



News from WSU-Mount Vernon NWREC

Summer 2009

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From the Director's Desk

Greetings from NWREC. Budget cuts and adjustments are now behind us. Overall, we weathered the changes and are hopeful they will result in a continuation of excellence and focus in all of our programs. We look forward to a great summer season.

We have added a plant breeding component to our research at the Center. It will focus on small grains but will expand to other crops as needs arise. Our molecular laboratory has quadrupled in size. In mid June the Seed Pathology program hosted an international workshop on molecular tools for disease screening. Scientists from four countries and three states attended.

Meanwhile on the farm, the weed and horticulture programs have planted nearly three acres of organic grapes to serve as long-term management studies. A large building that was previously used to store vehicles is being transformed to a dry lab for all programs to use directly from the field. A new compost facility is in the planning phase.

Our graduate student numbers are growing and with their involvement we anticipate many more interesting and innovative projects with direct grower participation.

I am thrilled to be here as the new director. I want to thank Debra Inglis and Pete Jacoby for their hard work and dedication over the past years in leading us programmatically and logistically. We have an incredible group of researchers and support staff. Together we will build on our long-term partnerships with community groups, farmers, and local industries to ensure a vibrant future for agriculture in Northwestern Washington.

Thank you for your continued support. We look forward to seeing you down the road and in the field.

Stephen Jones, Director

2009 Anniversaries WSU – years of service

Gary Moulton	30 years
Babette Gundersen	20 years
Jacky King	20 years

Awards and Honors

The awards process at WSU recognizes individuals that distinguish themselves and their programs as being truly excellent. In most cases only one award per year in each category is presented. This year six members of NWREC were given individual or team awards. Congratulations! This number confirms what we have all known; we have a great group of researchers and staff here at NWREC.

Jeanne Burritt received the 2009 President's Employee Excellence Award. As the center awaited a new director, she graciously handled many director duties as well as her own as administrative manager. Her extra efforts were greatly appreciated by the center staff.

Mike Derie received the 2009 WSU CAHNRS Academic Professional Excellence Award. He has demonstrated tremendous skills, aptitude and leadership in over 20 years at WSU.

Debra Inglis received the 2009 CAHNRS Women's History Recognition Award for Professional and Academic Leadership. She served as interim director and assistant dean for four years, overseeing the expansion of facilities and programs at the center.

Stephen Jones received the 2009 CAHNRS Faculty Excellence in Research Award. He developed six successful wheat varieties in 12 years and was the only U.S. scientist in a \$9 million European Union grant effort to improve nutrient efficiency in crops.

Tim Miller was a member of the Urban Integrated Pest Management and Pesticide Safety Education Team which received the 2009 CAHNRS Team Interdisciplinary Award.

Lindsey du Toit received the 2009 Kenneth J. Morrison Extension Award for numerous outstanding contributions to the improvement of Washington State's seed production.

NWREC Facts:

Established	1947
PERSONNEL:	
Faculty	8
Staff	19
Graduate Students	8
Time slip workers	32
Center Acreage	164
Number of crops being researched	32



World Class. Face to Face.

New Director



Dr. Stephen Jones

WSU-Mount Vernon NWREC welcomes new director, **Stephen S. Jones**. He assumed the director's role on May 15, 2009, bringing with him many plant breeding projects including low-input wheat, perennial wheat, organic wheat and improving nitrogen use efficiency in crop plants. Dr. Jones looks forward to expanding his research in areas relevant to the agricultural diversity in the Skagit Valley and surrounding areas and provide help to people from home gardeners to large scale operations. He was a molecular cytogeneticist for the USDA's Agricultural Research Service at the WSU campus and joined the WSU faculty in 1995. His research has been featured in *The New York Times*, *Gourmet Magazine*, *The Wall Street Journal*, *Newsweek*, *Audubon*, and *National Geographic*. He has written the "wheat" entry for World Book Encyclopedia, and co-authored the entry for "sustainable agriculture" with Dr. Carol Miles, who also works at the NWREC. Dr. Jones received his bachelor's degree from California State University, Chico; he also has a master's in agronomy and a doctorate in genetics from University of California, Davis.

New Staff

Jamie Anderson has been employed as a Fiscal Technician in the NWREC Administrative Office since September, 2008. She is a welcome addition and has previous fiscal experience working for Skagit Pediatrics and other businesses in Mount Vernon. Jamie is a long time Mount Vernon resident. Her familiarity with the area is a great asset and is appreciated by visitors to NWREC who require directions or ask for information about the Skagit Valley. We are fortunate that Jamie has joined our staff; she is a quick study, professional, and a pleasure to work with.

Ashley Bentley joined the General Administration department as the Office Assistant in June 2008 after working as a temporary employee in the following departments: General Administration, Vegetable Seed Pathology, and Weed Science. Her knowledge of these programs is a great benefit to her position in the front office and her expertise in administrative operations has been welcomed. As well as being a new staff member, she is also relative newcomer to the state of Washington having moved here from Arkansas with her husband and dog in July 2006.

Matthew Reichlin started in the new Farmer 2 position in March, 2008. Matthew is a graduate of Mount Vernon High School, and has previously worked at Pleasant Valley Farms, Delta Breeze Farms and Staffanson Harvesting in the Skagit Valley. He has experience operating and maintaining farm machinery, and doing a wide variety of farming and food production tasks. NWREC is very pleased to have him join the GA staff.

Agriculture and Northwest Ecosystems: A graduate student symposium Bringing community and research together November 10, 2009



Agriculture is a fundamental component of northwestern Washington's community and economy, yet there are growing concerns regarding agricultural sustainability and the effects of certain farming practices on wildlife habitat, water quality and soil health. Understanding the dynamics of our agricultural environment, in the context of conservation and community needs, is essential to developing sustainable food systems for the future. The purpose of this symposium is to display the wide range of graduate student research projects related to agriculture and natural resource conservation, now on-going in northwestern Washington. Graduate students and their faculty advisors from multiple disciplines and universities will engage with community participants in conversations about agricultural sustainability and resource management strategies. Local organizations and individuals will learn about regionally based graduate research now underway. All participants will have the opportunity to contribute ideas for new research topics and helps foster collaborations among Washington's universities, students, and agricultural and natural resource organizations in the future.

This event will be held at WSU-NWREC in Mount Vernon, WA. More information and a detailed schedule will be posted on our website in July. There will also be a graduate student reception at the Olson Heritage Farmhouse following the symposium. If you wish further information please contact Jessica Gigot at jgigot@wsu.edu.

Soil Amendment with Limestone for Managing Fusarium Wilt in Spinach Seed Crops in the PNW

Spinach seed crops in western Washington and Oregon annually produce 30-50% of the U.S. and $\leq 25\%$ of the world supply of spinach seed. Few areas of the world have the climatic conditions of the coastal PNW required to produce spinach seed - long summer days to trigger flowering, dry summers to minimize pathogens infecting the developing seed, and mild temperatures for uniform flowering. However, Fusarium wilt (caused by the soilborne fungus *Fusarium oxysporum* f. sp. *spinaciae*) has become the primary factor limiting spinach seed production in the PNW.

Cultivars with partial resistance are available, but many carry little or no resistance. The pathogen can survive >10-20 years in soils. Producers originally managed Fusarium wilt by growing seed crops in fields not previously planted to spinach. Subsequent depletion of virgin ground led to Fusarium wilt becoming the main factor limiting production of spinach seed. Losses to Fusarium wilt now necessitate rotations of 6-10 years for spinach lines with partial resistance, and 12-15 years for susceptible lines. Fields that meet these constraints and the required pollen isolation distances for seed crops are increasingly difficult to find. In contrast, ~15,000 acres of spinach seed crops are grown in Denmark annually on 4-5 year rotations.

The alkaline and calcareous soils in Denmark appear to suppress spinach Fusarium wilt. Since 2006, the Vegetable Seed Pathology program has investigated limestone applications to suppress spinach Fusarium wilt which could enable seed growers to reduce rotation intervals from 6-15 years to 5-8 years. An annual trial in growers' fields evaluated rates of limestone amendment on spinach lines ranging from susceptible to partially resistant to Fusarium wilt.



Different rates of limestone applied to plots



*Spinach Fusarium wilt trial 2009
—and Avi Alcalá*

Results

By July (mid-season) each year, limestone applied at ≥ 1 ton/acre had significantly suppressed Fusarium wilt. Plant biomass was greatest in plots with limestone. The best disease suppression and highest yields were in plots with ~2 tons/acre. The effects were most significant for susceptible spinach lines, with limestone reducing wilt up to 45% and increasing yields as much as 300%. For partially resistant lines, seed yield was highest at ~2-3 tons limestone/acre, and decreased at higher and lower rates. Soil pH, and soil and plant calcium (Ca) concentrations increased with increasing rate of limestone amendment. Rates >1 ton/acre reduced available zinc (Zn) and manganese (Mn) in soil and plants. Ca is important in host resistance, while Zn and Mn may promote aggressiveness of some Fusarium wilt fungi. Mn and Zn are also essential for plants, so decreased yields at higher rates of limestone on partially resistant spinach lines

may be associated with inadequate Zn and/or Mn for seed crops at the higher soil pH. The amount of *F. oxysporum* detected in the soil at harvest in plots with a partially resistant line was about 50% that of plots with a susceptible line, i.e., rotation intervals necessary between seed crops to avoid Fusarium wilt may need to be longer following crops with susceptible lines than following crops with more resistant lines.

A PhD student, Emily Gatch, is using these results to assess mechanisms of Fusarium wilt suppression to optimize and integrate this with other cultural practices. The objectives of Emily's project are to: 1) investigate soil properties that affect host-pathogen interactions; 2) develop a soil bioassay as a risk assessment tool for growers to select fields for seed crops; and, 3) assess levels of Fusarium wilt suppression induced with annual applications of limestone and other cultural practices to lower the carrying capacity of PNW soils for this pathogen. Using the new Core Molecular Lab at the NWREC, the Vegetable Seed Pathology program is working with Dr. Pat Okubara, USDA ARS pathologist in Pullman, to develop a molecular tool for detecting the spinach Fusarium wilt pathogen in soils in order to help growers assess the risk of Fusarium wilt.

Conclusions

This research has demonstrated clearly the potential for limestone applications to render naturally conducive soils of the PNW more suppressive to spinach Fusarium wilt. As a result, many spinach seed growers in the PNW and some in Holland have increased the rate of limestone amendment they use to grow spinach seed crops on acid soils, apparently with positive results. The research is expected to increase the capacity for spinach seed production in the US. Please contact Lindsey du Toit (dutoit@wsu.edu or 360-848-6140) with questions or suggestions.



*Emily Gatch (in front)
and Barb Holmes*

Acknowledgements

The Puget Sound Seed Growers' Association, WA State Commission for Pesticide Registration, Alfred Christianson Endowment, Robert MacDonald Graduate Student Fund, Western SARE, and USDA Western Region IPM provided financial support for this project. The project received in-kind support from the Western WA Small Seed Advisory Committee and seed companies, and excellent technical support from Mike Derie, Louise Brissey, Barbara Holmes, Ron Dralle, Matt Reichlin, Kerri Brooks, Ashley Bentley, Amy Christianson, Coen de Jong, Gabby Freier, and Katie Reed.

New Graduate Students

Jessica Gigot is a new PhD student in the Small Fruit Horticulture program. Jessica received her B.A. in biology and anthropology from Middlebury College in Vermont in 2001. Following graduation she returned home to Washington to pursue her interest in agriculture. After working on various farm and garden projects in the northwest she completed an internship, funded by the Kellogg Foundation, at S&S Homestead on Lopez Island, a WSU-Center for Sustaining Agriculture and Natural Resources demonstration farm. In 2006, she completed her M.S. degree (with Dr. Debra Inglis) in plant pathology from WSU and her thesis work was focused on the survival and transmission of *Phytophthora infestans* on volunteer potatoes. Jessica is interested in plant health management and defining soil quality parameters in both annual and perennial cropping systems. Her doctoral research project is related to sustainable management of *Phytophthora rubi* and nematode communities in raspberry systems.

Emily Gatch joined the Vegetable Seed Pathology program in fall semester of 2008, and is working on a PhD program in plant pathology. Emily grew up on a farm in eastern Iowa, and had an early introduction to the world of seed through summer jobs de-tassling corn and working for a prairie seed company. Emily obtained a BS in biology from Harvard University, followed by an MS in plant pathology at Iowa State University. Emily's MS thesis project examined the interaction of Bt corn hybrids and stalk rot, caused by a complex of fungal pathogens that includes several species of *Fusarium*. After finishing her degree in 2001, Emily worked for three years as a research associate at the West Tennessee Research and Education Center, reporting to both the horticulturalist and plant pathologist in the vegetable crops division. Emily later moved to New Mexico where she held a position as greenhouse and pathology coordinator at the research farm of Seeds of Change, an organic vegetable, herb, and flower seed company. In her efforts to assess and manage seed-borne disease challenges for the company, Emily became aware of the research program of Lindsey du Toit, and joined Lindsey's lab at the WSU Mount Vernon NWREC in August 2008, investigating management strategies for control of Fusarium wilt in spinach seed crops.

Jennifer Niem, an MS student in Vegetable Pathology program, has joined Debbie Inglis and Babette Gundersen in the Vegetable Pathology program. Ms. Niem obtained a BS degree in Agriculture with a plant pathology major from the University of The Philippines at Los Baños in 1999. From 1999-2001 she worked at the Volcani Center in Israel on a CDR-USAID project preventing post-harvest decays in subtropical fruits. Following, she held a position with UPLB, researching diseases of banana. She attended classes in the spring in Pullman and arrived at our research center in May. Her thesis project will be on the effects of flooding on survival of soilborne pathogens of potato, and is part of *The Nature Conservancy's* Farming-for-Wildlife project.



Ana Vida Alcalá ('Avi') joined the Vegetable Seed Pathology program in January 2009, and will be doing her PhD project on seed treatments for organic vegetable production. Avi took classes in Pullman in the spring and will attend in the fall semesters of 2009, but will be at the NWREC this summer and full-time next spring to work on her PhD research project. Avi completed her BS degree in agriculture followed by an MS degree in Plant Pathology, both from the University of the Philippines at Los Baños. Avi worked on the control of a postharvest disease caused by *Colletotricum gloeosporioides* on mango (*Mangifera indica*) for her MS thesis. Afterwards, Avi worked as a researcher on biological control of soilborne diseases of vegetables in the tropics, and management of postharvest diseases of paddy rice at the Philippine Rice Research Institute.



L. to R. Avi Alcalá, Emily Gatch, Jessica Gigot

(Continued on next page)

New Graduate Students ... continued

Lucas Patzek joined the Plant Breeding and Pathology programs as a PhD student in the fall of 2008. Growing up he spent nearly equal portions of his life in Texas and California. From an early age his parents nurtured in him a love of nature and exposed him to the magical worlds of biology, physics, chemistry, and mathematics. He began his undergraduate studies at the University of California at Santa Cruz in Physics, and took coursework in that direction for three years. Ultimately he decided on a life sciences degree, and in 2005 received a BS in Molecular, Cellular and Developmental Biology. After graduation he went to work at the Harvard Medical School where he researched Alzheimer's disease. Wanting to return to plant science (and Berkeley) he then studied the ecological and social impacts of oil palm plantations, and held the managing director position at the Green Century Institute, an educational non-profit operating in green urbanism. While working in the non-profit sector, Lucas helped organize numerous public debates, teach-ins, the 7th International Ecocity Conference, and a green urbanism design competition. His current research at NWREC addresses the design of low-input agricultural systems, especially from the stand-point of reduced nutrient and fungicide inputs, and the improved integration of such systems with urban centers. His planned research spans the fields of pathology, genetics and sociology.

Karen Hills joined the Plant Breeding program in 2009 as a PhD student. She earned a BS in Rural Sociology at Cornell University in 2000 and a MS in Plant and Soil Science at the University of Vermont in 2007 (thesis title: Disease Suppression and Soil Quality Indicators after Organic Amendment to Two Soils with Differing Management Histories.) Since 2007, she has been employed by University of Vermont Extension in the agronomy and nutrient management program. In this position, Karen has been involved with farmer nutrient management education for dairy and vegetable farmers, including the creation of an extension publication (Digging In: A Nutrient Management Curriculum for Farmers) and the modification of existing nutrient management tools for use with diversified vegetable farms. She has been a collaborator on two SARE-funded projects investigating oilseed crops and their by-products as alternative crops for Vermont farmers (Seedmeal as an Amendment for High Value Crops; Oilseeds in New England: A Farmer to Farmer Exchange) and is currently conducting a study of nitrogen release rates from amendments commonly used by organic vegetable producers in New England. Karen's interests include production issues faced by diversified and sustainable farmers, including soil fertility, crop disease management, and minimizing the environmental impacts of agriculture.



Undergraduate student internships

Lindsey du Toit and Lori Carris (WSU Mycologist in Pullman) received \$2,000 each from WSU Associate Dean, Kim Kidwell, for a "Translational Internship" for WSU freshman, **Katie Reed**, to create an opportunity for Katie to gain direct experience working in research programs in Pullman and at NWREC while an undergraduate student. Katie completed a 1-day "Job Shadow" in Lindsey's program in winter 2007-08, and then expressed interest in studying plant pathology at WSU. Katie is working on a molecular spinach project for Lindsey and Pat Okubara (USDA ARS pathologist in Pullman) together with Lacey Hulbert, another former "Job Shadow" high school student in Lindsey's program who is completing a BS degree at WSU.

Rick Sakuma of the Sakuma Brothers Farms worked as a volunteer in the vegetable and fruit horticulture programs this past April and May. One of the reasons that he chose to volunteer was to further his knowledge of horticulture and to work with Gary Moulton in the enology program. Rick hopes in the future to be involved in the wine and grape industry.

Students graduating and finding jobs

Former MS student in Lindsey du Toit's vegetable seed pathology program, **Jaime Cummings**, took a position in soybean pathology with Monsanto Corp. in St. Louis, MO.

MS student, **Deron Beck**, University of Idaho, completed his thesis on 'Management of Botrytis neck rot of onion and graduated in 2008. Lindsey du Toit served on Deron's MS thesis committee.

WSU Mount Vernon NWREC Scientists lead USDA Specialty Crop Planning Grant Project: Planning for Specialty Crop Covers that Use Degradable Mulches



tomato high tunnel experiment using traditional black plastic mulch (July 2008)

Drs. Debra Inglis and Carol Miles are the lead scientists on a USDA Specialty Crop Planning Grant entitled Project Planning for Specialty Crop Covers that Use Degradable Mulches (Proposal Number: 2008-04831, \$98,181). The team consists of 10 inter-disciplinary/multi-university members from University of Tennessee, Texas A&M, and Western Washington University. At WSU, team members include Drs. Karen Leonas (Apparel, Merchandize, Design and Textiles), Tom Walters (Horticulture and Landscape Architecture), and Héctor Sáez (CSANR).

The grant project: (i) assists with the adaptation and economic feasibility of high tunnels for the Pacific Northwest (PNW) (cool marine climate), Mid-South (hot, dry climate) and Southeast (warm, humid climate); (ii) seeks to gain a better understanding of biodegradable mulch materials used to replace polyethylene plastic mulch, and (iii) to generate a better understanding of how biodegradable mulches may impact soilborne microorganisms and plant health.

The team met last year at River Point, WI for project planning and to attend the University of Wisconsin's High Tunnel workshop. The meeting was also attended by invited national leaders in crop covers and biodegradable materials. Stakeholders from Washington (Curt Beus of WSU Extension Clallam County, Andrew Corbin of WSU Extension Snohomish County, Tom Thornton of Cloud Mountain Farm and Ben Craft of Alm Hill Gardens), Tennessee and Texas attended to provide project feedback. A Key Informant Survey in November targeted selected growers and industry members in the northwest, south-central and southeast regions of the U.S. New information and perspectives about crop covers integrated with biodegradable mulch materials is available on NWREC's website <http://vegetables.wsu.edu/plasticulture.html>. A primary outcome from this planning grant was the preparation and submission of a \$2 M SCRI SREP proposal in April 2009. If funded, the project will take place in the three states over the next 3 years. The authors gratefully acknowledge CSREES for the award (# 51180-0488)



tomatoes in high tunnel at last harvest, October 17, 2008; outside planting was eliminated by late blight and frost a month earlier

Highlights

Debra Inglis co-organized, with **Carol Miles**, for 30 participants and scientific experts from throughout the U.S., a symposium held at University of Wisconsin River Falls, October 31-November 1, on "Using Degradable Materials for Protective Crop Covers."

Lindsey du Toit started as an Associate Editor for the journal *Phytopathology* in January 2009 (2009-2011 term) and *Agronomy Journal* (Aug. 2008-Jul. 2011 term), and in February she finished a 3 year term as section editor for *Plant Disease Management Reports*.

Tim Miller received the 2008 Weed Warrior award from the Washington Weed Association at the annual Washington Weed Conference in Yakima.

Kevin Murphy, Scot Hulbert, and Stephen Jones received \$600,000 in federal grants for organic hops research.

Lindsey du Toit and **Mike Derie** procured funding from WSU (\$50,000 with assistance from Dean Pete Jacoby) and private donors (\$8,000 from Schafer Ag Services, Pop Vriend, and Gowan Seeds), and purchase equipment to set up the new Core Molecular Lab at the WSU Mount Vernon NWREC. This lab has enabled molecular research to be completed by graduate students, faculty, and staff at the NWREC, including real-time PCR analyses. The concept of this molecular lab was initiated by Debra Inglis while she served as Interim Director of the NWREC. Thank you Debbie!

In May and June 2009 **Tim Miller** gave weed management workshops in Puyallup, Mount Rainier, Port Angeles, Bellevue, Olympia, Mossyrock and George. He covered everything from crop plants to bulbs, to Christmas trees to turf grass.

Debra Inglis is serving as Senior Editor of the journal *Plant Disease*.



On the Littau raspberry harvester: l. to r. Mike Particka (driving), Briana Moulton, Mindy Moulton, and Patrick Elhardt (quality inspection) July 2009

raspberry". She also received the Eldred L. Jenne Research Scholarship for the 2009/2010 school year from the Dept. of Horticulture and the Elsie J. and Robert Aycocock Travel Award to attend the 2009 National Plant Pathology meeting in Portland.

ECOLOGICALLY-BASED PARTICIPATORY IPM FOR SOUTHEAST ASIA

Strawberry IPM Utilizing Native Predatory Mites for Biological Control of Spider Mites in La Trinidad, Province of Benguet Philippines

In La Trinidad, strawberries not only represent a high cash-value crop but the community itself is defined by the industry, "Strawberry Capitol of the Philippines." Until the mid-1990's the La Trinidad strawberry industry foresaw no problem with unrestricted pesticide use. By the late 1990's pesticide resistance had exacerbated efforts to control spider mites and the industry was in jeopardy of collapse.



The final year of the USAID IPM CRSP funded project headed by Drs. **Lynell Tanigoshi** and **Beverly Gerdeman** from NWREC, has resulted in establishing the first native predatory mite mass production facility in the Philippines. This year over 33,000 *Neoseiulus longispinosus* were released on 11 farmer strawberry plots covering over 1 hectare in size. Weekly sampling and meetings with farmer-cooperators has changed their attitude regarding use of predatory mites. To promote project sustainability a successful publicity campaign was launched to increase consumer awareness of beneficial mites and resultant reduction in pesticide usage and in developing a niche high-end market for those farmers using beneficial mites.

Through the project's funding, a hand tractor was presented to the strawberry farmer association, OBSPA, to promote proper planting techniques and healthy strawberry plants to aid in resisting pests. As a result, the community is becoming united with the help of Washington State University, USAID, and Governor Nestor Fongwan of Benguet province.



On April 8, 2009, a reception was held at NWREC for WSU's new director of the Viticulture and Enology Program, **Thomas Henick-Kling**. 12 local wineries and vintners brought samples of their wines and over 70 local business and community members attended the reception. Henick-Kling toured all of Washington's wine regions, noting that there is good opportunity for growth in this industry for the state.

Carol Miles served as host for three **Borlaug Fellows from Africa** who were completing three month internships at WSU on organic agriculture. The individuals spent a week at the WSU Mount Vernon NWREC in October 2008, including time with each of the Vegetable Horticulture, Vegetable Pathology, and Vegetable Seed Pathology programs.

The spring 2009 newsletter for the Seattle chapter of the Association of Women in Science (AWIS) includes an article "Nurturing Agriculture in Western Washington" which feature the research programs of Drs. Debbie Inglis, Lindsey du Toit and Carol Miles. link: <http://www.seattleawis.org/news.htm>

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The mission of Washington State University's Northwestern Washington R&E Center near Mount Vernon is to serve the agricultural, horticultural, and natural resource science interests of the state through research and extension activities that are enhanced by the unique conditions of northwestern Washington: its mild, marine climate, rich alluvial soils, diverse small and mid-sized farming enterprises, and unique rural-urban interface.