**FY 2003 AREERA Annual Report for University of Vermont Extension and Vermont Agricultural Experiment Station**

## A. Overview and Accomplishment Highlights

University of Vermont Extension and Vermont Agricultural Experiment Station (VT-AES) share the vision of using research and outreach education to improve the quality of life of Vermonters. University of Vermont Extension faculty and staff interact directly with a diverse set of audiences, to deliver targeted programming and to learn about and address, the problems and opportunities affecting Vermont citizens, including underserved audiences. More than 100 citizens serve in advisory capacities to ensure that educational programming is targeted toward areas important to Vermonters. Additionally, results from a representative, randomized annual poll of Vermonters assist in directing research and outreach priorities. Working with other departmentsat the University of Vermont, other states, and other institutions, VT-AES and University of Vermont Extension have strengthened their capacity to ensure that appropriate educational resources remain accessible and relevant to the state's citizens. For many Vermonters, Extension is a critical gateway to higher education and timely information, serving as the initial contact with Vermont's land grant institution.

### Funding Allocation

University of Vermont Extension and VT-AES benefit from a supportive state and federal partnership. State support augments both outreach and research efforts by matching federal funds from the USDA. In FY 2003, 45.5 percent of University of Vermont Extension expenditures were supported by the State of Vermont and 20.5 percent were supported by Smith-Lever funds. These funds are used by faculty and staff to secure additional competitive funds, and establish beneficial partnerships. University of Vermont Extension faculty, staff, and volunteers raised nearly one million in grants and contracts during fiscal year 2003. In fiscal year 2003, 31 percent of VT-AES expenditures were supported by the State and 19 percent were supported by federal Hatch dollars. The remaining 50 percent were secured through researcher-garnered competitive grants and contracts. Collectively, these funds supported 163 research projects conducted by VT-AES. Total state and federal expenditures toward research and outreach programs by UVM Extension and VT-AES totaled $9,046,692 (Appendix 1).

### Efforts

University of Vermont Extension and VT-AES professionals and para-professionals over 71 full-time equivalents (FTE's) toward research and outreach efforts during FY 2003 using a variety of approaches: 1,923 group presentations and workshops; 7,697 individual on-site and office visits; 10,210 phone consultations; 274 radio and television appearances; and production of 193 publications. University of Vermont has improved their reach to rural, disperse populations through the increased use of technology as a communication medium, and this past year conducted 118 distance education workshops, while producing and maintaining 41 web page publications. During the year 7,499 volunteers from communities throughout Vermont donated 60, 829 hours in support of Extension outreach efforts. This effort nearly doubles last year's contribution, and is an indicator of the increased engagement the Vermont public has in VT-AES and University of Vermont Extension programs and program direction.

Directed efforts enabled University of Vermont professionals and para-professionals to have 106,705 contacts with Vermonters to address issues of importance to them. Vermont's underserved populations are diverse and dispersed, with two thirds of the population identified by 2002 Census reports to be comprised of people living outside of metropolitan areas, and in effect, rural. Efforts made to recruit participants from underserved groups resulted in reaching large income-limited and rurally isolated segments of the state's population. Fifty three percent of all contacts identified were male, and 47 percent female. Contacts are still skewed slightly higher toward males relative to state census statistics, which indicate that 51 percent of the state's population is female. A contributing factor to this statistic is the fact that University of Vermont Extension and VT-AES directed 25 percent of effort and funding toward developing an agricultural system that is competitive in the global economy, where 65 percent of all contacts are male. Although the number and proportion of females in farming is growing, 2000 U.S. Census Bureau statistics indicate that they still represent just 20 percent of all people employed in the industry. This past year, more than 28 percent of all contacts were youths and young children.

According to U.S. Census Bureau statistics, Vermont's minority population represents 96.8 percent of the total Vermont population, with just two percent of the population identifying itself as a single race and within a minority group. University of Vermont Extension programs reached 841 people identified as black and 591 people identified as Asian, representing approximately 0.7 and 0.6 percent of all contacts, respectively. Fewer than five hundred people reached were identified as Native American or Hispanic. A total of two percent of all contacts were identified as belonging to minority populations. Several nutrition and youth-oriented programs specifically target and recruit minority populations, while a large majority of programs focus recruiting efforts toward rurally isolated, economically challenged, and income-limited groups. Highlighted outcomes and impacts of University of Vermont Extension and VT-AES efforts and expenditures are summarized in the following sections of this report.

## B. FY 2003 Highlights of University of Vermont Extension and Vermont Agricultural Experiment Station

### NATIONAL GOAL AREA 1:
### AN AGRICULTURAL SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL ECONOMY.

Agriculture plays a critical role in shaping Vermont's culture and economic status. Eleven percent of Vermont's gross state product comes from the sale of agricultural products. One out of every six working Vermonters is employed on a Vermont farm or by a business with a direct relationship to the agricultural industry. Agriculture and the industries associated with it conservatively add more than $2 billion to the state's economy, and agriculture is widely recognized as one of the primary driving forces in Vermont's flourishing tourism industry. As New England becomes more developed every day, Vermont has become a virtual island of rural agriculture. While Vermont has only 15 percent of New England's total land area, it contains more than one third of the region's farmland. VT-AES and University of Vermont Extension work together to ensure farmers and farmlands obtain the expertise and support needed to remain productive and viable for future generations. During FY 2003, University of Vermont Extension and VT-AES expended 17.82 FTE's, or 25 percent of total effort, toward projects in this National Goal Area, spending $976,037 (32 percent) of federal and $1,820,137(30.4 percent) of

state funds. Faculty and staff conducted or continued more than thirty research projects, made 1, 958 individual consultations, gave 249 group presentations and discussions, and ??? 2,229 office and phone consultations. To expand reach and take advantage of communication opportunities, University of Vermont Extension conducted 48 distance education workshops, produced and maintained 15 websites targeting specific populations, and produced 106 publications. Additionally, 427 volunteers contributed 4,322 hours of their time toward programming in this National Goal Area. Effort is valued at $43,220 based on $10 per hour. University of Vermont Extension made 25,903 contacts, including 16, 593 men, 9,310 women, and 5,041 youths.

According to the New England Agricultural Statistics Service, the cash receipts for all Vermont agricultural commodities in 2003 were approximately $563 million, with more than 70 percent resulting from milk receipts. According to the Vermont Agency of Agriculture, Food and Markets, the ripple effect on Vermont's economy from milk production annually totals between three and four billion dollars. Apples are another important commodity to Vermont's rural communities and working landscape. Of all the different fruits grown and harvested for sale in Vermont (i.e., strawberries, blueberries, raspberries, etc.), apples comprise 92 percent of total acreage planted to fruit in the state. The apple industry generates jobs and supports communities and businesses across Vermont. Annual cash receipts are estimated at $7.9 million and, when value-added products are considered, the value of the crop is reported at $25-28 million. Other important agricultural industries that University of Vermont Extension and VT-AES address through programs and research include the maple industry, with Vermont receiving the highest amount in cash receipts of any state in the country ; the small fruit and berry industry; and the equine industry, whose economic impact on the state has just recently been assessed. Agriculture's economic impact cannot be separated from a $4.2 billion tourism business critical to Vermont's economy that approaches $4 billion and which relies on the picturesque dairy and farmland vistas enjoyed by tourists from around the globe. University of Vermont Extension works with the public and farmers around the state with an understanding of this important link. VT-AES work has helped to clarify agriculture's link to other economic sectors for Vermont, such as tourism.

Dairy production has played a prominent role in Vermont's economy. Income loss for dairy farmers associated with the loss in 2002 of the Northeast Interstate Dairy Compact extended University of Vermont Extension's role working with farmers to help them weather the changes in pricing and markets they have experienced. Extension assistance in production, sales, marketing, and insurance plans are key factors to resolving the negative economic effects that increasing price volatility and decreasing production prices has had on Vermont dairy farmers. An emphasis on business-oriented workshops, information exchange, and face-to-face visits has assisted farmers in altering markets, human resource needs, and management strategies. Despite a decline in dairy farm losses, cow numbers in Vermont remain virtually unchanged, and over all milk, production has actually increased. Farmers have been consistent in describing the need for a temporary labor service to assist farmers. University of Vermont Extension has worked with other organizations and the legislature to establish and hand off a farm-led cooperative, the Vermont Farm Labor Service. The growth and success of diversified farming enterprises has allowed for the maintenance of approximately the same number of acres in agriculture over the past decade. University of Vermont Extension and VT-AES have been modifying their efforts to reflect this change in agriculture for the State. Land Link Vermont is addressing one of the most serious obstacles to getting started in farming: access to farmland. The program seeks to connect new-entry and relocating farmers with farming opportunities in Vermont and provide them with

appropriate information on farm transfer and farm business management issues. New product markets, such as wool mulch, soy-based and whey-based products, new grape and apple cultivars, new cheese production technology, tourism opportunities, and new yogurt products have helped existing farmers remain in operation or even expand, while also providing the opportunity for new farmers to emerge.

The potential market for *functional foods*, a phrase to describe commodities with new or unique health or nutritional properties, is massive. In 2002, the functional foods market was a $20.2 billion business with an anticipated growth rate of 7-10 percent a year. Ming R. Guo, a University of Vermont researcher in the field, says that in 20 years, 85 percent of all food will be functional, primarily due to the increased awareness by consumers of the benefits of healthier foods that also help prevent disease, such as tomatoes, grapes, tea, seafood, olive oil, low fat milk and enriched bread. VT-AES food scientists have developed a number of functional food products that include antioxidants, prebiotics and probiotics. In addition to enhancing the immune system and helping to prevent cancer, these live microbial food supplements have a number of other health benefits. Researchers have created “oagurt”, (oats and yogurt), buffalo yogurt, tofu skin, and are working on infant formula, a nutritional supplement for pregnant women, and a smoothie-like drink. "We’re near the forefront on a lot of this,” says VT-AES food scientist Mingro Guo. Rights for products have been sold to the Vermont Butter & Cheese Company in Websterville, Liberte Yogurt of Canada, (with a plant in Enosburg Falls), Star Hill Farms in Woodstock, and others. Researchers at VT-AES also create soy-based products, a market expected to reach $7.3 billion by 2007.

Organic food is the fastest growing segment of agricultural sales in the United States, increasing by approximately 20 percent each year for the past several years. Consumers spent $11 billion on organic foods in the last year, and projections estimate 2005 organic retail sales to reach nearly $20 billion. The number of state-certified organic farms has quadrupled in the past decade, from 55 in 1990 to 253 in 2002, with much of this growth in the organic dairy sector. Organic farming now represents 24,351 acres of 1.34 acres currently designated as Vermont farmland. This represents a growth of 34 percent since 1999. Gross sales from certified organic farms in Vermont totaled over $27 million, with $15 million in sales directly from farms. Organic milk receives significantly more than for conventionally produced milk, thereby increasing profits for some Vermont dairy farmers. The trend toward increasing consumption of organic products complements Vermont's efforts to strengthen an already strong Vermont "brand" on exports and maintain an environmentally sound working landscape. It has been shown that retailers can ask an average of up to 15 percent more for products with a Vermont label, and Vermont organic products have become increasingly common on store shelves along the East Coast and beyond.

Vermont organic farming is comprised primarily of small farms whose primary purchasers are local consumers, marketers and distributors. The new federal standards open the door to stiffening competition from large companies, such as H.J. Heinz, General Mills and Frito Lay, due to economies of scale. Some Vermont organic farmers will also pay a cost to make changes in manure practices, feed mixtures, and harvest practices associated with the new federal standards. Processors may utilize new marketing strategies, especially when working with overseas clients, now that federal standards are in place. University of Vermont Extension assists organic growers in determining how to meet more recent federal standards for organic foods. University of Vermont Extension also plays a role in keeping organic farmers abreast of

policy developments, including proposed cost-share programs to help organic farmers with certification costs, research to develop improved and more efficient organic farming techniques, and ways to promote exports of Vermont organic products. VT-AES continues to monitor the consumer base for organically grown foods and for consumer-preferred food labeling practices. Research is also underway by VT-AES integrated pest management scientists, who are developing whey-based pesticides for use on organic crops.

It is in these ways that University of Vermont Extension supports a healthy and diverse agriculture linked to healthy communities that coexist with a scenic and pristine natural environment.

**KEY THEME: MANAGING CHANGE IN AGRICULTURE**

**Knowing Our Dairy Audience –** According to the New England Agricultural Statistics Service, the cash receipts for all Vermont agricultural commodities in 2003 were approximately $563 million, with more than 70 percent resulting from milk receipts. According to the Vermont Department of Agriculture, Food and Markets, the ripple effect on Vermont's economy from milk production annually totals between three and four billion dollars. To better assist farmers, a mail survey was conducted by University of Vermont Extension. All 1517 Vermont dairy farms were surveyed in FY2002. Results were completed in FY 2003.

IMPACT
Mailed responses from 60 percent of farms surveyed assisted University of Vermont Extension personnel in making the following decisions regarding dairy education:

- *Assist in public policy debate through neutrally facilitated educational opportunities.* Areas of greatest concern for dairy farmers in a state highly reliant on their success were milk pricing, real estate taxes, environmental regulations, and local government regulations – public policy related issues, all. More than 50 percent of respondents placed these issues in the category of "most concern." Areas of less concern to the majority of farmers were those related to farm operation.
- *Emphasize estate planning and business transfer education*. The majority of farms are sole proprietorships. Fewer than 10 percent of dairy farms have established a corporation or limited liability company ownership.
- *Assist Farm Labor Service, now run by farm operators and assist farmers in land acquisition.* Nearly 38 percent of Vermont's dairy farmers intend to increase cow numbers in the next year. These farms are planning to increase acres farmed and employ more hired labor. Farmers also expressed their greatest dissatisfaction (52.6 percent rated as very dissatisfied or dissatisfied) with the degree to which they could spend time away from the farm. Nearly 40 percent of dairy farmers expressed the same level of dissatisfaction with "labor availability," whereas labor quality was less of an issue (21.9 percent expressed dissatisfaction).
- *Assist farm operations to enhance annual per-cow profits.* Although milk production remains stable, or has increased slightly, the number of dairy farms in Vermont continues to decline, and increases in cow numbers mean increased labor per farm. Therefore, efforts of University of Vermont Extension have targeted management practices designed to enhance annual per-cow profits.

Smith-Lever funds supported this project.

**Developing unity among leaders in the dairy industry --** Department of Animal Science scientists who perceived that there was a lack of cohesiveness in the dairy industry in Vermont conceived the Dairy 2010 group. Extension joined early in the group's formation with the goal of establishing a group of key industry leaders who would meet to discuss timely dairy issues for cooperative action and to identify a "point of unity" that all could work toward. After two meetings with approximately twenty dairy industry leaders, the group found that they were in agreement on several issues, with the rallying point being the support of long-term profitability for Vermont dairy farms. First, the leaders wanted to create a regional economic power; second, they hoped to create a unified VT dairy industry spokesgroup to communicate producers and industry issues with a single voice; third, the group hoped to develop an operating environment (policy, education, consumer acceptance) that brings together and serves and supports those who invest in the future of the industry. This year the group supported a Pro Dairy Winter Management School.

IMPACT
The FY 2003 Pro Dairy Winter Management School had attendees from five states, and one attendee from Uzbekistan. The two-day conference had 55 participants, nine different speakers and three exhibitors, including one who conducted free health checkups. A total of 12 presentations were made. Some of the evaluation comments about how attending this conference will affect farm operations are as follows:

⇒ "This was a good lesson for me to make some changes in our dairy business back in my country [Uzbekistan].

⇒ " I will do some partial budgets on projects. I wish to improve our farm and I can [better monitor] cash flow by doing partial budgets."

⇒ " [I will put] more thought into capital investments."

⇒ " Good ideas on how to use debt in low income periods."

⇒ " They [the speakers}all impacted positively in many small ways. These small aspects can hugely benefit the farm without any significant expense."

The Vermont dairy industry has been working as a more unified group to confront the issue of milk pricing and the loss of the New England Dairy Compact.

Smith-Lever funds supported this project.

**Assessing Agricultural Land Use Perceptions by the Public** – University of Vermont Extension and VT-AES recognize that farmers and the public do not have many opportunities for discussion about how each others' actions affect the others' lives, environment, and business operations. Efforts are underway to begin these discussions as Vermonters are faced with changing agricultural and residential demographics. University of Vermont Extension surveyed Charlotte town residents to assess attitudes toward agriculture and land use as they face changes in development and the agricultural industry**.** Almost 20 percent (294) of 1500 surveys mailed (one per household to all households) were returned. Of the surveys returned there was almost an even distribution between male and female respondents, and 77 percent reported to have college or advanced degrees. Almost all (96 percent) were homeowners, and considered themselves active in local governance, with over 90 percent voting in local elections. The top three preferred uses for currently open farmland or pasture in town were as (1) small specialty crop farms, (2) small livestock farms; and (3) large crop farms. Least preferred uses were for (1) development as small lot residences; (2) conversion to light industrial use; and (3) development

as large lot residences. Fourth most AND least preferred use of the properties was as large livestock farms. When asked what agricultural issues or practices were of concern in the town, 56 percent of respondents indicated that they were very concerned about water contamination. High levels of concern were also expressed about the use of insecticides and herbicides (58 percent), hormones (50 percent), antibiotics (48 percent), and genetically modified organisms (49 percent). When questioned about a proposed large dairy farm operation in the town, 69 percent of respondents expressed concerns about its effect on water quality (69 percent) and the effects of manure storage on the environment (61 percent). Only 18 percent of those responding indicated they would need more information before forming an opinion on the large dairy farm proposed. News features and fact sheets ranked highest as preferred modes for obtaining information on the topic. Just 32 percent of respondents agreed or somewhat agreed that the current large farm permitting process would adequately take their considerations into account, while 42 percent disagrees or somewhat disagreed that this would happen.

IMPACT
This information is being used to develop public issues education discussion forums, to be sponsored by University of Vermont Extension. A lead question derived from results is, “what role should individuals have in determining how land they do not own is used?” Since this survey, the State of Vermont denied the large farm permit due two key concerns focusing on leachate from a feed storage bunk and an inadequate nutrient management system for handling manure. The farmers may still pursue a large farm if they meet criteria specified.

Smith-Lever funds supported this project.

**Assisting Large Dairy Farm Operators --** Vermont continues to lose its dairy farms. The year has brought with it the lowest milk prices since the 1970’s, while the costs of services have doubled or tripled over the past decade. To preserve farms, owners are often either increasing the size of their operations to take advantage of the "economies of scale", or maintaining smaller herd sizes while capturing more of the consumer dollar through diversifying operations and/or producing value added products. Current milk prices have made it more difficult for farmers to find the capital needed to expand or diversify operations.

Vermont, with over 1400 dairy farms, has approximately 40 farms with at least 500 cows, and more than 200 with at least 200 cows. University of Vermont Extension coordinates and sponsors an annual Vermont Large Farm Dairy Conference for farmers of large farms, and for others considering the idea. The conference provides the latest technical information tailored to larger dairy farm confinement operations. The Vermont Large Farm Dairy Conference planning committee consists of five “large” Vermont dairy farm owners who plan the conference.

IMPACT
The fifth annual Vermont Large Farm Dairy Conference had 175 participants and 25 dairy industry sponsors. This support was surprisingly high, since other dairy programs had a drop in attendance by about 50 percent, in part due to the low price of milk. Twenty-one percent of participants reported that they intended to make changes to their farms based on information obtained by attending the conference.

Smith-Lever funds supported this project.

**Professional Extension Leadership Training in Sustainable Agriculture** -- Through University of Vermont's Center for Sustainable Agriculture (Center for Sustainable Agriculture), partially supported through Smith-Lever (b) and (c) funds, University of Vermont Extension has provided training in sustainable agriculture for northeastern states since 1994. The organization has leveraged $2 million in additional funding to support sustainable agriculture education activities.

IMPACT

Since its inception in 1994, Center for Sustainable Agriculture has organized four major conferences, eight days of farm tours, and 6 day-long workshops, with more than 2,000 participants. Impacts the organization has made on creating sustainable farms include the following programs, and their effects:

- Professional Conferences. More than 225 farmers, service providers and university personnel attended Center for Sustainable Agriculture-organized farm tours around New England. Evaluations of farm tours show that 95 percent of 225 participants learned something new about sustainable agriculture.

- *Land Link Vermont* (1998-present). University of Vermont Extension-sponsored Center for Sustainable Agriculture coordinates advising and matching service aimed at connecting farmers with farming opportunities in Vermont. A relational database has 165 active enrollees, and 464 cumulative participants. More than 800 people attended workshops, half of which provided information on farm transfer issues. Additionally, the coordinator made 400 farm visits, published three fact sheets, and provided 150 consultations annually. These efforts led to sixteen completed matches, affecting 60 people and 3232 acres of land.

- *New Farmer Network* (2002-present). A beginning farmer forum was led to develop collaborative efforts to serve new farmers. Publications and trainings are planned. Membership now stands at 45, with a target of reaching 200 in FY2004.

- *Pasture Outreach Program* (1996-present). Provides technical assistance and education on grazing. Helped to establish and now maintain the Vermont Grass Farmers Assn. (VGFA) of 250 farmers, and the Vermont Pasture Network of farmers and agencies (400 members). The University of Vermont Extension-sponsored Center for Sustainable Agriculture has organized eight annual grazing conferences, reaching over 2000 attendees, and the bulk of conference costs are now covered through members of the VGFA. The conference is now Vermont's second largest annual farmer conference. The organization also plans 20 pasture walks each year, holds discussion groups, produces a monthly newsletter, and consults with more than 200 farmers annually. Comments from members include:

⇒ "In the past 3 years my discussion group has helped me change practically every farm practice."

⇒ "The project is of immense value to the family farms and local agriculture... as inspiration, encouragement, creative stimulus, ideas, community... working with one of Vermont's most valuable resources... Grass!"

⇒ "Through discussion groups and pasture walks, I've learned of viable opportunities that I may not have known about otherwise."
⇒ "A workshop of rearing calves on nurse cows inspired me to try that... just one example of many."
⇒ "Discussion groups are where you really learn, farmers together figuring out how to grow the most grass, getting cows bred back, raising young stock, drought – everything. And many of these folks are at our same level so their input and ideas are so valuable!"
⇒ "The conference reminds us to set goals for our farm and to be more versatile with animals and grass."

Other states are now looking to the "Vermont model" to develop their own pasture programs. Meanwhile, the organization seeks additional funding to support an expanding list of requests.

- *Agro-Ecology Institute.* Through weeklong summer sessions, the Center for Sustainable Agriculture trained 17 public school teachers and 41 students; 92 percent increased their understanding of the positive impacts of agriculture.

- *Sustainable Agriculture Internship Program.* For-credit internships promoted systems-thinking and experiential education among University of Vermont students. Over three years, the program placed 60 of 99 undergraduate and graduate students that applied; 52 completed the program. Thirty-seven Vermont farmers, from a pool of 111 that applied, hosted interns; advisors were 22 Extension and CALS faculty. Ninety-one percent of interns said it was one of their best University of Vermont courses; 53 percent said it was THE best.

Smith-Lever funds supported this project.

**KEY THEME: AGRICULTURAL PROFITABILITY**

**Farm Loan Officer Agricultural Training** -- Few new farm loan officers with the Farm Service Agency have an agricultural background. Thus, influential members of a group instrumental in securing loans for farmers has limited understanding of agricultural production practices and farmer needs to sustain farms. Most farm clients of FSA have limited resources and represent high-risk customers. In cooperation with Pennsylvania State University, University of Vermont Extension designed a three-day course, including visits to different farms, machinery dealers, and agricultural input suppliers for loan officers.

Evaluation and test results indicate that 37 loan officer participants this past year increased knowledge and understanding about agriculture and farm needs. On a scale of one to five, participants rated a mean of "4.4" that attendance made them a better loan officer. Female officers, in particular, increased confidence levels about equipment and client needs. Several participants suggested that seasoned loan officers could also benefit greatly form the workshop.

Smith-Lever funds supported this project.

**Agricultural Business Management –** Many farmers need assistance in managing money. An agricultural business management course conducted by University of Vermont Extension personnel for farmers is designed to address this need.

IMPACT
Since its inception in 1992 and launching in 1994, this program has reached 620 farms. Typical results show that more than 70 percent of attendees apply what they learn in the course to their own operations.

This past year, examples of how the information was implemented include the following for farming attendees:

- decided that the business/lifestyle they had outlined and was not successful and they needed to pursue another business. This included moving to another location (success can be discovering that the present scenario will not work and that another course of action must be taken)
- submitted a business plan that took the part-time business to full time operation and increased profitability doubled crop size and has a 5 year plan to bring the next generation into the operation
- called three times since taking the course, and continued to take courses to learn more about the market
- after taking course more than twelve months earlier, returned with a five-page business plan including a detailed history of the operation, current situation, and future goals; also included balance sheets, income statements with 10 percent sensitivity levels, and soils maps.

As a result of the impact it has had on farm management, monetary support for farmers to attend the class has been extended by Vermont Farm Credit, Lyndonville Savings Bank, VEDA/VACC, St. Albans Coop, Agrimark, Vermont Land Trust, Dairylea, and Dairy Farmers of America, among others.

Smith-Lever funds supported this project.

**Vermont Dairy Profitability and Enhancement Project --** Vermont has a wide variety of farm management styles, from organic and intensive rotational grazing, to large confinement operations. No matter what the management style is, it is difficult for a Vermont dairy farm to be profitable. Dairy farm operators, managers, and employees need to have the necessary knowledge and skills that will make their operations sustainable and profitable in today's dairy market. Profitability is the main driving force behind dairy farm survival.

The Vermont Dairy Profitability and Enhancement Program (VT DPEP) was initiated here in Vermont just two years ago, with a plan of working with four farms in three years as a pilot program for the state. The goal of the program is to improve profitability and quality of life on Vermont dairy farms. Vermont's Dairy Profitability Enhancement Project was modeled after the Dairy Profitability and Enhancement Program in Minnesota, adapted to meet the needs of Vermont farmers. An enrolled farm receives assistance from a "farm team", consisting of between three and eight consultants and experts, and facilitated and coordinated through University of Vermont Extension. Teams establish three priority areas for each farm to address,

and the team works with farmers to produce action plans to accomplish goals that address these priorities. Farm teams meet on average of 3-4 times a year to assess positive changes and re-evaluate goals. Each farm has an advisory team consisting of between three and eight consultants and experts who already work with the farm family. Enrollees were eligible this past year for $500 each to utilize toward meeting team-specified goals.

IMPACT
To date, five farm families have enrolled in the program, with at least one representing each region of the state.
Farms enrolled in the Vermont Dairy Profitability and Enhancement Program have made several recommended changes, and report significant improvements to farm efficiency and quality of life:

- Farmers reported that milk production went up as the result of purchasing higher quality feed, a recommendation made by the DPEP team.
- Purchasing watering tubs and piping to set-up water for grazing paddocks improved per-cow milk production. Previously, animals walking a quarter of a mile to the barn to get water showed decreased dry matter intakes and milk production.
- Installing a feed wagon reduced health problems for one lactating herd. Previously this farmer did not have enough bunk space per cow, which resulted in slug feeding and severe metabolic disorders in fresh cows.
- The team recommended that one farm sell their bull in favor of using artificial insemination for cow reproduction. Using artificial insemination will improve the genetics of the offspring. Removing the bull will also reduce the likelihood of human injury or death.
- The newest enrolled farm is implementing tunnel ventilation and extended day lighting to improve herd and farmer health.
- One farm transitioned to the next generation ... via actual purchase and sale. Sons purchased cows, machinery was gifted/purchased. A lease agreement set into place and a purchase/sale date was set for rest of farm. Impact when finished with attorney will be a transfer of over $800,000 business from one generation to the next and continued agricultural enterprise in Vermont.

Smith-Lever funds supported this project.

**Improving Dairy Farm Operations and Expense Record keeping** -- Many farmers own computers, but have yet to learn how to put this technology to work for their own operation. "Quicken" workshops were conducted to teach farmers how to set up accounts, record income and expenses, produce reports, and write checks.

As with any successful business owner, records are critical to monitor positive or negative trends in the business, as well as to identify, trouble-shoot, and correct problems. The Vermont Dairy Herd Improvement Association (VT DHIA) is a record-keeping organization owned by dairy farmers. Thirty-seven percent, or 524 of 1417 farms, are enrolled in VT DHIA. The Vermont Dairy Herd Improvement Association board of directors sets aside funds each year for the education of its members to:

- increase use of records describing their dairy herds; and
- increase understanding and knowledge of using records to make management decisions that will enhance profitability and farm efficiency.

University of Vermont Extension facilitates record keeping workshops for members.

IMPACT
"Quicken" software use workshops reached 37 farmers. All farmers reported increases in knowledge about operating their computers, using their operating system, using word-processing and spreadsheet programs, and using Quicken as a record-keeping program. Nearly all participants agreed or strongly agreed that participation helped them to learn a better way to keep farm financial records, and understand more of the basics of farm accounting. All expected to use Quicken in the future as a record-keeping tool.

A farm visit to a herd in southern Vermont brought together four experts to discuss DHIA records with the farmer, and how to make better use of them. As a result, reports were created to track heifer heights and weights. This information will enable the producer to decide on whether or not to continue sending his heifers out to a contract heifer grower. The information will also assist the nutritionist in balancing rations for the heifers. The A.I. technician is also tracking signs of estrus using PCDART (VT DHIA dairy herd management software program). A reproductive specialist was brought to Vermont to provide expertise to VT dairy producers on reproduction efficiency and on using PCDART (dairy herd management software program for VT DHIA members) to manage their reproductive programs. Two farms found that their current reproductive program may not be working well due to the protocol of injection(s) they were using for their timed breeding program. If these farmers change their program to follow specialist recommendations, they could gain an extra $12.00 to $18.00 for every percentage increase in pregnancy rate per cow.

Smith-Lever funds supported this project.

**Improving the Business of Farm Operations** -- Beginning farmers and agricultural entrepreneurs have a difficult time finding assistance for their agricultural enterprises. Sometimes they lack knowledge of available resources. In other cases, they lack business experience to know how to approach the process of business expansion or development. Farms in transition are challenged with putting together the many pieces required to successfully and securely transfer assets in a desirable fashion. Through business classes, such as NxLevel, farmers learn how to prepare business plans, and to make decisions on parts of business plans. Quarterly meetings with bankers and dairy operators assist in communication, planning, and transitions.

IMPACT
This past year, 16 participants completed the 13-week (3 hours per week) NxLevel course. Of these, more than fifty percent are using business plans developed in class to make business decisions. All participants rated the course as one of "high value" or "somewhat high value" to their operations. A participant recently presented her successful agricultural enterprise development story to the National Farm Transition Network. When noting the key elements to her development and increased interest in developing a farm-based enterprise, she included her participation in a NxLevel course as an important component. Another farmer indicated that success in transitioning from laboring on another farm to developing a business on his own farm was partly due to knowledge gained by taking the NxLevel course.

Smith-Lever funds supported this project.

**Vermont Farm Labor Service** – Farm labor has consistently been identified by Vermont's farm community as the single most important initiative needed to provide assistance to farmers. All Vermont dairy farmers who responded to a 1999 survey (475 farms) stated that they would use a Vermont Farm Labor Service, and most respondents engaged in other types of farming also stated they would use the service. The goal of the program is to provide farmers with much needed temporary labor, thereby assisting small farms and strengthening the Vermont farm economy. University of Vermont Extension initiated action after research of Irish farms provided a working example. Farmer discussions in 1997 provided the necessary goal structure to produce a framework. Funding from the Vermont legislature allowed a pilot project to begin in FY2000 and 2001. Following active recruitment of members, the program was marketed and turned over to a farmer-owned and operated cooperative, with continued Extension advisement.

IMPACT
Vermont Farm Labor Service (VFLS) membership stands at 52, up from 36 in two years. In one county alone, the service placed over 600 billable hours in the first three months. Workers negotiate rates in the neighborhood of $15 per hour, with a $2 per hour surcharge to cover administrative costs associated with VFLS. The service now provides compensation insurance and director's liability insurance, obtained through businesses and members. A Workforce Training Grant is being used to train five workers on members' farms to produce a revolving group of workers and four key, reliable individuals. One farmer stated after using the service while recuperating from a serious illness, "If I hadn't had the service, I'd of had to sell the cows. They sent me good guys who know what they're doing. I used to think I was the only one who could milk my cows without causing udder problems, but we've had four different people doing it, and the herd is fine." Others who have used the service, state:
"We've had three people, and they've all worked out. As much as I love the cows, everybody needs a break sometime."
"By yourself, you're doing all you can just to take care of the animals. I could keep a person employed full time here just with all the projects that need doing [but with milk prices low, need part time labor to assist]. If milk prices ever come back, I may just get some of them done."
Future goals of the program include opening branch offices in all agriculture-rich areas of the state, and to coordinate with the agricultural program run in conjunction with Vermont Technical College to place students in farm apprenticeships, and to recruit students lacking farm backgrounds.

Smith-Lever funds supported this project.

**Women's Agricultural Network (WAgN) --** USDA figures show that the number of woman-owned farms is increasing, and Vermont statistics support the data. Sound management practices are critical to farm sustainability and profitability. Statistics also indicate, however, that the number of women benefiting from USDA is far from equal to the numbers of male farmers currently accessing these services. The Women's Agricultural Network (WAgN), originally funded through a USDA Technical Assistance Program, provides education and technical assistance for women farmers and introduces them to the services and programs of the USDA. Since its inception in1995, WAgN has grown to include 1,040 members in Vermont, and 189 out-of-state members. While 635 individuals have received technical assistance and 780

have attended workshops conducted through WAgN, 1,600 households actually subscribe to the WAgN quarterly journal.

IMPACT
Since the program's inception in 1995, more than 200 members have completed business plans, and the WAgN program has expanded to two other states (Maine and New Hampshire). WAgN leaders conduct an 18-hour class called "Growing Places" designed to inform prospective farmers about available resources and to develop a personal action plan that will help them determine if starting an agricultural business is a feasible choice for their situation. The following are the results of the third follow-up survey conducted for the program.

Seventy-seven women who participated between 2000 and 2003 were surveyed, and 48 percent. Or 37 women, responded. Responses indicate that 44 percent of these individuals have started an agricultural business and 22 percent have decided that a business is not a viable option. Thirty-three percent of respondents indicate they have continued to take classes and workshops to fill knowledge and skill gaps. Seventy percent of respondents indicate the Growing Places resource book continues to be a reliable source of information and assistance.

The follow-up survey asks respondents to consider 5 issues covered in Growing Places and to reflect on whether or not Growing Places a) increased their awareness of the issue; b) motivated them to learn more about the issue; and c) applied what they learned to starting/expanding their business. In the awareness category the positive responses ranged from 85 percent - 96 percent. In the motivated category the positive responses ranged from 56 percent - 89 percent. In the application category the positive responses ranged from 41 percent - 63 percent. Overall the survey indicated that respondents gained useful information on available resources, decision-making strategies, and goal-setting.

Smith-Lever funds supported this project.

**Dairy Engineering Assistance** -- University of Vermont Extension dairy specialists have observed an increased demand from dairy producers for agricultural engineering assistance and expertise. The Andrew C. and Margaret R. Sigler Foundation offered a generous gift of $6,000.00 to Vermont in support of an Agricultural Engineer to provide technical assistance on dairy farms. This technical assistance includes anything from expansion, barn design and lay-out, modifying ventilation systems, stall design and cow comfort issues, all the way to manure handling systems. A private Agricultural Engineer from New York, provided approximately 10 days of his consulting services and technical assistance on Vermont dairy farms. The itinerary and schedule of farm visits was coordinated, assisted and supported through University of Vermont Extension.

IMPACT
Twenty-three farms were visited in FY02 by Stan Weeks (agricultural engineer). Of these 23 farms, forty-three percent (10 farms) of them filled out and returned an evaluation six months following visits. One hundred percent found the engineering specialist visit to be beneficial to their goals of farm improvement. Ninety percent reported that they made one or more changes, eighty percent believed they improved farm efficiency, and forty percent reported improved farm profitability.

Smith-Lever funds supported this project.

**Evaluation of Equine Impact on Vermont Economy** – The University of Vermont and the Vermont Department of Agriculture, Food and Markets collaborated to identify the number and contribution of horses to the state's economy. More than 10,000 copies of the "Vermont Horses Count!" survey were distributed to Vermont horse owners through tack and feed stores, direct mailings, and internet sites used by horse owners.

IMPACT
Participation was less than ideal, with 532 valid surveys out of 542 returned, and an absence of surveys from several "identified farms." Participation was similar to that of other states conducting equine surveys. Other states report that three to four horses are unaccounted for every horse that is reported. Reasons provided for nonparticipation ranged from fear of taxation and fear of misuse of information to perceived invasion of privacy. The estimated number of horses based on survey responses falls in line with figures from the New England Agricultural Statistical Service estimates, when accounting for USDA designations. Average number of equine per household for survey respondents equaled 6.7 horses, nearly doubling since 1990. Based on likely unaccounted horses, Vermont horse totals may exceed 35,000. When compared with other states that have conducted equine surveys, Vermont has the highest horse population per capita (1:18), and rivals "horse states" such as Kentucky (1:26), Missouri (1:28), Texas (1:36), and California (1:146). In addition, only Kentucky, Ohio and Tennessee surpass Vermont when comparing the total number of equine per total state acreage. Total value of equine reported was $20,365,566, with horse prices ranging up to $6,816 per head. Vermont horse owners spend between $18 to $26 million each year on feed alone (an average of $520 to $739 per horse per year). On average, 40 percent of feed stores' total feed sales go to horse owners, with eighty percent of this attributed to personally owned horses (e.g. recreational and boarded horses). Additional sales of non-feed items, such as fencing and horse blankets, represent an average of 77 percent of all horse-owner purchases, which translates into between $60 to $87 million dollars, with total horse sales potentially reaching $113 million. This does not include the impact of satellite industries depending on the horse industry for their livelihood, such as veterinarians, farriers, nutraceuticals, chiropractors, truck and trailer operators, toy manufacturers and retailers, competition organizers, and tourism operators.

Smith-Lever funds supported this project.

**Vermont Grown Collaborative --** Vermont's Sustainable Agriculture Network was formed to support a more unified and focused strategy for developing local food systems, connecting consumers with local farmers and their products, and increasing the income of the Vermont agriculture communities. On behalf of the Vermont Sustainable Agriculture Network (SAN), the Department of Community Development and Applied Economics (CDAE) and the Center for Rural Studies (CRS) at the University of Vermont conducted preliminary research through multiple survey analyses and focus groups to examine Vermonters' perceptions and purchasing of local food. The study was designed to provide information that will assist in the direction and marketing efforts for the Vermont Locally Grown Collaborative.

Through bivariate and regression analysis of the survey results, this study found:

- Local food expenditures have the potential to increase regardless of how much a consumer is currently spending on local food products.
- Lower income consumers buy a different array of products than do higher income consumers, and are less likely to buy directly from the farmer.
- Consumers' expenditures on non-local organic food products compete with expenditures on local non-organic food products. Food products that are both organic and local may have a niche in the market.
- Focusing the campaign on increasing consumers' attitude towards local should increase purchases of meat and fish, vegetables, candy, beverages and herbs.

Smith-Lever and Hatch Act funds supported this project.

**Alburg Farmers' Market** -- Alburg, Vermont is a low-income community in northwestern Vermont whose economy retains a significant agricultural base, facing multiple indicators of economic stress: 11.8 percent unemployment rate (Census, 2000); 24 percent of families living below the poverty line (Census, 1989); 14.7 percent of the population receiving food stamps (Census, 1998); 54 percent of school-age children eligible for school lunch program (VT Department of Education, 2002). When University of Vermont was approached to assist in developing the town economically, the idea of researching the effects of a farmer's market won over an industrial park, as it was more consistent with the mission of Extension and VT-AES. A farmers' market could address issues associated with community development, health and nutrition, in addition to infusing capital into the town's farmers.

Alburg Selectboard, Alburg Planning Commission, local farmers and the Department of Community Development and Applied Economics (CDAE) of the University of Vermont developed a partnership that led to the creation of the first Alburg Farmers' Market. The local Mason's organization provided land for the Market, the Alburg Select board improved a parking area and the elected officers of the Alburg Farmers' Market spent hours laying out the site and recruiting vendors. Faculty also assisted in the formation of an Alburg Farmers' Market Committee and the drafting of by-laws for the Market. Northeast Organic Farming Association (NOFA) also contributed funds for Market Advertising through their Farmers' Market Mini-Grant Program

IMPACT
The Market enjoyed an exceptionally successful first year. Average weekly vendor income for the first season was $125, with individual vendors earning up to $375. Average weekly vendor income increased in 2002 and the market committee initiated important changes in the season length to ensure the markets future success. The 2003 season has been a season of continued growth with five new vendors joining the Farmers' Market and a consistent weekly customer base. In FY2002 market was certified eligible to participate in the Farm to Family Food Coupon program for the 2002 season, providing families receiving food stamps with coupons that can only be redeemed at Farmers' Markets. In cooperation with NOFA and a local restaurant, the Farmers' Market sponsored their first "Shop Fresh with the Chef" event.

New goals, after a new source of funding through University of Vermont Extension and VT-AES was garnered, include:

- expanding education about direct marketing with the expected impact of increasing income for farmers participating in the market;

- measuring the impact of the utilization of the Farm to Family food coupon program on food security for low-income families; and
- facilitating and measuring the impact of a farm gardening/ entrepreneurship project, developed as an outgrowth of the market, and in partnership with a local elementary school, on the nutritional quality of meals eaten by school-age children eligible for school lunch program.

Smith-Lever and Hatch Act funds supported this project.

**Organic Food Markets and Potential for Improving Farm Profitability --** Organic food has emerged as an important food industry and there is a growing need for information on consumer demand. This project examines the potential of Vermont's organic food industry and provides economic and market information to improve its efficiency and profitability.

IMPACT
Results based on a conjoint survey of 529 respondents suggests four major conclusions:

- There is a significant market in Vermont for organic foods -- 56.9 percent of respondents purchased organic food in 2001 and their average expenditure was $72.7 per month for organic foods.
- Organic farmers can charge a premium price and maintain a market base -- location (31.7 percent) was the most important factor in determining where organic food shoppers would purchase foods, while price (49.3 percent) was the most significant factor for respondents who did not purchase organic foods.
- Young people high income, smaller households size, and fewer children are willing to pay more for organic foods than other demographic groups.
- The group willing to pay the highest premium for organic foods consists of young, married, highly educated, females with small households, living in rural Vermont.

Information from this project will be used by Vermont organic farmers, consumers, and policymakers.

Hatch Act funds supported this project.

## KEY THEME: ANIMAL HEALTH

**Mastitis Prevention --** Another area of research and outreach emphasis for the dairy industry is the prevention of mastitis cases, which are common in dairy cows. This work has led to scientific breakthroughs that could significantly improve animal health and welfare and potentially save the dairy industry millions of dollars. Mastitis is a painful inflammation of the mammary gland, costs the dairy industry approximately two billion dollars annually, costs dairy farmers $30 million in Vermont alone, and is the most costly disease to dairy producers. Losses are from reduced milk production, discard of milk from cows being treated with antibiotics, and reduced milk quality. Antibiotic treatment is effective less than a third of the time. VT-AES researchers are active participants in a study of mastitis-resistant animals involving colleagues from 13 states as well as Canada and England.

***Mammary Biopsy Analysis*** --Researchers conducted an experiment by hormonally inducing lactation in dairy heifers and collecting mammary biopsy samples. Hormonal induction evoked a

significant increase in proliferation of mammary cells. Heifers exposed to short day photoperiod during induction produced significantly more milk than those exposed to long days. Researchers also obtained mammary biopsy samples from dry cows at several stages of gestation to conduct cell culture experiments. Using low density cDNA arrays and real-time PCR, samples from these trials are being analyzed to determine changes in gene expression and relate them to indicators of mammary development and function.

***Expressing the Antistaphylococcal Protein, Lysostraphin, in Mammary Glands*** --
*Staphylococcus aureus* is responsible for a significant proportion of bovine mastitis. In this project researchers introduced a bacteriocin, called lysostaphin, which works specifically against *S. aureus,* into the cells lining the ducts and cisterns of the mammary gland so that it is locally produced in sufficient quantities to prevent staphylococcal mastitis. Scientists then constructed a viral vector containing the lysostaphin gene. The vector was used to target expression of the lysostaphin gene in the mammary gland of lactating goats. Scientists then measured whether sufficient lysostaphin was produced to make the goat resistant to infection.

IMPACT
Preliminary results from hormone inducing lactation research suggest at least six genes were differentially expressed. Five abstracts have been submitted, and these and future results will be used to better inform farmers and dairy researchers about factors affecting milk secretion and production in dairy cows.

The antistaphylococcal protein expression project is the first to demonstrate that transgenic technology can be utilized to produce an animal that is genetically resistant to staphylococcal mastitis. "Our work has led to the world's most mastitis-resistant animals," says the lead researcher, currently serving as University of Vermont Provost, John Bramley. "Tests show the animals are perfectly normal, their milk supply is perfectly safe, and their offspring grow well." The key to this scientific advancement, published in the January 2001 issue of Nature Biotechnology, is the cloning and modification of a gene that helps destroy bacterial cells that cause mastitis. The University of Vermont researchers changed the lysostaphin gene sequence so that the protein would be manufactured directly, and only, by an animal's mammary cells. Researchers successfully expressed the antistaphylococcal peptide, lysostaphin, in both the murine and caprine mammary glands. Using an adenoviral vector a modified lysostaphin gene was introduced in the goat mammary gland and low levels of biologically active lysostaphin were detected in the mammary secretion. In a collaborative effort with scientists at the U.S. Department of Agriculture laboratory in Beltsville, Maryland, researchers have produced mice that are resistant to mastitis. The modified lysostaphin gene, attached to a milk protein promoter, was used to produce the transgenic mice. These mice secreted high levels of lysostaphin in their milk and showed substantial resistance to experimental infection by *Staphylococcus aureus*. "The beauty of lysostaphin is that it only attacks the staphylococcal bacteria that cause mastitis. It has no impact whatsoever on other cells," Bramley says. Bob Wall, USDA research physiologist, is collaborating with the University of Vermont scientists. "We have had this goal, since the technology became available, to improve milk production characteristics of farm animals to benefit the animal, the producer, and the consumer," he says. "University of Vermont has come up with the potential gene needed to do this."

Hatch Act funds supported this project.

**Treatment of Bovine Staphylococcus Infections** -- Bovine staphylococcal mastitis is a frequent problem for the dairy industry, and leads to estimated annual economic losses of $184 per cow per year, which costs the dairy industry an estimated $1.7 billion per year in reduced milk yield, reduced compositional quality, lower product quality, and increased veterinary bills. Mastitis is transmitted from cow to cow at milking time. Current therapies and preventative treatments for staphylococcal mastitis rely heavily on sterilization techniques, selective culling of animals with chronic recurring mastitis, and the use of ß-lactam antibiotics. There has been little success with vaccines, and sterilization techniques have less than a 15 percent success rate.

IMPACT
University of Vermont researchers have developed a gene therapy approach providing methods and reagents for expressing in mammalian cells microbial proteins that have anti-microbial, particularly anti-staphylococcal, activity. The invention provides altered genes, in which the naturally-occurring microbial sequences have been engineered to allow expression of active protein in desired mammalian cells or tissues. An altered gene has been modified in such a manner that the protein it encodes is not only produce in mammalian cells, but is secreted from those cells, so that a local concentration of anti-staphylococcal protein is created outside of the cells. Genes have also been altered so that the anti-microbial protein is expressed within cells that are sensitive to intracellular infection. This invention provides a gene therapy approach to eliminate the problem of mastitis, a disease that is costly to dairy farmers and cows. Researchers applied for a US Patent in 1998.

Hatch Act funds supported this project.

**KEY THEME: AGRICULTURAL COMPETITIVENESS**

**Climatic Influences on Vermont Maple Sugar Industry** -- Vermont's maple production season hinges on whether freezing nights and warm days will bring on the flow of sap. "There's a suggestion that sugarmakers are tapping trees earlier than in the past," says Tim Perkins, director of University of Vermont's Proctor Maple Research Center. "Everybody has anecdotal stories but no one has the data." As rumors that global warming could be devastating to Vermont's $225 million maple industry circulate, sugarmakers want to know, more than ever, just how climate affects their industry. For the past sixty years, since University of Vermont's Proctor Maple Research Center was established, scientists have been studying the effects of weather and climate on sap flow. Now modern technology has provided a means to use this research to gain a wider perspective. Researchers are developing a computer simulation model permitting them to input factors as climate change occurs in order to make predictions about climate change impacts on the maple industry over the next 50 to 100 years. Since maple tree growth takes many years, this will permit maple producers to proactively manage their operations in anticipation of climate changes.

IMPACT
Currently, Proctor researchers have five years of solid data with which to construct the model, and hope to have a working model finished by later this year. To coordinate with the computer model, and to develop and test algorithms for how climatic factors have influenced season shifts over the years, Proctor is also asking Vermont's several thousand sugarmakers for information on tapping start dates over the years, and first and last boiling dates from each season. From that data, they'll be able to get a good idea of how the season may have shifted over the years. Using

the computer model, Proctor researchers will be able to simulate past maple seasons and see if the timing of the first and last significant sap runs have changed. Within three years, they should be able to start analyzing historical records of sugaring seasons.

Weather, of course, can have more immediate consequences. Last year, Proctor finished a study on the effects of the devastating1998 ice storm and how crown damage affects trees' ability to make and store sugar. "We found that, with crown damage, trees are less able to make and store sugar, and a related study shows reduction in sap flow," Perkins says. These studies join a long list of important research that Proctor has contributed to the maple industry over the years, including how defoliation affects sap production, the effect of acid rain on maple trees, and a long range study of the state's forests in conjunction with the Vermont Monitoring Cooperative.

Hatch Act funds supported this project.

**Maple Education** – Vermont maple schools and a Maple Conference bring continuing education opportunities to sugarmakers. The programs were developed in 2002 and presented in 2003. In addition to profit-oriented workshops, safety programs are also highlighted.

IMPACT
About 850 sugarmakers from Vermont, New York, Massachusetts, New Hampshire and Connecticut attended workshops. Producers were presented programs on the newest tubing and vacuum systems and shown how they improve efficiency. The 2003 Vermont maple crop totaled 430,000 gallons, according to National Agricultural Statistics Service (NASS) estimates. That represents a drop of 14 percent from 2002's total of 495,000 gallons but is better than many expected given how uncooperative the weather was in the early part of the sugaring season. Nationally, 1.24 million gallons of syrup were produced with Vermont leading the country with 34.7 percent of the total. The value of this season's crop is estimated at between $12-15 million. Henry Marckres of the Vermont Agency of Agriculture, Food & Markets stated that "[despite the poor weather]…most sugarmakers with vacuum systems reported reaching normal or near normal production. He went on to say, "A significant number of the sugarmakers in Vermont are small and produce less than 100 gallons of syrup a year and don't use vacuum systems, but for many of those who are doing it on a more commercial scale, the investment in a vacuum system made a huge difference in a year like this. Several producers report direct improvements to their maple production as a result of attending Vermont maple schools, including an increase in sap production by as much as 40 percent, to fuel savings of more than 60 percent. Several mentioned that by adopting new technologies learned about in maple schools, such as reverse osmosis, they have saved money spent on fuel costs.

A program on Organic Certification was presented at 6 of the maple schools and NOFA, the organic certification organization in Vermont, reported a doubling of certification applications for 2003. Through an increase in efficiency, producers will have a better bottom line and therefore a better living. The development of the organic certification program in VT will help create niche marketing opportunities and an increase in sales dollars. Of participants surveyed, 40 percent reported they had adopted at least one new technique or technology learned about at the maple schools. Forty-five percent of surveyed attendees reported increases in production efficiency as a result of changes made. Safety programs reached more than 400 sugarmakers, with over 50 percent reporting they adopted a new practice recommended. Of those sugarmakers surveyed 75 percent reported gains in maple production efficiency.

Smith-Lever funds supported this project.

**KEY THEME: ORNAMENTAL/ GREEN AGRICULTURAL**

**Western flower thrips temperature sensitivity for New England greenhouse growers --** The western flower thrips (WFT) is a persistent and devastating pest to the greenhouse industry, particularly because of its ability to transmit plant pathogenic viruses. There is uncertainty if WFT survive winters in northern latitudes of the United States. Development of management strategies would be influenced by knowing whether WFT over winter or if outbreaks result from infestation on incoming plant material. A study underway is designed to provide new information about lethal responses of WFT larvae and adult females to low temperatures.

IMPACT
Results of the study show that survival of all larvae and adult females occurs at –10 degrees centigrade, while complete mortality occurs at –20 degrees centigrade. Data indicate that exposure to sub-lethal temperatures substantially reduces longevity and fecundity of females. This information will facilitate the development of cultural practices centered on low winter temperatures for greenhouse growers. Fecundity of surviving adult female WFT is now being examined. New work is also being done to compile information from growers about current practices used to manage thrips populations, and the perceived effectiveness of these practices. Workshops conducted in Vermont, Main and New Hampshire included sessions on biocontrols for insect pests and diseases, where this information was presented to more than 120 growers.

Hatch Act funds supported this project.

**Integrated Pest Management for Greenhouse Growers** -- Greenhouses are particularly good havens for pests, and growers are often eager to avoid using too many chemical pesticides. One major focus has been the development of biological controls to keep insect pest insects in check – especially hard-to-control thrips and mites. Those controls often use beneficial fungi and plants to protect plants in a variety of ways. Currently, "indicator" plants that attract insect pests are being used to give early warning signs of pest problems. The entomology lab has also worked with University of Vermont Extension staff and growers from three states for the last seven years to put on annual Tri-state Greenhouse IPM workshops in Vermont, Maine and New Hampshire.

IMPACT
The Lemon Gem marigold, a commonly grown flower, has turned out to be a beneficial plant. It can help growers spot pest infestations early and may also provide an oasis where "good" insects can proliferate. "It has great possibilities both as an indicator plant and as a 'banker' plant, where beneficial insects can breed," University of Vermont entomologist Michael Brownbridge says. "And it will really speed up time spent scouting. A big part of scouting is to detect pests as soon as possible." Conserve®, a new biopesticide effective on thrips, is an excellent example of just how important education is to the horticulture industry. Conserve® (a new biopesticide formulated from the soil-inhabiting actinomycete *Saccharopolyspora spinosa*) has a high success rate of controlling Western flower thrips, and plants treated with Conserve maintain higher numbers of beneficial insects and mites. Growers found out about it from the tri-state program and passed the information on to other growers. Jack Manix, an experienced Vermont organic farmer noted, "Conserve totally turned the industry around."

Smith-Lever and Hatch Act funds supported this project.

**KEY THEME: PLANT PRODUCTION EFFICIENCY**

**Optimizing Irrigation Efficiency in the Vermont Vegetable Industry –** Vermont vegetable production is a small (approximately 3300 acres), but diverse horticultural industry, having over 300 farms. In order to assist vegetable growers make effective varietal selections, improve irrigation efficiency, and better utilize local nutrients, researchers are examining the use of dairy manure compost (DMC) as a nutrient substitute to replace additional fertilizer inputs. Tests were conducted on quality yield responses in potato fields. Additional varietal tests were conducted using potatoes and tomatoes.

IMPACT
The dairy manure compost yielded a similar amount of potatoes and reduced the total amount of irrigation necessary by 22 percent to maintain 65 percent plant available water. The study also showed significantly different yields between cultivars tested, such that Butte Russet showed a greater marketable yielded than Russet Burbank when compost was amended at a rate of 40 tons per acre. Several heirloom varieties were shown to have significantly greater yields over others, which will help growers using this method of fertilization to select appropriate accompanying varieties. In addition to providing some vegetable farmers with a low-cost, high quality fertilizer, it provides dairy farmers with an additional means of translating a waste by-product of the industry into an asset. It also will serve to reduce overall nutrient loads on agricultural soils draining into waterways, thereby improving water quality.

Hatch Act funds supported this project.

**Corn Rootworm Monitoring –** Field corn is a very important crop to Vermont with about 95,000 acres grown each year. Over 95 percent of the corn is harvested as silage and is a major forage feed for dairy farmers in the state (the most important agricultural commodity in Vermont). Generally, about one-half of the forage fed to lactating cows consists of corn silage. The Field Corn IPM Program targets the Western corn rootworm (WCRW). The WCRW was first detected in Vermont in 1991 and has been found in almost every county in the state since then. According to research conducted at Cornell, the impact of larval feeding of WCRW on corn grown for silage can be quite significant even when there are neither obvious visual symptoms nor any impact on grain yields. Because of concern over WCRW, Vermont growers have applied insecticides at planting. Yet, we have very little quantitative data on actual WCRW populations and impact in Vermont. From 2000 to 2002, fields were monitored in many parts of Vermont for this insect. However, little data had been collected in western and central Vermont, where most major corn producing counties are located in the state. In 2003, 21 fields were monitored for Corn Rootworm in Addison County (western Vermont) and two in Washington County (central Vermont).

IMPACT
Only 3 out of 23 fields (13 percent of the total) were clearly above the critical threshold for making any kind of control decision; and one other field was close to threshold. Of these four fields, only 16 percent of the adults were found to be the more destructive Western species. This data will be very useful in making pest management decision recommendations, and will potentially reduce the need for some pesticide applications, saving farmers money and improving

the health of soils and water in and around agricultural sites.

Hatch Act funds supported this project.

**Improving Marketing and Production of Small Fruit and Berry Farming Enterprises** -- To remain competitive, commercial vegetable and berry growers need the latest production and marketing information that research, extension, industry and their colleagues have to offer. Commercial vegetable and berry growers need a variety of options for obtaining up-to-date production and marketing information. The 2003 New England Vegetable and Berry Conference and Trade Show was held on December 16-18 in Manchester, NH. This was the first time the conference was held in combination with the New England Fruit Meeting. Almost thirty steering committee members from across New England and eastern NY planned the conference, representing University of Vermont Extension, Connecticut Agricultural Experiment Station, grower associations, and industry. The committee used evaluations from 2001 conference and grower input to plan a three-day program that offered 120 thirty-minute educational presentations in 24 separate sessions that focused on a wide variety of crops, cultural practices, production and marketing methods. New this year and quite popular were several 'farmer-to-farmer' discussion sessions on topics such as labor management, transition to organic, and cut flower production.

IMPACT
The conference was attended by 1,348 people, including 285 people associated with the trade show of over 100 exhibits. Of the 231 people returning evaluations, 97 percent said the educational sessions were good or excellent, and 90 percent said the trade show was good or excellent. As a result of attending the conference, 92 percent of respondents said their pest management would be improved, 88 percent said their soil or nutrient management would be improved, and 82 percent said their farm profitability would be improved. A new source of information was found by 90 percent of respondents, and 79 percent said they planned to implement a new practice in the coming year as a result of the conference. Pesticide Recertification credits were offered for 18 out of the 24 sessions for a total of nineteen and half credits, and 238 growers received Pesticide Recertification credits.

Other educational events are organized for Vermont growers in the winter, and presentations are given at these and other similar meetings held outside the state. This information is supplemented with ongoing production of newsletters, consultations and publications. A survey was sent to 200 commercial vegetable and berry growers in Vermont to determine the impact of extension programs. The 66 growers that responded represent 1,580 acres of field production, 370,124 square feet of greenhouse production and average annual gross sales of $78,444 per farm. Over the past 3 years, 89 percent of the growers reported reading the vegetable and berry newsletter, 83 percent e-mailed or called Extension with a question, and 76 percent used the University of Vermont soil test recommendations, which were written for vegetable and berry crops.

Smith-Lever funds supported these endeavors.

**Apple Cultivar Advancements** -- Apples are an important commodity to Vermont's rural communities and working landscape. Of all the different fruits grown and harvested for sale in Vermont (i.e., strawberries, blueberries, raspberries, etc.), apples comprise 92 percent of total

acreage planted to fruit in the state. The apple industry generates jobs and supports communities and businesses across Vermont. Annual cash receipts are estimated at $7.9 million and, when value-added products are considered, the value of the crop is reported at $25-28 million. For Vermont orchardists, 72 percent of their total farm income is generated from apple production. In addition, orchards are a part of Vermont's agricultural diversity, contributing to the scenic rural vistas for which Vermont is well known and which generate a significant income for the region from tourism.

In addition to being under substantial economic pressure due to increased production costs and lower fruit prices, Vermont apple growers are subject to various topographical and climatic challenges. University of Vermont Extension and AES use an integrated approach of research and extension to provide growers with the knowledge and tools to encourage adoption of more efficient production and marketing practices for the region and adapt, where necessary, information available from other sources so that it is of maximum applicability to the situation in Vermont. University of Vermont Extension provide research, educational programs, newsletters and other media outlets, individual orchard visits and consultations to inform the growers on horticultural management practices and services to enhance orchard productivity while maintaining environmentally sound agricultural practices.

IMPACT
As a result of these efforts, this past year five additional apple growers have planted new cultivars. These new cultivars are bringing a higher per bushel return than the older, established cultivars. For example, growers who have planted Honeycrisp, a new cultivar, are receiving twice as much money per bushel than McIntosh. Honeycrisp apples perform well in cooler, New England climates and have a narrow climatic area for growing. Growers have taken 410 acres out of production, and replanted 235 with new cultivars, with 75 of the new acreage replanted with Honeycrisp. Full production of plantings, and rootstock comparisons will not be fully realized for five to seven years after planting.

Smith-Lever and Hatch Act funds supported this project.

**KEY THEME: NEW USES FOR AGRICULTURAL PRODUCTS**

**Protein Based Wood Finish --** A variety of finishes can be used to coat wood products and are typically based on binder resins such as acrylate or urethane resins, and include volatile organic carbon (VOC) solvents. These formulations are potentially toxic to those who come into contact with them. A VT-AES researcher invented a wood finish that incorporates a protein obtained from dairy whey, which is currently a disposal problem for dairy farmers.

IMPACT
In addition to using a substance that is typically a waste product, the incorporation of whey protein into a wood finish solution can provide for an improved wood finish. The formulations can be varied by altering whey protein concentrate or whey protein isolate, depending on the method of purification. These protein fractions can be denatured prior to their use in a wood finish solution by thermally treating the protein. The denaturing process results in disulfide cross linking within a protein molecule and across protein molecules. It is believed that this disulfide crosslinking is important in producing strong, resistant protein films that help to achieve the attributes of a favorable wood finish.

A variety of formulations have been made and tested for gauge hardness, scratch hardness, color values, and water resistance. A whey protein based wood finish can have increased density, viscosity, reduced VOC content, a harder and more scratch resistant film, better water resistance, and lower toxicity. It may also be produced at a much lower cost than current finishes. It also is environmentally safe, and safer for use by human applicators than wood products containing volatile organic carbon. The product has received a provisional patent and technology transfer is being advanced through work with Vermont companies.

Hatch Act funds supported this project.

**Environmentally Friendly De-Icer --** For every dollar spent on salt and chemicals to de-ice roads and airplanes, forty more dollars are spent to repair the damage the salt causes to roadways and surrounding areas. A University of Vermont researcher imagined that a whey-based product would be less damaging to roadways, waterways, and surrounding biota than salts, while also providing a market for what is currently a major waste product for cheese producers.

IMPACT
University of Vermont researchers are now developing environmentally safe de-icers by converting lactose in cheese whey to potassium acetate by using two-stage fermentation. Preliminary results show that whey products, including acid whey, are suitable for making an organic de-icer. Whey-based de-icing material provides another avenue for farmers to utilize a waste by-product in profitable markets.

Hatch Act funds supported this project.

**Making Wool Work** – A worldwide surplus of wool has depressed prices for wool. Because of this, many Vermont and Northeast sheep producers have not been able to sell their wool for the past several years. A new market for wool as a mulch product (woolch) would provide income to sheep producers and provide an outlet for a product that is now a nuisance. In 1998, 15,000 head of horn sheep yielded 110,000 pounds of wool.

IMPACT
A new, environmentally friendly mulching product made from surplus sheep's wool and cheesecloth has been developed by University of Vermont Extension. Initial data indicate that the wool mulch may offer several advantages over commercial products and could be sold profitably at a competitive price. In comparison tests conducted on research plots, the wool mulch was shown to equal or surpass commercial straw and plastic mulch in stabilizing soil and supporting grass growth. In addition, wool mulch is relatively low-cost to produce, biodegradable and environmentally benign.

Highway departments and commercial landscapers are the major target markets for wool mulch. By applying the product to land banks, they could prevent erosion while waiting for permanent sod to become established. Other potential commercial applications include stream bank stabilization, native revegetation of wildlife habitats, and prevention of erosion at construction sites. This year, the University of Vermont Extension research and outreach faculty member, Chet Parsons, applied for a non-provisional US patent for the product and its use as a mulch. Parsons is working with USDA Natural Resources Conservation Service, Forests and Parks and the Vermont Agency of Transportation to complete the research. Additionally, Parsons is

working with an engineering firm to develop machinery for producing the mulch product. They have obtained $10,000 in additional funding through University of Vermont's Experimental Program to Stimulate Competitive Research (EPSCoR) program. The main purpose of this grant was to facilitate the application of a Small Business Innovative Research (SBIR) grant. Several investors have expressed interest in forming a company to license the product. Additional licensing opportunities are still available to other mulch producers.

Smith-Lever funds supported this project.

**Improving Goat's Milk Yogurt:** Goat's milk products are becoming increasingly popular in the United States. Unfortunately, it is difficult to make probiotic goat's milk yogurt of good consistency due to its low casein content. In this study, the effects of microbial transglutaminase (MTGase) on the viscosity and syneresis of probiotic goat's milk yogurt, containing *Streptococcus thermophilus, Lactobacillus delbrueckii* subsp*. bulgaricus* and subsp. *lactis, Lactobacillus acidophilus, Bifidobacterium,* and *Lactobacillus paracasei* subsp. *casei*, were investigated. The effect of total solids on the viscosity was also studied.

IMPACT
A Brookfield viscometer was used to analyze the viscosity of the yogurt (at 22ºC). Results showed that the viscosity of the yogurts ranged from 3.2x103mPa for control yogurt to 2.0x104mPa for the yogurt fortified with milk powder (7 percent total solids) and 1.2x107mPa for the sample treated with 4.0 units of MTGase per gram protein. The effect of MTGase on syneresis was measured by centrifuging the samples at 640 x g for 10 min. at 4ºC. The viscosity of the goat's milk yogurt was significantly increased by the enzymatic crosslinking ($p<0.01$). The water holding capacity of the yogurt was also significantly increased ($p<0.01$). The results of the present study show that the enzymatic crosslinking may be an effective way to improve the consistency of probiotic goat's milk yogurt products by increasing its viscosity and water holding capacity. This technology, which can be used to improve the nutritional value of milk and yogurt based drinks and frozen desserts, has been licensed to Les Produits de Marque Liberte.

Hatch Act funds supported this project.

**Yogurt Products to Compete with Soft Drinks –** Yogurt products are more popular than ever in the U.S, due to the health benefits of probiotics. University of Vermont researchers are conducting studies to develop a prototype carbonated symbiotic yogurt beverage, and matching manufacturing technology.

IMPACT
The technology has been developed, and functional properties of the beverage such as viscosity and emulsion stability, chemical and microbiological analysis, and shelf-life stability are also being investigated. The newly developed technology for a carbonated symbiotic beverage is simple and easily adopted by the dairy industry. The product will help the dairy industry to compete in the lucrative soft drink market.

Hatch Act funds supported this project.

**KEY THEME: DIVERSIFIED/ ALTERNATIVE AGRICULTURE**

**Fruit Grower Diversification** -- A new crop that might lend itself to the diversification scheme is grapes. Horticulturally, grapes are very similarly to apples. However issues such as winter hardiness have prevented the development of a grape industry in the state. Recently, new winter hardy cultivars have been developed by other universities and these cultivars need to be tested in our state. Therefore, in 2004, grape culture will be explored by the University of Vermont Apple Extension program to determine if this crop fits into the needs of our clientele. \

IMPACT
Eight Vermont growers have vineyards for producing table grapes, wine, or both. The majority of apple growers learning about grapes through Extension vineyard tours are now considering planting grapes. Current costs to farmers for planting are estimated at $10,000 to $15,000 per acre of vineyard, land purchase costs (varies widely), $60,000 in equipment costs, and $1,000 in annual maintenance costs. New York grapes yield farmers anywhere from $300 per ton (Concord grapes) to $1,700 per tone (Merlot grapes). One acre produces approximately four tons of grapes, which produces approximately 600 gallons (or 3000 bottles) of wine. Profit margins are greater for wine grapes. Grapes offer the potential of greater profit margins for growers than for any other fruit grown in Vermont.

Smith-Lever and Hatch Act funds supported this project.

**Vermont Beef Grower Assistance** -- Vermont beef cattle producers receive 10 percent less for their weaned cattle than producers in western states, yet can sell finished cattle for a premium. These factors combined, suggest producers can increase their profit by retaining ownership of their cattle. Small herd size and lack of cattle finishing within the state suggest that producers work cooperatively to gain efficiencies of scale. University of Vermont Extension assist beef producers through support and education, and through a co-sponsored annual feeder calf sale.

IMPACT
Of nine participants, two increased profits, four broke even, and three lost money due to death loss. Two of these farmers are making changes to reflect University of Vermont Extension recommendations on how to prevent death loss. Producers in the Vermont Retained Ownership Program became strong proponents for a feedlot contract. Four participants are negotiating with feedlots for the coming year.

This year at the annual feeder calf sale, University of Vermont Extension was able to ensure cattle raised without antibiotics were identified in the sale catalog sent out prior to the event. The sale catalog was also made available on the internet the night before the sale for phone buyers to access. The two buyers who purchased the greatest number of cattle were buying to finish for natural beef marketing programs, thereby requiring certification of no antibiotic use. Estimates place the effect at several thousand additional dollars returned to Vermont beef producers for their cattle.

Smith-Lever funds supported this project.

## NATIONAL GOAL AREA 2:
## A SAFE AND SECURE FOOD AND FIBER SYSTEM.

During FY 2003 University of Vermont Extension and VT-AES expended approximately 2.5 FTE's each toward developing a safe and secure food and fiber system. Efforts were applied to initiate or continue four research projects, produce four publications, conduct 112 group presentations, 978 phone and in-person consultations, thereby reaching a total of 2963 people, including 2129 males and 834 females. Of these contacts, 766 were youths. A total of $732,062, or approximately five percent of total federal expenditures, were applied to National Goal Area 2.

This year, due to personnel shifts and timing of sabbatical appointments, University of Vermont Extension focused on children's outreach, while research has focused on agricultural product safety.

***Listeria monocytogenes*** is now recognized as a potentially serious health hazard for consumers. Traditional heat treatment of fluid foods can have undesired side effects. Research at VT-AES is exploring alternative methods to treat fluid foods for bacteria and has developed an industry-feasible method of using ultrasound technology to achieve desired bacteria reduction rates. The method is now being tested for side effects on two primary Vermont products – milk and apple cider. Additionally, VT-AES and University of Vermont Extension have worked with processing plants to develop and review HACCP plans, which has helped farmers find local options for food processing, and has added value to Vermont products prior to their exportation across borders. Cheesemaking assistance, through research advances in destroying pathogens while maintaining acceptable levels of beneficial microbes, odors, and taste, as well as through outreach with New England cheesemakers, is helping the artisanal cheesemaking industry to grow in the region.

Each year, 6.5 to 33 million people suffer from symptoms of foodborne illness and 5,000 will die. Vermont does not currently require certification or licensing of food handlers, however there is a national trend towards certification and implementation of food safety systems (such as HACCP - Hazard Analysis Critical Control Points). These numbers are estimates because most food related illnesses go unreported. The cost of these illnesses has been estimated at any where from $10.0-83 billion a year in medical, legal expenses and work time loss. University of Vermont has facilitated the education process toward certification of hundreds of current and potential workers in the food business.

### KEY THEME: FOOD SAFETY

**Ultrasonic Treatment of Milk and Apple Cider –** Heat treatment is widely used to pasteurize fluid foods, but heating also causes side effects that decrease perceived quality (color and/or taste) of the product and nutrient concentrations. Previous studies of ultrasound treatment have shown it can act supplementally to reduce bacteria, but is not effective as a sole treatment for fluids. A study was conducted to assess the feasibility of ultrasound to treat milk and apple cider, two products of agricultural importance in Vermont.

IMPACT
Total plate count of raw milk treated with ultrasound was reduced by 99 percent within six minutes. Similarly, levels of milk inoculated with *Listeria monocytogenes* are significantly reduced (by 99.95 percent). Ultrasonic treatment can be a promising alternative to heat as a method for treating milk. Studies continue to investigate the effect of ultrasound treatment on apple cider bacteria levels, color, and taste. This research may assist farmers in selling more high quality cider.

Hatch Act funds were used in part or in full to develop this project for the State of Vermont.

**Food, Flies and Fungus** – Food, Flies and Fungus is a 12-hour food safety curriculum targeting youth of 10 to 13 years of age. The curriculum, cowritten by Extension personnel at University of Vermont and the University of Connecticut, is based on experiential learning theory and covers microbiology, food safety basics and food preservation.

IMPACT
Thirty children in $4^{th}$, $5^{th}$ and $6^{th}$ grades at one school in rural Vermont participated in the Food, Flies and Fungus program. Children took part in scientific experiments learning how bacteria can grow and survive in various environments using agar plates provided by University of Vermont's Department of Nutrition and Food Science. The importance of washing hands thoroughly to prevent the spread of harmful bacteria was demonstrated using "glow germ", a phosphorescent powder and black lights. The children preformed skits to illustrate the various food safety skills to use when preparing food at home. All students demonstrated proper handwashing techniques by passing the "glow germ" test. There was a three-fold increase (from 20 to 80 percent) in the number of students who demonstrated that they had a good concept of the term "safe food". Researchers and Extension personnel are now seeking grant funds to develop an interactive online food safety education program using the Food, Flies and Fungus Curriculum as a base.

Smith-Lever funds were used to develop this project for the State of Vermont.

**School Food Safety and Sanitation certification program --** Children are more vulnerable to foodborne illness because their immune systems are not fully developed. Many children in Vermont eat breakfast, lunch and snacks at their schools. The Vermont Department of Education, in partnership with University of Vermont Extension, developed a curriculum in Food Safety and Sanitation that was offered to school food service workers. The American School Food Service Association recognizes the ten-hour certification course.

IMPACT
Extension expertise was used to design a nationally recognized certification course in food safety and sanitation for school food service workers. Since FY2001 225 food service workers have taken the training, and 190 have passed the certification test measuring knowledge and skills covered in the training. Certification makes food service workers eligible for a promotion and pay raise, and provides a great incentive for workers to take the course. This combination of education and incentive developed through a partnership between University of Vermont Extension and the Vermont Department of Education will lead to safer and more sanitary school food environments for Vermont children.

Smith-Lever funds were used to develop this project for the State of Vermont.

**Meat and Processed Foods HACCP Plan Production and Reviews –** Meat processing has several components, each of which poses risks for introducing agents that may lead to food borne illnesses associated with meat consumption. Meat processing plant HACCP plans in Vermont were reviewed to check for compliance with updated state regulations to increase food safety. The Vermont State Department of Agriculture asked University of Vermont VT-AES and Extension personnel to review plans for all meat-processing plants overseen by the State, and to make recommendations for changes. All of the state-inspected meat plants in Vermont have been reviewed for HACCP compliance. This included evaluating HACCP and SSOP plans for ten plants, totaling 25 sets of plans. An average of 200 safety related questions are answered for processing plants each year. University of Vermont Extension also works with the Vermont FoodBank, which provides discount-priced meat and meat products for limited income elders and families. Recent changes by large-scale suppliers have required that the FoodBank take on liability and labeling of products, thereby requiring internal HACCP plans for meat processing.

IMPACT
All of the state-inspected meat plants in Vermont have been reviewed for HACCP compliance. This included evaluating HACCP and SSOP plans for ten plants, totaling 25 sets of plans. Work is currently being done to update HACCP plans for Vermont's largest slaughter house. Of the recommendations made by University of Vermont personnel for fifteen plants reviewed, the State implemented the recommended changes for all of them. Changes in HACCP plans affecting management and food handling practices will increase food safety for people who consume Vermont-processed meats. This work is a great boon to farmers who can sell their meat within the state and without shipping. Several plants implemented value-added operations, such as beef jerky production, which now have HACCP plans in place. Outreach efforts have also created HACCP plans for non-meat processing plants involved in salsa, salad dressing and cheese production, adding value to Vermont agricultural products and its economy. Work with the Vermont FoodBank has led to the creation of their own HACCP plan and permitted them to sell meat in raw form, rather than just as a cooked product. This increases the ability of the FoodBank to improve access to safe and nutritional foods by limited-income elders and families.

Smith-Lever funds supported this project.

**Raw milk cheese processor safety guidelines and training** – The specialty food business (small-scale food business) is a vital part of the Vermont economy. A product having the "Made in Vermont" label sells at typically 15 percent higher than other brands. Raw milk and artisanal cheeses are viewed by many as having better appearance, aroma, taste, and beneficial microbes than factory cheeses, despite the increased risks they may pose for harboring pathogens. University of Vermont Extension is working with University of Connecticut to assist small-scale raw-milk cheese producers in New England in producing a safe product. The project has two components – a research component investigating processes and temperature requirements that can produce a safe raw-milk cheese product for consumers that is feasible and profitable for producers to implement, and an outreach component that involves developing peer-reviewed training manuals that meet or exceed all HACCP standards and the offering of regional and state training workshops for cheese producers based on this manual.

IMPACT
Scientists completed research to determine acceptable processing temperatures and handling techniques for producing cheddar and feta cheeses having acceptably low levels of food-borne pathogens. Time temperature parameters for sub-pasteurization have been evaluated using cow's milk, and will be used as guidelines for cow's and goat's milk. Additional literature review will be used to assess the likelihood that other pathogen-based mechanisms that might increase pathogen survivorship or multiplication under these time temperature parameters. These temperature and handling combinations are then to be tested for feasibility by cheese operators, who have been identified. Writers have completed the manual on food safety issues and HACCP for cheesemakers is currently being peer-reviewed. Both New England cheese producers and consumers will benefit from the increased product safety and knowledge of the cheesemaking process. Results and outreach efforts are expected to lead to safer raw-milk cheese products, maintenance or increased reputation for Vermont cheese products, and reduced incidence of food borne illness through the ingestion of Vermont-made raw-milk cheeses. This work led to a request for University of Vermont researcher Todd Pritchard to write a HACCP section for a book by a University of Vermont author that is ready for publication, entitled "Handbook of American Farmstead Cheesemaking."

Hatch Act and Smith-Lever funds supported this project.

**NATIONAL GOAL AREA 3:**
**A HEALTHY, WELL-NOURISHED POPULATION**

Health care costs in the nation and in Vermont are escalating. Lack of sufficient access to affordable health care means fewer opportunities for prevention. Vermonters are confronted with isolation and gaps in rural delivery systems and a lack of professional expertise. University of Vermont Extension is focusing on prevention and empowering people to practice healthy life styles. It is our expectation that our consumers will adopt healthy lifestyles by reducing high-risk behaviors and taking responsibility for health decisions.

University of Vermont Extension and VT-AES applied 9.3 FTE's toward outreach efforts to increase Vermonter's health and nutrition. During FY 2003 Extension personnel initiated or continued seven research projects, and 743 group presentations, 1,963 on-site visits, 16 television and radio broadcasts, 867 phone consultations, and 89 Extension office customer meetings, yielding a total of 12,363 contacts, with 3,781 of these being male and 8,586 of these being female. Programming effort toward National Goal Area 3 reached 3,924 youths. During FY 2003, $985,781, or approximately eleven percent of all federal funds expended, were directed toward improving Vermonter's health and nutrition. Policy shifts in the state indicate that University of Vermont efforts have had a significant impact on influential stakeholders. There are now efforts to improve school lunches by connecting school staff and students more closely with local agriculture and agricultural products. From establishing and maintaining student gardens, and incorporating agricultural and health concepts into curricula, to increasing formal links between growers and school cafeterias, the policies are beginning to be felt on local scales. Increasingly, decision making indicates observed connections between health issues and community development, agricultural sustainability, and environmental health.

Three of the leading causes of death in Vermont, cardiovascular disease, cancer, and diabetes are largely preventable with lifestyle changes. Each year in Vermont, approximately 1,100 people

die from some form of cancer, and 1,543 die from heart disease and stroke. An estimated 30,000 Vermonters have diabetes, with about one-third of the cases not yet diagnosed. Adult obesity (body mass index – BMI - of at least 30) rates in Vermont have increased from ten to nearly eighteen percent since 1991 (CDC Behavioral Risk Factor Surveillance System (BRFSS) 2001). Currently 53 percent of adult Vermonters, or 226,615 adults are over healthy weight (BMI less than 30 but over 25; Healthy Vermonters 2010, Vermont Department of Health). The percentage of obese adults in Vermont has increased 71 percent since 1990. Obese individuals are 40 percent more likely to die at an early age due to increased risk of heart disease. Other diseases related to obesity include type 2 diabetes, high blood pressure, gallbladder disease, joint problems, sleep disturbances, liver disease, menstrual abnormalities, female infertility, and certain cancers including breast prostate and colorectal cancer. Obesity related disorders now exceed the cost of alcohol and tobacco related diseases combined. Up to ninety million people are dieting today, and while weight loss has improved over the past twenty years, maintaining weight loss is still problematic. VT-AES research has developed a successful means of using the internet to maintain weight once it is lost. Faculty and staff with VT-AES and University of Vermont Extension worked with university administration to make "overweight and obesity issues" the topic for the annual Aiken Lecture Series, University of Vermont's premier public policy lecture. The theme for the day was "Who Chooses the Food You Eat – Agriculture, Industry, Advertising?"

Nationwide, childhood obesity rates have increased from eleven to fifteen percent during this same period. A 2001 Vermont Youth Risk Behavior Survey showed that teenage obesity rates ranged from nine to twelve percent, with eighth graders showing the highest obesity rates, and seniors showing the lowest. The same survey, conducted by the Vermont Department of Health, showed that 16 percent of eight grade students are at risk of becoming obese. Some behaviors contributing to current obesity rates and less healthy youths are diet related. Only 16 percent of teenage students consume three or more servings of vegetables daily, and 41 percent eat two or more fruits or fruit juice a day. Just 27 percent of teenage students eat five or more servings of fruits and vegetables per day. Only 27 percent of students drink three or more glasses of milk daily, with only 20 percent of female students drinking this much milk. Healthy Vermonter 2010 goals include trying to increase the percentage of teenagers who eat at least two servings of fruit and three servings of vegetables daily.

A VT-AES study showed that for children, the types of foods with added sugars included in children's diets affected the likelihood that their diets met the daily-recommended intake (DRI) for critical shortfall micronutrients such as calcium, folate, and iron. Soft drinks are the number one source of added sugars in youth diets and are displacing the consumption of milk. Results showed that sweetened dairy foods and presweetened cereals had a positive association on measures of diet quality, while sugar-sweetened beverages, sugars and sweets, and sweetened grains had a negative association. VT-AES research has also found that children who consume flavored milk have higher total milk intakes, lower sweetened soft drink and fruit drink intakes, higher calcium intakes, and similar added sugar intakes in comparison with children who are non-consumers of flavored milk. Data from these studies imply that children should moderate their intakes of added sugars, while selecting foods and beverages that enhance their diet quality. Other research from VT-AES shows high correlations between maternal and child milk consumption rates.

The Vermont elderly are another population at particularly high nutritional risk for a variety of reasons. A 1997 national study found that 8 to 16 percent of the elder population had experienced food insecurity within a six-month period. A recent evaluation of the elderly Nutrition Program of the Older Americans Act showed that 67 to 88 percent of participants were at moderate to high nutritional risk. Although the Older Americans Act mandates the provision of two nutrition education units per year per program participant, four of the five Vermont Area Agencies on Aging do not have qualified nutrition professionals for providing nutrition education. University of Vermont Extension has been asked to help address this unmet need. Programs targeting the elderly reached more than 200 Vermont seniors, in addition to a newsletter, Words to the Wise, with a circulation of over 3,500. Introducing educational programs, and computerized and mailed information resources to homebound elders showed marked improvements in food resource management practices, food safety practices, and mean key nutrient intakes. Directly combining research and outreach is a project where VT-AES researchers developed a novel approach to delivering nutrition, food safety and health information to Vermont's elderly population. A pilot is underway to determine if the Internet and a specific senior-oriented interactive website are effective modes for seniors to obtain and utilize health information such that they reduce nutritional risks associated with aging.

According to "Healthy Vermonters 2010", one of the most effective ways to improve the health in all age groups of the population is to improve nutrition and physical activity. In fact, consuming a diet low in fat and high in fruits, vegetables, and fiber, participating in regular physical activity, and achieving and maintaining a healthy body weight are all behaviors that would modify Vermonters' risk for developing chronic disease. However, initiating and sustaining behavior change is difficult and requires changing attitudes, acquiring new skills, and gaining knowledge. University of Vermont Extension is in a unique position to help Vermonters achieve these changes. Through practical education, linking diet and physical activity changes to reduced risk of disease, Extension helps Vermonters lead healthier, more productive lives.

Eight educational programs, including Dietary Guidelines, Dining with Diabetes, Food, Fun and Reading, Get Engaged in Healthy Aging, Make Nutrition Compute, Making It Fit, reached 3,123 Vermonters, including 275 youths, and more than 400 senior citizens. Results of these programs show that they have served to make a significant impact on human attitudes and behaviors toward nutrition, lifestyles, and meal preparation. The Expanded Food and Nutrition Education Program (EFNEP) and the Food Stamp Nutrition Education Program (FSNEP) help limited resource families in Vermont develop healthier consumer, food preparation, and dietary behaviors. Through long-term, intensive education, EFNEP helps families living in or near poverty to acquire knowledge, skills, and changes in behavior to achieve adequate diets providing normal nutrition. Data from cost benefit studies in Virginia and Iowa showed that for every dollar spent on EFNEP, over $10 was saved in health care costs. A 1998 cost benefit study in Tennessee showed that for every dollar spent on EFNEP, $2.48 was saved on food expenditures. Evaluation data in Vermont shows that adult participants demonstrate statistically significant improvements in nutrition, food safety, and resource management practices, such as reading food labels and planning meals ahead of time.

Using the EFNEP model, the FSNEP Make Nutrition Compute (MNC) intervention delivers innovative computer-based nutrition programming to the general food stamp audience. Youth-targeted programs combining nutrition, food preparation and gardening education and experience increased skills in gardening, as well as in choosing and preparing healthier snacks. It showed

improved knowledge of participants in making food choices that resulted in consumption of a higher quality diet. The program increased the level of experience that youths had in tasting and consuming healthy foods they had never tried before and then decided they liked some of them. A course targeting young populations developed by University of Vermont for use in schools (ages three to eight) called "Food, Fun and Reading," showed that participants increased their experience with trying new and healthy foods. The curriculum was revised to ensure increased parental involvement as their children progress through the course, and to better measure change in student knowledge and behaviors about how and why they should consume a higher quality diet.

Children and adults across the State of Vermont can sometimes face the experience of lacking continuous access to a nutritious, safe, acceptable, and affordable food supply. Food security is an issue in the remote rural areas of the state and in the populated urban areas, affecting people of diverse ages and backgrounds. In 1999, USDA released estimates on the prevalence of food insecurity and hunger by state. In Vermont, an estimated 7.7 percent of households were food insecure, and 2.6 percent were food insecure with hunger during the period between 1996 and 1998. For this reason, the new Healthy Vermonters 2010 report includes the objective to "increase food security to reduce hunger" statewide. In stark contrast to this lack of food security for so many Vermonters is an agricultural state that prides itself on production of a wide range of healthful and tasty products that are enjoyed by millions of people across the country. A focus of University of Vermont Extension and VT-AES is to address food security issues affecting those lacking access or purchasing power to maintain adequate diets. Two programs in particular aim to improve food security through education. The Farm Share for Seniors program increased confidence of consumers living in subsidized housing about their own food security by 56 percent, while also assisting communities to support one another, and improving nutrition-related behaviors. EFNEP supported programs also increased confidence and behaviors leading to increased food security and quality diets for low-income adults and children.

**KEY THEME: HUMAN HEALTH**

**ABCs of Good Health --** ABCs of Good Health classes are designed to improve dietary habits in accordance with recommendations in the dietary guidelines. The three main themes in the dietary guidelines are **A**im for fitness, **B**uild a healthy base, and **C**hoose sensibly. Specific topics emphasized in the curriculum include attaining a healthy weight, engaging in physical activity, understanding serving sizes, and evaluating a sample menu. When the class is taught for seniors participating in the *Senior Farm Share* program, the emphasis is on preparing and eating fresh fruits and vegetables. The message to increase consumption of fruits and vegetables is part of the dietary guidelines focus on building a healthy base.

IMPACT
Twenty-four ABCs of Good Health workshops were held this year reaching a total of 357 participants. Seventeen of the twenty-four workshops targeted seniors, and the remainder targeted a mixed age group of adults. Two types of surveys were used to measure knowledge gain and behavior change in these classes, with the type of survey dependent on the audience. Seniors who were participants in the Senior Farm Share program were given a survey to assess change in their food security status and fruit and vegetable consumption patterns. Other participants who were in the workshops for a mixed age group of adults received an eight-question survey aimed at identifying knowledge gains.

People participating in the sessions targeting the mixed age groups of adults completed thirty-nine matched pairs of pre and post surveys. Results showed statistically significant changes in the positive direction in response to six of the eight questions related to knowledge of food pyramid and dietary guidelines, body mass index (BMI), and nutritional labeling. Thirty-nine seniors who participated in the Senior Farm Share program and received at least one nutrition education lesson also completed both the pre and post surveys. Results showed significant positive changes in response to the food security questions related to having enough money to purchase food when needed, to eat balanced meals, and to eat appropriate sized meals. A high proportion of the written comments from seniors who were asked about any dietary changes mirrored the following statement:

- "I enjoyed fresh vegetables all summer that I would not have had otherwise. It made me realize how much I missed my fresh vegetables because I grew up with gardens and had my own for years."

As is the case with the *Making it Fit* curriculum, *ABCs* will be revised in the coming year based on educator and participant feedback. Our plan is to combine the two curriculums into one flexible curriculum that could be used to teach a series of classes, or used as a one-shot program.

Smith-Lever funds supported this project.

**Healthy Eating, Healthy Aging -- Many** older individuals are at increased risk for nutritional deficiencies and food borne illnesses due to various factors associated with aging, including physical disabilities, chronic diseases, social isolation, and sensory losses. The purpose of this project was to determine if the internet can be an effective tool in providing nutrition and health information for the elderly. Research and outreach personnel developed an interactive, multimedia, touch screen computer application, designed to collect nutrition and health information as well as deliver nutrition, food safety and health information tailored to the needs of older adults.

IMPACT
Sixteen senior Vermonters participated in the study by using the website, and 23 seniors participated in a control group with no website access. Approximately 75 percent of the participants were women, with two-thirds living alone, and 95 percent having incomes above poverty level. Significant positive changes were observed for internet users during the twelve-month study with regard to

- fat intake;
- eating vegetables and fruits as snacks;
- beliefs about one's own health levels;
- awareness about the relationship between diet and developing osteoporosis; and
- beliefs about the difficulty of including adequate calcium in their diets,

whereas no significant differences were noted for people in the control group. Secondary outcomes included significant differences in confidence using computers, and beliefs that using computers can aid in developing healthy eating habits.

Smith-Lever and Hatch Act funds supported this project.

**Effectiveness of Internet support for the maintenance of weight loss –** Currently over 60 percent of Americans are overweight or obese. (up to 90 million Americans, both young and adult). Maintaining intentional weight loss is problematic for many Americans. Even though advances have made it so that people lose 75 percent more weight than they did twenty years ago, maintaining weight loss is still problematic. This project is designed to determine if the internet can be used as a vehicle to enhance long-term weight maintenance. After a six-month weight loss program, 250 subjects were randomly assigned to support through either an internet site, frequent in-person counseling (using interactive television), or minimal in-person counseling group for twelve months.

IMPACT
Participants assigned to the internet-based weight maintenance program sustained comparable weight loss over 18 months to individuals meeting frequently for in-person consultations. A previous study had found a negative effect of the internet treatment for weight-loss maintenance. This studies positive result may be a result of the lower weight loss sustained by the ITV treatment group. It appears that the ITV treatment in this study was less effective than in previous studies. Although the complications of interpreting the results for ITV versus in-person, it appears from the study that the internet can now offer a cost-effective and accessible means for people to maintain weight loss as an alternative to an in-person program. Additional studies are being conducted to determine if the weight loss program itself, rather than just follow-up maintenance, can occur successfully using the internet as a tool. The VT-AES researcher notes that research and outreach will not solve the problem of obesity in our nation or in Vermont, and that policy changes that lead to decreases in poor nutrition and increases in activity levels are also needed to address the epidemic.

Smith-Lever funds were used in part or in full to develop this project for the State of Vermont

**The Impact of Added Sugars on the Quality of Children's Diets –** Added sugar intakes of U.S. children are rising at an alarming rate. Soft drinks are the number one source of added sugars in children's diets and are displacing the consumption of milk. The purpose of this study was to determine the impact of foods and beverages high in added sugars on the diet quality of U.S. children.

IMPACT
Sweetened dairy foods and presweetened cereals had a positive association on measures of diet quality, while sugar-sweetened beverages, sugars and sweets, and sweetened grains had a negative association. Children should moderate their intakes of added sugars, while selecting foods and beverages that enhance their diet quality.

Findings from this study are important when establishing nutrition policy for school nutrition programs. Results of this study support the view that maintaining the mandate that milk be served in schools is of utmost importance for the health of children. Equally important are policies that limit sales of and access to soft drinks and other foods and beverages of minimal nutritional value during school meal periods, since these do have a negative impact on children's diet quality. Results from this research and other studies have led to the establishment this past year of several projects by State and university agencies and departments to work with schools,

farmers, and the public to improve children's diets in schools. Impacts of these programs have not yet been tabulated, but the effect on outreach programming has been strongly realized.

Hatch Act funds supported this project.

**Effects of Flavored Milk on the Quality of Children's Diets --** Calcium is especially important for adolescents. Because almost 45 percent of skeletal mass is formed between the ages of nine and 18, health professionals recommend at least 1,300 mg of calcium every day for this age group; the equivalent of four servings of milk, cheese or yogurt. Milk consumption has declined at an alarming rate among U.S. school-aged children. The aim of this study was to determine the association between children's flavored milk intake and their diet quality.

IMPACT
An analysis of the diets of more than 3,000 children published in the January 2004 issue of the *Journal of Adolescent Health* shows a positive effect on children's diets when kids choose flavored milks and yogurts instead of sodas and sweetened drinks. The study showed that children ages 6-17 who consumed more than 6-8 ounces of flavored dairy products, such as milks, yogurts, ice creams and puddings, each day had a better diet than those who regularly drank sodas and sweetened fruit drinks. Those consuming more flavored dairy got more than two servings of dairy foods and took in more calcium, folate and iron, fewer added sugars and less saturated fat overall than children who drank more than 16-25 ounces of sodas and sweetened fruit drinks every day. The analysis also showed that only children ages 6-11 who did not consume sodas and sweetened drinks got the recommended amount of calcium each day.

These data help to dispel myths surrounding the appropriateness of flavored milk in children's diets and demonstrate that flavored milks are a nutritionally superior beverage choice over other popular non-milk options. "When sodas and fruit drinks replace dairy foods in the diet, it's hard for children to get the key nutrients they need for growth and development," says Dr. Rachel Johnson, professor of nutrition at the University of Vermont, and one of the study's authors. "Our analysis shows that flavored dairy products like milks and yogurts are a great addition to a child's diet because they are packed with important nutrients and have fewer added sugars than the soft drinks they are replacing." This study coincides with the American Academy of Pediatrics' newest policy statement which recommends that health professionals work to restrict the sale of sweetened drinks in schools in order to help prevent some of the health problems associated with too many sodas and sweetened beverages.1 The AAP recommends replacing sweetened drinks with real fruit and vegetable juices, water and lowfat white or flavored milk. The policy also notes that as sweetened drink consumption rises, milk consumption declines and milk is the primary source of calcium in the diets of children and adolescents.

Hatch Act funds supported this project.

**Expanded Food and Nutrition Education Program --** Although American diets in general are not meeting the recommended dietary guidelines, the average diet quality of people with limited resources is even lower than the general population. The Expanded Food and Nutrition Education Program (EFNEP) is an integral component of NFSH programming efforts. For over 30 years, EFNEP has helped families living in or near poverty - especially those with young children to acquire knowledge, skills, and changes in behavior to achieve adequate diets providing normal nutrition. EFNEP educators, trained paraprofessionals supervised by nutrition

professionals, provide in-depth education to adults and youth using a variety of hands-on methods, tailored specifically to meet the needs of limited resource families. Families are offered the opportunity to gain skills in food resource management, nutrition, and food safety practices. Data from a cost benefit study done on EFNEP in Virginia has shown that for every dollar spent on EFNEP, $10.64 is saved in health care costs. "The economic value of EFNEP to the community at large is significant," Joseph J. Jen, undersecretary for Research, Education, and Economics stated at the recent 35th anniversary of the program. "Research shows that $1 invested in EFNEP results in $10.64 in reduced health care costs and for every $1 spent to implement EFNEP, $2.48 is saved on food expenditures."

**Adult Audience:** Eighty-two percent of participants were enrolled in one or more food assistance programs. Adult females were served for 96 percent of families. Whites comprised 94 percent of adults served, while two percent of the participants were black, one percent were American Indian, one percent were Hispanic, and one percent were classified as Asian or Pacific Islander. Approximately seventy percent of adult EFNEP participants were between the ages of twenty-one and thirty-nine, and two thirds of participants were from towns of fewer than 10,000 people in areas of the state designated as rural.

Adult education occurred in group (73 percent), individual (16 percent), and a combination of group and individual (11 percent) settings. Fifty-eight percent of participants completed the program, with an average time to completion of 3.1 months. Another 28 percent of participants are currently continuing a program. Of the 14 percent of participants who terminated the program prior to completion, the average length of participation was 2.1 months. The most common reason given for not completing the program (37 percent of 43 respondents) was that they were "no longer interested." The programs yielded participant improvement in several behavioral areas.

IMPACT

**Impact for Adult Audience:** As a result of participation in EFNEP programs, eighty-one percent of participants showed improvement in one or more food resource management practices. Seventy-seven percent of participants showed improvement in one or more nutrition practices. Fifty percent of participants showed improvement in one or more food safety practices. While just 27 percent of EFNEP participants demonstrated acceptable food resource management practices upon entry to EFNEP, 45 percent demonstrated acceptable practices in this area upon exit from the program. Similar results occurred for nutrition practices, with 26 percent showing acceptable practices upon entry, up to 49 percent upon exit. Two thirds of participants already demonstrated acceptable food safety practices upon entry to EFNEP, and four fifths of participants did so upon exiting the programs. The percent of participants demonstrating acceptable practices in all three of these areas jumped from twelve percent upon entry to 30 percent upon exiting the program.

**Youth Audience:** Youth addressed through EFNEP programs were primarily white (92 percent). Five percent of participants were black, one percent were Hispanic, and two percent were classified as Asian or Pacific Islander. Youth came from towns under 10,000 (61 percent), towns and cities of between 10,000 and 50,000 people (37 percent), and farms (2 percent). The greatest proportion of youths participating in EFNEP were between the ages of nine and twelve years of age (39 percent), with 30 percent of youths aged between six and eight years of age, and 21percent below six years of age. Only nine percent of participants were teenagers. Programs

were conducted through organized clubs, short-term special interest programs and day camps, and school enrichment programs. The overnight camps attracted the highest percent of males (53 percent), while day camps and clubs attracted the highest number and percentage of females.

**Impact for Youth Audience:** Based on 169 responses, participants were shown to have improved safety practices by more often making sure not to leave meat and dairy out of the refrigerator for more than two hours (22 percent), and by thawing foods using refrigerator or cooking, rather than leaving out at room temperature (45 percent). Nutrition practices for EFNEP participants also showed improvement. Most participants (52 percent) used the "Nutrition Facts" on food labels more often to assist them in making food choices, 36 percent more often thought about healthy food choices when deciding what to feed their families, 30 percent did not add salt to foods they prepared, and 23 percent of families reported that their children ate breakfast more often after exiting the program than when they entered. Thirty seven percent of participants also improved food resource management practices by planning meals in advance more often. Thirty-one percent of participants compared prices more often when shopping, 47 percent used lists when they went grocery shopping more often than before they had completed the workshops. As a result, 34 percent of respondents stated that they ran out of food before the end of the month less often than before they had completed the workshops.

Programs for youth cover the same basic topics as those for adults, emphasizing improved nutritional, food safety, and food resource management behaviors. This year, the addition of a youth gardening program focusing on these topics assisted us in attracting more youths to nutrition-oriented group educational programs. Since not all areas addressed were surveyed, topics were analyzed by groups, and are reflected in these results. As a result of participating in EFNEP, 72 percent of 25 youths from two groups increased their ability to select low-cost, nutritious foods, while more than two-thirds of 40 youth participants from four groups (68 percent) increased the variety of foods eaten. Sixty-three percent of 138 youths from two groups increased knowledge about the essentials of human nutrition, and 63 percent of 43 youths from four groups improved practices in food preparation and food safety. University of Vermont Extension will strive to continue and expand our work with this audience who appear to strongly benefit from our resources.

The highest number and percentage of ethnic minority group participants were also found to occur utilizing these latter two delivery methods. While organized clubs attracted twenty people having an ethnic minority status (20 percent), short-term programs and day camps attracted 27 of these youths (just eight percent). Only two youths classified under an ethnic minority group attended school enrichment programs (1 percent).

Smith-Lever funds supported this project.

**Dining with Diabetes** -- An estimated 30,000 Vermonters have diabetes. Improved diet and exercise habits have been shown to help control diabetes and reduce complications such as blindness and kidney failure. "Dining with Diabetes", a three-part series of classes designed for diabetics, as well as those who may be at risk of developing diabetes, or prepare food for diabetics, teaches people how to control their blood sugar through diet. The primary goals are to learn how to meet nutritional needs while keeping blood sugar under control, and to try tasty, healthful recipes that can be replicated at home. A follow-up session is held approximately six months after the classes, during which time participants have the opportunity to ask questions,

try new recipes, and receive support for changes they have made or are about to make. Classes were held at eleven sites around the State of Vermont.

IMPACT
Dining with Diabetes classes have reached 596 people over the past three years, approximately 70 percent of whom have been diagnosed with diabetes. Average age of participants was 64 years, and approximately 75 percent of the audience was female. A post-test and one additional follow-up evaluation survey was administered to low-income seniors who attended the Dining with Diabetes six-month follow-up "reunion" sessions held across the State of Vermont. Evaluation data from these participants indicated that they were applying dietary knowledge and skills they gained from our series to eat in ways that research has shown could lower their health risks. Matched sets of pre- and post-tests were completed by 267 class participants and analyzed for statistical significance. Below we report only those areas for which statistical significant changes were found:

- Increased views about the ease of preparing meals for someone with diabetes; importantly, most people prior to taking the course felt that preparing meals for diabetics was “very hard” or “somewhat hard” and at the end of the course, the majority felt that preparing meals for diabetics was “somewhat easy “ or “very easy.”
- increased confidence levels in being able to control carbohydrates in their diets;
- an increased confidence in their ability to prepare healthy meals for someone with diabetes
- increase in new, healthy main-meal recipes tried; approximately 5 new recipes learned during the course were then re-prepared later at home (within six months following the course) by the average participant; participants intended to try at least five additional recipes learned about through the program

Trying new, healthy recipes is a good indication of the extent to which participants are engaging in behavior change. Remarks from participants in Randolph, Vermont, about the program and its value to them were very positive – most people reported that they had made and enjoyed the “diabetes friendly” recipes demonstrated in class a number of times for themselves and their families.

Smith-Lever funds supported this project.

**Making It Fit: Piecing Together Your Food Needs --** Making it Fit (MIF) is a program designed to teach low-income adults, including seniors, how to eat according to the food guide pyramid while staying within a tight budget.

IMPACT
Twelve series of *Making it Fit* classes were taught over the course of the year, reaching a total of 144 participants. Seventy-seven of the participants were enrolled in six series that targeted seniors, and the remaining 67 participants were an adult mixed-age group. Effectiveness of this program is measured with a pre and post written survey of participants. Fifty-five matched pairs of surveys were completed. Because occasionally respondents left questions unanswered, the actual number of responses to each question is between 52 and 55. Overall, for the group, the following improvements occurred:

- 20 percent of participants who were not regularly eating fruits or vegetables as snacks now do so almost always or always.
- 15 percent of participants who were not regularly reading nutrition labels in the store now do so almost always or always.
- 9 percent of participants who were not eating more than one kind of fruit daily now do so almost always or always.
- 8 percent of participants who were not adding extra vegetables to a dish during cooking now do so almost always or always.
- Participants were asked, on a scale of 1 to 10, how much confidence they had in their ability to plan healthy, low-cost meals. There was a statistically significant increase from 6.6 to 8.0 (pre to post) in the mean confidence level.

One participant responded to the statement, "one thing I plan to do differently after taking this class is…" by reporting, "I am now eating more fruits and vegetables. Actually, I have changed my eating habits overall. There is cancer that runs in my family. Now that I am 30 years old, through this class I now understand the importance of a good diet and healthy eating." Another stated, "This class and the teacher have changed my life in a way that I am now taking care of myself. Thank you!"

*Making it Fit* has been taught for a number of years now. Although outcome measures show that the program is successful in achieving our goals, educators have indicated that it is time to update some of the lessons and devise some new, creative teaching methods. During the FY-04 year, we will be reviewing the curriculum, conducting focus groups with educators, and making recommended changes.

Smith-Lever funds supported this project.

**4-H Growing Connections** – Research shows that 75 percent of youth do not eat recommended servings of fruits and vegetables, and that youth from families with low incomes are particularly susceptible to poor nutrition. Research also shows that youth are more likely to eat high fiber and nutritious foods when they are engaged in hands-on experiential activities growing and preparing foods. 4-H Growing Connections is a hands-on nutrition and gardening program for youth that includes: developing nutrition and cooking skills, planning and planting a garden, building food security and hunger awareness, and enhancing food safety and preservation skills. The primary goals are that youth will recognize the health benefits of eating more fruits and vegetables, increase their exposure and expand the variety of fruits and vegetables eaten, and increase their preference for the taste of fruits and vegetables by developing life skills to grow a garden and prepare and preserve food in a safe way. Last year was a pilot year for the program, and this year represents its first full year of implementation.

IMPACT
**Program expansion --** A total of 110 participants attended one of five 4-H Growing Connections trainings for instructors were conducted by nine University of Vermont Extension staff and faculty. Participants represented staff and volunteers of low-income housing communities, after-school time programs, free summer lunch programs, human service agencies, youth and community centers, schools, as well as AmeriCorps members, and Master Gardeners. At the end of the training, participants completed an evaluation form using a pre/post reflective questionnaire. A total of 87 surveys were completed. Before the training, an average of 17

percent of the participants stated that they felt prepared to help youth learn about gardening, nutrition, food safety, and food security. After the training, this increased to 69 percent of the participants.

**Impact on youth participants --** 4-H Growing Connections was delivered at 23 sites serving low-income youth throughout the State of Vermont. A total of 488 low-income youth between the ages of 5 and 18 attended at least one 4-H Growing Connections session. The total number of educational contacts (duplicated counts) is estimated at 2,500 over the course of the year. At 11 of the 23 sites youth received a free lunch as part of the Summer Food Service Program. The program was delivered by 9 University of Vermont staff and faculty and 65 volunteers representing AmeriCorps members (10), Master Gardeners (12), and other volunteers and staff (43) from partner organizations. A total of 119 matching pre/post tests were collected. The pre and posttests represent 24 percent of the total number of youth participants due to inconsistent attendance at many of the sites. Maintaining consistent attendance was difficult for a variety of reasons such as summer vacations, various family problems split family situations, and transportation problems.

This program reaches many young participants (between five and ten years old). Reflective self-reporting is not an effective survey tool for this age group. A new method was used this year to identify changes in participating youth's preference for fruits and vegetables. At the beginning of the program, each participant was given 24 stickers, each of which had a picture of a fruit or vegetable that is commonly eaten and grown in Vermont. Participants were also given a large piece of paper divided into four sections labeled "I like it", "It's OK", "I don't like it", and "I never tried it". They were asked to place each sticker in the appropriate category based on their exposure to the item and their like or dislike of the item. Results for the 119 matched pairs found the following statistically significant changes from the beginning to the end of the program:

1) The mean number of fruits and vegetables that participants indicated they liked increased from 11 at the beginning of the program to 13 at the end of the program.
2) There was a decrease in the mean number of items that participants indicated they had never tried, from two to one.
3) For children ages 8+ (82 of the 119), there was a slight decrease in the mean number of items that they did not like.

For each type of produce, an analysis was also done on how many children showed an improvement in their preference for that item, and how many showed a decline in their preference. For 21 of the 24 types of produce, there were more participants who indicated they had a greater preference for the item at the end of the program compared to the beginning.

Additional program outcomes were identified through planned observations. This means that the educator kept track of the number of youth who achieved each of the identified goals, and recorded these on a "planned observation" form. Educators recorded the following observations:

- 401 (82 percent) youth actively participated in growing vegetables in a group or container garden.
- 249 (51 percent) youth demonstrated the correct methods for planting a garden.
- 317 (65 percent) youth demonstrated proper hand washing for reducing the risk of food borne illness.

- 292 (60 percent) youth kept hands and surfaces clean when preparing, cooking, or serving food.
- 334 (68 percent) youth demonstrated an increased ability to prepare a meal with fresh produce.
- 85 (17 percent) youth intended to increase their consumption of fruits and vegetables at home.
- 99 (20 percent) youth demonstrated an increased skill in proper techniques for food preservation.
- 87 (18 percent) youth actively participated in community service by donating produce from the garden to a local food shelf.
- 230 pounds of fresh garden produce was donated to local food shelves.

Our evaluation tool also provided an opportunity for adult volunteers to share comments and other observations about what youth were learning and understanding about the subject matter. Of thirty positive comments collected, four are noted here, as they demonstrate the cross-disciplinary learning taking place by the youth participating:

- "Watching the children pick beans from the garden and eat them as fast as they were picking was great. Many kids who did not eat them before, started eating them because the others were and they found out that they really do like them."
- "Many parents remarked that they saw kids eating things that they thought their kids would never eat at home."
- "Another valuable piece of the curriculum was the nutritional aspect. It provided an important arena for some of the kids to work through self-esteem and body image issues. Seeing the children who struggle with such issues change their eating habits meant something beyond just a physical change, but a deep emotional change."
- "Two children clicked with the idea that by growing a garden and caring for it they could help others. They kept asking questions about what and how much they could donate! Who and where they could donate too!"

The 4-H Growing Connections program has been modified in a number of ways since the program's inception, based on educator feedback and observation. This year, formal volunteer trainings were conducted and the evaluation tool was modified, among other changes. Next year we intend to add new materials to a web site and make other recommended changes. The program outcomes that we have identified through our current evaluation tools indicate that our current methods, to a great extent, are successful for meeting our objectives.

Smith-Lever funds supported this project.

**Make Nutrition Compute --** Through use of laptop computers in the home, nutrition educators used a nutrition curriculum that is designed to be interactive, and specifically targeted to individuals and families with limited resources. This sixth year of the program, four nutrition educators used the *Pyramid Challenge* and *Pyramid Explorer* computer programs to work with a total of 40 low-income adults in their homes.

IMPACT
Forty program graduates received an average of ten lessons. To assess dietary changes, pre- and post- 24-hour food recalls were administered with Make Nutrition Compute participants.

Twenty-four hour recalls are a well-tested method of dietary assessment in which clients are asked to record everything that they had to eat or drink in the past 24 hours. The recalls were done at the beginning of the program before clients received any nutrition education via the computer, and then again at the completion of the program. A computerized nutrient analysis was then performed to determine whether or not there were any improvements in actual nutrient intake from the beginning to the end of the program. Dietary intake data on 22 participants showed the following improvements:

- 100 percent of participants reported an increase in the number of servings consumed in at least one of the five food groups so that their intake came closer to meeting recommendations in the food guide pyramid.
- 14 percent of participants reported eating 2 or more servings from the fruit group at program entry; this increased to 41 percent at program exit.
- 46 percent of participants reported eating 3 or more servings from the vegetable group at program entry; this increased to 64 percent at program exit.
- 32 percent of participants reported eating less than 2 servings from the meat, poultry, fish, dry beans, eggs, and nuts group at program entry; this increased to 64 percent at program exit.
- 9 percent of participants reported eating 25 or more grams of dietary fiber at program entry; this increased to 23 percent at program exit.
- 59 percent of participants reported receiving less than the RDA for iron at program entry; this decreased to 55 percent at program exit.
- 68 percent of participants reported receiving less than the RDA for vitamin A at program entry; this decreased to 46 percent at program exit.
- 68 percent of participants reported receiving less than the RDA for vitamin C at program entry; this decreased to 32 percent at program exit.
- 68 percent of participants reported receiving less than the RDA for vitamin B6 at program entry; this decreased to 55 percent at program exit.

The method of using laptop computers to conduct education has proven to be extremely successful with program participants. In particular, there are two components of the computer programs that seem to be most helpful as behavior change motivators. One component is part of the *Pyramid Challenge* program. Participants are shown, visually, how their dietary intake differs from the recommendations in the food guide pyramid. The visual disparity is often quite shocking, and consequently inspires people to want to change their eating patterns. Similarly, one of the computer programs assigns people a dietary score based on a possible total of 100. Participants seem to be driven to want to increase their scores. Both of these computer assessment tools seem to strike participants as more credible than an educator simply reviewing a diet and saying that it has particular shortcomings. While these teaching methods seem to be very effective, we would like to find a computer-based nutrition curriculum that is appropriate for low-income clientele in our program. In the absence of finding something appropriate, we continue to supplement the computer programs we're now using with paper materials.

Smith-Lever and Hatch Act funds supported this project.

**Get Engaged in Healthy Aging project** -- Nutritionally at-risk elders receiving home-delivered meals and people with limited resources may lack access to nutrition education. This project provided nutrition education to 15 at-risk elders in their homes using laptop computers.

IMPACT
Program results showed at-risk elderly participants made improvements in one or more of the following food practices: food resource management practices (64 percent), food safety practices (50 percent); nutrition practices (100 percent). Mean nutrient intakes that were measured for at-risk elderly participants improved for protein, iron, calcium, vitamin C, and vitamin B-6. At-risk elderly participants also increased their intake of the recommended servings from the five food groups. Indirect outcomes of the project included increased confidence and enjoyment using internet technology and developing computer skills.

Smith-Lever funds supported this project.

**Farm Share Food Security Program for Seniors** -- The most recent data on Vermonters indicates that the percent of adults who eat at least the recommended two daily servings of fruits is 50 percent and at least three daily servings of vegetables is 41 percent. Fruits and vegetables are known to decrease risk for some cancers. Eating locally grown fruits and vegetables also provides the benefit of supporting local farmers, investing in the local economy, and providing the freshest product possible to the consumer. During the summer of 2001, the Senior Farm Share program linked approximately 160 Vermont seniors to local Community Supported Agriculture farms (farms with community connections as a goal) in their communities. Seniors living in subsidized housing were targeted to participate in this program. Each participating Senior received a weekly allotment of fresh produce from the farm. Many of the seniors also had the opportunity to receive nutrition education.

IMPACT
Since 2001, Senior Farm Share participation has more than tripled, to include 538 seniors.

**Participant Impact***:* One hundred and forty-five seniors completed surveys both at the beginning and end of the program, describing the changes they experienced. Senior's responses to four questions on the pre and post surveys relating to food security indicated significant improvements in food security (e.g. In the past three months were there times when the food didn't last and you just didn't have money to get more?; In the last 3 months, were there times that you couldn't afford to eat balanced meals?). Additionally, 81 percent of participants reported that they intended to eat more fruits and vegetables year round after participating in the program. The program connected seniors with food resources, and participants increased their use of available resources during the program. Participant interest in the program was exceedingly high, with 92 percent stating they hoped to continue participating in the program if it was offered again. Two senior quotes summed up the majority opinion from those surveyed:

- "I didn't eat veggies very often before joining this program now I eat them daily".
- "I ate more fruits and veggies. They taste much better than the ones in the stores, especially tomatoes. I had a garden for many years so I can tell the difference between fresh and store produce (that is, until the farm fresh starts to come in). The veggies and fruits that we got every week were really fresh and flavorful."

This year, as part of a pilot project, thirty seniors from residential care homes participated in the project. Their results concurred with, and were sometimes even more positive than those not living in residential care homes. Survey response rates were too low to provide statistically significant data, so this data was not included in the analysis here.

**Community Impact:** The number of farmers who participated in the program increased from four in FY2002 to sixteen. Cost to seniors, who may redeem subsidized farm coupons to pay, was approximately 20 percent above wholesale and 20 percent below retail costs for produce. Farmers provided participants with approximately $5 worth of vegetables at this rate, per week. This translates into $53,800 generated for farmers through a customer base they would normally not reach. In addition to the financial benefits they reaped, the farmers got personal satisfaction out of participating. One farmer indicated that he was interested in devoting his entire farm to senior farm share participants. Two quotes express the feelings of the farmer respondents:

- "It was great to see people to whom food was always such a special thing, have a chance to renew their love of farm fresh veggies."
- "The seniors loved the food, much of which they grew up with, but have little access to now."
- "The aspect of this program that is most appealing to me is bringing 'local' food to 'local' seniors and getting them on to the farm." (25 percent of participants visited farms).

Smith-Lever funds supported this project.

## NATIONAL GOAL AREA 4: GREATER HARMONY BETWEEN AGRICULTURE AND THE ENVIRONMENT

Three themes dominated FY 2003 effort under National Goal Area 4 for University of Vermont Extension and VT-AES –

- water quality improvement-related behavioral changes;
- linking community-wide understandings of the link between natural resources and sustained community development; and
- reducing the negative impacts of pest management through the implementation of improved strategies.

University of Vermont Extension and VT-AES focused 16.3 FTE's, or 22.9 percent of effort toward addressing these issues this past year. During FY 2003, $1,708,272, or approximately 19 percent, of federal funds received were directed toward this National Goal Area. Effort included publishing eight articles, as well as conducting 26 group presentations and 442 phone, office, and on-site consultations. The following section summarizes highlighted outcomes directed toward developing greater harmony between agriculture and the environment.

**Water Quality Improvement-Related Behavioral Changes --** Water quality issues in Vermont, and nationally, are front-page stories. Storm water runoff is contaminating streams, rivers, ponds, and lakes. Additional development may be curtailed until water quality standards can be met. Summer beach closures threaten the quality of life and tourism development. It has been perceived that high nutrient inputs on farmlands and failed or failing septic systems, particularly along shorelines, have resulted in increased water pollution. Community concerns

are strengthening that private well water supplies are at increased risk due to both a long-term drought and land use activities. Failed septic systems, land use practices and risky disposal practices of household, business and industrial wastes pose risks to private water supply systems.

Excess phosphorus is the primary cause of impaired water quality in Lake Champlain. Dairy farms are considered a large source of phosphorus. A strong link between research and outreach is working to reduce the impact farmers have on phosphorus runoff into streams and lakes. University of Vermont is building models to enhance water quality while sustaining farm profitability by evaluating farm-level financial costs and environmental benefits associated with implementing alternative farm practices to achieve phosphorus reduction. Research on soil factors influencing phosphorus availability to plants and concentrations in runoff, comparisons of low-phosphorus and conventional feeds, and the development of an index and easy-to-use device to determine the likely concentrations of phosphorus runoff from farms provides useful information and tools for outreach. Outreach is focusing on increasing the number of farmers applying computer software designed to incorporate low-phosphorus strategies with other management strategies to maintain or increase profits while reducing phosphorus runoff.

University of Vermont Extension also provides demonstrations for residential neighborhood groups and commercial property owners on low-input lawn care, gardening, and waste elimination. Due to water quality concerns at a popular residential and summer vacation area along Lake Champlain, University of Vermont Extension is working with the Town of Colchester to facilitate a community-visioning program designed to address economic and social issues influencing water quality in Malletts Bay. University of Vermont's roles include developing baseline data through research endeavors as well as helping the committee to develop cooperators and resources to carry out tasks deemed critical to goal achievement. Much work focuses on septic system quality, and new rules passed by the Vermont legislature earlier in the year have led to the need to expend more energy in informing residents of new septic options available to them, and new compliance requirements. Additional work includes working with teachers to assist schools in implementing water quality-oriented curricula, and one-week summer camps for youth to learn about water quality issues.

In Vermont, there are over 80,000 drilled wells and an unknown, but perhaps equal number of dug wells, springs, and ponds used for private water supplies. Private wells are not required by law to be tested for bacteria, chemicals or radioactive substances. Many people relying on these water sources may be at risk of exposure to unsafe levels of contaminants in their drinking water. University of Vermont Extension is working with the Environmental Protection Agency and other New England states to develop a New England wise curriculum to assist people relying on private wells for their water. Extension personnel produced several television broadcasts targeting rural and elderly audiences to encourage annual well-water testing. This public education is combined with Realtor and Town Health Officer education programs to increase the number of wells tested annually. An unanticipated drought caused Extension to respond to more than twenty requests for assistance from well-water users who were out of water during critical farming periods, putting animals and humans at risk.

These strategies have been combined with a focus on educating youth using clubs and teacher's classrooms. The study of watershed function, phosphorus detection, and management approaches to improve water quality in natural waterways are the major themes of these youth efforts. Recent evaluations point out that educational programming in Vermont schools regarding natural

resources and the environment is inadequate. Many science disciplines are still being taught in an isolated manner because teachers currently do not have the resources or support to incorporate environmental education into their curricula. Non-classroom education faces the same problems. Water quality issues affecting local communities, are part of a hands-on, experiential curriculum developed and used with youth in many Vermont communities. The issues discussed include the effect of storm water runoff, failed septic systems; household and business waste disposal practices on natural water sources that can result in such things as contaminated private and public water supplies or beach closures that threaten quality of life and tourism development. Students produce projects and, in many cases, share information gleaned about local waterways with local officials.

*Improving awareness of the link between natural resources and sustained community development* – University of Vermont Extension worked with a diverse set of stakeholders having a history of confrontation and conflict to improve understanding and communication. Outcomes generate indicate how much can be accomplished in a short (one-year) span of time toward improving relationships between diverse groups, and how this change in dialogue can improve outcomes for all engaged participants and the constituents they represent.

*Improving Pest Management Strategies to Reduce Negative Impacts on the Environment and on Communities* -- Pest management is another area of concern for VT-AES and University of Vermont Extension. VT-AES is developing new methods allowing us to begin to quantify ecological impacts of biological control programs. VT-AES and University of Vermont Extension have also focused on reducing pesticide use while increasing profits for industries vulnerable to pest infestations, such as apples and greenhouse growers.

**KEY THEME: WATER QUALITY**

**Soil and Site Characteristics Influencing Phosphorus Loss to Runoff --** Phosphorus (P) in runoff from agricultural fields contributes to water quality problems in lakes and streams. This project is examining the effect of soil properties on phosphorus in runoff and finding the best chemical test to predict algae growth from runoff P. Results are being used to improve the P-Index for VT. Development of a research-based P-Index focuses water quality treatment efforts on problem fields, while allowing farmers more flexibility in management. In general, runoff water from soils with higher soil test phosphorus has higher concentrations of dissolved P. Other factors (such as the degree of contact between runoff water and soil) may explain some of the differences between soils in level of dissolved phosphorus in runoff water. A series of laboratory and field experiments indicated that soil phosphorus extracted by the modified Morgan Solution (ammonium acetate at pH 4.6) is a good predictor of phosphorus availability to crops. Tests also showed that as the aluminum (Al) content increases, higher levels of extractable phosphorus are needed to provide a given level of plant-available phosphorus. A survey of dairy farms found that a) most farmers are feeding phosphorus to dairy cows at levels significantly higher than needed; b) estimated net annual import of phosphorus onto farms was related to the number of animal units per hectare, the fraction of land in corn production, and whether rotational grazing was used during the field season; c) average soil test phosphorus levels correlated well with estimated net annual phosphorus import levels.

IMPACT
Tests have provided information needed to improve the accuracy of soil-based recommendations

for the use of phosphorus fertilizers and manures, as well as to decrease the amount of phosphorus fed to dairy cows. These improvements over the long run should reduce the amount of phosphorus from agricultural sources reaching surface waters of Vermont. Outreach efforts to inform farmers about the P-index have increased understanding by 60 farmers and agency personnel about the P-index. The work in this area is combined with outreach research and outreach efforts to improve soil quality while reducing costs to farmers of soil inputs, which fall under NGA1.

Hatch Act funds supported this project.

**Balancing economic and environmental impacts of phosphorus management --** Dairy farming is the primary agricultural land use in Vermont and the impact to surface water quality from livestock manure and fertilizer phosphorus has been identified as a major concern in the Lake Champlain Basin. Dairy farmers and crop consultants are trained to use the Vermont CropMDv3_VT computer database program to record activities and plan for improved farm practices that will increase profitability and reduce non-point source pollution. An increasing number of farmers are interested in and required to document their efforts targeted to reducing the environmental risks posed by their farms in order to maintain their status as USDA participants. VT-AES and University of Vermont Extension have worked together to:

1) develop a phosphorus index (P-index) for Vermont farmers to use in nutrient management planning to determine P runoff potential from farm fields;
2) collaborate with Penn State University to update software (Crop MD) that uses soil test values, manure test values, animal unit descriptions, and intended cropping practices to help farmers develop farm- and field-specific nutrient management plans to reduce non-point-source pollution from livestock waste; and train farmers to use the Vermont CropMDv3_VT computer database program to record activities and plan for improved farm practices that will increase profitability and reduce non-point source pollution.
3) demonstrate to farmers and agribusiness representatives how an effective Comprehensive Nutrient Management Plan (CNMP) can be an effective tool for farm management decisions to increase or maintain profits while reducing negative impacts on waterways.

IMPACT
Since FY2001:
1) the original Vermont P-index has been used in nutrient management planning on a number of farms, but is now undergoing evaluation and revision to incorporate current research and other information; 172 users in 2002 reported gains in knowledge about the use and efficacy of the P-index;
2) CropMD2v1_VT software has been revised twice (to version 3); 400 users have been trained in using the software (and have copies of the software); 130 agency personnel are trained and certified to interpret the summary output submitted to the Natural Resource Conservation Service (NRCS) / Farm Service Agency (FSA) for evidence of program participation compliance; 120 farmers have developed nutrient management plans using the software to mange nutrient loads on the farm; 85 percent of respondents to a follow-up survey felt that the software was excellent to good as a tool for improving their nutrient planning and record keeping ability; 100 percent of respondents indicated an improvement in farm profitability as a result of using the program; and
3) 370 farmers, consultants, industry representatives and agency personnel using three demonstration farms have attended education programs regarding the development of Comprehensive Nutrient Management Plans (CNMPs). Between fifty and ninety percent of

participants reported that the programs gave them "a good understanding of the components of nutrient management planning."

Hatch and Smith-Lever Act funds supported this project.

**Watershed Alliance** -- Educational programming for Vermont youth regarding agriculture and the environment is inadequate. Many science disciplines are still being taught in an isolated manner, in part due to a lack of resources and support for teachers and facilitators to incorporate environmental education into their curricula. The University of Vermont Watershed Alliance, a program shared by University of Vermont Extension, Lake Champlain Sea Grant and the University of Vermont's Rubenstein School of Environment and Natural Resources, provides schools and educational youth organizations with the necessary support and resources, including expertise, curricula, models, water quality testing equipment, and technical support. This cooperative effort makes it possible for students throughout Vermont to bring classrooms outdoors and learn about the watershed in which they live, and communicates to Vermont youth the shared responsibility humans have in protecting our watersheds and preventing water pollution. Students "adopt" a portion of their watershed, collecting, monitoring and analyzing water quality data, and make water quality-related recommendations to their local officials and community members based on their findings. In this way, the Watershed Alliance empowers youth to take action to conserve and protect water resources by enabling them to see that humans are not only part of the problem, but are also part of the solution. Measures collected include phosphorus levels, dissolved oxygen, pH, temperature, conductivity, benthic macroinvertebrate frequencies, and *E. coli* concentrations.

The program has been implemented in schools within ten of the 17 major watersheds of Vermont. Undergraduate students studying water resource management at the University of Vermont serve as interns, ensuring consistent methodologies and accurate results for compiled data. Students review monitoring protocols and safety procedures, learn about watershed ecology concepts using interactive models, collect water samples for analysis of physical and biological characteristics, and verify results of their analyses by working with technical specialists at a professional laboratory, prior to sharing recommendations with the public.

IMPACT
The Watershed Alliance program has now reached over 750 students, a substantial increase from last year. The program added six new schools in four new watersheds this past year, so that now, fourteen of the seventeen watersheds identified for Vermont have data being collected for them. The number of University of Vermont students in the School of Natural Resources that are working with the Watershed Alliance has more than doubled from four in 2001 to more than ten in 2003. Results have led to two river clean-ups and one town choosing to boil water for a period in response to results obtained from student measures of chemicals and bacteria in the town's water source. Results show than seventy percent of student participants gain an increase in knowledge of how waterways become polluted and ways to reduce pollution in waterways. Thirty three percent of schools continue to monitor waterways after they have completed working with the Watershed Alliance, as part of an ongoing curriculum. The program is expanding, and requests for assistance have led to the establishment of a program based on the University of Vermont developed curriculum in New York State.

One unanticipated outcome of the program has been the knowledge shared between students and farmers who permit access to waterways through their land. Students have been surprised and

impressed with how much effort some farmers expend toward reducing the impacts of their operations on water quality in the waterways surrounding them.

Future goals of the Watershed Alliance include having at least one school or youth group collecting annual data in each of the 17 major watersheds, as defined by the State of Vermont. This would translate into reaching more than 1,000 Vermont students with the water-monitoring program. The group is also working on the development of a central web-accessible database for collecting data, making it accessible to federal, state, and other organizations, such as citizen monitoring groups who may use the data for decision-making.

Smith-Lever Act funds supported this project.

**Neighborhood and Commercial Brook Pollution Reduction** -- Domestic non-point-source pollution is a threat to coastal water quality. Phosphorous, some from lawn care activities, contributes to poor summer water quality in Lake Champlain and other are waters. Many residents of northwest Vermont are unaware of appropriate lake friendly lawn care practices. While published and web based information is available, there is no effort to distribute these resources and use them to increase awareness of these issues for residents.

Local officials and residents assumed new residents (short term and new how owners), were unaware of how to operate and maintain septic systems, and were thereby primarily responsible for poor water quality and beach closures in Mallets Bay, a popular swimming and boating destination in northwest Vermont. This was the basis for focusing most town water quality education on septic operation and maintenance. A survey was conducted to assess awareness levels of new and long-term residents. The survey revealed that essentially all residents were familiar with septic systems, and that there were, in fact, relatively few new residents. This finding identified the importance of other domestic NPS sources for town officials.

A campaign to increase public awareness of how individual actions affect water quality in an urban tributary to Lake Champlain included conducting the following activities: local school sustainability expo featuring brook-oriented activities; student design of “Friends of Englesby Brook” logo; lake friendly field day for residents at a school community garden; newsletter distributed to over 500 watershed households; gardening and water quality summer program for underserved youth; distribution of a domestic non-point-source pollution survey to 500+ households in watershed designed to identify resident water quality concerns, the willingness of residents to change, constraints to change and current polluting activities practiced by residents.

IMPACT
Fifteen stakeholders (organic lawn care firms, land owners, watershed and lakeshore organization members) formed a volunteer organization to assume responsibility for informing northwest Vermont residents about non-point-source pollution threats from inappropriate lawn care practices and promote adoption of lake friendly lawn care. This significantly multiplies University of Vermont Extension ability to get this message out to coastal residents.

A survey of 800 new and long-term residents near Mallet’s Bay revealed that essentially all residents were familiar with septic systems, and that there were, in fact, relatively few new residents. This finding identified the importance of other domestic non-point-sources affecting lake quality for town officials, such as pet waste and domestic and wild waterfowl waste. Town officials are using the information to develop targeted education activities that address priority

domestic pollution sources identified in the survey. Regional agencies are using information to advise local officials about water quality protection in adjacent towns and counties. Project results contributed to the creation of two information resources to make water quality information more readily available to both residents and town officers. A resource center was established in Colchester Town Library, using information collected by the town's Water Quality Committee and supplemented with web and print based information developed by a University of Vermont intern. Based on this information, the Town of Colchester web page now includes a water quality resources section: http://town.colchester.vt.us/water/waterlinks.htm.

Results of the campaign to improve resident behaviors affecting water quality for an urban brook included:

- the entire fourth and fifth grade at Champlain Elementary and parents took part in the end of school sustainability exhibit; the Englesby Watershed map was a prominent component of the exhibit;
- all students taking part in the urban stream curriculum increased (44 students) knowledge of urban watersheds, Englesby Brook and it's restoration, and gained a clear understanding of importance of urban watersheds in carrying and cleaning up storm water;
- the "Urban Streams" curriculum, the first of its kind, was adopted as part of the Sustainability curriculum in Champlain School, to be repeated in Spring 2004;
- student-designed sign and door sticker for "Friends of Englesby Brook" was accepted by Burlington Public Works;
- signs will be printed and placed on watershed boundaries in spring;
- businesses and public buildings that have adopted lake friendly grounds care will display door stickers;
- all ten Englesby Brook residents attending the lake friendly demonstration reported that they intended to adopt low/no input practices for lawn and garden care; and
- all Burlington Area Community Gardens in the buffer zone of lakes or streams banned the use of chemical pesticides and fertilizers and adopted lake friendly practices.

Smith-Lever Act funds supported this project.

**Genetic and Physiological Characterization of a Novel Iron-regulated Bacterial Pollutant Degradation Activity** – Chlorinated solvents or pesticides frequently contaminate groundwater supplies. The purpose of this work is to understand how to promote a bacterial degradation process that eliminates chlorinated organic pollutants.

IMPACT
Hypotheses regarding the physiological and genetic basis of a bacterial dechlorination activity have been tested and confirm that the system is a component of a bacterial iron acquisition system. This basic knowledge provided will guide engineers in designing means of utilizing this process for less expensive technology to cleanup land contaminated with chlorinated pollutants.

Hatch Act funds supported this program.

**KEY THEME: NATURAL RESOURCES MANAGEMENT**

**Improving Decision-making Regarding Forested Lands** -- Wilderness creation is a controversial and complex topic in an traditionally agricultural state. It is timely as well because Vermont's congressional delegation may propose new wilderness designations in the Green Mountain National Forest. Serious concerns exist about several issues in the Green Mountain National Forest, including wilderness designations, timber-harvesting, and multi-use trail conflicts. Public issues education forums about wilderness were held monthly where 25 regular participants discussed the pros and cons of wilderness and marked-up maps to indicate specific interests in specific locations.

IMPACT
Participants who have a history of mistrust and initially would not speak to each other are now seen chatting informally during breaks. Ninety percent of the 25 regular participants report positive impacts on their communication with a diverse group of stakeholders. Progress is being made toward developing relationships and finding common ground. As an example, Conservation Law Foundation and Vermont Natural Resources Council (VNRC) informed the forum of a potentially controversial petition for Outstanding National Resource Waters before submitting the petition. VNRC held a meeting about the petition. This open, non-confrontational communication is an important step toward building trust and improving relations with the Forest Service and other stakeholders.

**Novel approach for developing PDE (partial-differential equation) models of the spread of invasive species --** The State of Vermont indicates that areas of Vermont are in poor health due to invasive species. A tool that can provide managers with the ability to predict where their control efforts should be concentrated is a mathematical model. Over the past eighteen months, VT-AES has been designing and evaluating a new approach that uses evolutionary computation for developing better models for predicting the speed of the spread of invasive species. Results show that developing better ecological simulation models of invasive species is feasible with this approach. Software development is nearly complete, with the following components having been internally and externally validated using certain models: the graphical-user interface (GUI) that links to a genetic algorithm library; the fitness function that incorporates the Aikaike Information Criterion for model selection parsimony; and the data analysis tools. The user can set genetic algorithm parameters (population size, selective pressure, number of iterations, mutation rate, etc.), launch the search for the best model fit, visualize progress in a window within the GUI in either 2D or 3D graphical form, write out results directly to an Excel spreadsheet, and if desired the search can be paused to change parameters and restart the search, without the need for recompiling.

IMPACT
The software system has been successfully tested on a nested suite of polynomial models and on a more complex ecological simulation. In both cases, the evolutionary approach successfully selected the correct model and appropriately fit parameters. Recent improvements include the incorporation of a partial-differential equation (PDE) solver for the suite of invasive species models, which led to a successful fit of a test data set of invasive species dynamics. Results were presented at an international meeting and are being published in a special journal section of biological applications of evolutionary computations. This year researchers set up a website to broadly disseminate results form the project and make available the software tools as they are developed and tested: http://www.uvm.edu/~jhoffma/models. Field-testing of the software will now begin. This project will benefit environmental managers by providing better predictions of

invasive species dynamics for directing control efforts.

Hatch Act funds supported this project.

**KEY THEME: INTEGRATED PEST MANAGEMENT**

**Western flower thrips coldhardiness and its relationship to greenhouse IPM –** Bedding plant sales are a major source of income for greenhouse growers. Growers rely heavily on insecticides to control western flower thrips, the primary pest of the crop. New cultural controls are needed. Many greenhouses in northern New England stand empty over the winter; we do not know if thrips can survive fallow periods in greenhouses to infest new crops in Spring. Thirteen winter-fallow greenhouses in three plant-hardiness zones in New England were monitored for thrips from December through May.

IMPACT
Thrips were found in nine greenhouses after one month and two months; eight of these had gravel and dirt floors; and virus was located in weeds in three greenhouses. Thrips were absent from greenhouses with fabric mats and where weeds were removed. This research will allow specialists to recommend specific cultural practices to eliminate overwintering thrips.

This project was funded by Hatch Act funds for the State of Vermont.

**Identifying Pests and Educating for Integrated Pest Management Intervention –** Pest control using integrated pest management strategies can reduce crop losses, money spent on pesticides and negative effect of pesticides on the environment. Laboratory analysis of pests and workshops are provided by a team of experts.

IMPACT
During FY 2003 more than 700 people were assisted, and more than 200 pest samples were identified in efforts to stem losses related to pests. Approximately 35 percent of contacts were able to directly use the information to reduce their need to purchase or apply pesticides, and crop losses were stemmed when an early outbreak of a devastating tomato pest was identified, and the news was broadcast, for growers. Approximately 400 growers and homeowners participated in workshops. Between 35 and fifty percent of participants stated they had implemented lessons learned in the workshop. One grower stated that he had saved hundreds of dollars in what would otherwise have been wasted pesticide use as a direct result of information gleaned from a workshop.

Smith-Lever funds supported this project.

**Integrated Pest Management Research and Outreach for the Apple Industry --** Apple orchards are complex ecosystems that require intensive management to produce high quality fruit. Tree growth and fruit production are intricately affected annually by the diverse biotic and abiotic factors within the environment, including numerous insects, mites, plant pathogens, weeds, and vertebrates. Effective pest management is critical in profitable and sustainable apple production.

Vermont Apple IPM Program provides orchard visits and one-on-one interactions, offering 'site-specific' information; workshops; meetings; farm tours; The Vermont Apple Newsletter; IPM

Alerts; the Vermont Apple IPM Focus website for apple IPM education and information (http://orchard.uvm.edu/uvmapple/pest); AIM (Apple Information Manager) website http://orchard.uvm.edu/aim/) and the New England Apple Pest Management Guide, which are the result of regional collaboration; and applied IPM research addressing the priorities and needs as defined by the apple industry in Vermont and the region. This past year, 150 apple orchard growers participated in IPM workshops and learning experiences.

IMPACT
The most recent evaluations of various components of the Vermont Apple IPM Program revealed that 98 percent of survey respondents used the IPM information presented in the program in their orchards; 98 percent of respondents believe participation in the IPM program improved their IPM practices; and 97 percent reduced or minimized pesticide use through using the IPM information presented in the program.

Hatch Act and Smith-Lever funds were used to support this research and outreach effort.

**Pesticide Education and Safety Program –** To apply restricted-use pesticides, Vermonters need a pesticide applicator's license. The public also needs information on safe use of pesticides. The Pesticide Education and Safety Program educates and trains certified applicators and the public on safe, effective use of pesticides and pesticide control strategies.

IMPACT
The program trained and educated 125 new applicators and more than 1,400 previously certified applicators in the safe use of pesticides and alternative pest management practices. Between FY2002 and FY 2003, more than 275 new applicators were certified. In previous years, surveys indicate that fifty percent of participants implement at least one practice recommended in the workshops.

Smith-Lever funds supported this project.

**KEY THEME: BIOLOGICAL CONTROL**

**Impact of beneficial microbes and insect-resistant transgenic corn on non-target soil microarthropods** – As new technologies are utilized in crop protection, it is important to assess their ecological impact. Special attention must be paid to microbial control agents, transgenic crop products, and residues because of their potential accumulation or multiplication in the environment. Laboratory trials have begun to evaluate toxic and chronic effects of biopesticides on non-target organisms (e.g., *Collembola*). Field trials are on going to monitor effects of transgenic corn on diversity and abundance of soil microarthropods.

IMPACT
Collembolan species diversity and number were slightly higher for isogenic silage corn plots than for transgenic (Bt) plots, though differences were not significant. In lab trials, significantly fewer eggs were produced by *Collembola* fed on diets containing Bt corn powder; there were no effects on longevity. Findings were consistent across root sample dates. Additional trials are ongoing. Results will allow us to quantify ecological impacts of biocontrol and define future research needs.

Hatch Act funds supported this project.

**Nontarget Effects of Entomopathogenic Fungi on *Pseudoscymnus tsugae* --**
Entomopathogenic fungi and beneficial predatory beetles, particularly *Pseudoscymnus tsugae,* are being developed for biological control of Hemlock woolly adelgid (HWA), an exotic pest that devastates hemlocks in parts of the eastern U.S. If both entomopathogenic fungi and predators (e.g., beneficial ladybeetles) are deployed in conjunction, it is important that they be mutually compatible. In 2001 we developed a petri dish assay system that provides for both contact and residual exposure of *P. tsugae* to entomopathogenic fungi. During 2002 we completed laboratory testing for nontarget effects against *P. tsugae* of four entomopathogenic fungi being developed to manage HWA. Adult beetles from the Alampi Beneficial Insect Lab were exposed to *Beauveria bassiana* (Bb–726 and GA–082), *Metarhizium anisopliae* (Ma–1080), and *Paecilomyces farinosus* (AT–159). During FY 2003, forest trials were conducted.

IMPACT
There was no significant difference in survivorship between P. tsugae treated with fungi and controls in laboratory trials. Negative effect of the fungi was observed against the beneficial predator in only one isolate. Initial results indicate that spring applications are reducing adelgid populations; fall trials are not yet complete. Results suggest that predator- and fungi-based management strategies are compatible, and that isolate selection is critical to success using this combination of treatments.

Hatch Act funds supported this project.

**KEYWORD: HOME LAWN AND GARDENING**

**Developing Master Gardeners --** There is a need to educate homeowners regarding the biology and life cycles of insects and diseases so that they use pesticides in a judicious manner. The program teaches interested gardeners many safe and judicious gardening practices during 14 interactive television sessions over a semester. Trainees also learn about food security, environmental and public beautification issues. Trainees then complete forty hours of community service related to gardening to obtain their certification. The Master Gardener program has increased membership by approximately ten percent per year for the past three years to more than 1,100 members around the State of Vermont.

IMPACT
This past year, more than 3,000 consultations via the Master Gardener Helpline and e-mail resulted in reduced pesticide use by home gardeners. Through efforts of the Master Gardener program, an additional 223-trained volunteers assisted in community outreach projects focused on environmental awareness, food security and public beautification. A total of 900 interns volunteered 9,000 hours to these efforts. As a result of the program, Vermonters are increasingly employing low-impact pest management practices that promote strong plant growth coupled with a decreased use of chemicals. This results in stronger, healthier crops and contributes to a decreased use of pesticides in the home garden. This year, Master Gardeners lead elementary students in projects focused on food security. Students were introduced to all of the basics of horticulture and furthered their understanding through lab projects both indoors and outside. Master Gardeners have established a full circle agricultural experience for these students. In a collaborative effort with teachers, students, and parents; they have established reclycling of

cafeteria food wastes, a composting system, and a vegetable garden. Produce harvested from the garden is used in the school cafeteria.

Smith-Lever funds supported this project.

## NATIONAL GOAL AREA 5: ENHANCED ECONOMIC OPPORTUNITY AND QUALITY OF LIFE FOR AMERICANS

During FY 2003, University of Vermont Extension and VT-AES expended 22.51 FTE's, or nearly 32 percent of all programming effort, toward enhancing economic opportunity and quality of life for Americans. A total of $2,824,403 in federal funds, or 31.2 percent of federal funding, was directed toward this National Goal Area. The effort included initiating or continuing four research projects, and conducting 793 workshops, 1,753 in-person visits, 1,114 office visits, and 6,532 phone consultations. Additionally, personnel developed four distance education events, conducted 119 radio and television appearances, and produced and maintained 23 websites.

University of Vermont Extension programs are designed to empower people and communities through research-based information and education, to address the economic and social challenges facing our youth, families, and communities. Vermonters know that change is inevitable. For many Vermont communities, the type of change during the last 15 to 20 years was not favorable. While jobs dependent upon land and natural resources have declined, the cost of living in rural areas has increased. Studies indicate a number of problems have resulted, ranging from declining levels of voter participation and public apathy toward elections to decreasing interest in volunteer activities and community groups. They also document the younger generation's apparent disinterest in public affairs and lack of knowledge about our political system. Robert Putnam has quantified this civic disengagement, documenting a 25-30 year decline in membership in civic-oriented organizations.

Rural communities that have survived and prospered have some things in common. In these towns, local efforts are fueled by a positive attitude and guided by a shared vision for the future. They promote open discussion of community needs, opportunities, and ideas in a non-judgmental atmosphere that leads to inclusive decision-making. University of Vermont Extension works with community leaders to establish a shared vision for the future of children, youth and families. Through open discussion of the current reality against this vision, opportunities and ideas are shared in a non-judgmental atmosphere leading to inclusive decision-making. Working with Extension staff, Community Steering Committees provide leadership for assessment, program initiation/expansion and evaluation

Programs such as University of Vermont Extension's Northeast Kingdom (NEK) Collaborative and Take Charge/Recharge, have leveraged more than $13 million in grants and loans supporting economic and community development projects in Vermont communities designated as Rural Economic Action Partnership (REAP) Zones. By creating periodic meetings in which groups such as economic development agencies, non-profit organizations, health care and other organizations having a stake in community well being come together, the opportunity for obtaining useful grants and loans supporting community infrastructure, housing, and rural business opportunities increases. Additionally, more than $320,000 of in-kind donations and financial contributions was raised in support of community-based improvements. Youth participation rates in community activities benefit from spin-off programs.

University of Vermont Extension also provided municipal officers with communication assistance through the Information Technology Capacity-Building in Rural Vermont program. Introducing town and municipal officers to communication opportunities using the Internet has helped 50 Vermont communities produce and maintain websites available for municipal businesses. Municipal officers and local planners from more than 100 communities have improved the use of their computer resources as communication tools. Eighty percent of towns in Vermont send officers to an annual educational conference conducted by University of Vermont Extension, where they learn how to succeed in their government positions. Large majorities find the information useful and anticipate using it frequently, and gain confidence that they can perform their jobs well.

Education, highlighting communication skills and decision-making tools, empowers individuals and families to apply practices that result in increased involvement in their communities. Targeted youth and families receive concentrated programming in life skills to enhance their success as active productive community participants. Over the past five years, thousands of parents participated in parenting workshops designed to improve parenting skills for families at-risk of violence or dissolution. By working with the Vermont justice system, University of Vermont Extension has been able to work with divorcing or separating parents to improve their skills during this period of transition. Since the workshop is mandated by the State, many do not initially attend with the expectation of gaining new insights. However, after participating and reporting gains in parenting skills, attendees report overwhelmingly that they are glad the program is state mandated.

A Babysitting Safety program teaching teenagers the behaviors and skills required to become competent babysitters has provided northern Vermont counties with more than 400 safety-certified babysitters. Most of the participants report being better able to market their skills after participating in the program. Most feel more confident and responsible, and an important few decide they are not yet ready to babysit.

New and innovative tools for assisting entrepreneurs with marketing strategies are emerging from the academic activities of faculty and students. Providing test sites in Vermont communities for this research is an effective learning opportunity for students, teachers and community members. Business people, state agency personnel and others have found that collaborations can be the key to success when managing change for a small state, such as Vermont. A multi-institutional program run with Cornell University involved the development of the Northeast Center for Food Entrepreneurship (NECFE) in order to provide a centralized source of information and assistance for small and start-up food manufacturing businesses in the region. The center provides one-stop shopping for business owners and managers in need of advice and information regarding product processing, packaging, labeling and marketing regulations. Efforts of NECFE have led to the evaluation of 456 new food prototypes for safety and technological feasibility, training for 50 instructors in the region who teach business development courses and workshops, the development of Hazard Analysis and Critical Control Point (HACCP) programs for juice, meat, seafood and egg products, the creation of new farmers' markets, and access to pilot plants to produce market trial products and demonstrate proper use of equipment. NECFE has reached over 2,000 potential and actual business entrepreneurs through workshops, websites, and phone questions answered. Efforts have assisted region-based entrepreneurs in developing

sustainable manufacturing operations of high quality foods for consumers. Expansion of web-available information and the use of video conferencing are planned for the future.

For many decades, Vermont's landscape has been a strong allure to visitors and residents alike. Research provides tourism groups and communities interested in economic development with information useful to targeting their development and marketing efforts.

**KEY WORD: PROMOTING BUSINESS PROGRAMS**

**Northeast Center for Food Entrepreneurship --** VT-AES and University of Vermont Extension have been working with Cornell University to assist new food-based processing and retail businesses in becoming successful enterprises. In its third year of operation, the Northeast Center for Food Entrepreneurship (NECFE) continued to successfully provide comprehensive assistance to food entrepreneurs with extended geographical coverage. The two center sites, Cornell University and the University of Vermont, have developed critical expertise to better address clients' needs.

IMPACT
Based on a survey of 255 people (19 percent from Vermont), since working with NECFE:

- Businesses sales generated between $600 and $4,300,000 (mean = $277,000; median = $26,000)
- Total sales of Vermont businesses totaled $7, 211, 500 (based on 58 Vermont respondents)
- 42 percent of current businesses served are farm-based
- 64 percent created employment in addition to their own job
- 53 percent of Vermont businesses reported an increase in their business assets
- 59 percent of Vermont farm-based businesses experienced growth in their business
- 100 percent of Vermont businesses remained in business while working with NECFE
  37 percent established a new business while working with NECFE. These businesses showed success in the following ways:
- 56 percent of new businesses created hired additional assistance
- New businesses generated $224,000 in sales
- In Vermont alone, 208 additional jobs were created, with 130 of these part time jobs with an average wage of $8.50 per hour and 78 of these full time jobs with an average wage of $9.25 per hour.
-

Eighty-five percent of those surveyed reported they planned to use NECFE services in the future.

Smith-Lever and Hatch Act funds were used to support this project.

**Linking community economic development with local natural resources --** There is a need in the Northeast Kingdom (NEK) to further process wood raw material like logs, pulpwood and lumber into higher value wood products. The first critical step in accomplishing this is to develop a greater capacity for kiln drying wood to the final moisture content. In particular is the need to develop small-scale drying operations suitable for the majority of small wood products businesses common in the NEK. Secondly, new higher-value products and markets need to be included in operations.

Information on alternative kiln drying methods has been researched, assembled and disseminated to small-scale wood products businesses, forest landowners, and small sawmills. One-on-one meetings and small group discussions were held to discuss the scientific principles of wood drying and practical methods of kiln drying, conditioning and equalizing wood for further high-value processing. Production and marketing strategies were also discussed.

IMPACT
An average of four lumber related businesses per year have expanded their business while working with University of Vermont Extension. Since the 1999 Plan of Work was put in place, this translates into approximately sixteen businesses. Expansions have involved increased profits, new markets, and new employee hires. In FY2001 and 2002, wood-processing plants made gains. This past year, three one-person craft shops were assisted in production improvements and in expanding marketing options for new high value products. One added a new chair line; one expanded into school furniture; and the third developed a line of items that integrated into marketing cheese products. These firms added a total of ten employees. Average increase in revenues was 20 percent. Additionally, one company was able to use high defect/low value wood to enhance chairs with character.

Smith-Lever funds were used to support this program.

**Income Tax School --** The income tax rules, laws and regulations for Vermont and Federal change yearly. Vermont is the most rural state in the union, second smallest population, lacks rural and urban services for clientele, and has one of the smaller incomes in the Northeast. State and Federal tax forms are often very complicated for Vermonters, due to the special circumstances related to rural life and businesses. Income tax schools provide opportunities for Vermont tax preparers to gain expertise and apply useful information to improve market competitiveness and savings for their clients. The University of Vermont Income Tax School is a 2-day school for CPA's, tax accountants, and tax preparers. The Income Tax School registered 373 CPA’s, tax practitioners, and others involved with tax issues.

IMPACT
This past year, 796 practitioners, representing 61 percent of all practitioners in Vermont, participated in one of two Tax Schools provided. Participants of the Income Tax School represent approximately 106,000 (more than half) of all returns filed in the state. Surveys from FY2002 indicate that 91 percent of participants improve their understanding of tax law and tax law changes by attending the course. The income tax school has decreased the average amount of time spent per tax return for tax-preparers. Each year, an attendee mentions that this is the best tax preparation program they attend all year, and many find that interactions with Internal Revenue Service (IRS) representatives are especially helpful. The IRS has a number of ‘advisory groups’ they use to edit publications. An Extension group is one of these advisory bodies. IRS representatives note that while they usually use ten to fifteen percent of suggestions made, they have used 60 to 70 percent of suggestions made working with an Extension group to revise publications.

Smith-Lever funds were used to support this program.

**KEYWORD: JOBS/EMPLOYMENT**

**Rural Farm Family Vocational Rehabilitation Program --** The agricultural industry is experiencing an economic crisis at this time. Farmers living with a disability have a daily struggle to perform daily chores, prevent secondary injuries, pay for extra medical costs, take time off from work to attend medical appointments or heal from an injury that doubles the stress from other able bodied farmers. Farmers with disabilities are more likely to stop farming due to disability. Rural and Farm Family Vocational Rehabilitation Program invests money to pay for vocational services to directly assist temporarily or permanently disabled individuals to successfully maintain an existing, or enter a new, employment situation. Paid services include worksite, home site modifications, health restoration services, training and education, transportation and other services to reduce the physical and social barriers to employment. Referral to other services, similar benefits, counseling and guidance were also provided at no cost to Rural and Farm Family Vocational Rehabilitation Program.

IMPACT
Rural and Farm Family Vocational Rehabilitation Program has invested a total of $935,857 towards paid vocational services from 1997 to 2003 directly to assist 435 temporarily or permanently disabled individuals in successfully maintaining or entering new employment. During this period, Rural and Farm Family Vocational Rehabilitation Program successfully assisted 250 individuals involved in agriculture (approximately 60 percent of all clients) to maintain the farm despite their disability. In a year like this past year, when farms received so little for their goods that many were on the brink of sustainability, several examples occurred where direct impact on program clients abated the need for farm closure. In some cases, the only assistance needed is labor coverage during a period while rehabilitation and healing take place. The program also successfully assisted 185 significantly disabled individuals to enter into successful employment not involved with agriculture. Clients work with RFFVRP for an average of 20 months prior to successful closure. The average cost per successful rehabilitation for agricultural clients during this period was $1,879. The average cost for re-employing someone in a non-agricultural position was $2,473.

Smith-Lever funds were used to support this program.

**Timber Markets --** Lack of markets and for logs, hardwood and softwood lumber and specialty wood products by individual wood products businesses and forest landowners; Communities, government, industry and individual citizens care because unemployment rises, wages stagnate, small businesses close; landowners reduce or cease sustainable management practices; state revenues decline. A small group of forest landowners, loggers, sawmill owners and specialty wood products business people were encouraged and facilitated to collaborate on a computerized wood product marketing system. The system brings buyers and sellers together on-line.

IMPACT
Pilot testing has had great success in improving the efficiency of the marketing process while increasing opportunities for forest products marketing. Market demand increased for successful wood producers and landowners. Operating revenue increased by an average of three percent and employment increased by one percent.

Smith-Lever funds were used to support this program.

**KEYWORD: COMMUNITY DEVELOPMENT**

**Town Officer Leadership Training --** Vermont's 251 municipal units (cities, towns, villages, etc.) face increasing challenges in local governance. Small states operate on more marginal economies of scale than do large states, due to the limited tax base they can provide. Vermont, with a total population of 680,000 living primarily in rural areas, faces challenging economies of scale. At the same time, Vermont historically relies on strong local governance and decisionmaking at local levels. The vast majority of local municipal officials are part time or volunteer relying on citizens to serve in both elected and appointed positions. At the same time that volunteers are becoming harder to recruit, legislative mandates are making these jobs more complex, more time-consuming, and more vulnerable to litigation. Education and professional development are critical if these municipal officials are to conduct the business of their town in a professional, efficient, and legally-defensible manner. On-going training allows officials to stay current on legislative changes, develop skills to improve their job performance, and to share strategies and concerns with their peers in other municipalities.

University of Vermont Extension has a long history of hosting comprehensive education and training for local officials through the Municipal Officers' Management Seminars and the Town Officers' Education Conference. Each of these conferences are held once each year at multiple sites around the state. The goals for these programs are manifold: promote understanding of the roles & responsibilities of local leaders; provide up-to-date information on Vermont laws, regulations, rules and policies; provide practical education in specific areas of municipal management (e.g. collecting delinquent taxes, conducting appraisals and appeal hearings, records management, and document restoration & preservation); and improve the communication and leadership skills of local officials (e.g. time management, meeting management, motivating volunteers, and conducting community needs assessments).

Unlike other learning opportunities available to this audience, Municipal Officers' Management Seminars and TOECs are unique in that they target officials from many different offices. A typical mix might include town clerks, treasurers, listers, selectboard members, planning commissioners, library trustees, health officers and zoning administrators. This mix creates a dynamic opportunity to build inter- and intra-community networks.

University of Vermont listens to its stakeholders, and maintains flexibility to meet the needs of communities facing rapid change. During workshops, Extension personnel also learned from participants that finding the balance between welcoming public comment and keeping public meetings running efficiently is a problem for many local officials. Many local officials requested training on running effective and efficient meetings. University of Vermont created a new workshop to address needs of local officials to adeptly run meetings, as a result of listening and adapting to new requests.

IMPACT

This past year, 780 officials, representing more than 80 percent of Vermont's 251 cities, towns, and villages, participated in Municipal Officers' Management Seminars. During FY 2003, 995 officials, representing 86 percent of Vermont municipal units, participated in the Annual Town

Officers Education Conference. Over the past decade, more than 10,000 local officials have been served through the programs.

Of the 780 officials participating in more than 25 workshops offered as part of the Municipal Officers' Management Seminars series during FY 2003, 59 percent reported they will be more effective in making decisions as a local official, 67 percent reported they received needed information to improve their job performance, and 52 percent reported they will use information learned at least "fairly frequently" or more.

The 995 officials responding to a survey following this year's Town Officer Education Conference reported that by participating in the conference they received needed information to improve their job performance (55 percent), they will be more effective in making decisions as a local official (53 percent), and they will use information learned at least "fairly frequently" or more (50 percent).

In evaluation following a new workshop emphasizing Meeting Fundamentals, 50 participant surveys found that 90 percent of participants believed the workshop materials would help them run meetings more effectively and 85 percent felt they had earned at least one new and useful technique they could implement at their next meeting. One participant emailed several weeks after the workshop to see if she could share the handouts of the workshop with another non-profit she works with to help them have more productive board meetings.

Smith-Lever funds were used to support this program.

**Stewardship of the Urban Landscape (SOUL) community leadership education --**
Community volunteers have a need to improve their leadership skills to gain support for projects in their towns or organizations. The SOUL Leadership Program, which teaches leadership competencies along with resource information related to improving a community's landscape, has been a successful approach to building capacity. Five 35-hour SOUL series courses were conducted this past year.

IMPACT
Ninety-eight Vermont residents completed the SOUL series between 1997 and 2002. More than half of these graduates also completed community projects as an extension of the program. The preliminary results from a 2003 follow-up survey of all Stewardship of the Urban Landscape Leadership program graduates indicate (23 percent response rate) that participation in the program motivated all participants to do something that they might not have otherwise undertaken, and to accomplish something for a community that might never been done, due to limited resources. All participants shared information with others, 80 percent changed the way they planted and cared for trees, 70 percent completed a community landscape project, half completed an urban forestry project in their communities, half applied information to work they do in local government and the media. Some of the completed community projects include:

- creating a street tree inventory and pruning trees
- landscaping for the community museum
- obtaining grant funds to implement management goals for a town forest
- lead project to bring "welcome" signs for town
- establishing a conservation commission

Sixty percent of participants stated the experience improved their effectiveness at creating change in their community through their impact on local policy-making.

Smith-Lever funds were used to support this program.

**Take Charge/ Recharge --** Community capacity for directing change increases with skillful facilitation of community-based meetings to obtain citizen input. Take Charge and Recharge programs are designed to work with rural communities in need of community development action plans.

IMPACT
More than ten of twelve participating communities, since program inception in 1992, have made significant positive changes resulting directly from work initiated through a Take Charge/ Recharge approach to decision-making and action planning. These communities have been able to leverage $6,000,000 in support of community projects. Examples include:

- One rural community's Take Charge Recreation Committee completed construction of their town playground. This committee was successful in raising over $70,000, in two years, to complete the project.
- An indoor recreation center for a rural county has been developed over twelve years after a Take Charge program identified it as a need in 1992. More than $4,000,000 has been raised since then to complete the building, where 14 people will be hired, and hundreds of families will be able to benefit through recreational opportunities the facility offers.
- A downtown revitalization committee secured over $1,000,000, completed improvements on Main Street including new sidewalks, plantings and lighting, as well as construction of a waterfront building on a local dock.
- A Recharge industrial development committee saw a need for more industrial land in their community. They were able to secure passage of a $500,000 bond to develop the infrastructure on purchased property. Today the property houses three businesses, including a large manufacturing company.
- When a ski company announced bankruptcy, local residents saw a need to recruit businesses. Efforts resulted in a successful brewery relocating to the area, development of a trails system that has enhanced summer recreation and employment opportunities in the area and received national recognition, and the purchase of the ski area by a local private school, thereby keeping it in operation. One committee member stated, "Whenever you want to accomplish something you need leaders, and Take Charge made some people step forward and be leaders. It is a lot of work, and some folks needed motivation to step forward."
- A Take Charge program in a rural county badly affected by economic woes associated with job losses due to company moves, included over 75 residents in attendance; in conjunction with the Vermont Sustainable Jobs Fund, they were was able to secure over $100,000 in funding for a Jobs Coach position, and a coach was hired to assist with employment opportunities.
- A town desired a welcome center to assist with economic and community development. Through contacts, a University of Vermont professional was able to link them with a University of Vermont student, who produced a construction plan that has since received town zoning approval.

- A town saw a need to create parking for an increasing snowmobile industry, and a dock for a lake; more than $20,000 was leveraged for construction of the projects. One committee member gave tribute to the project's success to the Take Charge program: "We wouldn't have done it without Take Charge."

Smith-Lever funds were used to support this program.

**Assessing Tourism Markets for Vermont** – Vermont tourism impacts the state by approximately $4.07 billion annually. U.S. tourists spent $2.58 billion in Vermont during this period. Economic development groups seek to better understand the structure of the Vermont tourism industry, in order to appropriately market plans for Vermont business and products. Between March 1999 and March 2000 University of Vermont researchers conducted a survey of U.S. tourists.

IMPACT
Final results of the survey indicate that U.S. tourists make 4.65 million visits annually to Vermont, with an average party size of 3.0 people, equivalent to 13.8 million person-trips. Survey data collected in 2000 and 2001 show a 47 percent increase in tourism visits between 1999 and 2001. The average length of stay per trip was 3.2.nights, average expenditure per household per trip was $445, and average expenditure on Vermont-made products was $52. Fifty-five percent of tourists reside in New England and mid-Atlantic states. August through September represent the peak visitation period, with many visiting more than once to see fall foliage (45 percent). Two thirds of visitors plan to visit again within twelve months. Annual household income of visitors tended to be $50,000 or more (45 percent), and visitors tended to have college degrees (43 percent, with 17 percent having post graduate degrees). Most visitors (68.3 percent) had no children under the age of eighteen. Almost half of all visitors (48.3 percent) used the internet as a source of information prior to their visit. In 2001, households in New England were four times more likely to make a tourism visit to Vermont than the average U.S. household. In 2001, relatively upscale households demonstrated the highest propensity to make at least one trip to Vermont, and households headed by individuals who have received a college or post-college degree were over 50 percent more likely than the average U.S. household to make one ore more trips to Vermont. Based on 2001 data, four distinct groups of households traveled to Vermont in disproportionate numbers, and hence warrant special attention: metro-achievers, small town movers, small town rustic, and new eco-topia. Results of the study provides a framework for estimating variables influencing tourism demand, and elasticities for each variable relating to number of visits, as well as to forecast the number of visits. In addition to business promoters, business owners and the general public will also benefit from the findings by using them to create a feasible strategy to adapt to the tourism industry, and to understand tourism-related issues pertinent to Vermont.

Hatch Act funds were used to support this project.

**KEYWORD: INFORMATION TECHNOLOGIES**

**CyberQuest --** One aspect of the digital divide relates to gender, in particular, among middle school age children. CyberQuest, a one-week day camp is conducted at University of Vermont

each year targeting middle school girls.

IMPACT
Approximately 20 middle school-aged girls complete the camp each summer since 1999. Eighty percent of CyberQuest participants learned new computer skills, increased their comfort level using information technology, and became more aware of careers that involve computers and information technology. Approximately 80 percent report intentions to use skills learned during the camp. For the first time in 2003, CyberQuest was staffed using a junior counselor who was a three-year alumnus of the program. This created the opportunity for a girl who had been mentored by the program to become a mentor herself.

Smith-Lever funds were used to support this project.

**KEYWORD: PARENTING**

**Parenting During Separation and Divorce** -- Strong families contribute to positive individual development and quality communities. Divorce and separation of parents can disrupt the lives and development of 40 percent to 50 percent of homes nationally and in Vermont. Parent education about the need for parents to communicate in the best interests of their children and to cooperate to protect their children from their adult conflict helps families' structure physically and emotionally secure environments for children. The transitions and adaptations family members must make can be viewed as opportunities for growth and development.

Coping with Separation and Divorce is a four-hour parenting seminar mandated at the discretion of the Vermont Family Court judges for parents with children under 18 years of age who file for divorce, legal separation, determination of parentage and child support (not married), and changes in parental rights and responsibilities. University of Vermont Extension provides the curriculum and trains community volunteers with related professional skills to facilitate the program in their local family courts. Over 100 classes are taught each year in 11 family courts, and all fourteen county courts mandate parents to attend the classes. More than thirty facilitators have been trained to teach the University of Vermont Extension-produced curriculum using video clips, role-plays, group discussion, a written response activity, the parent handbook, overhead summaries, a resource list and a take-home handbook activity.

IMPACT
Since 1993 approximately 24,000 parents have completed the 4-hour class and no parent has contested in court the judge's mandate to complete the class as part of the divorce/separation process. Seventy nine percent of parents attending the Coping Seminars agreed the class will help them be a better parent to their children through the divorce/separation process. Eighty-five percent said they intend to use something learned in the class. When asked at the beginning of the class, sixty-four percent stated they did not resent being mandated to attend the class, 21 percent stated resentment of the mandate and 15 percent did not respond to the question. At the end of the class 70 percent said the mandate is a good idea; only 32 percent said they would have attended the class without a mandate.

Parents attending Coping with Separation and Divorce classes in the County Courts have asked for more comfortable seating, and tables to write on for the four hour classes; some may also be intimidated by its location in a courthouse room. Negotiations with the Court Administrators'

Office are in process to restructure how the classes are offered face to face. An on-line synchronous class is also proposed and is currently being created to give parents another option for taking the mandated class in a place of their choice outside the courthouse. An on-line class offering would be available to parents in other states and could serve presently unmet needs in the area of improving parenting skills during stressful times, such as separation and divorce.

Smith-Lever funds were used to support this program.

**Active Parenting Program --** Active parenting programs are conducted in cooperation with Vermont Family Court for at-risk families. The Active Parenting curriculum is designed to improve parenting knowledge, skills, attitudes, and behaviors by parents of pre-schoolers, school-age children and teenagers. This past year's programs were conducted in Vermont's northeast region.

IMPACT
The program reached parents of 119 families over the past two years. Between 80 and 100 percent of participants reported they intended to use information presented at the workshop. Follow-up surveys show that an average of thirty-four percent (34 percent) of participants report improvements in parenting knowledge, attitudes and skills. An equal number, 26 participants, reported a change in behavior that improves family interactions. A common change in behavior reported was "staying calm and yelling less." A father who attended the parenting class wrote, "I had my son for the first time in 2 months and the classes that I took made a big difference in how I acted towards my son and how he acted towards me....Now I speak to him and ask him how he wants things and we talk about things and he listens to me instead of arguing with me. I give him alternatives and speak more firmly and he listens. I am impressed at the way this class helped me with him."

Smith-Lever funds were used to support this program.

**KEYWORD: WORKFORCE PREPARATION – YOUTH & ADULT**

**Horticulture education program for at-risk youth --** Various community-based studies cite a need for increased youth programming in order for youth to gain valuable life and job skills and to feel like valued and productive members of their community. Young people are increasingly becoming disconnected from where their food comes from. In addition, diet related health issues and obesity are becoming a national problem, especially among low-income populations and among children. A summer job training program and after school program for at risk youth were created and piloted. These programs engage young people in productive work on the farm and in the community and teach them necessary life, job and entrepreneurial skills. The educational programs focus on building teamwork and cooperation between youth through growing and marketing off-season crops in the greenhouse. The youth worked in teams to transform the greenhouse into a productive space. They learned to work together to get a task done, developing teamwork and communication skills. The young people also learned how to grow a product, develop a name and label for it, and sell it, developing important entrepreneurial skills in the process. Horticulture, or the growing and marketing of vegetables, flowers and herbs can provide a useful and integrated forum for teaching life and job skills to young people. Young people are also exposed to growing their own vegetables and are thereby encouraged to taste them and broaden their diets.

IMPACT
Results from a written survey by participants in the program show that 80 percent of the more than 300 youth participating over the past three years increased life skills related to workforce preparation and nutrition. More than a ton of vegetables have been grown and sold and/or distributed, and students of one of the two classes prepared complete business and marketing plans for their intended agricultural operation based on produce grown. Additional pre and post-testing showed that 85 percent of participants increased knowledge about growing horticultural crops, while 75 percent demonstrated increased knowledge of agriculture and food systems in general. Eighty-five percent of participants demonstrated an increased ability to excel in the job market, and 70 percent showed improvement in teamwork, communication, leadership, and/or public speaking life skills.

An unexpected secondary audience to the youth was also impacted positively during this quarter. The reactions from the teachers receiving the produce has been overwhelmingly positive. Our collaborating teacher has said that the delivery project has created a buzz in the middle school and high school unlike other projects. Teachers are excited about the quality of the produce as well as about the fact that youth are harvesting and delivering it to them and asking for their feedback. 100 percent of responding teachers were felt the quality of the vegetables were good or excellent. Quotes from the surveys the youth developed and distributed to the teachers follow: "Great program! I Your produce was some of the highest quality I've ever seen." "It's been great. I have loved knowing where my food has come from and delivered to my classroom door." "I loved your services and projects. I ate more veggies because they were so readily available." Youth participants were involved in every step of the process from harvest to delivery to analysis. They learned skills associated with business planning and customer service and were empowered by the positive feedback they received from their customers. In addition, youth in the mentoring program were encouraged to stay in school for that semester in order to be part of the program, thereby reducing truancy-related academic problems.

Smith-Lever funds were used to support this program.

**Vermont Farm Youth Corps --** Agriculture is a very important part of Vermont's economy and landscape. To perpetuate the future stewardship of Vermont's agricultural heritage the present stewards require opportunities to pass on their knowledge, and Vermont's youth need the training to learn from experienced elders. Vermont Farm Youth Corps (VFYC) is a program designed to increase agricultural work skills for young Vermonters (ages 16 to 21). Participants participate in an eight-week hands-on learning/working experience within the agricultural community. Focusing on intergenerational learning between current agricultural professionals and their enthusiastic VFYC apprentices, VFYC staff provides the link and necessary resources for both parties.

IMPACT
Of the more than 200 Vermonters completing the program over the past four years, more than one third remain in, or pursue careers in agricultural fields. This program was discontinued because of funding issues.

Smith-Lever funds were used to support this program.

**Babysitting safety program --** Teenagers are being hired to baby-sit without having received proper training or an understanding of safety issues associated with infant and toddler care. A Babysitting Safety Program teaches youths in grades five through eight the behaviors and skills needed to become competent babysitters, and to improve the safety of children who are being babysat. Life skills that support workforce preparation are also introduced to training participants during the five sessions required to complete the program.

IMPACT
As a result of the Babysitting Safety Program, families in northern counties of Vermont now have more than 400 certified babysitters available to them. Sixty-six percent of one group (64 participants), and 55 percent of another group (80 participants) stated they are able to better market their skills after taking the program, thereby increasing the income they can make and/or the quality of jobs they can select. Seventy-two percent of those participating in a follow-up survey of seventeen participants stated that as a result of taking the course they are "demonstrating concern for others." Also important is that 10 percent of participants decided they were not yet ready to take on the responsibilities of babysitting. Community members have expended more than $2,000 in volunteer coordinator time over the past five years to bring babysitting safety program to fruition.

Smith-Lever funds were used to support this program.

**KEYWORD: YOUTH DEVELOPMENT/4-H**

**4-H Youth Club activities** -- The University of Vermont Extension 4-H club program is an important part of the total youth development opportunity in the state. The number of youth in both urban and rural settings provides the opportunity to grow the volunteer base of 4-H, which in turn builds the youth base of the program. The beauty of 4-H is that the interests of adult volunteers can be channeled to work with a group of youth in a 4-H club. The knowledge that nearly 20 percent of all youth in Vermont under the age of 21 are in contact or have had contact with the justice system indicates the level of need to provide our youth with the opportunity to

learn positive life skills. The volunteers within a 4-H club program structure are important mentors to our youth in developing decision-making, problem-solving and communication skills, among others. The use of animals, sewing, rocketry, dance, or other similar activities are the focus for developing life skills. 4-H club activities are experiential in nature, and designed to engage youth, since an engaged person is more receptive to learning life skills from the volunteer and with their peers. Citizenship education is a major focus of 4-H activities in the State. Events include the Citizenship Washington Focus program for 4-H teens delivered through a one-week experience in our nation's capitol (held in even years); National, Vermont and New England Teen Congresses; and a Day at the Capitol. These events are followed up by voluntary completion of community service projects accomplished using the 4-H Club method. Exhibitions, Fairs, Regional and State Days and Field Days are opportunities to share 4-H Life Skills education with the community through demonstrations, exhibits and public speaking.

IMPACT

During 2003, 9,000 Vermont youths enrolled in 4-H activities, the majority of these ranging from grades five through eight and residing in rural areas or towns having fewer than 10,000 people. During FY 2003, more than 2,500 students learned about embryology, 1005 participated in horsemanship exercises, 361 participated in gardening programs, 496 participated in cattle oriented exercises, 663 participated in food and nutrition-oriented activities, and 198 participated in shooting sports. 4-H youth need an opportunity to demonstrate developing life skills in the areas of communication, record keeping, and planning/organizing. Participation in the Vermont State Fair provides the opportunity to showcase these skills, as well as many others. There was a 17 percent increase in the number of 4-H members taking part in demonstrations, livestock exhibits and project related displays at the Fair. All participants completed a 4-H project record book. After state and regional gatherings, where students demonstrate and exhibit their skills, 85 percent of 4-H youth club participants were reported to have increased knowledge and skills in public speaking or performing, and 75 percent of 4-H youth club participants increasingly applied 4-H defined life skills during the year. Life skills and knowledge gains are many and varied, depending on club emphases. Examples are noted below:

- 94 percent of youth involved in a natural resources-oriented gardening program increased understanding of water quality issues and 50 percent of these youth and their parents are actively applying skills learned to conserve water.
- 57 percent of youth working on financial skills adopted improved savings behavior.
- 56 percent of youth involved in gardening programs demonstrated an increased ability to plan and plant a garden.
- 80 percent of a youth involved in a nutrition-oriented gardening program increased their consumption of vegetables.
- 70 percent of youth completing community service projects involving mentoring report that the mentoring process was highly valuable to them.

The 4H Embryology program taught in schools around the state has reached an audience of 2,563 students, with a total audience of over 6,000 the past three years. Decision-making and direction-following skills increased for student participants. 4-H teens need a better understanding of how their government works so that they may become active and productive citizens in the future. This year, 115 Teen Congress and 14 Day at the Capitol participants gained knowledge about how the state government functions and how to make their voice heard on issues that concern them. This past year, 1,563 adult and 331 youth volunteers logged approximately $400,000 in volunteer time (based on $10 per hour). Since 1999, more than

$1,500,000 in volunteer time toward improving life skills-oriented experiences for youth has been logged.

Smith-Lever funds were used to support this program.

**Forests, Fields and Futures Teambuilding for At-Risk Youth** -- Nine percent of Vermont high school students are dropping out of school by senior year. The majority disengage students are dropping out academically between 7th and 9th grade. The majority of students are spending more time isolated in front of a computer, losing connection with peers and the community. They are less involved and concerned with natural resource issues and their community. Crime, drug use, suicide and indifference result in economic and social costs. The Forest, Fields , and Futures program identifies middle school youth at risk, and addresses issues within a total class setting to help them connect with other students, adults , and their community, and to provide a network of support for academic and social success. A teambuilding program centered on environmental conservation education was developed for at-risk youth. Youth collaborate with adults and other students to learn about environmental issues through experiential and hand-on learning options.

IMPACT
Since the program's inception, 225 at-risk youth have been served and thirty educators have been trained to conduct parts of the program. During educator training, 92 percent of participants demonstrated an increase in knowledge related to teaching life skills to youths at risk, and 88 percent of participants reported they intended to implement information gleaned from the experience. Multiple recreational trails have been established in local areas to the students and their families, and families travel the trails built by the students as part of the program. From surveys following educational experiences, 66 percent of youth participants reported skill mastery of a targeted life skill and 98 percent demonstrated improved academic success. In the first year of the program 98 percent of the students succeeded in all segments of the program. One student out of sixty six failed a class. That student now has a team of student, teacher and community volunteers to support her academic and social progress.

In a rural school with many students at risk, students cooperatively came up with a creative positive plan to address a school safety issue... a trail for students to get to school without walking up the snow cover main highway. Natural resource, youth development, highway professionals, town officials, and volunteers have come together to support the students in successfully accomplishing the trail building community service project They have laid out a plan, broken it into group projects, and begun to explore issues surrounding each segment of the plan, such as landowner permission from seven different owners. The community is very interested in the outcome of the project as a whole because it will increase the safety of children traveling to school. An online curriculum is being produced for this program.

Smith-Lever funds were used to support this program.

**Migrant Education** -- The Migrant Education Recruitment Program (MEP) serves children and youth who move with family member(s) or guardian(s) to obtain or in search of temporary or seasonal work in agriculture or logging. MEP recognizes that a positive relationship between parents and school is essential to the success of their children's academic life. In order to further and support this positive relationship, MEP offers statewide support to migrant families by identifying and submitting qualified applicants to the VT Department of Education. University

of Vermont Extension staff work closely with VT Department of Education, Supervisory Union Consortia, teachers, parents, and the agriculture community to provide services authorized by MEP legislation. University of Vermont Extension conducted presentations, put up displays, and provided promotional material at agricultural meetings, such as the Vermont Farm Bureau, Dairy Cooperative, and VT Education Office Assistants annual meetings, and the Vermont Farm Show. Newsletters and milk checks also included inserts promoting the program. Personnel distribute appropriate educational materials to newly signed up families and continue to make books and other educational materials available to qualifying families at least once every six months. Migrant Program eligible students in areas where there are no direct services often lose connection to the program, start to feel alienated, and as a consequence lose interest in learning. This year, University of Vermont Extension enlisted the cooperation of school support staff to distribute books and other educational materials to students in areas not served by a participating consortium or supervisory union.

IMPACT
This past year, 342 students eligible for the Migrant Education Program were identified, and received educational services they would not otherwise have received, as a result of the program. In order to get students engaged in reading we decided to target reading materials to their individual interests and abilities. A letter was sent from this office to all school principals who had eligible students requesting information about students' interests and reading levels. Fourteen principals responded, and 37 students received three books each that were specifically selected to fit their individual needs and fields of interest. A teacher from a very rural school called to say how much the books were appreciated by the students as well as the teachers, and how well MEP had responded to reading levels and students' interest in the selection of the books. Some rural areas do not qualify, based on migrant numbers, for a representative, but need to identify eligible students anyway. Following a mailing to one such school, a teacher volunteered her time to assist in interviewing the parents of students who might be eligible for MEP. She not only provided detailed directions to the residence and arranged for a second family to be present for possible MEP eligibility, but also made sure that there was an interpreter present. Due to her efforts, all of the identified students qualified for services.

Smith-Lever funds were used to support this program.

**KEYWORD: CHILDREN, YOUTH AND FAMILIES AT RISK (CYFAR) PROGRAM**

**Expand Caring Communities:** Programs are initiated and expanded to help youth acquire attitudes, behaviors and skills in the following competency areas: health; personal/social; knowledge, reasoning and creativity; vocational; and citizenship to succeed as adults. A variety of programming methods are incorporated at program sites to teach the competency area to children and youth audiences. As an example, youth in the Northeast Kingdom are in need of workforce development and personal responsibility lifeskills education. EnviroQuest has provided a means by which to meet the needs of at risk youth in a fun way. Through environmental science and technology programming, utilizing the JASON curriculum, these youth are improving skills in the areas of learning to learn and decision making. These weekly meetings, and week long camps during school vacations, address these needs in activity based programming that youth enjoy.

IMPACT

Impact on Children and Youth – During our previous funding period (1996 to 2001), 4,450 youth were reached in five communities with life skills programming, with 69 percent of this population demonstrating at least one positive behavior change. Year one of the second funding period began in mid-2002 and has so far accomplished the following:

- provided $47,742 in-kind and cash match by community organizations, agencies, service groups and government;
- initiated or expanded 12 site project programs;
- 11 of these programs involved and/or were led by volunteers;
- 19 community organizations, agencies, service groups and/or government officials worked in collaboration with the site projects.
- reached 664 youth with Life Skills development programming;
- 185 youth (28 percent of those reached) indicated at least one behavioral change related to Life Skills programming based on planned observation or Washington State Life Skills Evaluation System;
- reached 40 youth with 50 or more contact hours during the annual funding period; and
- initiated or expanded 3 site project programs with volunteer involvement and leadership program efforts.

One community elementary school had an established after school program two days a week called REACH (Resources, Enrichment, and Challenge) that had not attracted the seriously "at risk" students the school would like to serve. The school has had difficulty attracting and maintaining volunteers to work directly with children in the after- school program, and has also had little success in involving families of at-risk youth in school programming. Extension coordinated a new program for after-school and summer programming targeting reading and computational skills for at-risk youth using learning approaches. The program developed a Memorandum of Understanding to hire a program coordinator, and helped to raise $8450 in in-kind and cash match from community organizations, agencies, service groups and government. School administrators reported at a national site visit that the program has resulted in increased at-risk youth participation in after school programming and a well-planned, fully enrolled summer program to be offered for at-risk area youth. Coordinators report the new CYFAR programming has attracted at least 10 at risk youth who were not enrolled in the REACH program.

Of 390 youth reached with Enviroquest training, 40 demonstrated at least one positive behavior change as a result of program participation. Students contacted via in-school programming have shown strong interest in a proposed summer program. An additional 44 students were reached through summer camps. Utilizing the Washington State Life Skills Evaluation Tool, 56 percent of students reported gains in the areas of decision making and wise of use of resources. Additionally, volunteer leaders have developed such a positive relationship with the students, that five students have now received 150 contact hours of programming with a caring adult through the program.

Smith-Lever funds were used to support this project.

## B. UNIVERSITY OF VERMONT EXTENSION AND AGRICULTURAL EXPERIMENT STATION STAKEHOLDERS

At the University of Vermont, the "Research-Extension-Vermonter" connection is a continuous cycle. University of Vermont Extension and Vermont Agricultural Experiment Station rely on the input and advice from many Vermonters to help determine the relevance, usefulness, and quality of programs and research projects. This advice comes from a variety of sources and in multiple forms.

## VERMONTER POLL

Working with the College of Agriculture and Life Sciences, Center for Rural Studies, the Vermont Agricultural Experiment Station and University of Vermont Extension seek input from an annual Vermonter Opinion Poll. University of Vermont Extension has supported the university's Center for Rural Studies in conducting the representative survey of Vermonters since 1990. The 2003 poll, with 641 respondents, identified important issues for Vermonters. Poll respondents were asked to tell interviewers what issue came to mind when considering statements matching the USDA-CSREES-identified National Goal Areas (e.g., "an agricultural system that is competitive in the global economy"). Priority research and outreach programs are a reflection of Vermonter-held ideas of critical issues, as indicated by highlighted projects in this report. Poll results are used to help prioritize allocation of competitive Hatch research funds. Several shifts in perspective from those surveyed in relation to the five National Goal Areas are worth noting:

**NATIONAL GOAL AREA 1: AN AGRICULTURAL SYSTEM THAT IS HIGHLY COMPETITIVE IN THE GLOBAL ECONOMY** -- Milk prices and dairy compact statements were more frequently mentioned among people polled in FY 2003 than in FY2002.

**NATIONAL GOAL AREA 2: A SAFE AND SECURE FOOD AND FIBER SYSTEM --** Statements reflecting concern about effects of chemicals on foods increased. The top three issues of concern – chemical, organic agriculture, and GMO's/rBST in foods -- remained the three most frequently stated issues for a second year.

**NATIONAL GOAL AREA 3: A HEALTHY, WELL-NOURISHED POPULATION** – "Organic foods" was stated most frequently (tied for first rank with "balanced diet/ obesity") as an issue related to a healthy, well nourished population. In FY2002, organic foods was mentioned as an issue related to this statement by just 3.6 percent (ranked 9$^{th}$) of those polled, while this past year showed a more than four-fold increase in people stating that organic foods was an important issue related to achieving a healthy, well nourished population.

**NATIONAL GOAL AREA 4: GREATER HARMONY BETWEEN AGRICULTURE AND THE ENVIRONMENT** – Again, organic foods increased in frequency of statements, doubling from nine percent of last year's respondents to 18 percent of those surveyed this year. Water quality also increased in frequency as a stated issue for this National Goal Area statement, increasing from eight to 13 percent.

**NATIONAL GOAL AREA 5: ENHANCED ECONOMIC OPPORTUNITY AND QUALITY OF LIFE FOR AMERICANS** – Education related topics were stated less frequently, with just 9 percent of those polled referring to these statements, compared with 22 percent last year. However, "farming" was stated more frequently, with 14 percent of those polled including the topic, up from 4.5 percent in FY2002.

University of Vermont has focused VT-AES research and outreach programs on agricultural, economic, health, and environmental issues to reflect responses to poll figures, in addition to recommendations made by other stakeholder groups and expert sources.

## VERMONT AGRICULTURAL EXPERIMENT STATION BOARD OF ADVISORS

The Vermont Agricultural Experiment Station is additionally advised through the Board of Advisors for the College of Agriculture and Life Sciences. This Board consists of leaders in agriculture, small business, sustainable agriculture, food and nutrition, biology and life sciences, rural community development, higher education, and public affairs. Board members are appointed by the Dean of the College of Agriculture and Life Sciences, who is also the director of the Vermont Agricultural Experiment Station, and consist of a Board chair and two standing committees -- executive and nomination. Terms for members are for three years, with members allowed to serve up to two consecutive terms. The Board meets two times each year to advise the College of Agriculture and Life Sciences and Vermont Agricultural Experiment Station, and other times at the discretion of the president and provost of the University of Vermont. In addition to assisting Vermont Agricultural Experiment Station in identifying trends, issues and new developments in each of the CSREES-defined national goal areas, the Board advises the group on formulating strategies, setting priorities, developing resources, reviewing program plans, and cultivating relationships to bring about learning experiences, field-based research, and employment opportunities for students.

## UNIVERSITY OF VERMONT EXTENSION ADVISORY GROUPS

Individuals serving on University of Vermont Extension advisory boards and councils are central and essential to the evaluation of existing programs and the planning of new programs. University of Vermont Extension meets with a State Advisory Board four times annually, and receives advice from regional and program-oriented advisory committees on similarly periodic bases. Please see Process Review (Section C) for additional detail into the process for obtaining input from University of Vermont Extension Advisory Groups. Leaders and topic experts from throughout the Vermont and national community regularly and generously offer advice and guidance to University of Vermont Extension and the Vermont Agricultural Experiment Station. Stakeholder input for University of Vermont Extension can be further explained by describing how it is obtained for program areas within each national goal area.

### UNIVERSITY OF VERMONT EXTENSION STAKEHOLDER INPUT MECHANISMS FOR NGA 1

The most structured mechanism for receiving advisory support toward programs focusing on agricultural competitiveness is through University of Vermont Extension Advisory Councils. Advisory Councils are structured to solicit input from a broad array of interest groups. Agricultural representation includes conventional farmers, organic farmers, agribusiness professionals, and representatives of organizations and agencies. Each of the four regions has Advisory Councils with agricultural representation. The Councils meet between four and six

times per year and provide input to Regional Chairs, faculty and staff. Similarly, the State Advisory Council provides input on statewide issues. Specific program areas receive input from additional advisory boards. The Agricultural Business Management program has an advisory group that is composed of a banker, dairy producers, non-livestock producers, FSA employees, and representatives of industry. This board provides input relative to the structure and content of Agricultural Business Management workshops conducted throughout the state. Similarly, formal input is solicited on an annual basis from the Internal Revenue Service, the Vermont Tax Commissioner, and private tax accountants relative to the design of curricula for tax management workshops. The Rural and Farm Family Vocational Rehabilitation Program has active citizen advisory groups in the Northeast and Northwest Regions. These groups provide valuable input and provide a support network for disabled farmers and rural residents. Vocational Counselors receive input on program delivery and strive to address the needs of clientele.

Individual faculty and staff targeting programs toward agricultural enterprises work closely with commodity organizations on both a formal and informal basis. Extension professionals serve on committees in many of these organizations and frequently act as technical advisors. Input flows from commodity groups on both a formal and informal basis. Because of the size of the state, there is a general awareness among commodity organization about effective input channels. "Discussion Groups" are conducted throughout the state on various commodity-based topics. These groups meet on a regular schedule to discuss issues affecting their sectors. University of Vermont Extension faculty and staff members serve as facilitators for these groups. This past year University of Vermont Extension asked approximately 50 dairy producers to fill out questionnaire on specific topics they wanted cover at a future dairy meeting. A total of 38 people responded, and topics and speakers were selected using responses as a measure of interest.

Working closely with University of Vermont's Proctor Maple Research Center, Extension and Vermont Agricultural Experiment Station faculty and staff respond to the needs of Vermont's twelve county sugar maple associations and sugar makers in general. University of Vermont Extension is the only comprehensive educational and informational resource available for both commercial and small, family-based maple sugar operations. Vermont sugar makers have recommended and guided the design of an educational series on small-scale maple sugaring and have contributed critical financial resources to support the work of University of Vermont's Entomology Laboratory.

Other Vermont agencies having an interest in the agricultural sector are also consulted. A close working relationship exists between Extension and the Vermont Department of Agriculture. Many cooperative programs exist, and ideas are routinely exchanged via individual visits, telephone conversations and electronic mail. Extension professionals also readily interact with USDA FSA and NRCS personnel on both formal and informal bases. Similarly, Extension professionals maintain working relationships with personnel in local conservation districts.

Because of the small size and populations of many New England states, multi-state interaction is a necessity for effective programming. Expertise is readily exchanged across state lines. Formal interaction is facilitated through regular meetings among agricultural program leaders and Vermont program area representatives. In 2001, an agricultural directory was developed listing expertise of Extension professionals in Vermont, New Hampshire and Maine. Faculty and staff

participate in numerous multi-state programs and maintain functional informal relationships with counterparts in other states.

**UNIVERSITY OF VERMONT EXTENSION STAKEHOLDER INPUT MECHANISMS FOR NGA'S 2 & 3**

Many stakeholder groups provided input about programming related to the goals of providing safe and secure food sources, and healthy and well-nourished populations. They include University of Vermont faculty from the department of Nutrition and Food Science, Northeast Center for Food Entrepreneurship, University of Vermont Sustainable Agriculture Center, University of Vermont Extension Nutrition, Food Safety and Health Curriculum Team Advisory Group, Vermont Food Safety Network, Vermont Food Bank, Northeast Organic Farmers Association, Education and Training Council, Vermont Department of Health, Vermont Department of Education, Food and Markets, Vermont Department of Agriculture, Vermont Department of Aging and Disabilities, Southwest Council on Aging, Vermont Restaurant Assoc., Vermont Manufacturing Extension Center, AARP, Vermont Campaign to End Childhood Hunger, Serve New England, Vermont Department of Employment and Training, Head Start, Community Action Agencies, Farmer's Market Association, Vermont Specialty Food Association, Vermont Fruit and Berry Association, Conference on Food Protection, childcare providers, food service managers and food producers.

To maintain an engaged stakeholder population University of Vermont Extension faculty initiate and sustain regular communications, and involve stakeholders in programming and impact analysis. University of Vermont Extension personnel use both formal and informal approaches to engage stakeholders. The formal approach includes group process, focus group interviews, and retreats. Three priority areas were selected for programming: Food Safety, Food Security and Practical Education Nutrition and Food Preparation information. In 2000, the advisory group determined it was appropriate to allocate resources to diabetes education and to enhance our efforts to reach Vermont's senior citizens with nutrition and food safety information. Food stamp monies have helped to offset the costs of these new initiatives.

With regard to food safety issues, University of Vermont Extension food safety specialists have worked with another formal advisory group, the Vermont Food Safety Network. The network has a membership of over sixty people representing educators, food producers, regulators, and others who are interested in promoting food safety in Vermont. The Vermont Food Safety Network has, through group process, prioritized food safety issues for the state. Top priorities included: education and training; the need for certification standards regulation, and statewide strategies for the food industry; and leadership in food safety for all groups and parties.

Informal contact with stakeholders regarding food safety, food security, and nutrition programs take place daily as University of Vermont Extension personnel work with members of their communities to plan and implement their programs. Results of a survey of local food shelves and community kitchens conducted by the Vermont Food bank has been used by University of Vermont Extension to determine what types of nutrition and food safety workshops should be conducted to help Vermonters with limited resources. It is University of Vermont Extension's goal to continue to address issues specific to Vermont, enhancing the quality and impact of these program efforts by engaging in collaborations with land grant institutions across the nation, with the research and teaching faculty at University of Vermont and with other Vermont agencies and institutions.

**UNIVERSITY OF VERMONT EXTENSION STAKEHOLDER INPUT MECHANISMS FOR NGA 4**
Four major groups are consulted to obtain input on programs designed to increase harmony between agriculture and the environment: landowners in control of natural resources management; users of Vermont's natural resources; organizations interested in natural resource management; and individuals interested in natural resources management. Information on programming to meet the needs of these stakeholders comes from a variety of means. These include using surveys, personal discussions, memberships on boards and committees, and including a wide range of representatives on Extension boards and councils.

Input that was received included the need to address the economic basis of natural resources management within Vermont and balance this use against the desire to maintain a sustainable resource that meets the needs of a diverse population. There is a desire among youths to know more about their role in maintaining a sustainable environment and community while developing a sense of place.

**UNIVERSITY OF VERMONT EXTENSION STAKEHOLDER INPUT MECHANISMS FOR NGA 5**
Community and Economic Development initiatives benefit from the input of a ten-member advisory council representing a variety of agencies and organizations as well as community volunteers. These people have varied backgrounds and bring diverse perspectives to discussions and decision-making. The advisory council meets twice a year, receives informational mailings & telephone calls, and additionally, using e-mail technology, participates on a Community and Economic Development listserve. Annually, members provide advice related to programs during our planning period and help to set priorities for the team. The most recent advisors' assessment was in April 2002, when they ranked each of the potential programs based on their experience and sense of community need.

**UNIVERSITY OF VERMONT EXTENSION AND VERMONT AGRICULTURAL EXPERIMENT STATION STAKEHOLDER INPUT ON DEVELOPING RESOURCE-EFFECTIVE PROGRAMS**

Extension advisors and other Vermonters help guide Extension programs in agriculture, natural resources and environmental management, nutrition, food safety, and health, and family and community resources and economic development. The following are just some examples of programs developed in consultation with a network of University of Vermont Extension faculty and staff and advisors--including clients, commodity groups, and other Extension, Experiment Station, or University colleagues--to help determine the best use of limited resources, the most effective way to deliver a program, and opportunities for creating partnerships.

Working closely with University of Vermont's Proctor Maple Research Center, Extension and Vermont Agricultural Experiment Station faculty and staff respond to the needs of Vermont's twelve county sugar maple associations and sugar makers in general. University of Vermont Extension is the only comprehensive educational and informational resource available for both commercial and small, family-based maple sugar operations. Vermont sugar makers have recommended and guided the design of an educational series on small-scale maple sugaring and have contributed critical financial resources to support the work of University of Vermont's Entomology Laboratory.

University of Vermont Extension is an important leader among the vast number of individuals and organizations throughout the state working to support the positive development of Vermont youth. More than 1,500 volunteers invest numerous hours and incredible talent to 4-H camps and clubs and other youth-related program efforts.

**UNIVERSITY OF VERMONT EXTENSION AND VT-AES INFORMATION SHARING**

On-line databases, CRIS and VERRN, as well as circulated and on-line newsletters, IMPACT and Outreach Outlook, make program information transparent and accessible for all University of Vermont faculty and staff. An annual joint retreat with all University of Vermont Extension and VT-AES faculty and staff increased information sharing and integration opportunities. Cost savings require that University of Vermont Extension reduce levels of participation in this endeavor during FY2004. In FY2004, however, a joint retreat between Continuing Education and University of Vermont Extension will help to increase information and resource sharing among these converging groups.

## C. Process Review for FY 2003

**UNIVERSITY OF VERMONT EXTENSION**

A comprehensive system of state, regional, and curriculum advisors has contributed greatly to the ongoing, informal review of University of Vermont Extension programming. In response to AREERA, a more formal merit review of outreach activities was conducted in May 1999. Two reviewers from each of University of Vermont Extension's four curriculum/program teams' advisory groups were selected to systematically review all proposed curricula. Reviewers were asked to rate each curriculum plan according to the following criteria:

**Impact** -- programs have high potential for producing a measurable, positive impact on Vermonters
**Resource availability/accessibility** – resources exist to implement programs successfully
**Reaching diverse audiences** – programs are likely to meet needs of diverse underserved audiences
**Customer demand** -- programs are linked to clearly articulated customer need
**Collaboration** -- potential exists for collaboration within and between states and institutions
**Innovation** -- programs are unique or are not done well by others

Results of the merit review process were shared with members of the University of Vermont Extension program management team that included the chairs of on campus and regional units and program teams. Extension representatives continue to meet with the State Advisory Council four times per year to evaluate the merit of past, current and future programming foci.

As we entered the second half of this five-year plan of work, University of Vermont Extension began to implement a program development process integrating the Logic Model and Outcomes-Based Evaluation concepts into an adaptive management framework in order to improve our ability to effectively respond to the needs of Vermonters. The focus in our framework is a logical development of programs to obtain specified outcomes, and the use of feedback loops to better respond to shifts in resources, audiences, and goals. The attached model illustration (Figure 1) and timeline (Table 1) are used to assist in summarizing the process, emphasizing our focus on measurable outcomes-based programming. The model shows how our five Program Committees (Dairy; Diversified Agriculture; Family, Community Resources, and Economic Development; Natural Resource and Environmental Management; and Nutrition, Food Safety,

and Health) use their own expertise, up-to-date information, and advisor and other stakeholder input to determine a feasible set of goals for University of Vermont Extension to achieve during the next year (see Box 1: PLANNING/ INPUTS). After Curriculum Plans are produced, committees devise a set of performance (outcome) indicators that can be used to measure goal achievement.

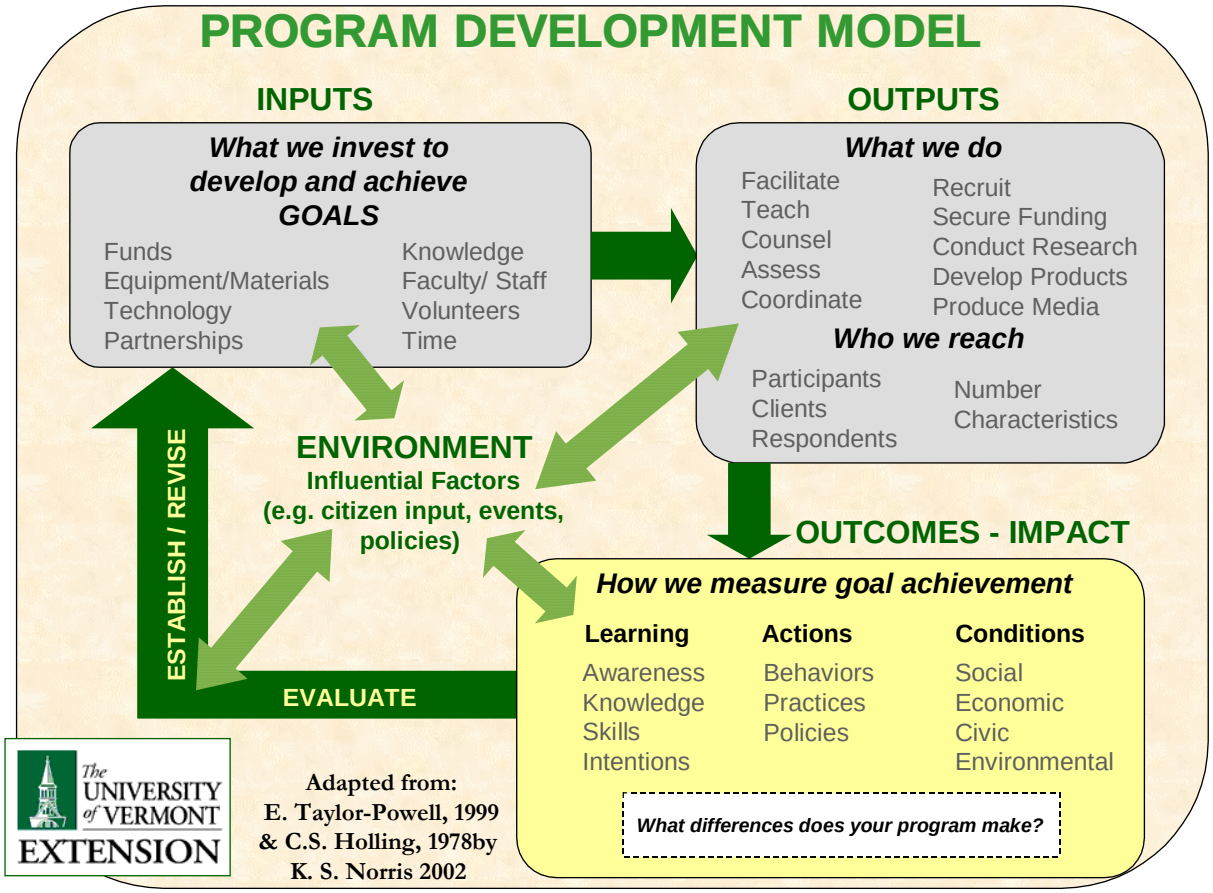


**Figure 1. University of Vermont Extension Program Development Model**

Extension faculty and staff members work together to determine how they each can best contribute to University of Vermont Extension goals by looking at the composite University of Vermont Extension Curriculum Plan (the five program-based curriculum plans combined) during the upcoming year. Then, individuals develop Personal Performance Plans describing their unique contribution to the University of Vermont Extension Curriculum Plan, including what they plan to do, and for what target audience (see Box 2: OUTPUTS). Individuals also utilize their expertise and the set of indicators provided in Curriculum Plans to define how they will measure their progress in achieving goals (see Box 3: OUTCOMES – IMPACT).

During each quarter, individuals review their Personal Performance Plans and report on their progress toward goal achievement through Statistical Summary Reports describing what they accomplished, who they reached, and the changes in learning, actions, and status or condition for the target audience they observed and/or measured (see Box 2: OUTPUTS, and Box 3: OUTCOMES – IMPACT). Personnel also have access to plans and reports of all other faculty and staff members, which can be used to modify and coordinate plans during the year.

**Table 1. University of Vermont Extension Outcomes-based Programming Timeline and Deadlines**

| Product | Responsible Party/Manager | Process Period | Deadline |
|---|---|---|---|

| | | | |
|---|---|---|---|
| Recommended priority team goals for upcoming year* | Regional Advisory Councils<br>Regional Office/Regional Chair | April | May 1 |
| Future trends report | Extension Futures Group<br>Extension Futures Group Chair | January | February** |
| Annual Report and distribution | CTR/State Office | November - January | March 1 |
| Recommended upcoming year's priority program objectives* | Program Advisory Groups<br>State Office/Program Coordinator | February - March | April 1 |
| Assessment of program effectiveness* | Program Advisory Groups<br>State Office/Program Coordinators | October - November | November 30 |
| Curricular Plan Outline (goals, objectives, outcomes, and indicators) | Program Teams Program Coordinator | April - May | June 1 |
| Recommended modifications of Curricular Plan Outlines* | State Advisory Council<br>State Office | June | July 1 |
| Approval of Curriculum Plan Outlines | State Office | June | July 1 |
| Personal Performance Plans (PPP's) | Faculty and Program Staff | July | August 1 |
| Critique of individual PPP's fit with Curricular Plan | Program Coordinator | August | August 15 |
| Approval of PPP's | Unit Chairs | August - September | September 15 |
| Final Approval of PPP's | State Office | September 15-30 | September 30 |
| Individual quarterly reports (January, April, July, and October) | Faculty/Staff | quarterly | 10th of month |

* Citizen advisory input

** Full reports are delivered only in the third and fifth year of the Five-year Plan of Work

Curriculum Plans, information about available resources, and an annual report summarizing actual outcomes and impacts collected using an online database, are shared with key (program-, regional-, and state-level) advisors and other stakeholder groups to gather feedback regarding the quality of our accomplishments, gaps in progress, and recommendations for changes in direction based on new information gleaned over the year (see "EVALUATE" and "ESTABLISH/ REVISE" arrows). We rely on active participation and input of well-appointed advisory group members (see reference in the "ENVIRONMENT – Influential Factors" bubble), when establishing, evaluating, and revising our goals and objectives each year. Extension Program Committees likewise evaluate progress and available resources, and incorporate new information gathered from our advisors. Data from committees and stakeholder groups are then used to revise the next year's Curriculum Plan, including changes made to goals and performance indicators. (return to Box 1: PLANNING INPUTS). In this way, University of Vermont Extension utilizes quarterly and annual feedback loops that involve individual, program committee, external, and organizational evaluation and revision processes to improve program relevance and effectiveness on a continuous basis. A flexible, "real-time" on-line integrated program for planning and reporting is used as an information sharing mechanism for all stages of program development.

FY 2003 was the first year the program development model has been fully implemented. Preliminary feedback from advisors indicates they feel they are listened to in an effective manner using this new program development framework. The system has not been in place long enough for advisors or employees to determine whether it has impacted programming quality. However, we have had shifts in program direction taking place since this system has been introduced. Some of these shifts were driven by changes in staff numbers and positions. Some people in the organization have moved to higher priority issues, as outlined by program teams in Curriculum Plans, developed with the input from statistical summary report data and advisors, as well as other stakeholders. Feedback from employees indicates that the newer program development framework provides a better opportunity to obtain quality data from advisors. We are re-evaluating our mechanisms for obtaining stakeholder feedback, including the process used for selecting advisors, in order to ensure that we obtain useful, representative, balanced information to help us proceed toward fulfilling our mission. We are also working to better track cumulative information for our longer-term programs, to better describe cumulative impacts relative to expectations.

**VERMONT AGRICULTURAL EXPERIMENT STATION**

The Vermont Agricultural Experiment Station awards Hatch funding annually through a competitive, rigorous peer review process. Reviewers represent faculty from a variety of disciplines. Proposals are judged in the following areas:

- Problem Statement – Is the problem well justified? Will this project enhance the capacity of VT-AES to attract new resources or to generate knowledge?
- Importance of the research to Vermont
- Scientific and Technical Feasibility
- Overall assessment of scientific merit
- Past record of accomplishment of P.I.(s) and/or potential for future success
- Budget justification
- Potential for timely application or transfer of results.

The review process is for all Hatch funded research, including regional projects. Proposals may be approved with or without funding. Approved proposals are sent to USDA/CSREES for final approval at the federal level. A copy of Hatch proposal review guidelines is appended to this report. Since the implementation of this competitive review process in 1994, the Vermont Agricultural Experiment Station has witnessed a marked increase in research proposal quality, and an increase in the absolute amount and percent of funds leveraged through external sources.

A rigorous review process is also held for funds set aside from Hatch and Smith-Lever monies to fund projects that effectively assist the Vermont public through a combination of research and outreach. **Vermont Integrated Research and Extension Award (VIRECA)** proposals are merit and peer reviewed by a panel consisting of research and Extension faculty as well as stakeholders representing research and Extension constituencies. Eligible proposals must include at least one VT-AES and one University of Vermont Extension faculty member, and must be clearly linked to at least one the five national goal areas and priority areas identified by our advisors and stakeholders. These priorities include food safety; food security; rural communities; and water quality. The program has funded four projects since FY2000. Additionally, two new projects are being funded for FY2005-2006.

## D. Evaluation of the Success of Multi and Joint Activities

**MULTI-INSTITUTIONAL AND INTERDISCIPLINARY ACTIVITIES**

A recent update on stakeholder-expressed goals for University of Vermont Extension and VT-AES (through the use of a regular, formal process of advisory review at several levels, as well as polls conducted with state-based field experts and citizens at large) show that the organizations are addressing the critical issues identified by stakeholders today, while still responding to critical issues from the FY2000 – 2004 Plan of Work. Vermont's work with other states and institutions addresses these issues. Interdisciplinary research and outreach also serve to address these issues. Despite the relative lack of racial diversity in the state (approximately 97 percent of Vermonters are White), there are other characteristics of Extension clients and stakeholders that identify target populations as underserved for educational programming and human service efforts. Examples of these populations include rural people and communities (most of Vermont's area is rural); limited-resource Vermonters; small scale agricultural producers; people affected by disabling injury or disease; women; and children, youth and families at-risk. Below, multi-institutional, multidisciplinary, integrated, and multistate activities are described in relationship to identified stakeholder interests and concerns. The reader will note from these descriptions that through combining resources with other institutions and personnel, planned programs met and exceeded expected outcomes and impacts for the period, and program effectiveness and efficiencies were improved.

***Stakeholders** have a strong interest in **reducing soil, water and airborne chemicals** and their negative effects on the environment and quality of life, **while also strongly supporting farms** and agriculture as sustainable businesses and lifestyles for Vermonters.* Stakeholders show a keen interest in protecting water through reduced high-nutrient run-off, changing land use patterns, and a reduction in conventional pesticide and herbicide use. The reader will be able to see from the examples below, that combining projects and multiple state aims to improve water quality in waterways has effectively increased the ability of VT-AES researchers and University of

Vermont Extension field faculty and staff to leverage additional funds, and to expand reach and scope of projects for a small state like Vermont.

The **Integrated Crop Management** project has led to strong commitment on the part of ten participating communities along either side of the river (and therefore in different states). By-laws of the newly formed bi-state organization have been developed and implemented. Impact on policies, programs, or behaviors affecting the Connecticut River Valley watershed has yet to be determined. Additional efforts in the area of water quality improvement include a nutrient management planning and education program targeting dairy farmers in Vermont, New York, Pennsylvania, and New Hampshire. Colleagues have joined forces to advance research, which has led to recommendations for farmers about the most cost effective ways to reduce phosphorus loading in waterways leading from their fields.

University of Vermont research and outreach specialists have been collaborating with Penn State University to update software (Crop MD) that uses soil test values, manure test values, animal unit descriptions, and intended cropping practices to help farmers develop farm- and field-specific nutrient management plans to reduce non-point-source pollution from livestock waste. Personnel then train farmers to use the **Vermont CropMDv3_VT** computer database program to record activities and plan for improved farm practices that will increase profitability and reduce non-point source pollution. To date, 400 users have been trained in using the software (and have copies of the software); 130 agency personnel are trained and certified to interpret the summary output submitted to the Natural Resource Conservation Service (NRCS) / Farm Service Agency (FSA) for evidence of program participation compliance; 120 farmers have developed nutrient management plans using the software to mange nutrient loads on the farm; 85 percent of respondents to a follow-up survey felt that the software was excellent to good as a tool for improving their nutrient planning and record keeping ability; and 100 percent of respondents indicated an improvement in farm profitability as a result of using the program. Reducing the phosphorus content in feed, creating buffers, and receiving advice from consultants, provides dairy farmers with a cost-effective mechanism for maintaining water quality as herd size grows.

University of Vermont researchers have been refining a useable measure for farmers to use in determining the potential for phosphorous runoff from individual fields and thereby provide farmers the flexibility to modify management practices related to manure and crop management on their fields. The original **Vermont P-index** has been used in nutrient management planning on a number of farms, but is now undergoing evaluation and revision to incorporate current research and other information; 172 users in 2002 reported gains in knowledge about the use and efficacy of the P-index.

The **Watershed Alliance** project focuses on education and outreach related to watershed and coastal water quality around the Lake Champlain Basin. The project is supported by USDA, University of Vermont School of Natural Resources, and Lake Champlain Sea Grant dollars. While University of Vermont Extension is focused on watershed management and stewardship, colleagues at State University of New York -- Plattsburg offer expertise in fisheries for the bi-state Lake Champlain Sea Grant program. The efforts have created youth-led actions resulting in safer water for communities. Vermont has been working with New York to bring Vermont's Watershed Alliance curriculum and program coordination to middle school students in New York. This program has helped thousands of students learn how humans impact waterways, and the results of these impacts on water quality and associated water uses. Actions to improve

water quality have been taken by some communities in response to findings presented by students.

**Greenhouse and apple growers** have serious insect pest problems that limit their productivity and the value of their crops. Greenhouse growers would like to **reduce their reliance on chemical insecticides**. These compounds pose risks to applicators and the public. They also are losing efficacy due to insect resistance. In cooperation with colleagues throughout New England, University of Vermont research and Extension specialists continue to deliver cutting edge research and educational information to aid greenhouse growers in adopting safer integrated pest management strategies. Tremendous success in this area has helped the greenhouse industry to "blossom" in this region of the country. Examples of our recent successes include research and outreach that has improved what greenhouse growers know about fungi that can supplant conventional sprays to reduce insect pests; about spraying techniques and tools that can reduce the amount of pesticides used while increasing spray effectiveness; changing greenhouse flooring to eliminate overwintering insects without resorting to chemical pesticides; and numerous other integrated pest management strategies. This past year, Vermont produced the New England Apple Pest Management Guide in coordination with other New England states.

***Stakeholders** have a strong interest in **improving health and access to safe and healthy foods** for Vermonters.* University of Vermont researchers and outreach specialists joined forces to conduct several technology-based projects addressing the food-oriented needs of the underserved. Additional funding was leveraged for the projects due to their emphasis on explicitly and effectively combining research with outreach, and/or working with other states addressing the same problem set.

The first project highlighted here was conducted to determine if the internet is an effective tool for **providing nutrition and health information for the elderly,** while providing outreach and support for this target population in the process. VT-AES and University of Vermont Extension personnel developed an interactive, multimedia, touch screen computer application, designed to collect nutrition and health information as well as deliver nutrition, food safety and health information tailored to the needs of older adults. Significant positive changes were observed for internet users during the twelve-month study with regard to fat intake, eating vegetables and fruits as snacks, beliefs about one's own health levels, awareness about the relationship between diet and developing osteoporosis, and beliefs about the difficulty of including adequate calcium in their diets, whereas no significant differences were noted for people in the control group. Secondary outcomes included significant differences in confidence using computers, and beliefs that using computers can aid in developing healthy eating habits.

Through use of **laptop computers** in the home, **nutrition educators** used a nutrition curriculum that is designed to be interactive, and specifically targeted to **individuals and families with limited resources**. More than 200 participants have shown nutrition gains. University of Vermont Extension **food safety** specialists are working with faculty from New England, New York, Wisconsin, and West Virginia on food safety programs that emphasize reducing microbial contamination on produce. Food safety curricula have been developed, used to train instructors, and disseminated throughout the country, based on the combined efforts of University of Vermont Extension, University of Rhode Island, University of Connecticut, and the University of New Hampshire. Pooling resources made what may have otherwise been a daunting task for any one state to complete, quite feasible and effective in reaching a large, critical audience.

Food certification of school food service workers translates into safer school food for our children, who are most at risk of food-borne illnesses.

***Stakeholders** express a strong concern for **the viability of small farms and dairy farms** in Vermont.* Multistate and integrated projects have increased in-state and out-of-state participation by both experts and laypeople, who benefit from the synergy of these shared experiences. Projects have benefited from increased funding leveraged and improved facilities combined with complementary areas of expertise. Farmers benefit by the greater advances occurring in the research realm as a result of these efforts, and by the synergistic effect associated with broader and deeper educational experiences possible due to the combined efforts and diverse experiences of researchers and outreach personnel from multiple states.

An excellent example of University of Vermont researchers working with other states is the **bovine mastitis** project. VT-AES researchers are active participants in a study of mastitis-resistant animals involving colleagues from 13 states as well as Canada and England. This work has led to scientific breakthroughs that could significantly improve animal health and welfare and potentially save the dairy industry millions of dollars. The key to this scientific advancements has been the cloning and modification of a gene that helps destroy bacterial cells that cause mastitis. The University of Vermont researchers changed the lysostaphin gene sequence so that the protein would be manufactured directly, and only, by an animal's mammary cells. The University of Vermont gene has been used successfully in a collaborative effort with scientists at the U.S. Department of Agriculture laboratory in Beltsville, Maryland, who have produced mice that are resistant to mastitis. The USDA and Vermont scientists also are working with the University of Vermont gene to produce a mastitis-resistant cow. "The beauty of lysostaphin is that it only attacks the staphylococcal bacteria that cause mastitis. It has no impact whatsoever on other cells," says John Bramley, lead researcher. Bob Wall, a USDA research physiologist collaborating with the University of Vermont scientists, states, "We have had this goal, since the technology became available, to improve milk production characteristics of farm animals to benefit the animal, the producer, and the consumer. University of Vermont has come up with the potential gene needed to do this."

University of Vermont Apple Team researchers and Extension faculty are continuing long-term collaborations with Cornell University to **develop and field test new apple and grape cultivars** that will eventually improve the hardiness and quality of Vermont's apple crop, and expand the fruit growing industry in Vermont. Several apple cultivars have been developed and field tested for Vermont, and outreach efforts have increased their use throughout the state, where apple growers are receiving increased per-bushel prices. Several grape cultivars have also been identified as appropriate for Vermont climate and orchard conditions, and field testing of these cultivars will begin this year. The 2003 New England Vegetable and Berry Conference and Trade Show was held on December 16-18 in Manchester, NH. This was the first time the conference was held in combination with the New England Fruit Meeting. Almost thirty steering committee members from across New England and eastern NY planned the conference, representing Cooperative Extension groups, Agricultural Experiment.Stations, grower associations, and industry. The conference was attended by 1,348 people with a vast majority planning to implement practices learned through the conference.

University of Vermont Extension agricultural specialists are working closely with the University of New Hampshire to improve the business acumen of farmers. **Agricultural Business**

**Management** courses taught to Vermont and New Hampshire audiences improved business knowledge, use of business plans, and success in financing business decisions by farmers. A recent letter from University of New Hampshire Extension Dairy professor and specialist, John Porter noted that Vermont's collaboration with New Hampshire has increased farmer participation in programs, whose educational experience is improved by the complementary facilitation styles of the two state's Extension representatives. Additionally, he noted that Vermont's longstanding work in the program offers program continuity, which improves program effectiveness. Typical results show that more than 70 percent of attendees apply what they learn in the course to their own operations. As a result of the impact it has had on farm management, monetary support for farmers to attend the class has been extended by Vermont Farm Credit, Lyndonville Savings Bank, VEDA/VACC, St. Albans Coop, Agrimark, Vermont Land Trust, Dairylea, and Dairy Farmers of America, among others.

***Stakeholders** show a high interest in supporting **diversified and organic agricultural** pursuits.* This once small area of interest is rapidly growing, and represents an area where demand can greatly exceed supply when research and outreach demands are considered. Multistate efforts combining product testing and outreach help to serve more food industry clients trying to break into this niche more effectively, as there can be a "one-stop-shopping" opportunity for information regarding several areas of interest to entrepreneurs – from product testing and safety guidelines to packaging and marketing questions. Multistate efforts have broadened the support and service base for women entering agriculture as well. Research has combined with outreach efforts to assist in developing solutions to address economic woes of traditionally rural areas interested in sustaining farms and farmlands. Research helped to provide an avenue for change, and outreach assisted in the capacity building and implementation of desired change at a community level. Examples are provided below.

The establishment of the joint University of Vermont—Cornell University **Northeast Center for Food Entrepreneurship (NECFE)** through the successful proposal award of $3.8 million by USDA Fund for Rural America, has produced a synergy among researchers and outreach personnel for food manufacturing start-up and small businesses in northeastern states from Pennsylvania to Maine. NECFE has assisted in analyzing more than 400 products for safety and marketing feasibility. The center provided direct assistance or training to more than 1,900 people in food safety, food processing, and business development and marketing, complemented by appropriate referrals to existing local service providers. Among other outcomes, 85 percent of clients agreed that NECFE services met their expectations and 87 percent agreed that NECFE services provided the information and assistance that they needed. The center has also helped entrepreneurs to expand sales beyond state lines – to other regions, and internationally. NECFE is a growing organization, creating a large, northeast cooperative for food manufacturing entrepreneurs.

The **Women's Agricultural Network (WAgN),** originally funded through a USDA Technical Assistance Program, provides education and technical assistance for women farmers and introduces them to the services and programs of the USDA. One objective of the program is to develop federal, state and local partners to provide women with a comprehensive continuum of services. Since its inception in 1995, WagN has grown to include 1,040 members in Vermont, and more than 189 out-of-state members. While 635 individuals have received technical assistance and 780 have attended workshops conducted through WagN, 1,600 households actually subscribe to the WagN quarterly journal. WagN has served as a model program for

newly started WagN's in Maine and New Hampshire. Since the program's inception in 1995, two hundred members have completed business plans, and the WagN program has expanded to two other states (Maine and New Hampshire).

Combining Extension and VT-AES funds, University of Vermont conducted preliminary research through multiple survey analyses and focus groups to examine Vermonters' perceptions and purchasing of local and organic foods. The study was designed to provide information that will assist in the direction and marketing efforts for the **Vermont Locally Grown Collaborative**. Through bivariate and regression analysis of the survey results, one study found that consumers' expenditures on non-local organic food products compete with expenditures on local non-organic food products, and foods that are both organic and local may have a niche in the market. A **farmers' market** developed in one economically depressed area of Vermont is infusing capital into the town's farms. The Market enjoyed an exceptionally successful first year. Average weekly vendor income for the first season was $125, with individual vendors earning up to $375. Average weekly vendor income increased in 2002 and the market committee initiated important changes in the season length to ensure the markets future success. The 2003 season has been a season of continued growth with five new vendors joining the Farmers' Market and a consistent weekly customer base.

***Stakeholders** support the **economic viability** of the many rural towns and villages in Vermont, as well as **quality education** for residents throughout Vermont.* Working with a Kentucky-based CYFAR Liaison, and people from Iowa, Arizona, and Penn State, several projects have been initiated and expanded as part of an umbrella to E**xpand Caring Communities** and **Engage Youth in Communities**. During the previous funding period (1996 to 2001), 4,450 youth were reached in five communities with life skills programming, with 69 percent of this population demonstrating at least one positive behavior change. Year one of the second funding period began in mid-2002 and has so far provided $47,742 in-kind and cash match by community organizations, agencies, service groups and government; initiated or expanded 12 site project programs; 11 of these programs involved and/or were led by volunteers; 19 community organizations, agencies, service groups and/or government officials worked in collaboration with the site projects; reached 664 youth with Life Skills development programming; 185 youth (28 percent of those reached) indicated at least one behavioral change related to Life Skills programming based on planned observation or Washington State Life Skills Evaluation System; reached 40 youth with 50 or more contact hours during the annual funding period; and initiated or expanded 3 site project programs with volunteer involvement and leadership program efforts.

## MULTI-STATE ACTIVITIES

As part of the national land grant system, University of Vermont Extension and Agricultural Experiment Station are involved in a variety of multi-state outreach and research activities that address the five national goal areas. Many of our agricultural research and outreach efforts involve other states, since Vermont and many neighboring New England states are small in size and population. Sample sizes and economical outreach numbers often improve when efforts are combined. Table 2 shows that $506,340 in federal and state funding supported more than twenty multi-state programs conducted by UVM Extension. Below are highlighted multi-state projects showing how interstate coordination produced quality impacts for citizens in Vermont and elsewhere.

Research conducted on **western flower thrips for greenhouse growers** was conducted in coordination with other New England states. The western flower thrips (WFT) is a persistent and devastating pest to the greenhouse industry, particularly because of its ability to transmit plant pathogenic viruses. There is uncertainty if WFT survive winters in northern latitudes of the United States. Development of management strategies would be influenced by knowing whether WFT overwinter or if outbreaks result from infestation on incoming plant material. Data indicate that exposure to sub-lethal temperatures substantially reduces longevity and fecundity of females. This information will facilitate the development of cultural practices centered on low winter temperatures for greenhouse growers. Fecundity of surviving adult female WFT is now being examined. New work is also being done to compile information from growers about current practices used to manage thrips populations, and the perceived effectiveness of these practices. Workshops conducted in Vermont, Main and New Hampshire included sessions on biocontrols for insect pests and diseases, where this information was presented to more than 120 growers. Also, many greenhouses in northern New England stand empty over the winter; it is not known whether thrips can survive fallow periods in greenhouses to infest new crops in Spring. Thirteen winter-fallow greenhouses in three plant-hardiness zones in New England were monitored for thrips from December through May. Thrips were found in nine greenhouses after one month and two months; eight of these had gravel and dirt floors; and virus was located in weeds in three greenhouses. Thrips were absent from greenhouses with fabric mats and where weeds were removed. This research will allow specialists to recommend specific cultural practices to eliminate overwintering thrips.

To remain competitive, **commercial vegetable and berry growers** need the latest production and marketing information that research, extension, industry and their colleagues have to offer. Commercial vegetable and berry growers need a variety of options for obtaining up-to-date production and marketing information. The 2003 New England Vegetable and Berry Conference and Trade Show was held on December 16-18 in Manchester, NH. This was the first time the conference was held in combination with the New England Fruit Meeting. Almost thirty steering committee members from across New England and eastern NY planned the conference, representing Cooperative Extension groups, CT Agricultural Experiment.Station, grower associations, and industry. The conference was attended by 1,348 people, including 285 people associated with the trade show having over 100 exhibits. Of the 231 people returning evaluations, 97 percent said the educational sessions were good to excellent, and 90 percent said the trade show was good or excellent. As a result of attending the conference, 92 percent of respondents said their pest management would be improved, 88 percent said their soil or nutrient management would be improved, and 82 percent said their farm profitability would be improved. A new source of information was found by 90 percent of respondents, and 79 percent said they planned to implement a new practice in the coming year as a result of the conference.

**Greenhouse and apple growers** have serious insect pest problems that limit their productivity and the value of their crops. Greenhouse growers would like to reduce their reliance on chemical insecticides. These compounds pose risks to applicators and the public. They also are losing efficacy due to insect resistance. Growers have indicated in surveys that workshops with a hands-on format are the best for transferring pest management techniques. In cooperation with other extension specialists, we organized workshops in Maine, Vermont and New Hampshire to address this educational need. These workshops encourage sound IPM practices that minimize chemical pesticide use, which will reduce risks to the environment and human health. University of Vermont Extension conducted three hands-on workshops to demonstrate non-chemical

approaches to managing pests. Thirty-nine of 155 workshop respondents (25 percent) stated that they planned to adopt at least one management practice recommended in the workshop. This past year, Vermont produced the New England Apple Pest Management Guide in coordination with other New England states.

The **Integrated Crop Management** project has led to strong commitment on the part of ten participating communities along either side of the Connecticut river (and therefore in different states). By-laws of the newly formed bi-state organization have been developed and implemented. Impact on policies, programs, or behaviors affecting the Connecticut River Valley watershed has yet to be determined. Additional efforts in the area of water quality improvement include a nutrient management planning and education program targeting dairy farmers in Vermont, New York, Pennsylvania, and New Hampshire. Colleagues have joined forces to advance research, which has led to recommendations for farmers about the most cost effective ways to reduce phosphorus loading in waterways. Reducing the phosphorus content in feed, creating buffers, and receiving advice from consultants, provides dairy farmers with a cost-effective mechanism for maintaining water quality as herd size grows.

The **Women's Agricultural Network (WAgN),** originally funded through a USDA Technical Assistance Program, provides education and technical assistance for women farmers and introduces them to the services and programs of the USDA. One objective of the program is to develop federal, state and local partners to provide women with a comprehensive continuum of services. Since its inception in 1995, WagN has grown to include 1,040 members in Vermont, and more than 189 out-of-state members. While 635 individuals have received technical assistance and 780 have attended workshops conducted through WagN, 1,600 households actually subscribe to the WagN quarterly journal. WagN has served as a model program for newly started WagN's in Maine and New Hampshire. Since the program's inception in 1995, two hundred members have completed business plans, and the WagN program has expanded to two other states (Maine and New Hampshire). Grants now fund the project's coordinator. Seventy-seven women who participated between 2000 and 2003 were surveyed, and 48 percent, or 37 women, responded. Responses indicate that 44 percent of these individuals have started an agricultural business and 22 percent have decided that a business is not a viable option. Thirty-three percent of respondents indicate they have continued to take classes and workshops to fill knowledge and skill gaps.

The establishment of the joint University of Vermont—Cornell University **Northeast Center for Food Entrepreneurship (NECFE)** through the successful proposal award of $3.8 million by USDA Fund for Rural America, has produced a synergy among researchers and outreach personnel for food manufacturing start-up and small businesses in northeastern states from Pennsylvania to Maine. NECFE has assisted in analyzing more than 400 products for safety and marketing feasibility. The center provided direct assistance or training to more than 1,900 people in food safety, food processing, and business development and marketing, complemented by appropriate referrals to existing local service providers. Among other outcomes, 85 percent of clients agreed that NECFE services met their expectations and 87 percent agreed that NECFE services provided the information and assistance that they needed. The center has also helped entrepreneurs to expand sales beyond state lines – to other regions, and internationally. NECFE is a growing organization, creating a large, northeast cooperative for food manufacturing entrepreneurs.

University of Vermont Extension **food safety** specialists are working with faculty from New England, New York, Wisconsin, and West Virginia on food safety programs that emphasize reducing microbial contamination on produce. Food safety curricula have been developed, used to train instructors, and disseminated throughout the country, based on the combined efforts of University of Vermont Extension, University of Rhode Island, University of Connecticut, and the University of New Hampshire. Food certification of school food service workers translates into safer school food for our children, who are most at risk of food-borne illnesses. Vermont has certified over 200 food service workers, making them eligible for promotion and pay raises, as well.

**Table2**

**U.S. Department of Agriculture**
**Cooperative State Research, Education, and Extension Service**
**Supplement to the 5-Year Plan of Work**
**Multistate Extension Activities and Integrated Activities**
**(Attach Brief Summaries)**

**Institution___University of Vermont Extension_____**
**State_____Vermont_____**

**Check one: _X_ Multistate Extension Activities**
**____ Integrated Activities (Hatch Act Funds)**
**____ Integrated Activities (Smith-Lever Act Funds)**

| | Estimated Costs | | | | |
|---|---|---|---|---|---|
| **Title of Planned Program/Activity** | **FY 2000** | **FY 2001** | **FY 2002** | **FY 2003** | **FY 2004** |
| **NGA1: Competitive Agriculture_____** | **71,367** | **120,532** | **118,449** | **158,380** | _____ |
| **NGA2: Food Safety_____** | **17,329** | **25,526** | **24,947** | **57,700** | _____ |
| **NGA 3: Nutrition _____** | **1,472** | **0** | **0** | **0** | _____ |
| **NGA 4: Natural Resources & Environment** | **30,885** | **10,400** | **131,456** | **80,926** | _____ |
| **NGA 5: Economic Opportunity/Quality of Life** | **19,133** | **102,218** | **183,192** | **209,334** | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| **Total** | **140,186** | **258,677** | **458,044** | **506,340** | _____ |

**_____ __3/14/03_____**
**Director Date**

## INTEGRATED ACTIVITIES

An effective method of integrating research and Extension activities at the University of Vermont is through the split appointment of faculty. At present, there are faculty with split appointments in the following departments: Animal Sciences; Community Development & Applied Economics; Plant & Soil Science; and Nutrition & Food Science. In addition to teaching and research, faculty members are assigned to Extension curriculum/program teams and play active roles in developing and implementing outreach programs.

To encourage greater collaboration and integration between University of Vermont research and Extension faculty, a pool of targeted funds has been developed to support a competitive grant proposal process—The Vermont Integrated Research and Extension Award (VIRECA). Funding for accepted proposals comes from a fund joining Hatch and Smith-Lever funds. Research proposals are merit and peer reviewed by a panel consisting of research and Extension faculty as well as stakeholders representing research and Extension constituencies. Eligible research proposals must include at least one VT-AES and one University of Vermont Extension faculty member, and must be clearly linked to at least one the five national goal areas and priority areas identified by our advisors and stakeholders. These priorities include:

- Food Safety
- Food Security--increasing local consumption of Vermont grown foods
- Rural Communities--the Working Landscape and Workforce Development
- Water Quality--reducing non-point source pollution, alternative nutrient management and feeding management strategies

The program has funded four projects since FY2000. Additionally, two new projects are being funded for FY2005-2006. Below are projects integrating Hatch and Smith-Lever funds to combine research and outreach activities, beginning with the four projects supported through VIRECA funding. Nearly $900,000 in Smith-Lever funds and more than $600,000 in Hatch Act funds supported integrated projects during FY 2003 (Tables 3 and 4). Below is a summary of projects that effectively combined research and outreach activities to achieve impacts for Vermont citizens.

**Farmer's Market Development --** Building on a variety of community development projects already underway this project investigates strategies to expand the community development benefits of farmers' markets. The project is focusing on expanding and evaluating how education and direct marketing strategies for farmers affect the incomes of participating farmers. The project is also involved in promoting and measuring the impact of the Farm to Family food coupon program on improving access to healthy foods for low-income families.

IMPACT

The farmer's market enjoyed an exceptionally successful first year in FY2002. Average weekly vendor income for the first season was $125, with individual vendors earning up to $375. Average weekly vendor income increased in 2002 and the market committee initiated important changes in the season length to ensure the markets future success.

The 2003 season has been a season of continued growth with five new vendors joining the Farmers' Market and a consistent weekly customer base. In FY2002 market was certified eligible to participate in the Farm to Family Food Coupon program for the 2002 season, providing families receiving food stamps with coupons that can only be redeemed at Farmers' Markets. In cooperation with NOFA and a local restaurant, the Farmers' Market sponsored their first "Shop Fresh with the Chef" event.

**Phosphorus Index Research and Outreach** -- This project focuses on refining a useable measure for farmers to use in determining the potential for phosphorous runoff from individual fields and thereby provide farmers the flexibility to modify management practices related to manure and crop management on their fields. The use of this measure will help to identify the problem areas on a farm and allow the farmer to focus remedial efforts on prioritized fields.

IMPACT
The original Vermont P-index has been used in nutrient management planning on a number of farms, but is now undergoing evaluation and revision to incorporate current research and other information; 172 users in 2002 reported gains in knowledge about the use and efficacy of the P-index. Tests have provided information needed to improve the accuracy of soil-based recommendations for the use of phosphorus fertilizers and manures, as well as to decrease the amount of phosphorus fed to dairy cows. These improvements over the long run should reduce the amount of phosphorus from agricultural sources reaching surface waters of Vermont. Outreach efforts to inform farmers about the P-index have increased understanding by 60 farmers and agency personnel about the P-index. The work in this area is combined with outreach research and outreach efforts to improve soil quality while reducing costs to farmers of soil inputs, which fall under NGA1.

**Integrated pest management research and outreach for the apple industry** – Apple orchards are complex ecosystems that require intensive management to produce high quality fruit. Tree growth and fruit production are intricately affected annually by the diverse biotic and abiotic factors within the environment, including numerous insects, mites, plant pathogens, weeds, and vertebrates. In the area of agriculture, Vermont has developed an integrated orchard management approach in which horticultural and pest management aspects have been interwoven in Extension and research activities. The University of Vermont Apple Program emphasizes a team approach. The team includes a pomologist, an IPM specialist, qualified technical personnel, and graduate and undergraduate students. The program features one-on-one interactions with apple growers, orchard demonstrations, meetings, workshops, publications, active research in commercial orchards, and development of Internet web sites for education and information delivery. The University of Vermont Apple Team provides the scientific and technical expertise necessary to help apple growers remain competitive in local, national and international markets while maintaining a sustainable agricultural system.

Effective pest management is critical in profitable and sustainable apple production. Vermont Apple IPM Program provides orchard visits and one-on-one interactions,

offering 'site-specific' information; workshops; meetings; farm tours; The Vermont Apple Newsletter; IPM Alerts; the Vermont Apple IPM Focus website for apple IPM education and information (http://orchard.uvm.edu/uvmmaple/pest); AIM (Apple Information Manager) website http://orchard.uvm.edu/aim/) and the New England Apple Pest Management Guide, which are the result of regional collaboration; and applied IPM research addressing the priorities and needs as defined by the apple industry in Vermont and the region.

IMPACT
During FY 2003 150 apple orchard growers participated in IPM learning experiences. The most recent evaluations of various components of the Vermont Apple IPM Program revealed that 98 percent of survey respondents used the IPM information presented in the program in their orchards; 98 percent of respondents believe participation in the IPM program improved their IPM practices; and 97 percent reduced or minimized pesticide use through using the IPM information presented in the program.

**Western flower thrips temperature sensitivity for New England greenhouse growers** -- The western flower thrips (WFT) is a persistent and devastating pest to the greenhouse industry, particularly because of its ability to transmit plant pathogenic viruses. There is uncertainty if WFT survive winters in northern latitudes of the United States. Development of management strategies would be influenced by knowing whether WFT overwinter or if outbreaks result from infestation on incoming plant material. A study underway is designed to provide new information about lethal responses of WFT larvae and adult females to low temperatures.

IMPACT
Results of the study show that survival of all larvae and adult females occurs at –10 degrees centigrade, while complete mortality occurs at –20 degrees centigrade. Data indicate that exposure to sub-lethal temperatures substantially reduces longevity and fecundity of females. This information will facilitate the development of cultural practices centered on low winter temperatures for greenhouse growers. Fecundity of surviving adult female WFT is now being examined. New work is also being done to compile information from growers about current practices used to manage thrips populations, and the perceived effectiveness of these practices. Workshops conducted in Vermont, Maine and New Hampshire included sessions on biocontrols for insect pests and diseases, where this information was presented to more than 120 growers.

**Healthy Eating, Healthy Aging --** Many older individuals are at increased risk for nutritional deficiencies and food borne illnesses due to various factors associated with aging, including physical disabilities, chronic diseases, social isolation, and sensory losses. The purpose of this project was to determine if the internet can be an effective tool in providing nutrition and health information for the elderly. Research and outreach personnel developed an interactive, multimedia, touch screen computer application, designed to collect nutrition and health information as well as deliver nutrition, food safety and health information tailored to the needs of older adults.

IMPACT
Sixteen senior Vermonters participated in the study by using the website, and 23 seniors participated in a control group with no website access. Approximately 75 percent of the participants were women, with two-thirds living alone, and 95 percent having incomes above poverty level. Significant positive changes were observed for internet users during the twelve-month study with regard to

- fat intake;
- eating vegetables and fruits as snacks;
- beliefs about one's own health levels;
- awareness about the relationship between diet and developing osteoporosis; and
- beliefs about the difficulty of including adequate calcium in their diets,

whereas no significant differences were noted for people in the control group. Secondary outcomes included significant differences in confidence using computers, and beliefs that using computers can aid in developing healthy eating habits.

**Make Nutrition Compute --** Through use of laptop computers in the home, nutrition educators used a nutrition curriculum that is designed to be interactive, and specifically targeted to individuals and families with limited resources. This sixth year of the program, four nutrition educators used the *Pyramid Challenge* and *Pyramid Explorer* computer programs to work with a total of 40 low-income adults in their homes.

IMPACT
Forty program graduates received an average of ten lessons. To assess dietary changes, pre- and post- 24-hour food recalls were administered with Make Nutrition Compute participants. Twenty-four hour recalls are a well-tested method of dietary assessment in which clients are asked to record everything that they had to eat or drink in the past 24 hours. The recalls were done at the beginning of the program before clients received any nutrition education via the computer, and then again at the completion of the program. A computerized nutrient analysis was then performed to determine whether or not there were any improvements in actual nutrient intake from the beginning to the end of the program. Dietary intake data on 22 participants showed the following improvements:

- 100 percent of participants reported an increase in the number of servings consumed in at least one of the five food groups so that their intake came closer to meeting recommendations in the food guide pyramid.
- 14 percent of participants reported eating 2 or more servings from the fruit group at program entry; this increased to 41 percent at program exit.
- 46 percent of participants reported eating 3 or more servings from the vegetable group at program entry; this increased to 64 percent at program exit.
- 32 percent of participants reported eating less than 2 servings from the meat, poultry, fish, dry beans, eggs, and nuts group at program entry; this increased to 64 percent at program exit.
- 9 percent of participants reported eating 25 or more grams of dietary fiber at program entry; this increased to 23 percent at program exit.

- 59 percent of participants reported receiving less than the RDA for iron at program entry; this decreased to 55 percent at program exit.
- 68 percent of participants reported receiving less than the RDA for vitamin A at program entry; this decreased to 46 percent at program exit.
- 68 percent of participants reported receiving less than the RDA for vitamin C at program entry; this decreased to 32 percent at program exit.
- 68 percent of participants reported receiving less than the RDA for vitamin B6 at program entry; this decreased to 55 percent at program exit.

The method of using laptop computers to conduct education has proven to be extremely successful with program participants. In particular, there are two components of the computer programs that seem to be most helpful as behavior change motivators. One component is part of the *Pyramid Challenge* program. Participants are shown, visually, how their dietary intake differs from the recommendations in the food guide pyramid. The visual disparity is often quite shocking, and consequently inspires people to want to change their eating patterns. Similarly, one of the computer programs assigns people a dietary score based on a possible total of 100. Participants seem to be driven to want to increase their scores. Both of these computer assessment tools seem to strike participants as more credible than an educator simply reviewing a diet and saying that it has particular shortcomings. While these teaching methods seem to be very effective, we would like to find a computer-based nutrition curriculum that is appropriate for low-income clientele in our program. In the absence of finding something appropriate, we continue to supplement the computer programs we are now using with paper materials.

**Vermont Grown Collaborative --** Vermont's Sustainable Agriculture Network was formed to support a more unified and focused strategy for developing local food systems, connecting consumers with local farmers and their products, and increasing the income of the Vermont agriculture communities. On behalf of the Vermont Sustainable Agriculture Network (SAN), the Department of Community Development and Applied Economics (CDAE) and the Center for Rural Studies (CRS) at the University of Vermont conducted preliminary research through multiple survey analyses and focus groups to examine Vermonters' perceptions and purchasing of local food. The study was designed to provide information that will assist in the direction and marketing efforts for the Vermont Locally Grown Collaborative.

Through bivariate and regression analysis of the survey results, this study found:

- Local food expenditures have the potential to increase regardless of how much a consumer is currently spending on local food products.
- Lower income consumers buy a different array of products than do higher income consumers, and are less likely to buy directly from the farmer.
- Consumers' expenditures on non-local organic food products compete with expenditures on local non-organic food products. Food products that are both organic and local may have a niche in the market.

Focusing the campaign on increasing consumers' attitude towards local should increase purchases of meat and fish, vegetables, candy, beverages and herbs

**Table 3**

**U.S. Department of Agriculture**
**Cooperative State Research, Education, and Extension Service**
**Supplement to the Annual Report of Accomplishments and Results**
**Multistate Extension Activities and Integrated Activities**
**(Attach Brief Summaries)**

**Institution__University of Vermont Extension_____**
**State__Vermont_____**

**Check one: ____ Multistate Extension Activities**
**____ Integrated Activities (Hatch Act Funds)**
**__X_ Integrated Activities (Smith-Lever Act Funds)**

| | Actual Expenditures | | | | |
|---|---|---|---|---|---|
| **Title of Planned Program/Activity** | **FY 2000** | **FY 2001** | **FY 2002** | **FY 2003** | **FY 2004** |
| **NGA1: Competitive Agriculture_____** | **249,240** | **309,544** | **480,466** | **503,880** | _____ |
| **NGA 2: Food Safety_____** | **4,646** | **88,404** | **90,326** | **64,519** | _____ |
| **NGA 3: Nutrition_____** | **4,646** | **30,012** | **26,910** | **43,410** | _____ |
| **NGA 4: Natural Resources & Environment** | **164,893** | **108,148** | **83,984** | **116,603** | _____ |
| **NGA 5: Economic Opportunity/Quality of Life** | **109,235** | **78,543** | **145,184** | **149,329** | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| **Total** | **532,660** | **614,651** | **826,870** | **877,741** | _____ |

**_____ ___3/14/03_____**
**Director Date**

**Table 3**

**U.S. Department of Agriculture**
**Cooperative State Research, Education, and Extension Service**
**Supplement to the Annual Report of Accomplishments and Results**
**Multistate Extension Activities and Integrated Activities**
**(Attach Brief Summaries)**

**Institution__University of Vermont Agric. Experiment Station**
**State__Vermont_____**

**Check one: ____ Multistate Extension Activities**
**__x_ Integrated Activities (Hatch Act Funds)**
**_ Integrated Activities (Smith-Lever Act Funds)**

| | Actual Expenditures | | | | |
|---|---|---|---|---|---|
| **Title of Planned Program/Activity** | **FY 2000** | **FY 2001** | **FY 2002** | **FY 2003** | **FY 2004** |
| **NGA1: Competitive Agriculture_____** | **224,721** | **254,956** | **218,501** | **281,251** | _____ |
| **NGA 2: Food Safety_____** | **9,292** | **36,.741** | **30,139** | **27,823** | _____ |
| **NGA 3: Nutrition_____** | **9,292** | **27,357** | **133,724** | **53,864** | _____ |
| **NGA 4: Natural Resources & Environment** | **117,496** | **77,925** | **145,682** | **228,746** | _____ |
| **NGA 5: Economic Opportunity/Quality of Life** | **99,972** | **48,385** | **59,987** | **60,394** | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| _____ | _____ | _____ | _____ | _____ | _____ |
| **Total** | **460,773** | **445,364** | **588,033** | **652,078** | _____ |

_____ **___3/14/03_____**
**Director** **Date**

## Appendix A. University of Vermont Extension and Agricultural Experiment Station Total Resources for FY 2003

**FY2003 Human and Fiscal Resources**

| Human Resources FY2003 | Extension | | Agricultural Experiment Station | | Total |
|---|---|---|---|---|---|
| **National Goal Area** | **Professional FTEs** | **Para-professional FTEs** | **Professional FTEs** | **Para-professional FTEs** | **FTEs** |
| **1: Competitive Agriculture** | 7.92 | 0 | 6.0 | 3.9 | **17.82** |
| **2: Food Safety** | 2.17 | .49 | 1.6 | .8 | **5.06** |
| **3: Nutrition** | 2.99 | 0 | 3.7 | 2.6 | **9.29** |
| **4: Natural Resources & Environment** | 2.69 | .41 | 5.5 | 7.7 | **16.30** |
| **5: Economic Opportunity/Quality of Life** | 12.65 | 7.06 | 1.4 | 1.4 | **22.51** |
| **Total** | **28.42** | **7.96** | **18.2** | **16.4** | **70.98** |

| Expenditures for FY2003 | Extension | | Agricultural Experiment Station | | Total |
|---|---|---|---|---|---|
| **National Goal Area** | **Federal Expenditures** | **State Expenditures** | **Federal Expenditures** | **State Expenditures** | **Expenditures** |
| **1: Competitive Agriculture** | 401,846 | 879,850 | 574,191 | 940,287 | **2,796,174** |
| **2: Food Safety** | 129,387 | 283,296 | 109,359 | 210,020 | **732,062** |
| **3: Nutrition** | 135,884 | 297,520 | 212,043 | 340,334 | **985,781** |
| **4: Natural Resources & Environment** | 221,557 | 485,103 | 317,477 | 684,135 | **1,708,272** |
| **5: Economic Opportunity/Quality of Life** | 798,734 | 1,748,850 | 160,209 | 116,610 | **2,824,403** |
| **Total** | **1,687,408** | **3,694,619** | **1,373,279** | **2,291,386** | **9,046,692** |