

NWREC Program Overview 2022



DELIVERING EVIDENCE-BASED SOLUTIONS

North Willamette Research and Extension Center

15210 NEW Miley Road, Aurora, OR 97002

<https://extension.oregonstate.edu/nwrec>

<https://agsci.oregonstate.edu/nwrec>

<https://tinyurl.com/NWRECYoutube>



Oregon State
University

North Willamette Research and Extension Center



Situated in the most productive farming region of Oregon, the North Willamette Research and Extension Center (NWREC) in Aurora is one of the 11 Oregon State University's agricultural experiment stations across the state. By serving Clackamas, Columbia, Marion, Multnomah, Polk, Washington, and Yamhill Counties NWREC plays an important role in the region where 65% of Oregonians live. Small fruits, Christmas trees, grass seed, hazelnuts, herbs, nursery crops, vegetables, and specialty seed crops are among the major commodities that NWREC researchers work on

at the 160-acre facility. By evaluating new varieties, improving production practices, developing environmentally friendly crop protection solutions, and exploring ways to conserve natural resources and optimize agricultural inputs, various research and extension programs at NWREC contribute to thriving farm businesses, strong economy, healthy communities, and safe environment. Despite having minimal infrastructure resources, the research and extension efforts from NWREC help both rural and urban communities in the Portland area for their food, health, and cultural needs through science-based real-world solutions.

We are grateful for the support and guidance of our stakeholders, advisors, and local communities that help us serve better. Join us in one of the outreach events and learn what we do and explore how we collaborate.

We are out here to serve you!

Sincerely,

Surendra Dara
Director & Professor

North Willamette Research and Extension Center

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Oregon State
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Berry Crops Extension Program

Faculty: Wei Qiang Yang

Faculty Research Assistants: Sarah Doane

Crops: Blueberry

RESEARCH:

- Mechanical harvesting for fresh quality blueberries.
- Crown gall disease management.
- Food safety challenges in blueberry harvesting.
- Blueberry tree development – rootstock resistance to phytophthora root rot.

These research activities have been supported by the Blueberry Commission, Oregon Department of Agriculture, OSU Venture Fund, and the Center for Produce Safety.

EXTENSION:

- The annual Oregon Blueberry Conference (Co-organized with the Blueberry Commission) has become the largest blueberry educational event on the West Coast, which attracts more than 350 growers with a blueberry themed trade show.
- Annual North Willamette Horticultural Society Conference and Trade Show (Co-organized with NWREC faculty).
- Annual blueberry nutrition workshop
- Annual blueberry pruning workshop
- OSU extension publications, such as the blueberry economics, pest management guide, and nutrient management guide have been used widely by growers in the Pacific Northwest.

IMPACT:

The annual pruning and nutrition workshops led to the adoption of improved pruning techniques and nutrient management practices resulting in an estimated economic impact of more than \$390,000 annually. The adoption of measuring fruit firmness to manage postharvest fruit quality by four major blueberry processors had an estimated \$1.2 million annual economic benefit.

The first commercial blueberry rootstock is being developed. A blueberry-tree based orchard system with rootstocks will significantly reduce harvesting labor and eliminate the current 15-25% fruit loss during mechanical harvesting. The estimated economic impact is more than \$18 million per year for the Oregon blueberry industry.

The research in machine harvesting for fresh market blueberries was focused on improving fresh blueberry quality with a soft catch surface. The adoption and commercialization of the soft catch system by the harvester manufacturer OXBO International signified a major advancement in harvester technology in the last 30 years. The 75% savings in harvesting labor by using the new over the row harvester will generate an estimated economic impact of more than \$10 million in Oregon annually.



Berry Crops Research Program

Faculty: TBD.

Faculty Research Assistants: Amanda Davis and Patrick Jones

Crops: Blueberry, blackberry, red and black raspberry, strawberry, kiwifruit, and table grape



RESEARCH:

Production & Physiology

- Primary research areas: organic blueberry and blackberry production (cultivars, mulches, fertilization, irrigation practices, and training); development of production systems for new cultivars released by the cooperative breeding program (reduced-labor techniques, plant spacing, mechanical harvesting, and pruning/training methods); nutrient management and development of regionally-specific nutrient sufficiency standards (blueberry, blackberry, and kiwifruit)

Cooperative Breeding Program

- Cooperation with the USDA-ARS for over 100 years on berry crop breeding (breeder is with the USDA and the horticulture partner is with OSU)
- We evaluate advanced selections of strawberry, red and black raspberry, blackberry, and blueberry for growth, yield, and fruit quality and compare them to currently grown cultivars.
- Tillamook strawberry is the most planted by the industry and Black Diamond and Columbia Star blackberry lead the acreage in Oregon now.

For both aspects of the program, we respond to priorities set by the berry commissions and the Northwest Center for Small Fruits Research and address emerging issues in the berry industry as they arise. Our trials are funded by federal grants, industry Commissions, gifts, and in-kind support.

EXTENSION:

- Annual strawberry, caneberry, and blueberry field days attract ~200 growers and researchers each year
- Recent extension publications include Growing Kiwifruit, Non-lethal bird deterrent strategies, Growing Berries in the Home Garden and Growing Berries on the Oregon Coast (both are a series of individual publications by crop)
- [Online pruning modules](#) available to the public with both lecture and video content
- Website with up-to-date research and extension activities: <https://agsci.oregonstate.edu/berries>

IMPACT:

The economic impact of new production systems developed in the last 30 years has been estimated at over \$12 million per year. Over 20 cultivars have been released with value to PNW industry and nurseries of over \$450 million in the last 10 years.



Berry Initiative Program

Faculty: Erica Chernoh

BioScience Research Technician: Cora Bobo-Shisler

Crops: Strawberry (day-neutral cultivars for fresh market)

RESEARCH:

High and low tunnel production of day-neutral strawberries for season extension (2021-2023)

- The objective of this trial is to evaluate plastic culture production of day-neutral strawberries grown under high and low tunnels for season extension. The tunnels were constructed in the summer 2021, with a fall planting in 2021 and spring planting scheduled for spring of 2022. Funded by the Northwest Center for Small Fruits Research and Oregon Legislature.



Low tunnels for season extension of day-neutral strawberries (2019-2020)

- The Oregon strawberry industry has shifted in the past decade from producing strawberries for the processed market to fresh market production. Due to this industry shift, there is a need for research on day-neutral cultivar performance in Oregon. Furthermore, season extension techniques provide growers an opportunity to extend the season and produce a harvestable crop during parts of the year berries are in high demand. This initial two-year study (2019-2020) evaluated the use of low tunnels for season extension and their effects on plant growth and yield for day-neutral strawberry cultivars in Oregon's Willamette Valley.

Substrate strawberry production systems for fresh market in greenhouse elevated benches (2021)

- This preliminary study explored the feasibility and equipment needs for two different system designs, evaluated different planting media combinations, determined best practices for fertilizer use, and overall equipment and labor costs for elevated substrate production of strawberries under greenhouse cover in Oregon.

EXTENSION:

- Annual strawberry field days attract ~200 growers and researchers each year.
- Field tour to North American Strawberry Growers Association in 2021.
- Recent OSU Extension publication: How to Build a Low Tunnel in Oregon: Design, Construction, and Costs.
- Journal publications include three articles in Acta Horticulturae in 2021.

IMPACT:

Oregon strawberry growers are facing a changing industry. There is increased grower interest in, and consumer demand for, fresh strawberry fruit over a longer harvest season; however, there is a need for alternative production practices adapted to Oregon's climate and unique grower culture. Low and/or high tunnels may provide cost-effective ways for Oregon growers to increase their fresh market production earlier in the spring and later in the fall. Our research team conducted a low tunnel demonstration for season extension of day-neutral strawberries in 2018. Our demonstration showed that low tunnels can be built for less than \$100 per 100-foot row.

Metro Small Farms Program

Outreach Program Coordinator: Heidi Noordijk

Education Program Assistant: Clint Taylor



Areas and crops covered: Serving small-scale farmers and ranchers in Clackamas, Multnomah, and Washington Counties. Areas of focus include beginner farmer education, diversified organic vegetable systems, and direct market channels.

EXTENSION

Vegetables: Addressing soil, pest, and crop production issues for organic and sustainable agriculture systems. Soil conservation, nutrient management, ecological pest management, and enhancing biodiversity are emphasized. Collaborating with plant breeders, seed companies, and wholesale distributors on vegetable variety trials for PNW farmers and others on field days, marketing events, educational programming, and winter vegetable project website. Over 22,000 unique viewers have watched online programming developed for the project.

Community Food Systems: Working with community partners to develop an equitable and sustainable local food system. Addressing alternative and specialty marketing through creation and enhancement of local and regional food systems and farm direct marketing channels.

Small Farm School: Full-day educational and networking event for small-scale farmers and rural landowners in the North Willamette region on topics ranging from crop and livestock production to farm business and marketing, tractor safety, and land access.

Field Days and Workshops: Vegetable and cover crop variety demonstrations, mechanical cultivation, IPM, soil health, dry farming, fruit tree pruning, crop planning, and other topics based on stakeholder priorities.

Outreach Materials:

- Book [Whole Farm Planning from Start-Up to Sustainability](#) and [Growing Farms](#) online modules for beginning farmers.
- Website with extension projects and resources: <https://smallfarms.oregonstate.edu/>
- [Eat Winter Vegetables project website: https://www.eatwintervegetables.com](https://www.eatwintervegetables.com)

IMPACT

Western Oregon has a favorable climate for winter vegetable production and through increased marketing and education demand is growing. Through variety demonstrations, field days, and consumer events OSU Extension developed outreach and programming from 2019-21 to promote winter vegetables for farmers, chefs, and consumers. Wholesale distributors and farmer market managers reported increased interest and sales of winter vegetable since 2019. Wholesale market sales from three local distributors/retailers increased from \$1.5 million to \$1.78 million during the project. Five winter markets exist in the Portland Metro area and market managers have seen substantially more interest among customers in winter vegetables. Nearly 88% of surveyed farmers plan to increase winter vegetable acreage or sales.



Nursery Plant Pathology Program

Faculty: Luisa Santamaria

Faculty Research Assistant: Maria Marlin

Crops: Ornamentals and nursery crops

EXTENSION:

We engage growers through personalized nursery visits, listening to their concerns and presenting science-based information on identifying and managing plant diseases. We address a critical need: education of the nursery workforce, including the Spanish-speaking community.



- [Healthy plants, Happy people:](#) In 2022, we are offering a novel bilingual webinar series focused on engaging the industry through monthly meetings to increase awareness about plant health.
- [Disease Diagnosis and Prevention for Nursery Workers:](#) This is a bilingual certification program requested by the industry about plant disease management, from the basics to understanding steps for diagnosis, offered by the Professional and Continuing Education program (PACE) at OSU, launched in 2021.
- [Bilingual educational tools:](#) Several fact sheets and field diagnostic guides to identify diseases of concern, available through Extension & Communication at OSU.
- [Food Safety education for fresh produce growers:](#) Ten years ago, we initiated a Food Safety training workshop that has been in high demand every year since then. Target audience is people who train personnel during harvest season to prevent the risk of food contamination (growers, contractors, and small farmers). We have bilingual tools including a manual and videos to support educational activities that trained 250 participants in the past two years.

RESEARCH:

- *Soilborne pathogens:* Our research interests include the biology and management of soilborne pathogens in ornamentals; we conduct efficacy trials for *Phytophthora* and *Pythium* species.
- *Foliar pathogens in ornamentals:* We are searching for alternative cultural control methods (i.e., UV light) to manage *Botrytis* gray mold.
- *Cyanobacteria:* These photosynthetic microorganisms have opened new avenues of research. We are investigating their biology and role in nursery recycling water and exploring alternative management practices for the slippery mats caused by *Nostoc* spp.



IMPACT:

With the improved knowledge from the training programs, nursery workers have started to apply recommendations to reduce the spread of plant pathogens by adopting and improving sanitation practices. Trained trainers provide training to others.

Nursery Production and Greenhouse Management

Faculty: Lloyd Nackley

Faculty Research Assistants: Dalyn McCauley, Brian Hill, Brent Warneke

Research Scientist: Melissa Scherr

Grad Students: Sadie Quinn, Raven Hartley



Crops: Nursery and greenhouse crops

RESEARCH:

Irrigation Science-Pest Management-Plant Nutrition-Plant Evaluation

We conduct various agronomic and crop protection studies with a focus on the following:

- Improving irrigation practices with sensors to optimize water use and minimize nutrient leaching and disease development.
- Identifying drought-tolerant plants in collaboration with universities in Arizona, California, and Utah.
- Monitoring crop health with the help of drones, run-off pads, and other technologies.
- Controlling tip-feeding insects like thrips and lygus, managing flatheaded borers, cultural controls of boxwood blight, integrating beneficial insects, and optimizing sprayer systems.

EXTENSION:

- Organize outreach events such as Crop Adaptive Spraying and other Air-blast Sprayer trainings, which are usually attended by dozens of growers.
- Publications in Oregon State Catalog and Nursery Trade Journals
- Online with blog at Oregon State University and social media on Twitter and Instagram @NackleyLab

IMPACT:

- A soil solarization project has contributed to a 50% to 70% reduction in hand-weeding with an estimated annual savings of \$1000 per acre.
- My substrate research has allowed for the diversion of thousands of tons of tectonite mineral waste from going to a landfill saving hundreds of thousands of dollars per year to the Warm Springs Composite Products.
- Our Intelligent Sprayer research has shown a 45% to 70% reduction of spray volumes, 40% to 85% reduction in aerial drift, and 65% to 90% reduction in off-target ground spraying. The economic impact, in terms of labor and materials, is an estimated annual savings of \$3,500 to \$4,300 per acre, depending on farm size and crop types.



Orchard Crops and Hazelnut Research Program

Faculty: Nik Wiman, Associate Professor and Orchard Specialist

Faculty Research Assistant: Heather Andrews

Bio-Resource Technician: Kody Transue

Crops: Hazelnuts and orchard crops such as tree fruits.

RESEARCH:

- Biology and sustainable management of invasive pests including the brown marmorated stink bug in hazelnuts and the spotted-wing drosophila in cherries
- Precision irrigation in hazelnuts to conserve water and maximize production
- Improved management of secondary pests in hazelnut including developing phenology models and action thresholds for aphids, mites, and their natural enemies
- Nutrient management in hazelnuts to increase efficiency, reduce waste and boost production
- Evaluating cultural practices such as mulching and use of trunk guards to improve orchard establishment and promote early tree growth
- Monitoring nonstructural carbohydrate in hazelnuts to better understand carbon source/sink dynamics and to predict yields and tree health
- Hazelnut orchard design and novel high-density training and management systems
- Cover crops in orchards for to improve soil conservation and soil health
- Biology and sustainable management of flatheaded borers in orchard crops
- Evaluating cider/heirloom apples and orchard systems to support the PNW cider industry
- Viable alternative orchard crops for the Willamette Valley such as late-blooming almonds to highlight economic opportunities for growers
- Ethephon to promote earlier nut drop as a harvest aid in hazelnuts



Drone image of a Hazelnut Field Day that attracted 800+ stakeholders to NWREC

EXTENSION:

- Contributing to grower success through on-farm plant diagnostics, grower consultations and responding to Ask Extension questions covering western Oregon and beyond
- Organizing and participating in educational events including field days, workshops, and trainings reaching thousands of stakeholders annually
- Disseminating evidence-based information to stakeholders through extension publications, trade journals, popular press articles and social media posts reaching thousands of stakeholders annually.

IMPACT:

Expected impacts of this program include adoption of reduced-risk pest management strategies with reduced use of broad-spectrum insecticides for big bud mite, flatheaded borer, and filbertworm control and increased savings from the new irrigation and nutrient management. Growers have also started using the big bud mite phenology model.



Organic Vegetable Extension Program

Faculty: Nick Andrews

Crops: [Organic Extension](#): vegetables



RESEARCH AND EXTENSION:

Cover crops and organic nutrient management

- We work with farmers to enhance cover cropping and nitrogen management on their farms so they can improve soil health and optimize yield while protecting water quality. Our work includes on-farm cover crop trials, the [OSU Organic Fertilizer & Cover Crop Calculator](#), Extension Publications and [online professional courses](#).
- We are developing the [Western Cover Crops Council](#) with farmers and other agricultural professionals in the Western U.S. to “facilitate and enhance communication and collaboration that promotes the successful adoption and integration of cover cropping into Western U.S. agricultural systems.”

Crop production

- We develop and maintain [Croptime](#) vegetable and weed degree-day models that support crop scheduling, marketing and weed management decisions on farms. Extension Publication: [Vegetable Degree-day Models: An Introduction for Farmers and Gardeners](#) introduces degree-day models and our research.
- We have hosted winter vegetable trials and field days in collaboration with farmers and the [Culinary Breeding Network](#). We are publishing a major revision of [PNW 548](#) as *Winter Vegetable Production on Small Farms and Gardens West of the Cascades* (64 pp, in production).

Pest management

- We provide pest diagnosis and management advice to farmers through conferences, workshops, and individual consultation. Our online module [Insect Pest Management on the Farm: An Ecological Approach](#) introduces beginning farmers to IPM principles and practices.
- With a new [USDA: Western Sustainable Agriculture Research and Education](#) grant we are investigating novel vole management strategies utilizing canine scent detection.

International sustainable and organic agriculture

- We collaborate with the Royal University of Bhutan’s [College of Natural Resources](#) and Bhutan’s [National Plant Protection Centre](#) to develop undergraduate organic agriculture curriculum and professional development seminars.
- In a new collaboration with the UK’s [Agriculture and Horticulture Development Board](#) we hope to strengthen linkages between Extension faculty in the UK and PNW to advance sustainable agriculture.

IMPACT:

The OSU Calculator is accessed in every U.S. state and more than 47 countries. It supports optimal nutrient management and water quality with an estimated annual economic impact of \$2 million. Croptime models have been used 15,000 times, currently >3,000 times per year. Extension publications, [Oregon Small Farm News](#), websites, conferences and workshops are well accessed or attended and highly rated.



Pesticide Registration Research Program

Faculty: Dani Lightle

Faculty Research Assistant: Monte Mattsson

Crops: All Oregon specialty crops including berries, hops, tree crops, vegetables, hemp, and grass and clover seed on the only IR-4 Field Research Station in western Oregon and Washington that serves as the EPA Region 12



RESEARCH:

- Conducting pesticide magnitude of residue research studies known as IR-4 residue studies to support of new uses of pesticides on specialty crops
- Conducting field studies to find chlorpyrifos alternatives for managing cabbage maggot in vegetable systems and aphids and weevil in clover seed systems based on a grower needs survey

Pesticide Degradation in Blueberry

- Conducting studies since 2020 to identify pest management tools compatible with pesticide tolerances for important blueberry export markets, by monitoring pesticide degradation of 31 active ingredients

EXTENSION:

IR-4 State Liaison Representative

- Submit residue project requests on behalf of Oregon researchers and producers to the IR-4 Project for prioritization
- Advocate for Oregon priorities during the IR-4 National Food Use prioritization workshop

Western IPM Center Network Coordinator

- Monitor the US Environmental Protection Agency (EPA) re-registration process for pesticides
- Respond to requests for information on Oregon production practices and submit comments to the EPA detailing impacts of proposed changes

IMPACTS:

- Based on magnitude of residue studies conducted at NWREC, 46 new labeled uses of those pesticides have become available to specialty crop producers since 2019, significantly increasing their pest control choices. Additionally, 41 magnitude of residue research trials conducted between 2019 and 2021 will result in the new uses of those pesticides starting from 2023
- Responded to requests for information and submitted public comment on six federal dockets, and directly influenced the final label language on three of those active ingredients to benefit Oregon producers
- Advocacy at the 2021 IR-4 Food Use Workshop led to funding of 17 residue trials that benefit Oregon production systems. The combined cost of these projects is \$2.5million in federal funds, which will directly benefit Oregon specialty crop producers



Vegetable and specialty seed crops program

Faculty: Kristie Buckland, Extension Specialist

Faculty Research Assistants: Ann Rasmussen

Bio Technician: Joe Battilega

Crops: Fresh market (beets, broccoli, cabbage, cauliflower, leafy greens, radish, rutabaga turnip, and snap beans), processed vegetable (beets, broccoli, cauliflower, carrots, snap bean, and sweet corn), and specialty seed crops (brassica vegetables, flowers, garlic, herb, quinoa, squash/pumpkin, sugar beet, and spinach)



Aerial view of quinoa trials in August 2018. As quinoa nears harvest, it changes color to the bright shades seen on the right.

RESEARCH:

Supported by \$1.6 M in industry and grant funding in the past 4 years

Integrated Management of Cabbage Maggot (fresh market, processed, and seed crops)

- Developing innovative control methods to interrupt pest lifecycle with baited feeding attractants, field application of barrier technology, pesticide timing and new products, and field-scale population management with crop arrangements

Aerial Images for Crop Protection

- Disease detection and phenotyping capacity in vegetable and seed systems
- Developed two highly specialized specific crop/disease detection models

New Crop Options for Farm Sustainability

- Identifying crop options for improved farm income and on-farm trials in quinoa, medicinal herbs, and Asian vegetable crops

EXTENSION:

- Four new herb production fields train growers on adopting three new crops.
- Annual grower field days, workshops, and meetings attract ~200 growers and researchers each year.
- Examples of recent extension publications include [Unmanned Aerial Systems](#), [Quinoa Production for the Willamette Valley](#), and [Hemp Sex-Ed](#).
- Website with up-to-date research and extension activities: [https:// horticulture.oregonstate.edu/oregon-vegetables](https://horticulture.oregonstate.edu/oregon-vegetables).

IMPACT:

- Reduced pesticide applications are expected to limit exposures, contribute to resistance management, and reduce crop protection costs.
- Earlier disease detection when fully implemented is expected to minimize crop and seed loss over 19,000 susceptible acres annually.
- New crops Tulsi and Ashwagandha projected to increase farm profit 10 times the market value over current crops



Radish with cabbage maggot feeding damage.

Statewide Christmas Tree Extension Program

Faculty: Chal Landgren

Bio-Science Research Technician: Judy Kowalski

Crops: Major PNW Christmas tree species focusing on noble fir and Douglas-fir, and newer exotic species including Nordmann fir, Turkish fir and Trojan fir. Oregon ranks No. 1 in the United States in commercial Christmas tree production, selling about 4½ million trees a year and remains one of Oregon’s top value commodities.



RESEARCH:

Breeding Program

- Conducted years of progeny trials of native PNW trees and exotic tree species from areas in Turkey and the Republic of Georgia for outstanding Christmas tree traits.
- Established five grafted seed orchards at NWREC.

Cultural Practices

- Multi-year Seedling Survival –studies testing different cultural methods, soil amendments and foliar sprays effectiveness in noble fir seedling survival.
- Multi-year Leader Control –studies testing different pruning methods and growth regulators to manage terminal leader growth in noble and Turkish fir.

Pest and Disease Mitigation

- Conducted studies for aphid control with non-chemical alternatives or less toxic materials, monitoring and controlling Douglas fir twig weevil, and development IPM strategies for slugs on Christmas Trees.
- Conducted studies for Delphinella abietis control with fungicides and cultural methods in large noble fir trees.

We work closely with WSU, the Pacific Northwest Christmas Tree Association (PNWCTA) and many area Christmas tree producers to fulfill the research needs of the industry. We receive funding through grants from the PNWCTA, the Christmas tree Promotion Board (CTPB) federal funds, Agricultural Research Foundation at OSU and the Oregon Department of Agriculture (ODA).

EXTENSION:

- Recently updated extension publications include “Developing Quality Christmas Trees in the Pacific Northwest” and 2 full color, bi-lingual field guides. Complete catalogue of publications and other grower resources found on [Christmas Tree Resources Webpage](#).
- We participate in PNWCTA educational events and field days yearly, host Zoom educational events for growers, participate in Tree School yearly, contribute articles to professional publications and newsletters, and participate in the International Christmas Tree Research and Extension conference (CTRE).

IMPACT:

Research led to the approval of pesticides and plant growth regulators, which benefit the Christmas tree growers by producing healthy trees with a desirable structure and savings of \$1.25 per tree.

Recommendations for using wood chips around seedling tree bases has improved up to 20% of tree survival in drought years. Outstanding trees identified through the breeding program were grafted into 7 grower seed orchards. These orchards will provide improved seed to supply the industry’s increasing demands.

