



Annual Report

for the Fiscal Year **2005**

AES
Vermont
Agricultural Experiment Station

 *The*
UNIVERSITY
of **VERMONT**
EXTENSION



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FRONT COVER

The Intervale along the Winooski River is rich farm land and forest smack dab in Vermont’s largest city, Burlington. Photo by Shirley Chevalier/Fly-Rite Aviation.

THIS PAGE

The Conant Farm in Richmond is representative of Vermont dairying. Photo by Cheryl Dorschner.

For a full summary of this annual report visit



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Outreach and Research

We address farm profitability, water quality, disease resistance, global climate change, renewable energy, obesity, and youth education.

The Vermont Institute for Artisan Cheese helps Vermonters make the farmstead cheeses for which the state is becoming well known. Research scientist Paul Kindstedt with students Elissa Ballentine, left, and Nicole Losambe practice the science behind small-batch, raw-milk cheeses.

We relish our annual duty to report the results of Vermonters' investment in the Vermont Agricultural Experiment Station and University of Vermont Extension. This annual report is our chance to pause a moment to celebrate our hard-won successes, show these programs' relevance to all Vermonters, ask for your ideas, and thank the Green Mountain State's leaders for their efforts on our behalf to bring home the state and federal funds that we put to work for you.

Scientific research that serves the state's agricultural needs is the foundation on which the Vermont Agricultural Experiment Station (VT-AES) was established in 1886. Likewise, University of Vermont Extension is also a state and federal partnership through UVM. Since its founding in 1912, its aim has been to translate research-based conclusions into information that Vermonters can use. Extension outreach helps farmers, gardeners, forest and land stewards, and anyone who wants to improve business profitability and economics or nutrition and food safety. Plus, Extension offers life-skills education to youth and adults.

In 2005 alone, VT-AES conducted 176 new or ongoing research projects representing more than \$8.5 million, while Extension's combined \$7 million budget – including grants and

contracts – reached more than 96,700 contacts statewide. This tally does not even account for Extension's large presence at events such as the Everything Equine show, regional fairs, annual farm and flower shows, in the media, and on the "Across the Fence" weekday television show.

"Partnership" seems too small a word to describe the complex community ties that make this important work happen – work that touches so many Vermonters' lives.

The efforts of our state and federal representatives and those who garner private research funds are remarkable in this era of fiscal constraints. Committed faculty, staff, students, and volunteers carry out untold hours of the research itself and the corresponding outreach programs. Our work is guided and evaluated by dedicated citizen advisers with whom we meet regularly to review priorities, spending and program impact. (See page 6 for a full list of advisers.) And we seek feedback at every Extension event, via surveys and statewide polls. We meet with University, local, state, and national opinion leaders, and policy makers to review our research and outreach portfolio and direction.

It was feedback from people like you that caused us to

revamp our annual report format last year, and to improve on it for this fiscal 2005 edition. In the next three pages, we mention what we feel are VT-AES and Extension's most visible, high-impact work. These address the important issues of farm profitability, water quality, dairy-herd disease resistance, global climate change, renewable energy, obesity, and youth education in science and technology. Highlights of our funding distribution follow on page 5. Lastly, we summarize research projects in two-sided pages arranged by study area: agriculture; nutrition, food safety, and health; environment; economic and community issues; and life sciences.

For a full summary visit www.uvm.edu/vtaes.

TACKLING PROBLEMS ON THE FARM

With a dramatic shift in Vermont's agriculture landscape continuing – 58 farms quit dairying in 2005, yet the number of farms remains steady as farmers pursue many other diverse forms of agriculture – farm profitability is among the foremost skill sets that VT-AES and Extension can offer. Our **Farm Profitability Projects** include these:

- Dairy farm profitability is obviously tied to the health of the herd. Russ Hovey is studying how hormones influence mammary gland development and milk production. Pigs are the subject for this mammary gland biologist's research. Hovey's work has application to both the swine and dairy industries as well as breast cancer research by determining if a pig's mammary glands react biologically the ways that those in humans do.



uvmphoto

- Molecular biologist David Kerr's work on mastitis speaks to preventing a bacterial infection of cows' udders that is difficult to control with antibiotics and results in lower milk production and discarded milk. His years of USDA-partnered research on gene transfer paid off in 2005, when the USDA produced, for the first time, genetically modified dairy cows resistant to a widespread and painful form of mastitis. Announcement of this breakthrough traveled internationally via media outlets. Building on the work of animal scientist John Bramley and others, Kerr's lab produced the

Mammary gland biologist Russ Hovey's work applies to the swine and dairy industries as well as to breast cancer research.

gene that enables cows to make a naturally occurring enzyme in their milk that appears to ward off one form of mastitis. Kerr and colleagues also made progress in 2005 in isolating and reproducing a microbial enzyme that may prove deadly to a pathogen that causes bovine mastitis.

- Robert Parsons and a dozen Extension faculty colleagues again conducted the Crop Insurance Education Program for Vermont Farmers – a one-year, \$226,000 project funded by the USDA's agricultural risk management partnership that has been renewed. Parsons, Glenn Rogers, Dennis Kauppila, and Qingbin Wang's study of the profitability of organic dairy farming – new in fiscal year '05 – will run two years, and the researchers will seek third-year funding. These Vermont researchers split more than \$300,000 with the University of Maine to survey and tally the net profit of a sampling of farms in the two states. Yet another project that continues through 2006 involves holding workshops throughout New England to aid farmers in transferring their farms to family members and others.
- The Farm Viability Enhancement Program is another approach to this issue. UVM Extension and the Center for Sustainable Agriculture engage farmers in custom-tailored business planning. Doubling its outreach numbers in its second year, 98 farms – representing more than 35,100 acres of productive farmland – have been referred to the program. Richard LeVitre, Alan Curler, Kenneth Leach, and Marcy Guillette helped 20 Vermont farms create business plans. They tackle farm management practices, transfer issues, business diversification, and product marketing.

TACKLING PROBLEMS IN THE ENVIRONMENT

Farmland is inextricably tied to the ecosystems beyond its fence rows, and both farmers and researchers work together



Cheryl Dorschner

Constructed Wetland Research Center intern Eric Seitz ('05) monitors the experiments no matter what the season. Research tests strategies to reduce pollutants from farmyard effluent.

toward sustainability along with profitability. VT-AES and Extension are literally and figuratively testing the waters – innovations in handling run-off, converting natural resources into energy, and tapping indicators of climate change are among our top **Environment Projects**:

- Testing strategies of constructed wetlands and phosphorus filters technologies to reduce pollutants from farm effluent continues at Paul Miller Research Center. Aleksandra Drizo and colleagues experiment with optimal design of the wetlands and steel slag filters at the Constructed Wetlands Research Center. Projects beginning in 2005 included phosphorus and nitrogen removal and transformations, greenhouse-gas emissions measurements and investigations of the flow patterns in constructed wetlands using tracer studies.
- Extension specialists Heather Darby, Jeffrey Carter, Sid Bosworth, and colleagues work to integrate alternative forages into dairy cropping systems to improve profitability, soil conditions and environmental quality. In 2005, Darby published results of the northwest Vermont corn silage hybrid performance trial and results of both the hay-crop and corn-silage quality labs. Carter continued to support dairy farmers and industry consultants to develop and implement environmentally sensitive nutrient-management plans.
- The use of nematodes and microarthropods as biological indicators of soil quality and for environmental monitoring is the focus of Deborah Neher's research. About a half dozen projects continued in this area in '05. Among the topics, Neher seeks to: quantify contributions of soil organisms to nitrogen availability in arable soil, identify potential non-

target effects of genetically modified corn on soil organisms, examine ecosystem productivity and stability of arid soil as it relates to climate change, and monitor microbial communities to assess soil quality and progress of remediation of waste sites and contaminated sediments.

- With an eye toward the sustainability of Vermont's maple syrup crop, Timothy Perkins and colleagues at Proctor Maple Research Center monitor the health of forests and determine the impacts of air pollution on maple trees. Work continues in evaluating the impact of global climate change, acid rain, and other stresses on the maple industry of the Northeast. Additional studies focus on developing and evaluating methods to maximize sap production and improving processing techniques to produce pure, high quality maple syrup. This work is made possible with appropriations from the office of U.S. Sen. Patrick Leahy.



Cheryl Dorschner

Extension specialists Heather Darby, Jeffrey Carter, Sid Bosworth, and colleagues work to integrate alternative forages into dairy cropping systems to improve profitability, soil conditions and environmental quality. Darby was also an organizer of the ninth annual Vermont Grazing Conference in January '05.



Mark Starrett

Soil scientist Deborah Neher studies soil microbes as biological indicators of soil quality and as ways to monitor the environment.

TACKLING PROBLEMS IN THE COMMUNITY

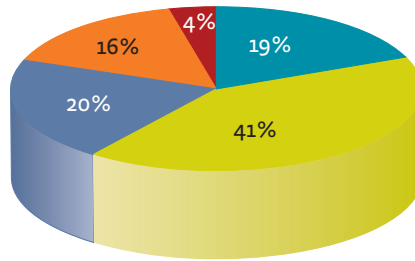
Extension and the VT-AES help people where they live. Though our research conclusions offer lessons nationwide, even globally, we apply our results closer to home, in our own **Communities' Projects** such as these:

- Obesity is a problem of epidemic proportions in the U.S. Health problems associated with obesity threaten to crush the nation's medical care system. In keeping with the size of this crisis, one of largest competitive grants ever received by the Vermont Agricultural Experiment Station is the work of Jean Harvey-Berino and colleagues. A \$3.5 million National Institutes of Health grant expands the number and diversity of participants of the successful VTrim Internet weight-loss research program. Harvey-Berino, a nutrition scientist, and her collaborator Delia Smith West of the University of Arkansas believe that if new studies continue

In this last year of his service, we express our gratitude to Sen. James Jeffords, longtime friend of VT-AES and UVM Extension. Among his top appropriations:

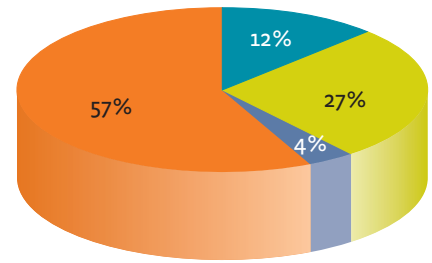
- National Transportation Center
- Constructed wetlands project
- New applications for whey
- Identifying off-flavors in maple syrup
- Barriers to pathogens in raw milk cheeses
- Upgrading the Morgan Horse Farm
- Acid rain research initiative
- Stormwater run-off project

UVM Extension Expenditures FY 2005



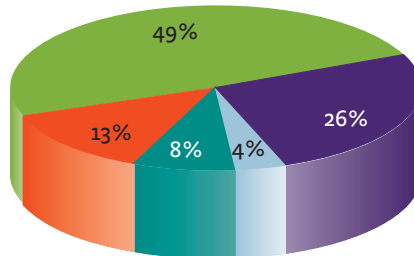
- USDA-Base - \$1,635,831
- State/UVM - \$3,646,214
- USDA-Earmarked - \$1,791,612
- Grants & Contracts - \$1,365,453
- Sales & Fees - \$328,252

VT Agricultural Experiment Station Expenditures FY 2005



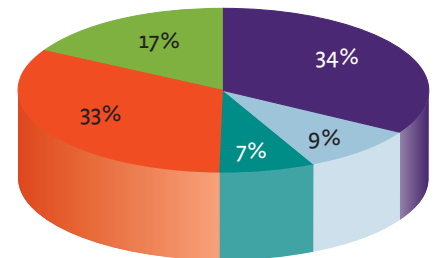
- Federal Funds - Hatch - \$1,066,623
- State/UVM - \$2,293,133
- Federal Funds - Multi-state - \$319,054
- Grants & Contracts - \$4,892,817

UVM Extension Expenditures by National Program Area – FY 2005



- Agricultural Systems
- Food Safety
- Nutrition
- Natural Resources & Environment
- Economic Opportunity/Quality of Life

VT Agricultural Experiment Station Expenditures by National Program Area – FY 2005



- Ag System that is Highly Competitive
- Safe and Secure Food and Fiber System
- Healthy, Well-Nourished Population
- Greater Harmony Between Ag & Environment
- Economic Opportunity/Quality of Life



U.S. Sen. James Jeffords, left, was inducted into the Vermont Agricultural Hall of Fame in August 2005. Here Extension equine specialist Betsy Greene and animal science department chair Thomas McFadden offer congratulations. Jeffords' efforts gained significant allocations for UVM Extension and the Vermont Agricultural Experiment Station.

the success rate of previous work, VTrim could be useful as a model of low-cost, high-reach obesity treatment. Because online participants lost an average of 21 pounds in six months, Harvey-Berino's work received national media attention, including in 2005, *USA Today* featured VTrim in a six-week series.

- *The New York Times* pointed out that Vermont has as many licensed artisan cheese makers as all five other New England states, "perhaps because it has more good alpine-like grass, perhaps because it has always been a dairying state, and perhaps because the state has done so much to help its dairy farmers." In June 2005, the book, *American Farmstead Cheese: The Complete Guide to Making and Selling Artisan Cheese* by Paul Kindstedt was published. It is the only science-based guide of its kind to serve this burgeoning group of farm craftsmen. "A little bit of science can make you a better artist," Kindstedt told the *Times*.

- A new science and technology 4-H project was launched in the rural southern town of Whitingham, Vermont. Middle schoolers in the Whitingham Wings 4-H Tech Club learned basic GIS/GPS remote sensing skills, then applied them to create a visitors' map to Lake Whitingham, thanks to the leadership of Deborah Fajans and a partnership with the Trans Canada natural gas company. The club went on to present another project – the story of the town that once was Mountain Mills – at Whitingham's Town Meeting Day.
- In 2005, Extension launched the pilot 4-H program: Science of Energy, Light, and Lighting. Eighty-five youth learned the scientific concepts behind use and learned about its impact on the environment, economy, and society. The program conducted in Burke, Burlington, East Haven, Halifax, Lunenburg, and St. Johnsbury, included principles of 4-H life skill development and addressed Extension's goal to enhance youth involvement in communities as active, productive citizens. This project was a partnership among Extension, the Department of Energy, and Office of Energy Efficiency and Renewable Energy to promote an energy-conscious society. Vermont was one of seven states involved.



Stephen Mease

UVM Extension strives to be a state leader in developing youth to become productive citizens and catalysts for positive change to meet the needs of a diverse and changing society. To meet this mission, 4-H and other youth programs offer challenging leadership and learning opportunities.

TACKLING CHALLENGES NOW AND IN THE FUTURE

In an era of flat federal budgets, our scientists continue to do cutting-edge research, because they are highly competitive and successful in being awarded grants and contracts.

In 2005, Extension hired its first development officer who, within the year, helped Extension and the State 4-H Foundation triple the amount raised to support 4-H. Development will continue to work with faculty, staff, and longtime supporters to recover costs of programs and find revenue from foundations, agencies, and individuals. Extension has also worked to help people understand the range of programs we provide and our connection to the knowledge base of UVM faculty. We have worked hard to contain program costs while still making Extension accessible to anyone interested. Extension focuses on addressing selected critical problems in Vermont, so Extension programs yield the greatest impact. Extension moved forward in 2005 with renewed energy and focus to meet the needs of Vermonters. All of these efforts aim to help Vermonters recognize our worth, our significance and our importance to cultivating healthy communities in Vermont.

UVM Extension and VT-AES receive USDA funding which is matched by state funding. In fiscal year 2005 (which ran from October 1, 2004 through September 30, 2005), 41 percent of Extension expenditures were funded by the state, and 19 percent were supported by federal Smith-Lever funding. Additional grants and contracts brought in more than \$1,365,000. See the chart on the adjacent page.

During that same period, 27 percent of Vermont Agricultural Experiment Station expenditures were supported by the state; 12 percent were covered by federal Hatch funds; and competitive grants and contracts accounted for 57 percent of the budget – or nearly \$4.9 million. Again, see the chart on the adjacent page.

Heartfelt thanks go to our state and U.S. representatives and senators who worked on our behalf when, initially, cuts were announced. In this last year of his service to Vermont, we express our gratitude to Sen. James Jeffords, long a friend of UVM Extension and the Agricultural Experiment Station.

We do not need a crystal ball to predict that the tight fiscal trend that we have seen for a decade may continue the next five years or longer. We are prepared to become still more competitive for funding that *is* available, and to focus our research and outreach efforts on what we do best and on what Vermonters need. It is during challenging times that Vermonters most need VT-AES and UVM Extension.



uvmphoto

Doug Lantagne,
Director,
University of Vermont
Extension



uvmphoto

Rachel Johnson,
Dean and Director,
Vermont Agricultural
Experiment Station

Advisory Groups

Our work is guided by dedicated citizen advisers who meet regularly to review priorities.

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Agricultural Systems



Cheryl Dorschner

UVM Extension and VT-AES serve Vermont's equine community with industry data that aids business planning.

Farmland is inextricably tied to the ecosystems beyond its fence rows; farmers and researchers work together toward sustainability along with profitability.

FARMING (11 projects)

Research scientists and outreach specialists

- help new farmers succeed by connecting them to appropriate training and information resources.
- train agricultural service providers to better understand how farmers can deal with the potential impacts of climate change.
- strengthen the ability of farmers to address farm estate/transition issues.
- provide agricultural service providers and farmers with tools to better integrate legal issues into business planning.
- demonstrate best environmental and livestock practices on a modern dairy farm.
- develop self-assessment tools for dairy farmers to improve sustainable farming practices while meeting state and federal environmental regulations.
- determine the benefits, interest level, and financial opportunities for Vermont farmers to produce alternative seed-oil crops.
- increase decisionmakers' knowledge of dairy profitability, sustainability, and water quality to achieve informed, statewide agricultural policy.
- overcome barriers that prevent women farmers from participating in USDA programs.

DAIRY (17 projects)

Research scientists and outreach specialists

- evaluate the effect of treatment of subclinical mastitis on dairy farms.
- evaluate and demonstrate cropping systems that improve soil quality and reduce phosphorus runoff.
- demonstrate how management-intensive grazing can help reduce costs and environmental impacts on livestock farms.
- integrate alternative forages into dairy cropping systems to improve profitability, soil conditions, and environmental quality.
- understand the immune response to mastitis; test and develop animals that are resistant to the disease.
- provide agricultural engineering advice to Vermont dairy farmers.
- determine optimal milking frequency to enhance dairy farm profitability.
- assist Vermont farmers to make more informed decisions on organic production.
- provide economic data to dairy farmers about on-farm processing activities.
- investigate the effect of both milk replacer feeding protocols and supplemental lactoferrin on calf health, growth, and future production.

- teach improved calf health and performance to calf managers by implementing better management practices.
- evaluate dairy farm management practices to reduce incidence of pathogens.
- study the role of glucose uptake in bovine tissues in supporting milk production.

MAPLE (6 projects)

Research scientists and outreach specialists

- conduct group and individual educational programs for the Vermont maple industry.
- educate Vermont maple sugarmakers about the threat of pear thrips.
- evaluate maple syrup production for effects on chemistry, quality, and flavor of maple syrup.
- educate the public about the Asian longhorned beetle, an exotic pest of maple trees.
- develop new guidelines for managing sugar maple stands used for production of maple syrup.



Stephen Mease

Vermont is known for its blue-ribbon maple syrup, a mix of agriculture, art and alchemy. Researchers at the Proctor Maple Research Center unravel what affects maple flavor and maximizes sap production.

LIVESTOCK (16 projects)

Research scientists and outreach specialists

- educate producers about existing value-added markets and practices that improve sustainability of small beef herds.
- provide education and technical information (such as nutritional information) about dairy goats to lower feed costs, improve milk production, and engage more feed companies to provide this service.
- develop proactive methods to improve safety behaviors in equine facilities.
- provide economically feasible methods to improve horse and human safety while improving land management and water run-off issues.
- provide industry data to current and potential equine operators to facilitate business viability evaluations.
- evaluate growth data for optimal management of Morgan horses.



Cheryl Dorschner

As Vermont becomes a center for artisan cheeses, more sheep and goat farmers rely on VT-AES and UVM Extension for information to help them lower feed costs and improve milk production.

- collaborate with University and industry partners to provide updated information to clientele.
- provide information to equine industry on effective disease prevention practices.
- produce equestrian safety materials that are recognized and promoted by national equestrian organizations.
- collaborate with state agricultural partners to address equine business issues.
- determine the genetic variation and biological function of the porcine prolactin receptor in order to improve growth and milk production.
- establish hormonal regulation to understand mammary growth and milk production in swine and dairy cows.

FRUITS AND VEGETABLES (11 projects)

Research scientists and outreach specialists

- minimize economic, health, and environmental risks associated with insect and disease management through IPM.
- evaluate performance of cold-hardy grape varieties under Vermont conditions.
- promote sustainable production practices that improve soil stewardship and pest management to enhance the long-term viability of Vermont's vegetable and berry farms.
- survey incidence of exotic apple pests in Vermont, and use integrated pest management to lessen reliance on pesticide controls.
- determine the most effective uses of compost for vegetable production in a horticultural setting.

ORNAMENTAL HORTICULTURE (8 projects)

Research scientists and outreach specialists

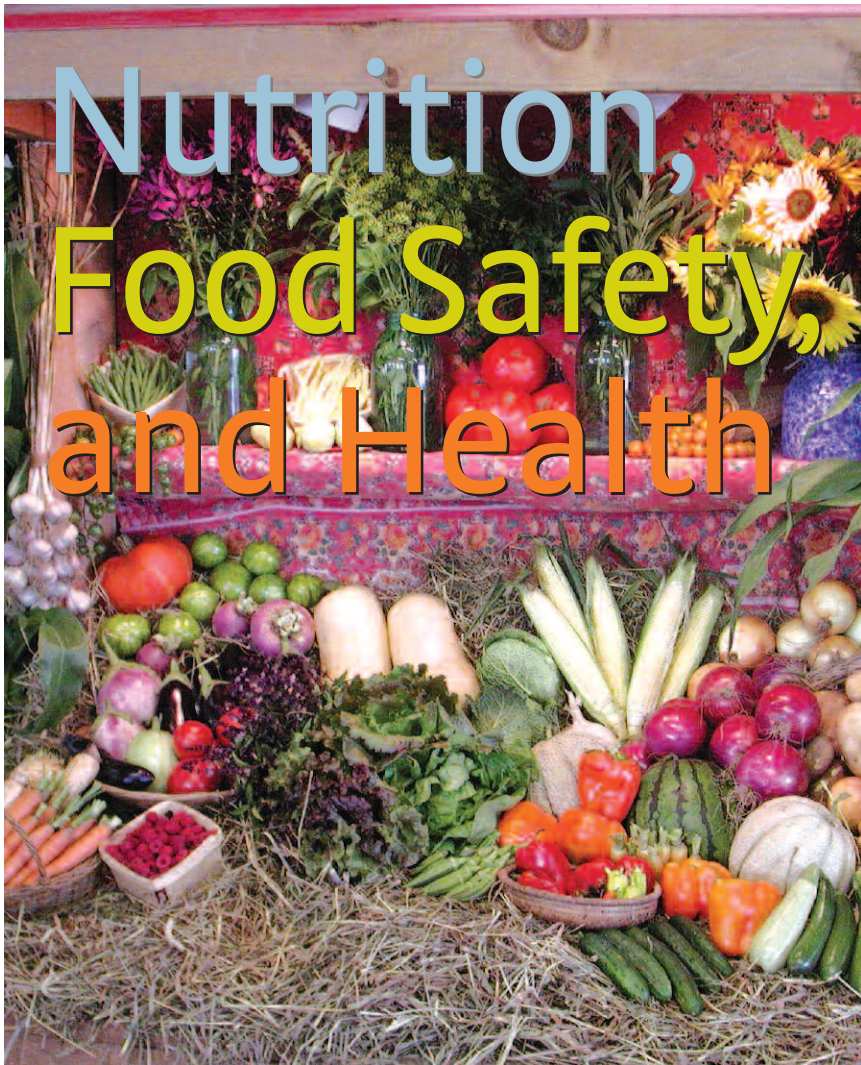
- provide new information to assist growers in the timely detection of western flower thrips.
- provide composting alternatives to home gardeners to decrease the amount of organics entering landfills in Vermont.
- expand Master Gardener Program to educate Vermont gardeners and promote successful, safe, and environmentally prudent home horticulture practices.
- determine the effects of freezing conditions and soil moisture on herbaceous perennials.
- develop salt-tolerant sugar maple cultivars to increase suitability for use in urban landscapes.
- evaluate the effectiveness of different mulches as a top-dress application to control growth of liverworts.
- develop a multi-media resource for worldwide greenhouse science education.



uvphoto

Mark Starrett evaluates cold tolerance in plants and the effectiveness of mulches against liverworts.

Nutrition, Food Safety, and Health



Stephen Mease

One goal of UVM Extension and VT-AES is that older adults have access to fresh produce and nutrition education. This, in turn, supports small-scale farmers.

NUTRITION (20 projects)

Research scientists and outreach specialists

- educate adults about healthful eating to reduce the risk of complications associated with diabetes.
- provide fresh produce and nutrition education to underserved older adults, increasing their food security and providing economic support to small-scale farmers.
- empower limited-resource Vermonters to eat more healthfully on a tight budget.
- understand the factors that influence beverage choice for very young children.
- develop an intervention to increase physical activity in childcare settings.
- develop an obesity treatment intervention that is widely accessible and broadly applied.
- provide data for health and parent groups making educated decisions on school food options to limit caffeine-containing beverages in schools.
- use nationwide nutrition and health information to understand

UVM Extension and VT-AES help Vermonters where they live. Our research offers lessons worldwide, but we apply the results close to home.



Maartje Van Caspel

Extension works with schools and families to improve childhood nutrition.

- the association between beverage consumption and obesity in a representative sample of U.S. children.
- learn that food intake records are useful ways for persons to self-monitor dietary intake patterns for appropriate behavioral modification.
- evaluate the impact of providing locally produced food to school districts to improve low-income student nutrition.
- help individuals adopt dietary guideline recommendations to reduce the risk of chronic diseases.
- develop and evaluate a Web-based computer application for older adults to improve nutrition and health.
- develop and evaluate a Web-based application for teaching middle school children about energy balance and health.
- develop a computer application that will allow people to assess and improve their dietary intake.
- assess the impact of restaurant food labeling on consumer choice.

- help young people increase their preference for fresh fruits and vegetables through gardening.

FOOD SAFETY (9 projects)

Research scientists and outreach specialists

- develop improved sampling and detection strategies of *Listeria* to improve safety in ready-to-eat foods and other food systems.
- analyze microbiological hazards associated with raw milk cheese manufacture.
- develop and evaluate a multi-media, multi-player Web application for teaching food safety to middle school children.
- distribute manuals on HACCP and farmstead cheesemaking to aid in the production of safer cheese.
- train food managers, handlers, and processors to train



UVM Extension Master Gardeners give information and advice at events statewide. Marge Allard, left, and June Jones receive visitors at the Vermont Flower Show.



Testing the quality of *Lactobacillus acidophilus* for probiotic yogurt, graduate student Su Li works with professor Mingro Guo to develop new uses for dairy products and their byproducts.



Nutrition scientist Jean Harvey-Berino received a \$3.5 million National Institutes of Health grant to expand the number and diversity of participants in her successful VTrim Internet weight-loss research program.

employees, and to monitor and reinforce food safety practices in their establishments to prevent foodborne illness.

- advise the public about safe home food preservation practices to reduce the risk of foodborne illness.
- train home gardeners to integrate food safety principles into planting, harvesting, and post-harvest handling to reduce the risk of microbial contamination of fresh fruits and vegetables.
- educate children on proper handwashing practices to reduce the risk of illness.

FOOD SCIENCE (7 projects)

Research scientists and outreach specialists

- provide scientific and technical information to cheese manufacturers to maintain maximal quality and safety of artisan cheese.
- develop environmentally friendly snow and ice melting products from cheese whey.
- develop soy-based functional foods for diversification of Vermont agriculture.
- identify causes and prevent growth of undesirable crystals on Cheddar cheese.
- develop value-added products from whey and other waste materials that are benign to the environment.

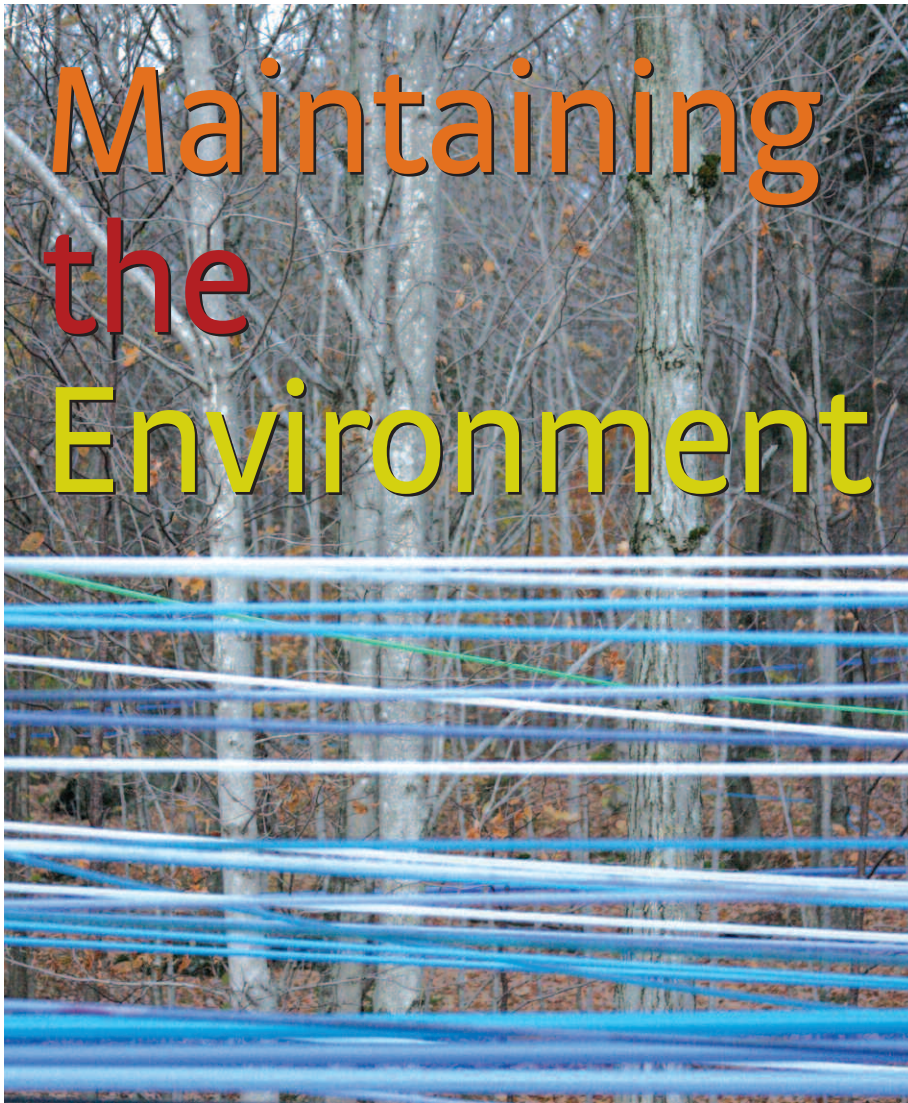
HEALTH (2 projects)

Research scientists and outreach specialists

- collect an inventory of locally managed health resources in Vermont to identify sites for additional resource allocation.
- provide health resources to low-income Vermonters to become more physically active and improve health.

Maintaining the Environment

Cheryl Dorschner



Proctor Maple Research Center monitors the health of forests, determines the impact of air pollution on maple trees and evaluates the effect of global climate change, acid rain, and other stresses on the maple industry in the Northeast.

ENVIRONMENT (3 projects)

Research scientists and outreach specialists

- provide hands-on instruction for transportation systems analysis and modeling.
- quantify contributions of soil organisms to nitrogen availability in arable soil.
- conduct environmental monitoring to provide plant conservation efforts.

ENTOMOLOGY AND INTEGRATED PEST MANAGEMENT (18 projects)

Research scientists and outreach specialists

- minimize the economic, health, and environmental risks associated with insect and disease management through IPM.
- develop research and education to support agricultural stewardship and sustainability in cold climate grape production.

VT-AES and UVM Extension literally and figuratively test the waters – we try innovative ways to handle run-off, convert resources into energy and tap indicators of climate change.



uvmphoto

Entomologists Margaret Skinner and Michael Brownbridge educate Vermonters about insects whose damage could become widespread, such as: soybean aphid, pear thrips and hemlock woolly adelgid.

- monitor the level of economic damage by the soybean aphid and increasing the awareness of this insect pest.
- develop fungal biocontrol agents to address insect pests of worldwide importance.
- implement a standardized sampling plan for monitoring hemlock woolly adelgid, an invasive insect destroying hemlock trees.

- educate Vermont pesticide applicators about safe and judicious pesticide application.
- develop biocontrol agents for management of hemlock woolly adelgid.
- investigate the potential of a fungal complex for control of elongate hemlock scale.
- increase awareness of IPM adoption in greenhouse crops to benefit growers, consumers, and the environment.
- provide information on the detection and use of biocontrols to treat western flower thrips and to reduce risk to humans and the environment.

NUTRIENT RUN-OFF AND WATER QUALITY (5 projects)

Research scientists and outreach specialists

- test and develop constructed wetlands technology as a viable solution for dairy effluent treatment and nutrient management.
- test and develop P reducing filters technology as a viable solution to prevent phosphorus pollution.
- develop better manure management recommendations.
- develop a tool to examine watershed phosphorus management options.

ENVIRONMENTAL MANAGEMENT

(10 projects)

Research scientists and outreach specialists

- build predictive models to better manage our environment.
- evaluate the dangers of toxic products in the home and promote the use of non-toxic or less toxic alternatives.
- evaluate which genes and characteristics of invasive plant species contribute to aggressiveness.
- identify potential non-target effects of genetically modified corn on soil organisms.
- examine ecosystem productivity and stability of arid soil as it relates to climate change.
- monitor microbial communities to assess soil quality and progress of remediation of waste sites and contaminated sediments.

FOREST RESOURCES (8 projects)

Research scientists and outreach specialists

- develop policy recommendations that promote the desirable combination of ecological, social, and economic benefits from the Northern Forest.
- monitor the health of forests in Vermont and determine the impacts of air pollution on trees.
- evaluate the impact of global climate change on the maple industry of the Northeast.



Cheyl Dorschner

Measuring the amount of light a leaf absorbs during photosynthesis could help scientists track global warming changes. Botanist Thomas Vogelmann, left, and Ph.D. student Craig Brodersen believe the effects of diffused light on photosynthesis are poorly understood. Controlled experiments such as theirs could change that.

- determine the relative impacts of management decisions of nitrogen compounds in forested ecosystems through the understanding of chemical behavior.
- identify mineral calcium forms in forest soils and use to predict possible depletion caused by acid rain.
- educate the public about a serious exotic forest pest, the Asian longhorned beetle.



Connecticut Agricultural Experiment Station

A brief 2004 introduction of the hemlock woolly adelgid to Vermont has UVM Extension entomologists monitoring the invasive pest.

Economic Opportunity and Quality of Life

Our research and outreach focuses on what we do best and on what Vermonters need. It is during challenging times that Vermonters most need VT-AES and UVM Extension.

Diversifying farms to include several products spanning the seasons is one more way to increase farms' economic viability. UVM Extension and VT-AES give farmers the tools to do just that.

FARM PROFITABILITY AND AGRICULTURAL ECONOMICS (8 projects)

Research scientists and outreach specialists

- provide resources and employment tools/skills for rehabilitation of agricultural and rural Vermonters with disabilities.
- increase farmers' business management skills to operate farms more profitably.
- help communities to develop farmers' markets and other entrepreneurial activities to enhance economic opportunity and well-being.
- provide recommendations to farmers wishing to transition to organic practices.



The Young Entrepreneurs in Agriculture conference brought farmers and wannabees together in Burlington in April 2005 to network and talk of trials and inspiration. UVM alumni Ross ('96) and Amanda ('94) Thurber told how they are changing Ross's family farm in Brattleboro, yet working with family members.



umphoto

Consumer economist Jane Kolodinsky, left, talks with Dawn Morin-Boucher of Boucher Family Farm in Highgate Center about her farmhouse cheeses.

CONSUMER ECONOMICS (2 projects)

Research scientists and outreach specialists

- increase financial literacy among high school students to enhance financial planning skills.
- determine consumer willingness to pay for genetically modified (GM) or GM-free products.

ECONOMIC AND COMMUNITY DEVELOPMENT (16 projects)

Research scientists and outreach specialists

- develop dynamic systems models with diverse stakeholders to help communities make informed decisions about tourism and recreation development.
- assess the economic impacts of the Northern Forest Canoe Trail to help communities maximize benefits.
- provide current information and resources for use by the Vermont tax community.
- evaluate the impact of access to capital on micro-business owners.
- teach life skills to youth enabling them to become contributing citizens and potential future leaders.
- create new jobs and provide assistance through new business development.

- develop and provide materials for use by citizen planners and local officials for effective municipal government activities.
- develop a technical assistance tool kit that will help small businesses in Vermont effectively and successfully integrate e-commerce into their operations.
- collect and share data with community planners to support local decisionmaking processes.

FAMILY RELATIONS (8 projects)

Research scientists and outreach specialists

- evaluate the impact of training low-income Vermonters to start or enhance in-home registered child care businesses.
- evaluate the impact of lead paint safety training on low-income micro-business owners.
- provide meaningful jobs and training in life skills to incarcerated individuals.
- provide educational opportunities to integrate migrant farm families into Vermont communities.
- provide community outreach and educational opportunities for youth which contribute to life skills development and to the four elements of positive youth development: mastery, belonging, independence, and generosity.



Stephen Mease

John Merchant addresses a group of 4-H Club members at the poultry barn of the Champlain Valley Exposition in August 2005. Merchant, long known for teaching citizenship and leadership skills to youth through 4-H, died on January 14, 2006.

Life Sciences



Cheryl Dorschner

Laboratory life science at the University of Vermont seeks answers that can be applied to human diseases including cancer and HIV.

In the laboratory scientists find the solution to some problems at the cellular level. Others take an even closer look – at the molecular level.

LIFE SCIENCES (5 projects)

Research scientists and staff

- identify the genetic changes that lead to the development of new crop species from wild plant relatives.
- develop and host Web programs for all land-grant institutions to use to submit and manage required research documentation for USDA's online Current Research Information System.
- determine the efficiency of plants to absorb light in response to global climatic change.
- support career development in structural and computational biology.

MICROBIOLOGY AND CELL BIOLOGY

(9 projects)

Research scientists and staff

- understand the physiology of plant roots to improve soil quality without addition of commercial fertilizer.
- understand the genetic mechanisms that control cell growth and when damaged lead to cancer.
- search for new anti-fungal drugs to control disease-causing microbes.
- investigate the molecular mechanisms that periodontal disease bacteria use to adhere to teeth and gums.

- understand mechanisms of HIV transmission.
- understand how plant roots function to increase ability to absorb water and nutrients from soil.
- identify proteins that are targets for new drugs for the treatment of microbial parasites.
- understand how microbial parasites cause disease.
- determine how cells identify one another during normal development and disease conditions.

MOLECULAR GENETICS (8 projects)

Research scientists and staff

- develop tools to prevent viral infections.
- determine how RNA mediates biochemical reactions.
- examine RNA to control viruses and other harmful RNA in cells.
- determine the molecular mechanisms that ensure faithful transmission of genetic information from one generation to the next for increased nutrition/resistance to pathogens.
- provide clues to the role of DNA damage in cancer and aging.
- provide insights into the molecular mechanisms underpinning cancer and other human diseases.
- understand cellular mechanisms that prevent damage to DNA, the genetic material.

Contacts

*We welcome
your ideas
and comments.
Call, email,
or visit the
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Stephen Mease

The future of farming in Vermont passes to the next generation.

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In 2005, the research and outreach of University of Vermont Extension and Vermont Agricultural Experiment Station scientists was called on by journalists and writers in a wide range of media including *The Chronicle of Higher Education*, *The New York Times*, *USA Today*, *The Boston Globe*, *Audubon* and *O*.



University of Vermont Extension educator Alan Curler, right, worked with the Crawford family of Leicester, Vermont to develop their farm business plan. He shows the plan to Jim and Cindy Crawford while their daughter, Dacie, and family dog, Indy, look on. Theirs was one of nearly 100 farms reached in 2005 by UVM Extension's Farm Viability Enhancement Program. Photo by Ken Leach.

Annual Report

for the Fiscal Year **2005**

AES
Vermont
Agricultural Experiment Station

The
UNIVERSITY
of VERMONT
EXTENSION