LAND-GRANT UNIVERSITY RESEARCH

agInnovation NORTHEAST



agInnovation Northeast: RESEARCH

Project Summaries from the Northeast Region
September 2026

LAND-GRANT UNIVERSITY RESEARCH
agInnovation NORTHEAST

Foreword

At our directors' suggestion, we asked every member station in late 2025 and early 2026 to submit two research descriptions, one on a mature research project and the other on a new project. We envisioned the collection of stories to be an annual or semiannual publication that we'd call, *agInnovation Northeast: Research*. Here's the first edition.

The goal for creating such a compendium was to serve as an introduction, station to station, institution to institution, on what new research was emerging and what work was under way. Please share this document widely. More importantly, use it as a research connector.

We look forward to future editions. We're eager to hear your suggestions.

Regards,

Rick Rhodes
agInnovation Northeast
Executive Director

David Leibovitz
agInnovation Northeast
Coordinator

Cover image provided by the Connecticut Agricultural Experiment Station.

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Table of Contents

Page	Project Title	Institution	New / Mature
4	**Tree regeneration and understory plant dynamics in the wake of emerald ash borer invasion** - Elisabeth Ward	Connecticut Agricultural Experiment Station	Mature
4	**Resilience And Optimization of RNAi In Fungal Disease Management** - Nathaniel Westrick	Connecticut Agricultural Experiment Station	New
5	**Characterizing genetic variability and insecticide resistance in Culex pipiens mosquitoes along the northeastern U.S.** - Andrea Gloria-Soria, Philip Armstrong	Connecticut Agricultural Experiment Station	New
6	**New filtration method preserves nutrients in juice concentrate** - Mark Emile Punzalan, Carmen Moraru, Olga Padilla-Zakour	Cornell AgriTech	Mature
6	**Robot matches humans in scouting for vineyard diseases** - Ertai Liu, Kaitlin M. Gold, Lance Cadle-Davidson, Kathleen Kanaley, David Combs, Yu Jiang	Cornell AgriTech	New
7	**New York State Tick Blitz: Understanding expanding range of tick disease vectors impacting human and animal health** - Laura Harrington	Cornell University	New
7	**Designing sustainable multistory cropping systems for maple sugarbushes** - Aaron Wightman	Cornell University	Mature
8	**Improving Alternative Protein Production, Extraction, and Structuring by Combining Advanced Processing and Computer-Aided Engineering Approaches** - Lutz Grossman, Jiakai Lu	UMass Amherst	Mature
8	**Recovering Fertilizers from Freshwater Bodies Impacted by Agricultural Runoff Using a Novel Biofilm System and Repurposing the Recovered Nutrients for Agricultural Use** - Caitlyn Butler, Ashley Keiser, Ahmed Abouhend	UMass Amherst	New
9	**Renewable Heating Systems for High Tunnels** - Md Sazan Rahman	University of New Hampshire	New
10	**Reducing Risk in Forest Management Decision Support** - Mark Ducey	University of New Hampshire	Mature
11 - 12	**Understanding Root Exudates Dynamics under Controlled Environment Agriculture** - Camilo Villouta	University of Rhode Island	New
13	**Advanced Understanding and Prediction of Pollutants in Critical Landscapes in Watersheds** - Soni Pradhanang	University of Rhode Island	Mature
14	**UVM demonstrates commitment to interdisciplinary climate research and policy innovation** - Asim Zia	University of Vermont	Mature
14	**UVM Establishes the Soil Health Research and Extension Center - SHREC**	University of Vermont	New

CONNECTICUT AGRICULTURAL EXPERIMENT STATION

Tree regeneration and understory plant dynamics in the wake of emerald ash borer invasion [Mature]

Elisabeth Ward - Research Scientist
(contact: Elisabeth.Ward@ct.gov)

Sustaining forest productivity following tree mortality from pest and pathogen invasions is contingent on securing adequate tree regeneration. We found that ash mortality from emerald ash borer (EAB) is increasing non-native understory plant cover while simultaneously reducing native tree regeneration, suggesting that forests severely impacted by EAB are transitioning to a degraded state. We are now investigating how different management practices can promote tree regeneration to improve forest health and recovery in the aftermath of EAB.

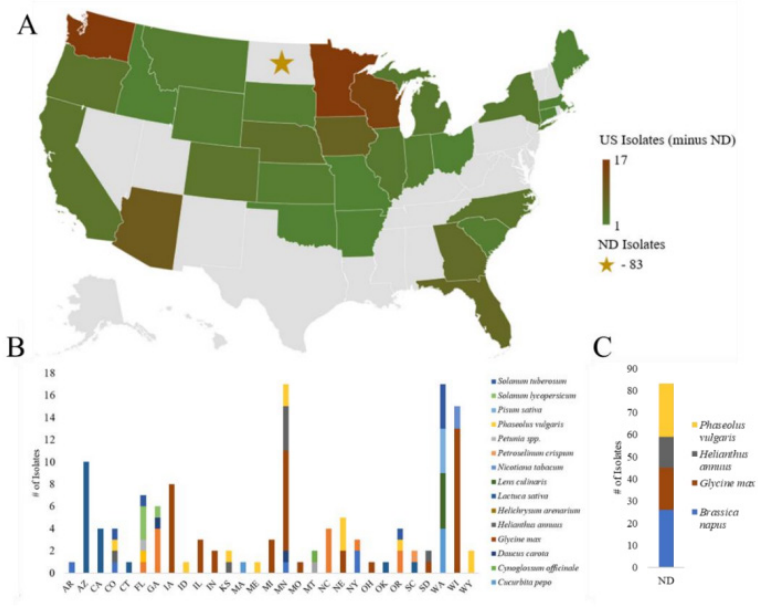


Read the full project description (CT.gov)

Resilience And Optimization of RNAi In Fungal Disease Management [New]

Nathaniel Westrick - Research Scientist
(contact: Nathaniel.Westrick@ct.gov)

Fungal pathogens are among the most persistent and economically damaging threats to agriculture, capable of rapidly adapting to control measures and causing significant yield losses across diverse cropping systems. RNA interference (RNAi) offers a transformative approach to managing these diseases by enabling highly specific, gene-targeted suppression of pathogens, but key challenges remain in designing effective RNA molecules and ensuring their durability under real-world conditions. Ongoing work at CAES is addressing these gaps by evaluating RNAi efficacy across genetically diverse pathogen populations and optimizing systemic activity within plant tissues, helping to translate this technology into practical disease management tools.



Read the full project description (CT.gov)

CONNECTICUT AGRICULTURAL EXPERIMENT STATION

Characterizing genetic variability and insecticide resistance in Culex pipiens mosquitoes along the northeastern U.S. [New]

Andrea Gloria-Soria - Research Scientist (contact: Andrea.Gloria-Soria@ct.gov)
Philip Armstrong - Chief Research Scientist, Entomology

Culex pipiens mosquitoes are vectors of West Nile virus (WNV) in the northeastern U.S. due to flexibility in host feeding patterns across their distribution range; therefore, they are the target of vector control interventions in the region. We seek to create a genomic database of Culex pipiens mosquito populations across the northeastern U.S. to understand population connectivity, dynamics, and to identify genetic markers linked to host choice and insecticide resistance. As part of this project, our team is developing a low-cost user-friendly molecular assay to aid with species identification and provide information on insecticide resistance markers or interest to assess disease risk.



This work is part of Hatch-Multistate Research Project NE 2443 *Biology, Ecology & Management of Emerging Disease Vectors*

CORNELL AGRITECH

New filtration method preserves nutrients in juice concentrate [Mature]

Mark Emile Punzalan - Extension Support Specialist, Cornell Food Venture Center Saratoga County (contact: mp665@cornell.edu)
Carmen Moraru - Professor of Food Processing and Engineering, College of Agriculture and Life Sciences
Olga Padilla-Zakour - Seneca Foods Professor and Director of the Cornell Food Venture Center

Cornell food scientists developed a room temperature juice concentration method that combines reverse osmosis and forward osmosis to preserve nutrients normally destroyed by heat-based processing. They demonstrated the approach using cranberry juice, showing that it maintains heat sensitive vitamins and bioactive compounds while producing a highly concentrated product. This technology could lower shipping and storage costs, reduce environmental impact, and offer the juice industry a healthier, high quality alternative to traditional thermal concentration.



Read more about the project (Cornell CALS News)

Robot matches humans in scouting for vineyard diseases [New]

Ertai Liu, Kaitlin M. Gold, Lance Cadle-Davidson, Kathleen Kanaley, David Combs, Yu Jiang - Cornell AgriTech (contact: kg557@cornell.edu)

Cornell researchers built and tested an autonomous ground robot that uses AI driven image analysis, GPS, and remote sensing data to detect grapevine diseases with accuracy comparable to expert human scouts. The system was deployed across research and commercial vineyards, where it successfully identified disease symptoms, mapped infection severity, and operated with low computational power suitable for field use. This technology could ease labor shortages, enable more precise and sustainable fungicide use, and strengthen growers' ability to manage climate driven disease pressures.

Read more about the project (Cornell CALS News)



Robotics technician Cole Regnier works on an autonomous robot designed to detect disease on grapevines on the Cornell AgriTech campus in Geneva, New York.

CORNELL UNIVERSITY

New York State Tick Blitz: Understanding expanding range of tick disease vectors impacting human and animal health [New]

Laura Harrington - Professor (contact: lch27@cornell.edu)

This four-year community-driven "Tick Blitz" collected nearly 3,000 ticks across 15+ counties, revealing that Lyme disease was the most prevalent pathogen, while Powassan virus risk was significantly higher in Northern and Western New York. The project also showed that anaplasmosis risk is consistent statewide, improving understanding of regional disease patterns beyond deer ticks alone.

By generating large-scale, region-specific data and training volunteers, the program created a scalable, community-based surveillance and education model that strengthens public health response and helps communities better prevent tick-borne diseases.



Read the full project overview(Cornell CALS)

View resources developed by NY State Tick Blitz

Designing sustainable multistory cropping systems for maple sugarbushes [Mature]

Aaron Wightman - Co-Director Cornell Maple Program (contact: arw6@cornell.edu)

This project supports maple farmers and consumers by evaluating the growth performance of potential crops to grow alongside maples in a sugarbush agroforestry system and by developing value-added maple product concepts. Field trials identified pawpaw, hazelnut, Cornelian cherry, and aronia as the best-performing understory crops in maple sugarbush systems, while others like raspberries and currants showed poor survival or productivity.

The project provides practical guidance on crop selection and product innovation, helping maple producers diversify income, improve land use efficiency, and strengthen resilient, agroforestry-based farming systems.



Read the full project overview (Cornell CALS)

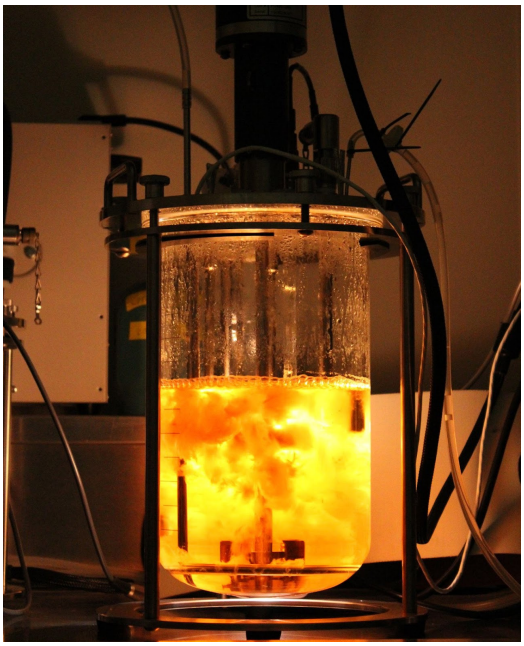
Read an article about the project (Cornell CALS News)

UMASS AMHERST

Improving Alternative Protein Production, Extraction, and Structuring by Combining Advanced Processing and Computer-Aided Engineering Approaches [Mature]

PI - Lutz Grossman - Assistant Professor, Food Science
(contact: lkgrossmann@umass.edu)
CI - Jiakai Lu - Associate Professor, Food Science

The project fostered engagement across multiple sectors of the food system, spanning academic research, industrial innovation, policy, and education. Public-facing impacts focused on increasing awareness of alternative protein technologies and their potential to support environmentally sustainable and resilient food system Through an emphasis on alternative proteins as part of integrated food system solutions, the project strengthened understanding of pathways to reduce environmental burdens and improve food security. (Link to full project text)



Bioreactor growing mycelium, a mycoprotein grown on different substrates such as pea flour to increase the nutritional and flavor profile

Recovering Fertilizers from Freshwater Bodies Impacted by Agricultural Runoff Using a Novel Biofilm System and Repurposing the Recovered Nutrients for Agricultural Use [New]

PI - Caitlyn Butler - Professor, Civil & Environmental Engineering (contact: csbutler@umass.edu)
CI - Ashley Keiser - Assistant Professor, Stockbridge School of Agriculture
CI - Ahmed Abouhend, Postdoctoral Research Associate, Civil and Environmental Engineering

With global phosphate reserves in decline and demand surging in agriculture and solar manufacturing, recovering phosphorus from nutrient-impacted waterways has become a critical priority for sustainable resource management. Simultaneously, recovering nitrogen from these waters can offer a dual benefit: providing an eco-friendly alternative to synthetic fertilizers and reducing greenhouse gas emissions by preventing the conversion of nitrogen present in water bodies into nitrous oxide. By integrating phosphorus and nitrogen recovery, these efforts will not only address resource scarcity but also promote a circular economy, conserve vital resources, and strengthen ecological resilience. (Link to full project text)

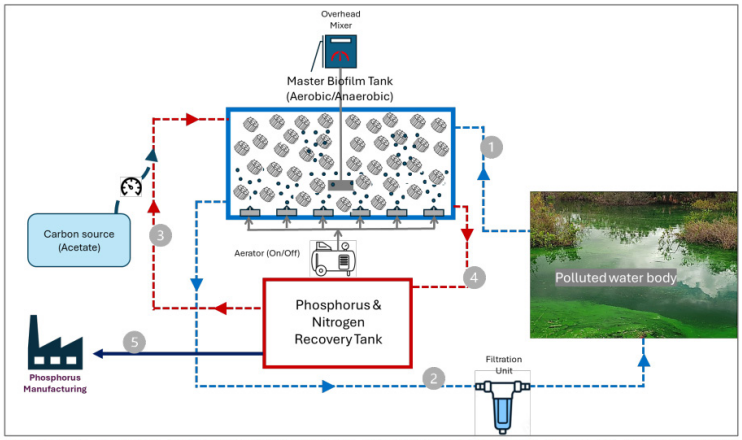


Fig. 2: *The patented biofilm system developed by the Butler Research Group for efficient nutrient removal and recovery from freshwater bodies affected by agricultural and stormwater runoff. The process begins with contaminated water entering the biofilm reactor (Path #1), where biofilm-coated carriers host microorganisms, such as polyphosphate-accumulating organisms (PAOs), optimized for phosphorus uptake. During the aerobic phase, aeration and mixing create optimal conditions for PAOs to absorb and store phosphorus within their cells, while also reducing organic matter, ammonia, and total nitrogen. The treated effluent is then filtered and discharged back into the water source as clean water (Path #2). In the anaerobic phase, aeration is stopped, and a nutrient-free recovery solution is added along with acetate (Path #3) to stimulate the PAOs to release stored phosphorus into the bulk liquid. The phosphorus-enriched recovery solution is then released and stored in a designated recovery tank (Path #4). This cycle is repeated continuously, and once the recovery solution becomes saturated with phosphorus, it is sent for industrial reuse, such as phosphate fertilizer production (Path #5).*

UNIVERSITY OF NEW HAMPSHIRE

Renewable Heating Systems for High Tunnels

[New] Md Sazan Rahman - Assistant Professor
(contact: MdSazan.Rahman@unh.edu)



Short growing seasons and cold winters limit year-round food production in New England, slowing the ability of the region to strengthen its local and regional food security. Over the past decade, small and medium-sized farmers have increasingly invested in affordable structures such as unheated high tunnels to help extend the season by trapping solar heat and enabling them to produce food throughout the shoulder seasons and a greater variety of products. However, winter temperatures even in high tunnels commonly fall well below levels, limiting year-round production in the region.

Some farmers use fossil fuel–based heaters to compensate for lower temperatures, but these systems are costly and increase greenhouse gas emissions. This project is developing a renewable heating system that converts an already abundant resource across the northeast—manure from dairy, equine, and other livestock—into usable heat through aerobic digestion. The work is focusing on engineering and testing small scale, affordable systems that can be implemented with existing high tunnels. Specific goals are to test production during New England winters by moving generated heat from composting manure into high tunnels using (a) a heat pump and (b) directly moving heating and filtered air into the structure. These two approaches will provide a direct comparison of growing environment, yield, crop quality, energy use, and economic payback.

By demonstrating how farm waste—often a byproduct across New England farms—can support continuous vegetable production, this research aims to reduce heating costs, lower carbon emissions, and improve food security.

UNIVERSITY OF NEW HAMPSHIRE

Reducing Risk in Forest Management Decision Support [Mature]

Mark Ducey - Professor (contact: Mark.Ducey@unh.edu)



Building on nearly two decades of forest composition research in the Northeast, this NHAES project addresses a core constraint facing forest management across the region: decision-making is limited by inventory and projection tools that are poorly suited to structurally complex, disturbance-prone forests. In states like New Hampshire, unreliable inventory has become a documented barrier to silvicultural investment, forest rehabilitation, and credible projections of timber, carbon, and watershed services.

The project's impact lies in reducing that risk by modernizing the full information pipeline. First, it couples emerging mobile LiDAR technologies—deployed at operational scales—with classical sampling theory, ensuring that high-resolution data are not only detailed but defensible for management and policy use. Second, it replaces decades-old, regression-based growth models with data-driven, imputation and AI/ML-based approaches, explicitly designed to perform better under changing disturbance regimes and long-time horizons.

For the region, this work provides a scalable pathway to more credible investments, stronger forest health planning, and policy-relevant assessments of timber supply, carbon, and watershed protection under insect and disease threats.

UNIVERSITY OF RHODE ISLAND

Understanding Root Exudates Dynamics under Controlled Environment Agriculture

[New]

Camilo Villouta - Assistant Professor, College of the Environment and Life Sciences
(contact: camilo.villouta@uri.edu)

Recirculating hydroponic systems can make spinach production more efficient, but they can also allow compounds released by roots (root exudates) to accumulate in the nutrient solution over time. This accumulation can shift solution chemistry, alter nutrient availability, and influence microbial activity, contributing to reduced growth or inconsistent performance. Growers and researchers currently lack spinach-specific guidance on how exudates change across development and how to manage these dynamics in controlled environment systems.

During this reporting period, we made strong progress toward the Hatch project's goals by pairing a clear synthesis of existing science with new spinach-specific experimental data generated under controlled environment conditions. First, we published a peer-reviewed review paper that consolidates what is currently known about root exudates in controlled environment agriculture. The review describes, in accessible terms, what root exudates are, why plants release them, how exudate profiles can shift with developmental stage and stress, and why closed, recirculating systems are particularly prone to compound buildup. This product directly supports the project's objectives by establishing a strong knowledge base for spinach hydroponics, identifying which mechanisms are most likely to be relevant in real production settings, and clearly defining research gaps that currently limit the development of practical guidance (for example, how exudates change over time in recirculating solutions and which plant or root traits may be predictive of those changes). The review also helped refine experimental priorities and confirm that the project's focus on developmental stage, production system comparisons, and root phenotyping is essential for translating exudate science into actionable management recommendations.





UNIVERSITY OF RHODE ISLAND

Understanding Root Exudates Dynamics under Controlled Environment Agriculture

[New] Camilo Villouta - Assistant Professor, College of the Environment and Life Sciences
(contact: camilo.villouta@uri.edu)

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In parallel, we completed replicated spinach experiments designed to provide the biological and physiological foundation required to interpret exudate dynamics in later project phases. We compared hydroponic NFT production to soil-based production across multiple harvest times that represent distinct developmental stages relevant to commercial leafy greens production. Across these stages, we collected standardized measurements of plant performance and detailed root traits that are tightly connected to exudation, including root system architecture and branching patterns using root imaging approaches, and root anatomical characteristics using microscopy-based assessments of tissue development. Because exudate release is strongly influenced by root growth rate, fine-root abundance, and root tissue structure, this year's work generated the context needed to move beyond simply documenting exudate presence toward understanding why exudate profiles change and how those changes relate to crop performance.

Just as importantly, this work generated practical deliverables that increase the project's rigor and efficiency going forward. We refined sampling timelines, standardized processing and measurement protocols, improved data management workflows, and validated a pipeline for quantifying root traits across many plants and time points. These steps reduce the risk of confounding and strengthen the project's ability to link belowground traits and production outcomes to the exudate processes that the Hatch project is designed to understand. Overall, the activities completed in this period represent significant progress toward the project's overarching goal: building a spinach-specific foundation that enables prediction of when exudate-related issues are most likely to occur in recirculating hydroponics and informing management strategies to prevent productivity losses.

The spinach experiments completed during this period provide direct, crop-specific evidence describing how spinach roots differ between hydroponic NFT and soil-based production and how root traits shift across commercially relevant developmental stages. For the target audience, this matters because root structure and growth patterns are the biological drivers of exudate release and also influence nutrient uptake and stress sensitivity. By establishing when root system changes are most pronounced and how production system affects root architecture and anatomy, the project helps identify "high-leverage" windows where monitoring or interventions may be most effective. These results also support the creation of more actionable hypotheses and decision-support guidance in future phases, such as focusing exudate sampling and management strategies around specific growth stages, rather than treating exudates as a static phenomenon.

UNIVERSITY OF RHODE ISLAND

Advanced Understanding and Prediction of Pollutants in Critical Landscapes in Watersheds [Mature]

Soni Pradhanang - Professor, College of the Environment and Life Sciences
(contact: spradhanang@uri.edu)



The project addresses the equitable design and implementation of climate resilience strategies, ensuring that Nature-based Solutions like green infrastructure benefit all communities fairly. It also tackles specific environmental threats, including greenhouse gas emissions from coastal systems, urban water pollution, and the risks saltwater intrusion poses to freshwater supplies.

The integrated research activities directly advanced the project's scientific and societal goals by generating critical, place-based knowledge. Monitoring the jellyfish-biochar treatment train provided empirical data on pollutant removal efficiencies, moving innovative green infrastructure from concept to validated practice. Concurrently, mapping the freshwater-saltwater interface and modeling watershed hydrology produced foundational datasets that transform subjective planning into predictive, science-based management of water resources and climate risks. Most significantly, the transdisciplinary ENACTS framework established a methodological pipeline—from stakeholder engagement to equity-centered design—ensuring that the resulting NbS are not only biophysically effective but also socially just and broadly adoptable.



The research leads to cleaner urban waterways, safer management of dam removal projects, and more reliable freshwater resources protected from saltwater intrusion. By grounding equity and community input into climate solutions, the work helps ensure that these improvements—from reduced flooding to healthier ecosystems—are distributed fairly, creating more sustainable and resilient communities for all residents.

UNIVERSITY OF VERMONT

UVM demonstrates commitment to interdisciplinary climate research and policy innovation

[Mature] Asim Zia - Associate Dean of Research and Postgraduate Education (contact: Asim.Zia@uvm.edu)



Read more: UVM Leads Global Climate AI Dialogue at COP30 in Brazil (UVM CALS News)

UVM took a leading role at the 2025 United Nations Climate Change Conference (COP30) in Belém, Brazil, organizing a high-profile side event focused on the intersection of artificial intelligence and climate resilience. This critical panel event was spearheaded by Dr. Asim Zia, a professor in UVM's College of Agriculture and Life Sciences (CALS), whose research spans computational policy analysis, governance networks, social ecological systems, sustainable development, food, energy and water systems. Dr. Zia opened the session with an overview of how AI-enabled technologies—such as early warning systems, precision agriculture, and climate diplomacy tools—can support global and local efforts to build climate resilience.

UVM Establishes the Soil Health Research and Extension Center - SHREC [New]

The Soil Health Research and Extension Center (SHREC) at UVM is a statewide hub for integrated research, testing, and outreach, delivering comprehensive soil health assessments to Vermont farmers, agricultural service providers, and researchers to inform data-driven management decisions. SHREC stands out for its farmer-focused approach, with clear emphasis on ensuring research and testing results are accessible and useful. This relationship is key to helping Vermont farmers improve productivity, enhance environmental sustainability, and build resilience to climate change.



Visit the SHREC website to learn more