network Program Leader and Endeavor Center Manager

2016 has been another successful year for the OSU Endeavor Center. The center operated at a 100% occupancy rate for most of the year, with new partners ready to come on board to fill vacated offices when they became available. Mid America Conversion Services is the latest business to become an Endeavor Center partner. There are 17 partner companies that occupy 25 office and light industrial bay spaces. We also have three virtual partners that occupy the building on a part-time basis but do not occupy an office. There has been much activity and many visitors through the Endeavor Center doors this year. We hosted over 400 training or meeting events with well over 5,000 visitors during 2016.

The Small Business Development Center (SBDC) at the OSU South Centers was recently successful in obtaining the SBDC funding award for another two-year period, 2017 and 2018. We will continue to provide business consulting to the existing and start-up small businesses in our service area, which changed slightly as Fayette County is now included in the Region 7 SBDC network. The SBDC area served now includes Adams, Brown, Gallia, Fayette, Highland, Jackson, Lawrence, Pike, Ross, Scioto, and Vinton Counties. For fiscal year 2016 the SBDC at the OSU South Centers provided the following assistance:

- Provided consulting to 345 clients of which 212 received five or more hours of consulting
- Assisted with starting 27 businesses
- Helped clients obtain \$10,037,949 in capital
- Logged 5,002 consulting hours
- Held 20 training events with 503 attendees
- Clients created 172 new jobs and retained 1,011 jobs
- Recorded \$7,415,000 in general sales growth for clients

SBDC work with the University of Rio Grande:

The OSU-RIO Collaboration broadcasts are multi-media (Radio, TV, YouTube and Live Internet Streaming) educational shows with a host of different topics that promote Small Businesses, Business Support Organizations, Programs at The Ohio State University South Centers, and Educational Programs at the University of Rio Grande/ Rio Grande Community College.

As a result of the URG/OSU programming success, OSU was able to secure grant funds to install a recording studio at the South Centers. Currently, we are airing weekly shows pertaining to business and manufacturing.
(continued on page 8)

Endeavor Center and Small Business Development Center (continued)

The Small Business Administration provided additional support to the SBDC to have detailed marketing projects completed for SBDC clients. This project was completed in partnership with the University of Rio Grande in which students from Dr. Wesley Theone's marketing class completed market research and developed comprehensive marketing plans for five SBDC clients.

SBDC Work with the Chillicothe Veterans Affairs Medical Center:

Over the past six months, the SBDC has partnered with the Office of Rehabilitative Services at the Chillicothe Veterans Affairs (VA) Medical Center to establish an entrepreneurship program for veterans. The program is divided into three two-hour classes and occurred quarterly. The classes focus on business feasibility and entrepreneurship readiness, business plan components, marketing, and operations. The veterans who have successfully completed this course have either already started or are in process of starting their own business. The next series of classes will begin in February.

SBDC work with SOACDF:

SBDC continues to work with the Southern Ohio Agricultural and Community Development Foundation in providing assistance to area farmers interested in applying for the Ag Development Grant and the Young Farmer Grant programs. This is a program where our SBDC counselors work closely with area farmers to write business plans for projects that will be submitted to SOACDF for potential grant funding to assist with their project. This year, we helped 43 individuals complete and submit applications for these programs. You can see details and deadlines about the program at www.soacdf.net/.

SBDC work in Export Assistance:

International markets provide opportunities for businesses to increase sales and create jobs. Many small companies lack the expertise or resources to expand their business into international markets. The Export Assistance Program (EAP) helps companies to expand globally through counseling in the areas of market research, due diligence, general export education, export readiness assessments, and trade missions.

The EAP worked with 19 Appalachian companies that were awarded \$83,856 from the International Market Access Grant for Exporters (IMAGE) and/or the Appalachian Export Grant to expand their international marketing efforts and increase their exports.

Be sure to visit our weekly Blog and stay up-to-date with the OSU South Centers business development network at u.osu.edu/osubusinessdevelopmentnetwork.

The Ohio State University Direct Agricultural Marketing Team is excited to once again, offer FREE marketing webinars once a month. Each month we have a new topic to discuss, with various educational presenters.

Each webinar begins at noon, and is approximately one hour in length. Attendees have the opportunity to ask questions to the presenter, and comment to other attendees. This is a great way to network and share valuable information with one and other.

Please see the flyer on the next page for dates, topics, and presenter information.

All webinars are recorded. For all our previous webinars, you may go to directmarketing.osu.edu

If you have questions regarding this year's webinar schedule, please contact Christie Welch, OSU Direct Marketing Specialist at welch.183@osu.edu.

OHIO AGRICULTURAL RESEARCH AND DEVELOPMENT CENTER
OHIO STATE UNIVERSITY EXTENSION

Ohio State University Direct Agricultural Marketing

2017 Webinar Series

One-hour webinars bring exceptional speakers to your home, office or local Extension center.

If you're interested in finding out more about direct marketing issues, visit <http://directmarketing.osu.edu> for more details.



Date	Topic	Lead Presenter	Connection
Jan. 19	Social Media Strategies for Small Farms	Ivory Harlow	go.osu.edu/SocialMediaStrategiesforSmallFarms1-2017
Feb. 16	Marketing Lessons Learned from the Super Bowl	Eric Barrett	go.osu.edu/MarketingLessonsLearnedfromtheSuperBowl2-2017
Mar. 16	Marketing Small Ruminants	Tony Nye	go.osu.edu/MarketingSmallRuminants3-2017
Apr. 20	Are You Still Accepting Cash in a Digital World	Eric Barrett	go.osu.edu/AreYouStillAcceptingCashinaDigitalWorld4-2017
May 18	Managing Negativity	Rob Leeds & Jacci Smith	go.osu.edu/ManagingNegativity5-2017
June 15	Organic, Naturally Grown, Chemical Free: What do these mean?	Eric Pawlowski & Amalie Lipstrue	go.osu.edu/OrganicNaturallyGrownChemicalFree6-2017
July 20	Breaking into Small Retail Sales with my Locally Produced Products	Amanda Osborne & Jacqueline Kowalski	go.osu.edu/BreakingintoSmallRetailSaleswithmyLocallyProducedProducts7-2017
Aug. 17	Creating Your Customer Profile	TBA	go.osu.edu/CreatingYourCustomerProfile8-2017
Sept. 21	Marketing Your Farmers' Market	Amanda Osborne & Christie Welch	go.osu.edu/MarketingYourFarmersMarket9-2017
Oct. 19	Marketing Milk and Cheese from Your Small Dairy Farm	TBA	go.osu.edu/MarketingYourFarmersMarket9-2017
Nov. 16	Getting Market Ready for Wholesale	Tim Wood	go.osu.edu/GettingMarketReadyforWholesale11-2017
Dec. 21	What Marketing Issues Did You Encounter this Past Season?	DM Team	go.osu.edu/WhatMarketingIssuesDidYouEncounterthisPastSeason12-2017

For recordings of all webinars go to go.osu.edu/DirectMarketingWebinars



THE OHIO STATE UNIVERSITY
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<http://directmarketing.osu.edu>

CFAES provides research and related educational programs to clientele on a nondiscriminatory basis. For more information: <http://go.osu.edu/cfaesdiversity>.

OSUE Direct Agricultural Marketing Team 2016 achievements

By Christie Welch, Direct Marketing Specialist

The Direct Agricultural Marketing Team had a great 2016 assisting Ohio's farm markets, farmers' markets, agritourism operators, and stakeholders. Some of the trainings provided included:

- Monthly webinars on a host of direct marketing topics that are archived on our website for viewing anytime, by anyone with an internet connection.
- Many workshops and presentations from social media marketing to designing your farm market for flow and profit.
- Collaborated with attorney Peggy Hall, OSUE Agricultural and Resource Law Field Specialist, to offer a free webinar and resources at the Farm Science Review about the new agritourism law in Ohio; Ohio Senate Bill 75.
- Collaborated with the Ohio Proud Program to offer two day-long training programs to Ohio's direct marketers to improve their online presence to better communicate with their customers.
- Collaborated with the Ohio Small Business Development Centers to provide a train-the-trainer program, DeviceReady (previously Maps&Apps). This program will be used by the Ohio SBDC counselors to better assist their small business clients with online marketing.
- Collaborated with the Ohio Produce Growers and Marketers Association to offer a direct ag marketing track at their annual Congress. This 3 day conference provided training to nearly 350 Ohio produce growers and marketers.
- The annual team meeting gathered at Easton Town Center to do some on-site learning of marketing and merchandising techniques for businesses at Easton.

2017 is gearing up to be a busy year of additional training and assistance for Ohio's direct marketers. We will be once again offering our free monthly webinars, many workshops including Ohio MarketReady trainings, and many presentations. We will be assisting Ohio's direct ag marketers with how they can take advantage of current food trends and how to more effectively communicate with their customers. If you would like to learn more or would like assistance for your agricultural enterprise, please go to our website southcenters.osu.edu/marketing or contact Christie Welch, Direct Ag Marketing Specialist at welch.183@osu.edu.



Brad Bergefurd and Rob Leeds exploring how other industries market their products at Lush at Easton Town Center during our annual Direct Ag Marketing Team meeting. (Photo by Christie Welch)



OCDC achievements

By Hannah Scott, OCDC Program Manager

2016 was an exciting year at the Ohio Cooperative Development Center (OCDC) at The Ohio State University South Centers! The center continued its mission of rural economic development by providing education and assisting cooperative businesses across Ohio and West Virginia.

Cooperative Education Across the Region

OCDC provides education on the cooperative business model and business development that not only increases awareness of the business model, but helps groups who are exploring the start-up of a co-op business to make informed decisions.

Throughout 2016, OCDC provided a number of educational sessions at events like the West Virginia Small Farm Conference, the Ohio Produce Growers and Marketers Association Annual Congress, the Ohio Aquaculture Association Annual Conference, and the West Virginia Agricultural Innovation Showcases in Huntington and Moorefield. Specialists with OCDC lead programs for high school agricultural science students from Portsmouth and Piketon, Ohio, and presented to business students at the University of Rio Grande.

Technical Assistance

In order to support the development of rural businesses, OCDC counselors provide technical assistance in a number of areas including feasibility analysis, business planning, cooperative formation counseling, and financial planning, among others. In 2016, OCDC counselors worked with a variety of clients who were forming new cooperatives or existing cooperatives that were working to improve their businesses.

For example, OCDC staff provided support to the Southern Ohio Growers Cooperative (SOGC) to explore the cooperative business model, legally incorporate a new business, and build financial projections for the 2016. The co-op was up and running for the 2016 growing season, marketing a variety of pumpkins to retailers across the state and helping member farms increase their revenue!

Ohio and West Virginia Food Hub Network

OCDC continued convening and facilitating the successful Ohio and West Virginia Food Hub Network throughout 2016, bringing together food hub managers, directors, developers, and technical assistance providers for peer learning and networking. The network met quarterly and included sessions focused on financing, quality and process controls, and institutional markets. Multiple network meetings throughout the year included tours of operating businesses, including produce aggregation and distribution businesses and local food grocers. The tours of operational facilities gave participants the chance to observe working facilities, learn from employees about how produce is sourced from growers, protocols for aggregating and distributing products, as well as the importance of quality and safety control throughout the supply chain. OCDC was pleased to partner with the West Virginia Food and Farm Coalition and the Value Chain Cluster Initiative to host the August 2016 network meeting. *(continued on page 12)*



**Pumpkins grown by members of the Southern Ohio Growers Cooperative are delivered for distribution.
(Photo by Hannah Scott)**

OCDC achievements (continued)

Building OCDC's Capacity

OCDC is committed to building the center's capacity for technical assistance in order to enhance the support available to Ohio and West Virginia's new and emerging cooperatives. In October, OCDC took a large step forward toward increasing capacity by welcoming a new staff member!

Ivory Harlow is a Program Specialist working to provide technical assistance and educational programming to rural businesses in the region. She holds a Bachelor of Arts in Business Administration from Strayer University and earned a Master of Arts from Ohio Christian University. Ms. Harlow is a veteran of the United States Air Force, where she served as a medical material logistics journeyman. She is a graduate of Syracuse University Whitman School of Management's Veteran Women Igniting the Spirit of Entrepreneurship (V-WISE) program, and Entrepreneur Bootcamp for Veterans (EBV) at the Trulaske College of Business, University of Missouri. Ivory has a background in agriculture and business development. She is the owner of Dickie Bird Farm LLC in Ross County, Ohio. She writes *Farm Forward*, a weekly agriculture column for *Farm and Dairy Newspaper*.

OCDC Recognized by the U.S. Department of Agriculture

On October 3, 2016, the Ohio Cooperative Development Center was recognized by the U.S. Department of Agriculture Rural Development with an Award of Excellence. The award was granted, "In honor of nearly two decades of steadfast promotion and support of co-ops, leading to the success of innumerable rural and agricultural-based businesses in the Buckeye state." Sam Ridders, Administrator of USDA Rural Development's Rural Business Cooperative Service presented the award to OCDC staff along with Tony Logan, Director of USDA Rural Development in Ohio. The two visited Piketon to help kick off Co-op Month 2016 and to announce awards for USDA's Rural Cooperative Development Grant (RCDG). As a recipient of an award through the grant program for the upcoming year, OCDC received funds to support business assistance throughout the region, focusing particularly on businesses in agriculture, forest and wood products, transportation, and energy.



Ivory Harlow joined OCDC as a program specialist in October and has been busy working to develop training materials and provide client assistance.
(Photo by Kimberly Roush)



USDA Rural Development presents an Award of Excellence to the Ohio Cooperative Development Network. Left to right: Tony Logan, USDA Rural Development; Debbie Rausch, USDA Rural Development; Hannah Scott, OSU South Centers; Dr. Tom Worley, OSU South Centers; Administrator Sam Ridders, USDA Rural Development.
(Photo by Beth Rigsby)

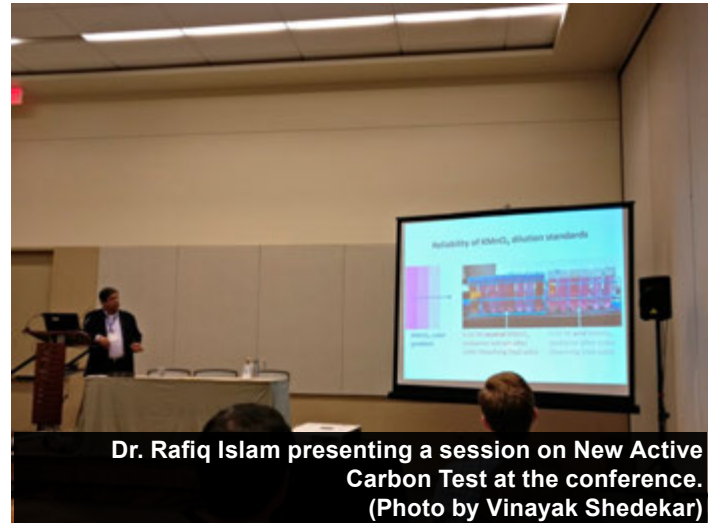
Soil, Water and Bioenergy Program research highlights at the 2016 American Society of Agronomy International Meetings

By Yogendra Raut, Soil, Water and Bioenergy Resources

Five research presentations were made at the American Society of Agronomy/Crop Science Society of America/Soil Science Society of America International meetings by Rafiq Islam, Yogendra Raut, and Vinayak S. Shedekar in Phoenix AZ, November 6 to 9, 2016.

The OSU Soil Organic Matter Calculator - a Decision Tool to Manage Soil Health was presented by Vinayak S. Shedekar with Rafiq Islam, Randall Reeder, and Jerry Grigar (USDA-NRCS Michigan) as co-authors. This presentation was selected for second prize in the Graduate Student Competition based on intellectual quality and merit. This is a simplified version of the computer model designed as a user-friendly decision support system to be used by producers to manage their farm operations and farm profitability. This is free software and can be downloaded from the Soil, Water, and Bioenergy Resources program website go.osu.edu/SOMCalculator.

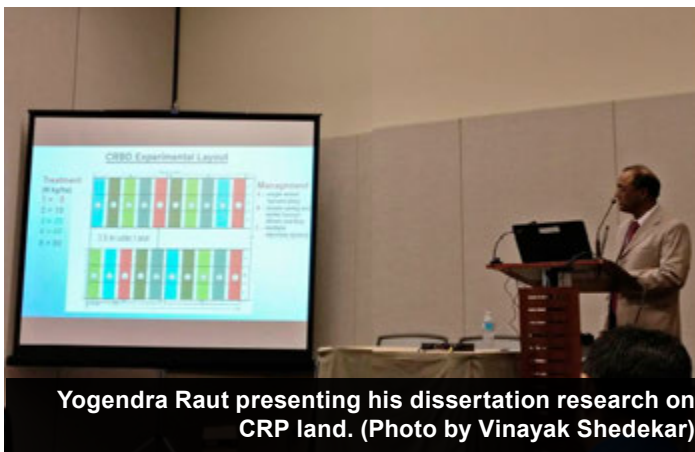
Yogendra Raut delivered a scientific presentation entitled "Bioenergy Production and Carbon Sequestration Dynamics under Conservation Reserve Program Management System" based on his Ph.D. dissertation work with Drs. Warren Dick and Vinayak Shedekar, as co-authors. The long-term study has shown that harvesting of aboveground biomass from Conservation Reserve Program (CRP) land would be a win-win situation in terms of bioenergy feedstock production, carbon credit and improved soil quality.



Dr. Rafiq Islam presenting a session on New Active Carbon Test at the conference. (Photo by Vinayak Shedekar)

Rafiq Islam delivered three presentations, two on soil quality and one on soil organic matter quality and storage. His first presentation, "Soil Organic Matter Quality and Storage under Different Land-Use Systems Following Primary Deciduous Forest Conversion" featured USDA-Borlaug scholar Emmanuel Amoakwah from Ghana as the primary author. The study showed that the temporal land-use changes at the OSU South Centers Research farm at Piketon affect the land quality in terms of carbon source and sink. He delivered the second presentation entitled "Evaluating Anthrone Reactive Carbon as a Measure of Soil Quality" as a new approach based on soil health core indicator properties functionally associated with soil quality that are largely controlled by labile organic carbon in soil.

Rafiq delivered his third presentation during the Soil Health Assessment and Management session on "A New Active Carbon Test to Evaluate Agricultural Soil Health Globally." This is a modified version of the earlier soil quality test, based on active carbon. In general, the earlier procedure is suitable for mineral soils and not consistently desirable for soils with high carbon content, mine reclaimed soil, muck soil, Ca-rich soil, Fe- and Al-rich red soils, and submerged or rice soils. This new soil quality test can be successfully used to measure soil quality of various soils on a global scale.



Yogendra Raut presenting his dissertation research on CRP land. (Photo by Vinayak Shedekar)

South Centers leads the Ohio State University Extension Signature Program: Healthy Soil – Healthy Environment

By Vinayak Shedekar, Research Associate

The Healthy Soil – Healthy Environment is an Ohio State University (OSU) Extension Signature Program launched in July 2016 that will create a Soil Health Education and Outreach Network comprised of OSU researchers, Extension educators and 4-H educators. Vinayak Shedekar, OSU South Centers Research Associate and Alan Sundermeier, Wood County Extension Educator co-lead the program. Dr. Rafiq Islam, Brad Bergefurd, and Dr. Dan Remley from OSU South Centers are also members of the team.

The new signature program intends to serve a variety of clientele including: all farmers (traditional, organic, no-till, sustainable or low-input), landowners, 4-H members and youth, urban gardeners (youth and adults), Master Gardeners, crop consultants, ag retailers, salesmen, underserved populations, non-profit organizations, and the general public. The program's long-term goal is to help improve Ohio's Soil Health and Environment by educating farmers, youth, and the general public. Over the past half century, OSU researchers have developed a plethora of knowledge and practical solutions farmers can use to better manage their soils. Examples include the long-term no-till studies in Wooster, cover crop studies in Piketon, and the long-term soil drainage and compaction research at Hoytville. This vast knowledge base will be made available to the stakeholders through the Healthy Soil – Healthy Environment program.

Maintaining a healthy and productive soil is the foundation of sustainable agriculture. However, a majority of producers, youth in agriculture, and urban gardeners are unaware of the importance and ways to manage soil health. The OSU Healthy Soil – Healthy Environment signature program is intended to bridge this knowledge gap, by providing knowledge and tools, and educational curricula related to soil health and its assessment under different agricultural management settings. The program will develop factsheets and other educational materials, conduct in-service training, workshops and field days focused on sustainable soil management practices, and develop curriculum that could be incorporated into state-wide 4-H and youth-education programs.

The program team also includes OSU soil scientists Warren Dick, Nick Basta, Rafiq Islam, and Steve Culman, and OSU Extension Agriculture & Natural Resources and 4-H educators Clifton Martin (Muskingum County), Dr. Robert Horton (Columbus), Jason Hendrick (Putnam County) and Sarah Noggle (Paulding County), Michael Schweinsberg (Paulding County), and Les Ober (Geauga County).

Program website: soilhealth.osu.edu

Twitter: @OhioSoilHealth



Vinayak Shedekar speaking at the Soil Health Workshop, in Wooster, Ohio April 29, 2016. (Photo by Rafiq Islam)



Alan Sundermeier speaking at the Urban Soil Workshop, in Wooster, Ohio Jan. 25, 2017. (Photo by Vinayak Shedekar)

Collaborative graduate research highlights in Soil, Water and Bioenergy Resources Program

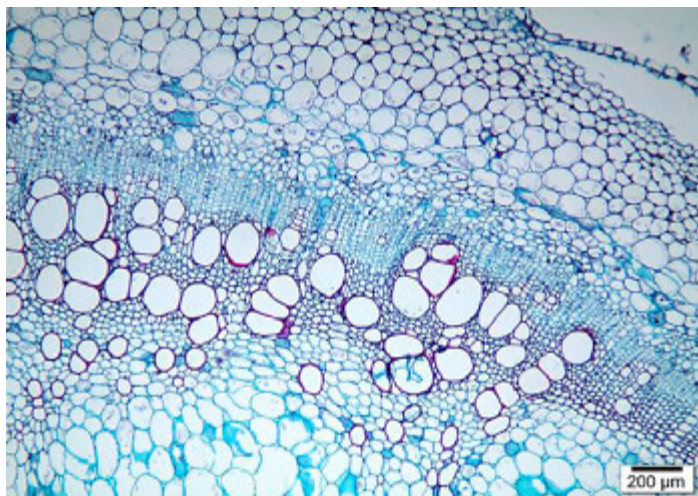
By Dr. Rafiq Islam, Soil Program Director

Since 2002, the Soil, Water and Bioenergy Resources Program at the Ohio State University South Centers has developed a graduate research and educational collaboration with numerous universities across several continents. Currently, two graduate students are visiting scholars working in the Soil, Water and Bioenergy resources Program on their Ph.D. research work. Heba Said Ali El Desouky El Abd, Assistant Lecturer, Botany Department, Faculty of Agriculture, Benha University, Egypt is funded by the Government of Egypt for a 2-year research scholarship. Emmanuel Amoakwah, Research Scientist at the Council for Scientific and Industrial Research (CSIR) - Soil Research Institute, Kwadaso – Kumasi, Ghana, is funded by USDA Norman E. Borlaug Leadership Enhancement in Agriculture Program (LEAP).

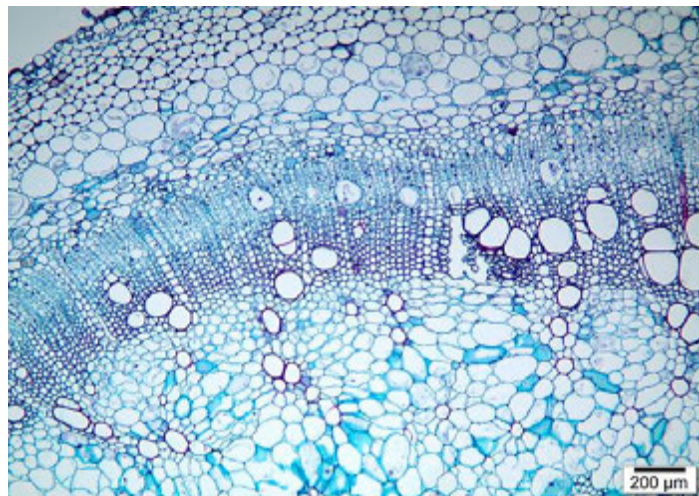


Heba Said Ali El Desouky El Abd

Heba is working on her Ph.D. thesis work entitled “Plants Response to Nano- and Chelated Nutrients” under the supervision of Professor Hosny Mohamed Abd-El Daym, Plant Physiology, Botany Dept., Faculty of Agriculture, Benha University, Egypt (principal supervisor) and Rafiq Islam, Program Director, Soil, Water, and Bioenergy Resources at The Ohio State University South Centers, Ohio, USA (host supervisor). Her research work focuses on using iron-based nanotechnology (nano-fertilizer) on the physiological processes, growth and yield of greenhouse grown tomato and cucumber production, compared with conventional and chelated Fe fertilizers. So far, she has generated tremendously high quality data to observe that precision technology such as Nanotechnology is far superior to the conventional systems to modify the plant root, stem, and leaf cell structures to improve water and nutrient uptake by plants and consequently, increase plant growth and economic yields. Some of her research slides on modified plant cell structures and fruit quality are shown below:



Chemical iron fertilizer effects on tomato stem cell



Nano iron fertilizer effects on tomato stem cell



Fig. 1: Conventional iron fertilization (7), chelated iron fertilizer (8) and nano iron fertilizer (9) effects on tomato fruits

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Collaborative graduate research highlights (continued)

Emmanuel Amoakwah, a Ph.D. student in the Dept. of Soil Science, University of Cape Coast, Ghana is funded by the USDA-Borlaug LEAP program for a 10-month scholarship to complement his Ph.D. research work in Soil, Water and Bioenergy Resources. This is his second time to visit and study at OSU South Centers. The first time, he came in 2013 as a USDA-Borlaug short-term scholar to learn more about newly developed lab and field research techniques. That work experience he acquired at the OSU South Centers persuaded him to enroll in the Ph.D. program at the University of Cape Coast in Ghana. His Ph.D. research study is titled "Biochar Effects on Nutrient Recycling, Mitigation of Pollution and Greenhouse Gas Emissions, and Crop Productivity." Specific objectives of his research are to: (1) Characterize physico-chemical characteristics of biochar, (2) Determine the effects of biochar greenhouse gas emissions, (3) Measure the effects of biochar on soil quality, and (4) Determine the effects of biochar on crop productivity. Some progress of his work is illustrated on this page.



Emmanuel Amoakwah, USDA-Borlaug scholar is measuring greenhouse gas emission in his experimental plots.



(Photo by Vinayak Shedekar)



Ryan Slaughter presented results from our elderberry research project. (Photo by Gary Gao)

Small fruit progress

By Dr. Gary Gao, Extension Small Fruit Specialist and Associate Professor, OSU South Centers Adjunct Associate Professor, Department of Horticulture and Crop Science and Ryan Slaughter, Research Assistant, OSU South Centers

2016 was a busy and productive year for our specialty fruit crops horticulture program area. We conducted Extension and outreach programs for commercial fruit growers, revised fact sheets for consumers, conducted applied research projects, received new grants, and participated in international activities.

Extension Outreach:

Three key educational programs were offered at OSU South Centers in Piketon. They were the Ohio Super Berry and Wine Grape Workshop in March, Ohio Super Berry, Container Fruit Production and Wine Grape Field Night in July, and Wine Grape Analysis Work in December. Our research and demonstration plots were featured at all of these programs in addition to classroom presentations and field demonstrations by Gary Gao, Patrick Pierquet, Dong Qin, Ryan Slaughter, and Todd Steiner.

We also offered numerous tours of our research plots to students, new and existing growers, our colleagues at The Ohio State University and several other universities. Our group also participated in the 25th year celebration of OSU South Centers in Piketon.

Dr. Gary Gao served on the planning committee for the 2016 Ohio Grape and Wine Conference in Dublin. The program drew an excellent attendance in 2016 and evaluations were very positive.

Dr. Gary Gao spoke at the OPGMA Congress, OEFFA Conference, Beech Creek Garden Symposium, Southwest Ohio Specialty Fruit and Vegetable School, Master Gardener volunteer training schools, and Farm Science Review in 2016. He also made several presentations in China which are highlighted in the International activities section.

Dr. Gary Gao and Ryan Slaughter also updated and revised Extension fact sheets.

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Gary Gao demonstrated the pros and cons of three blackberry production systems. (Photo by Ryan Slaughter)

Small fruit progress (continued)

The following revised fact sheets are now available on Ohioline:

Growing Apples in the Home Orchard:
ohioline.osu.edu/factsheet/hyg-1401

Growing Peaches and Nectarines in the Home Landscape: ohioline.osu.edu/factsheet/hyg-1406

Raspberries for the Home Fruit Planting:
ohioline.osu.edu/factsheet/hyg-1421

Growing Grapes in the Home Fruit Planting:
ohioline.osu.edu/factsheet/hyg-1423

Growing Strawberries in the Home Garden:
ohioline.osu.edu/factsheet/hyg-1424

Pruning Blueberry Bushes in the Home Garden:
ohioline.osu.edu/factsheet/hyg-1430

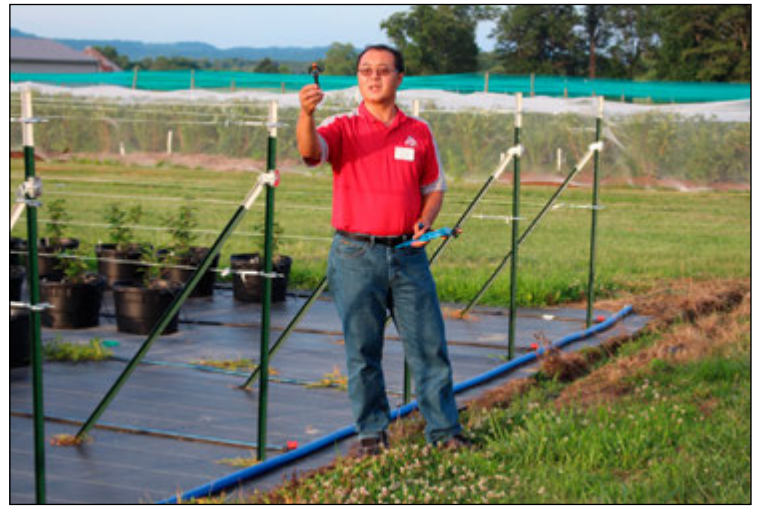
Pruning Erect Blackberries in the Home Garden:
ohioline.osu.edu/factsheet/hyg-1431

Research Projects:

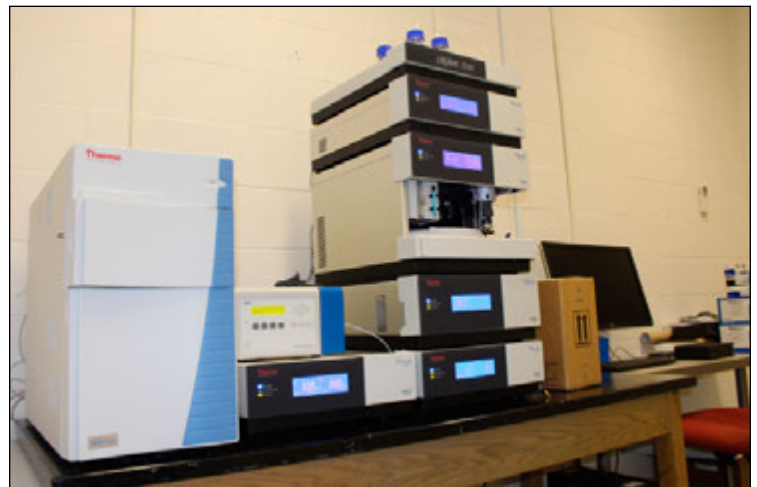
Dr. Gary Gao and Ryan Slaughter had several on-going research projects at OSU South Centers in Piketon in 2016. They were: Super Berry for Farm Diversification and Season Extension, Wine Cultivar Trial and Winter Protection, Container Fruit Production, and Chemigation for Pest Management. Dr. Gao is also a Co-Principal Investigator of a multimillion dollar national USDA Specialty Crop Research Initiative (SCRI) project with Dr. Heping Zhu of USDA in Wooster and Dr. Peter Ling of OARDC/OSU, along with other faculty members at The Ohio State University and several land grant universities in the U.S.

In 2016, Dr. Gary Gao and Ryan Slaughter received a new specialty crop block grant from USDA through ODA to work on grafted blueberry “trees,” new processing blueberry cultivars and fertility management of blueberries. The project started in November, 2016. Stay tuned for more information.

Dr. Gary Gao along with several researchers at OSU South Centers received an OARDC equipment grant in 2016. With the help of several cooperators, supporters, and our director Dr. Tom Worley, we were able to purchase a ThermoFisher Ultimate 3000 UHPLC ultra high performance liquid chromatography system and a MSQ single quadrupole mass spectrometer. This new system will greatly enhance the research capacity of all research areas at OSU South Centers.



Gary Gao demonstrates the use of micro sprinklers in chemigation for pest management in front of our container berry production plot. (Photo by Ryan Slaughter)



UHPLC (ultra high performance liquid chromatography) system and a MSQ single quadrupole mass spectrometer in the research lab at South Centers. (Photo by Ryan Slaughter)



Gary Gao gave a presentation on sustainable fruit production in the U.S. to students and faculty members at Shanxi Agricultural University.

Research collaboration and Extension outreach in China - one of OSU's gateway countries

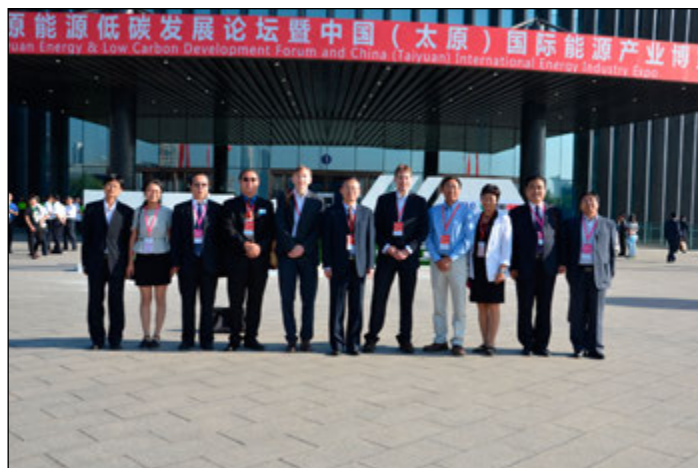
By Dr. Gary Gao, Extension Specialist and Associate Professor

Gary Gao shared his research and extension expertise on fruit production in 2016 with researchers, extension professionals, farmers, and college students in Gansu, Hebei, and Shanxi provinces in China. He gave four lectures to graduate students and faculty members at Shanxi Agricultural University (www.sxau.edu.cn/) and Hexi University (www10.hxu.edu.cn/w/Default.htm). In addition, he visited more than 10 farms and gave three presentations to farmers.

Gary Gao taught a daylong session on English writing to a master's level class at Shanxi Agricultural University. He also conducted joint research with several faculty members there. He and his collaborators at Shanxi Agricultural University had one paper accepted in 2016 by the Journal of Forestry Research for publication in 2017.

Gary Gao hosted Dr. Dong Qin, an associate professor of fruit crops from Northeast China Agricultural University (<http://www.neau.edu.cn/>). Dr. Qin conducted joint research projects, demonstrated fruit production techniques, and visited growers in Ohio. Drs. Qin and Gao had two journal articles accepted in 2016 for publication in 2017.

Collaborative research and Extension work has been immensely beneficial to Gary's research projects and extension programs in Ohio. For example, his invited trip to Gansu Province helped directly with his Super Fruits Project with Ohio Department of Agriculture and USDA, since he received first-hand knowledge on how Chinese goji berries are produced. He also applied for and received a training grant with Beau Ingle to host a team of Chinese visitors as a part of the Scientific Cooperation Exchange program between USDA and Chinese Ministry of Agriculture.



Gary Gao (4th from left) participated in the Scientists Forum at the Energy and Low Carbon Forum as a special guest by Vice President of Shanxi Agricultural University.

USDA grant received to explore greenhouse vegetable soilborne disease control

By Brad Bergefurd, Extension Horticulture Specialist

In 1994 the Piketon Research & Extension Center began high tunnel research on tomato and berry crops. Since that time over 3,000 high tunnels have been adopted by fruit and vegetable growers as a way to extend the harvest season. However, continuous cropping of high tunnels with specialty crops is resulting in reduced yields and quality of tomato crops. Partnering with Dr. Sally Miller of the OSU/OARDC Plant Pathology Department and her Vegetable Pathology Lab, USDA funding was received in 2016 to conduct on-farm research that explores soil-borne disease control methods.

Partnering with the Zimmerman family who owns Spring Valley Farm in Cynthiana, Ohio, this on-farm research trial was established in 2016 to conduct research and outreach programs to reduce the impact of soilborne diseases on production of locally grown, high-value vegetable crops. Two disease management strategies, anaerobic soil disinfestation and grafting, are being optimized for Ohio farms and farmers are being educated on these technologies through specially designed workshops and trainings. Data being collected from this study is being used to develop a new soil diagnostic testing service to identify key soilborne diseases.



Anaerobic soil disinfestation and tomato grafting treatments both highly promising disease management practices being researched to address the growing problem of soilborne diseases in greenhouses and high tunnels.



Soilless bag culture is being researched as an alternative high tunnel tomato production method.



Spring Valley Farm is partnering with OSU on the anaerobic soil disinfestation and grafting research project.

Harker receives 2016 Outstanding Staff Awards from the Ohio State University and the OSU College of Food Agricultural and Environmental Sciences

By Brad Bergefurd, Extension Horticulture Specialist

Thomas C. Harker, Horticulture Research Assistant at the OSU South Centers and a 20-year dedicated OSU College of Food, Agriculture and Environmental Sciences (CFAES) and OSU South Centers Horticulture and Field Research team member, was recognized with a plaque presented by OSU President Michael Drake in May as one of 12 from over 25,000 staff members at the Ohio State University selected to receive the prestigious 2016 Ohio State University *Distinguished Staff Award*. Annually OSU honors twelve individuals for their outstanding achievements, service, leadership and dedication to The Ohio State University. The Distinguished Staff Award is the highest honor bestowed upon staff at the university since its inception in 1984.

Thom was also recognized and received the OSU College of Food, Agricultural and Environmental Sciences (CFAES) 2016 Staff Advisory Council (SAC) *Above and Beyond Innovation Award*. This award is given annually by CFAES to recognize a staff member for developing and/or participating in project initiatives and/or process operations improvements that enhances CFAES, Extension, OSU Agriculture Technical Institute (ATI) or OARDC and its mission. Thom was recognized and received a one-time cash award and a plaque which was presented to him by the CFAES Administration at the CFAES Staff Advisory Council's staff recognition banquet in November at the Nationwide & Ohio Farm Bureau 4-H Center.

Thom oversees daily management of Horticulture field & greenhouse research and Extension education projects at Piketon, Bowling Green and Wooster CFAES campus locations. He manages this research with an innovative approach, practical, and whole-hearted effort.



Thom Harker (bottom right) was one of 12 Outstanding OSU staff members recognized by President Dr. Michael Drake in 2016.

He has developed creative and innovative solutions to CFAES research facilities that have resulted in significantly more effective, economically viable, and efficient research operations. He provides outstanding and ongoing excellence in service to all program leaders, farmers, agriculture industry clientele, and OSU faculty, students and staff to enhance the CFAES research and Extension mission.

As new projects or ventures are implemented, Thom as a "Farmer Engineer" has invented machinery, equipment and/or processes to accomplish important agricultural research tasks at very modest costs, saving the University thousands of dollars. Some of these innovative examples have been; the modified grape hoe, deer fence, drip irrigation, hop high trellis system, moveable greenhouse or high tunnels (which have now been adopted by the agriculture industry), whole-farm underground irrigation and a bird netting applicator that can protect grape, berry, and fruit plantings, Israeli style micro-irrigation technology, tomato plant grafting methods, field plasticulture technologies, micro-fertigation of crops, and greenhouse food crop production technology. Many of these innovations have been adopted by farmers not only in Ohio, nationwide but also by African researchers, students and farmers at the Université Gaston Berger in Saint-Louis, Sénégal.

Thom currently manages operations of eleven field and greenhouse research projects that account for over \$380,000 in external funding. With his attention to detail, Thom can spot potential problems with field research operations before the problems affect important data collection and he rectifies the problems immediately to protect data collection.

Horticulture program receives funding to research mechanical harvesting of hops in Ohio

By Brad Bergefurd, Extension Horticulture Specialist

With the rapidly expanding acreage of Ohio hops being planted and the increased high demand from the Ohio craft brewing industry for locally grown hops, the Horticulture program began researching in 2016 the adoption of small-scale, mobile hop harvesting production options for Ohio growers.

The intent of this project is to demonstrate the feasibility of a mobile hop harvester with sufficient capacity to harvest one acre of hops per day. Mechanical harvesting technology like this is needed since most Ohio hop acreage is beginning to reach its peak harvest maturity, and the current hand-picking methods being used are very labor intense, costly and slow. This research and education project is in partnership with HopsHarvester LLC of Honeoye Falls, New York as a part of a USDA-funded hop research project.

How It Works

The hop bine or plant is attached to a specially designed hook and is fed into the harvester using a chain drive. As the bine is pulled through the stripping section, stripping fingers remove leaves and hop cones from the bine. These are dropped to a main conveyor at the bottom of the machine as the stripped bine is pulled out the back of the harvester. The leaves and cones are dropped into a section of dribble belts which are inclined and rolling upward. The rough top of the dribble belts grabs leaves which lay flat on the belt while cones roll "downhill." A suction fan also separates the leaves from the cones.

In 2016 the Hop Harvester was demonstrated at field days in Piketon and Bowling Green, Ohio with over 200 viewing its operations.



Horticulture Research Assistant Thom Harker and Farm Manager Wayne Lewis demonstrate the mobile hop harvester.



The Hopster5P PTO-powered Hop Harvester being researched can be moved by a truck and trailer.

Horticulture program receives USDA and industry grant support to conduct strawberry market and season Extension research

By Brad Bergefurd, Extension Horticulture Specialist

Thanks to grants from the Ohio Department of Agriculture, the United States Department of Agriculture and the Ohio Vegetable and Small Fruit Research and Development Program, Ohio strawberry research and Extension education programs are increasing. Brad Bergefurd, Extension Educator & Horticulture Specialist, the projects Principle Investigator, is leading this strawberry research project to further support the growth of the expanding consumer demand for locally grown strawberries.

Ohioans consume over 89 million pounds of strawberries annually, however Ohio farmers only produce 1.8 million pounds annually (USDA, NR-15-06, 2015). This additional 87 million pounds of strawberries, currently sourced from farms and related jobs outside of Ohio, has an estimated farm level value of \$165.3 million.

This industry development project is using applied strawberry field production research and educational programming to capture dollars and jobs that are currently being sent out of Ohio by Ohio's produce marketing industry, by expanding Ohio's strawberry production and plant propagation capabilities. This research is currently evaluating new strawberry cultivars, innovative plant propagation and field production systems, and protective culture production systems including high tunnels and greenhouse production techniques that can be adopted by Ohio farmers to increase strawberry production from the traditional three week June harvest season to a six month production system.

J.M. Smucker Company in Orrville, Ohio that utilize a large portion of strawberries for their processing operations and Sanfillipo Produce Company in Columbus that utilize fresh market strawberries for their Ohio 1st Local Food program are providing industry support for this research.





OSU CFAES student Emily Bauman inspects fruit size at an area orchard to determine pest threshold levels.

Horticulture program develops an Integrated Pest Management scouting program for area specialty crop farms

By Brad Bergefurd, Extension Horticulture Specialist

As a part of the OSU College of Food Agriculture and Environmental Sciences (CFAES) Sustainable Food Systems area a Specialty Crop Pest Scouting Program was organized in partnership with the OSU Extension Ross and Pike County Offices. Funding received was a part of a USDA National Institute of Food and Agriculture (NIFA) grant for a Crop Protection and Pest Management for an in-season fruit and vegetable integrated pest management scouting, monitoring and education program. Two OSU CFAES students were employed to scout 12 fruit and vegetable farms in four counties. These farms represent over 300 acres of high-value specialty crops reported, reducing and/or better managing pesticide applications and developing an increased awareness of pest management scouting practices.



THE OHIO STATE UNIVERSITY

COLLEGE OF FOOD, AGRICULTURAL,
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