CROSSCUTTING ISSUES

Food System Education

What role does education play in strengthening our food system? Are there quality educational opportunities that prepare our young people for careers in Vermont's food system?

The success and resilience of Vermont's food system depends, in part, on its educational institutions for scientific knowledge, resources, best practices, skilled leadership, networking opportunities, and student training. Vermont's K through 12 *Farm to School* offerings are considered a model by the national farm to school movement. Many out-of-school activities are grounded in farming: Thousands of Vermont residents have participated in *4-H* activities related to agriculture, and thousands more have participated in the *Future Farmers of America* (FFA) Vermont state chapter. Several of Vermont's colleges and the *University of Vermont* (UVM) offer an expanding array of food system course offerings.

"I think if we look back from 2020 and it's successful, then we've encouraged and developed the young people to either stay on the farm or start a food enterprise. I think this would reenergize the state."

—Rutland focus group participant

This section summarizes the range of educational opportunities—from preschool to college—that Vermonters can experience relating to food systems. Combining Vermont educational opportunities with technical assistance (see Chapter 4, Section 4) can result in a highly supportive, continuous learning and mentoring environment for Vermonters young and old alike, in which they can explore food system careers.

4-H calf winners, date unknown.

PHOTO CREDIT: UVM Special Collections

GETTING TO 2020

Goals 10 and 16 of the F2P Strategic Plan highlight priority areas in the effort to improve food system education and to better prepare the next generation of farmers and food system workers for success.

Goal 10: All Vermonters will have a greater understanding of how to obtain, grow, store, and prepare nutritional food.

Goal 16: Vermont K-12 schools, Career and Technical Education Centers, and institutions of higher education will offer a wide range of curricula, certificate and degree programs, and conduct research aimed at meeting the needs of Vermont's food system.

CURRENT CONDITIONS

A recent study on the workforce development needs of Vermont's food system by *Regional Technology Strategies* notes that the original federal legislation for agricultural education owes a great deal to the state of Vermont: "The first federal funding for secondary education, the *Smith-Hughes Act* of 1917, came about largely as a result of the guidance and tireless efforts of Vermont's Senator Carroll Page. He introduced the first legislation to support vocational education in 1912, and many believe should have had his name on the eventual legislation five years later. In the early years, vocational agriculture received funding equal to industrial arts and home economics combined."[1]

Historically, food system education in Vermont has focused on dairy farming, reflecting the dominant feature of Vermont's farming communities, and such educational programs were "targeted mainly to children of farmers who were likely to inherit the farms and become the "future famers of America.""[2] In the past 10 years, a growing movement toward sustainable agriculture—with local food production and consumption, environmental protection, and diversified farming as core elements—has taken off, with a corresponding interest in a wide variety of farming and food-related careers.

Today, according to *Regional Technology Strategies*, Vermont has at least six distinct populations that could benefit from programs in food systems education. They are:

- Youth who expect to get their primary source of income from farming or forests
- Youth who will earn their living employed or be self employed in some part of the food system value chain
- Adults, often with credentials and degrees in other fields, who are making mid-career changes to farming or natural resources
- Youth and adults for whom farming will be a lifestyle and also a secondary source of income
- Youth who will benefit from the experiential pedagogy associated with agricultural or natural resource career and technical education but who will end up in other careers
- The large number of students who would benefit from a better understanding of their food systems and natural resources in order to become better consumers, stewards, and healthier citizens.[3]

Food system education opportunities in Vermont currently consist of the following:

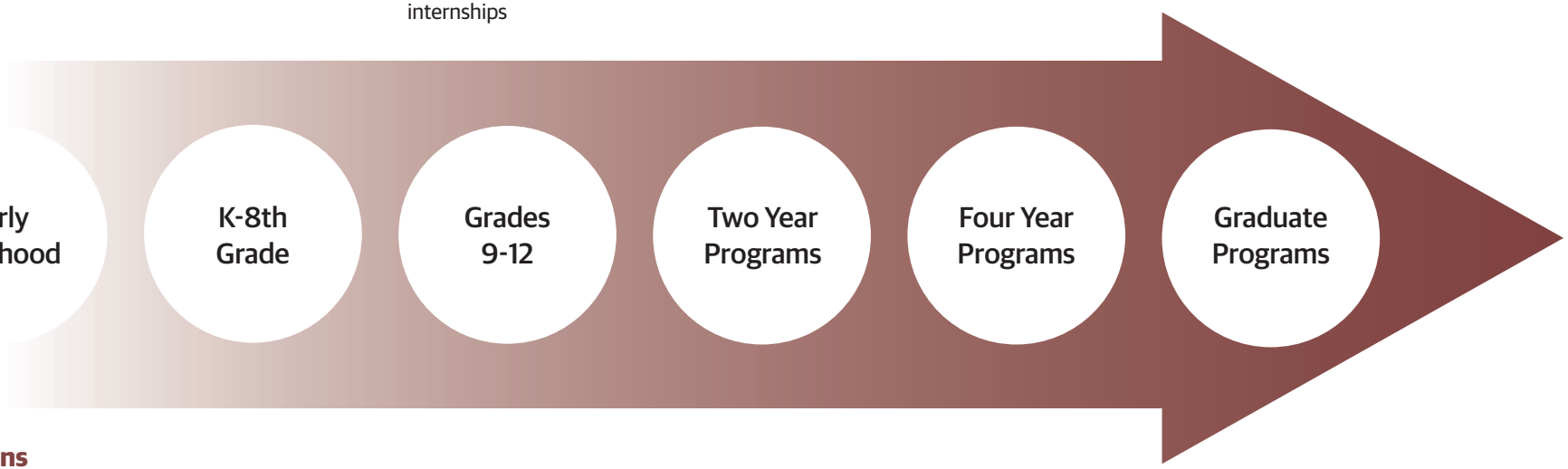
- A variety of early childhood offerings (e.g., the *Adventures Preschool Program at Shelburne Farms*)
- Summer farm and food camps (e.g., *Farm and Wilderness* summer camps)
- Public and private K-8 programs (e.g., *Vermont FEED*)
- Career and technical education, from fundamentals in grades 9 and 10 through career programs in grades 11 and 12 (e.g., *Hannaford Career Center*)
- Postsecondary but prebaccalaureate education at *Vermont Technical College*
- Baccalaureate and postbaccalaureate programs at public and private colleges and the *University of Vermont* (UVM)
- Noncredit education provided by *UVM Extension*, industry associations, regional food centers, and nonprofits.

Figure 4.2.1 shows the continuum of Vermont's food system educational activities and examples from early childhood to graduate school. Figure 4.2.2 shows the locations of 17 *Career and Technical Education Centers*, 6 postsecondary education institutions,

Figure 4.2.1: Food System Education For All Ages

Curriculum

Early Childhood	K-8th Grade	Grades 9-12	Two Year Programs	Four Year Programs	Graduate Programs
Family gardens or community gardens	Food and Farm learning in school curricula	Embedded in school curricula	Associate's degrees	Bachelor's degrees	Graduate degrees
CSAs and farmers markets	After school programs, FFA, 4-H	Career and Technical Education programs	Licensing / certification	2+2 Program	Certificate programs
Pick your own	Summer programs	After school / summer programs		Apprenticeships / internships	Non-credit programs
Gleaning	Farm camps	Apprenticeships / internships			

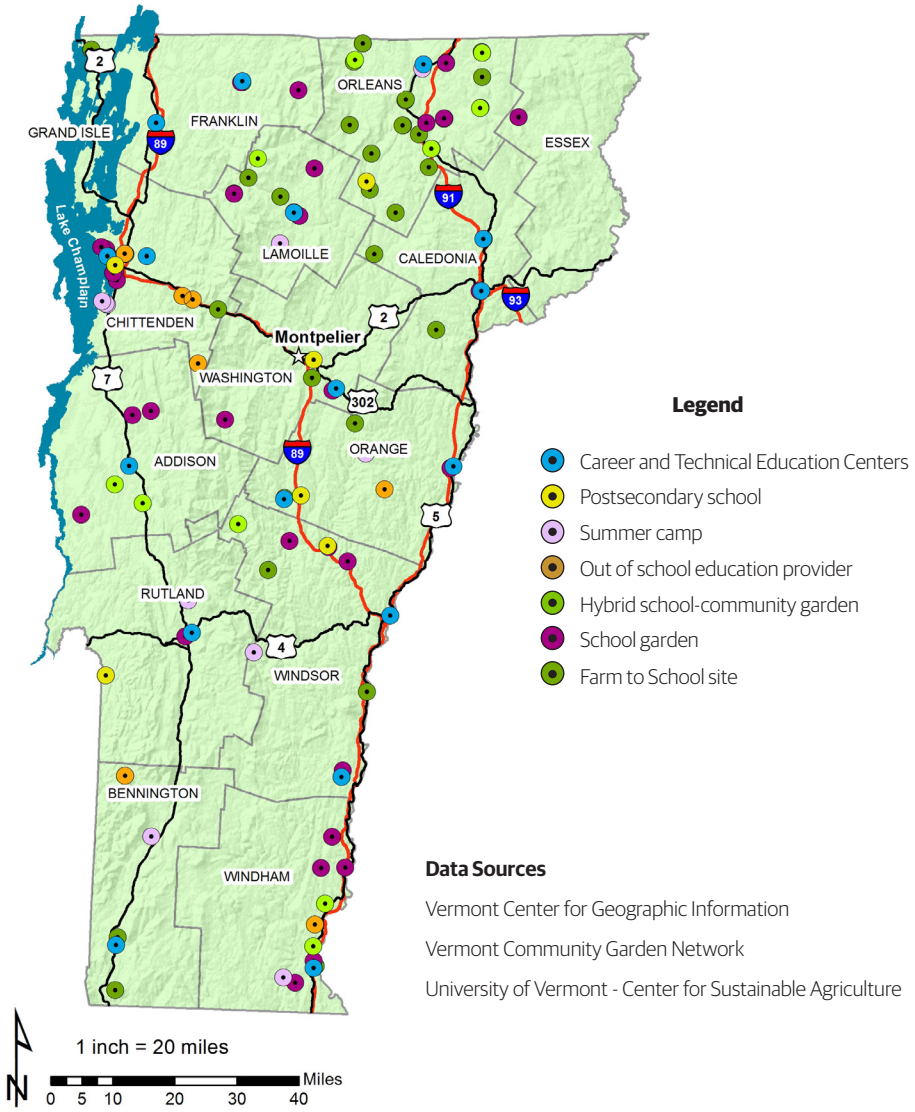


Institutions

Early Childhood	K-8th Grade	Grades 9-12	Two Year Programs	Four Year Programs	Graduate Programs
Shelburne Farms	VT FEED	Vermont Youth Conservation Corps	Vermont Technical College: Dairy Farm Management, Agri-business Management	Vermont Technical College	Vermont Law School
Billings Farm and Museum	Green Mountain Farm-to-School	The Walden Project	New England Culinary Institute: Professional certificates, Culinary Arts Associate's Degree	Green Mountain College	UVM Master's Degree Programs: Animal Nutrition and Food Sciences, Plant and Soil Sciences, Natural Resources
Merck Forest and Farmland	Burlington School Food Project	Beginning farmer apprenticeships		University of Vermont	
Cedar Farm Educational Center	4-H embryology program			Sterling College	
				NECI	

8 out of school programs, 11 summer camps, 19 school or school-community gardens, and 23 *Farm to School* sites that provide some form of food system education.

Figure 4.2.2: Vermont Food System Education Locations



For the most up to date maps, please visit the Vermont Food System Atlas at www.vtfoodatlas.com.

Agricultural education operates in a very different economic and learning environment. Many of the young people who will create Vermont's future in sustainable food systems and natural resources have not grown up on farms. Many other prospective farmers are adults from other places moving to Vermont for a new career and/or lifestyle—often already holding postsecondary credentials. And still others want the skills to grow food or raise farm animals without ever intending to earn their full living from that enterprise. These changes create a new set of opportunities and challenges for Vermont's educational system.

—Regional Technology Strategies, Inc., 2010, p. 67.

Early Childhood through Preschool

Early childhood defines the years from birth through preschool that research has defined as the most important for brain development. Learning about food early can play a significant role in stimulating a lifelong interest in agriculture and our food system.

Potting soil lessons at Pete's Greens.

PHOTO CREDIT: Pete's Greens

From the moment a baby can be strapped to a parent's back or chest, he or she can begin to learn where food comes from. Parents have many options for teaching their children about food and how it gets to the plate, including having a family garden, raising livestock, participating in a community garden, buying a CSA share, going to a farmers' market, picking fruit or vegetables when in season, helping with local sugaring, and participating in a community gleaning program. Many Vermont families spend a lot of time doing outdoor activities, from hiking and biking to hunting and fishing, and food exploration can be an integral part of these activities.

Parents can also support food learning beyond their own families by organizing field trips to farms, orchards, markets, and food processing facilities; leading food-related

discussions or experiments; leading or organizing school cafeteria purchases of local food; or volunteering with youth agricultural organizations such as 4-H.

Children ages 3 through 6 can be exposed to opportunities for agricultural and food learning through local nonprofits and preschools. One of the most respected and well-known programs statewide is the *Adventures Preschool Program at Shelburne Farms*. The program offers age-appropriate, hands-on activities that attempt to instill a conservation ethic through outdoor experiences such as gardening, hiking on farms and through forests, and visiting farm animals.

According to the Agriculture Development Coordinator at the *Vermont Agency of Agriculture, Food and Markets* (VAAFM), requests for preschool agricultural and farm education opportunities are growing, but such programs are largely unavailable. This gap is worth exploring as more public discourse emerges around preschool education.

Elementary and Middle Schools: Kindergarten through Eighth Grade

"Vermont has really taken it on in quite the most holistic way and not just in a couple of school districts but statewide."

—Anupama Joshi, Director of the National Farm to School Network

The most visible and successful food systems education program for elementary schools is the *Farm to School program* organized through the VAAFM. *Farm to School* encompasses many elements beyond education, including bringing locally grown food into school cafeterias, improving the storage and handling of local foods, and training teachers and staff. Vermont's *Farm to School* effort is frequently identified throughout the country as the most extensive and most successful.

- Since 2007, 13,730 students have been reached (nearly 20% of all Vermont students); 35 schools have programs; 3,000 volunteers, teachers, and staff have been trained; and 120 farmers have been involved.[4]
- Over $375,000 in grant awards have been made to support local food purchases, organize student farm visits, and implement composting programs.[5]
- The *National Farm to School Network* has recognized Vermont's model of integrating local food into cafeterias, classrooms, and communities as a best practice.

Vermont Food Education Every Day (Vermont FEED) is the organization that launched Vermont's *Farm to School* Program. Vermont FEED is a collaboration of three nonprofit organizations: *Shelburne Farms*, *NOFA Vermont*, and *Food Works at Two Rivers Center*. Vermont FEED schools are involved in a wide range of activities, including creating school gardens, arranging farm-based field trips, providing student taste tests, organizing community-led food and nutrition committees and nutrition and agriculture education, and purchasing local foods for their cafeterias. Other regionally based *Farm to School* initiatives have developed over the past several years, including the *Upper Valley Farm to School Network* and *Green Mountain Farm-to-School*. Various *Farm to School* programs work collaboratively with organizations and agencies around the state, including *Hunger Free Vermont*, the *Burlington School Food Project*, *Addison County Relocalization Network* (ACORN), the *Vermont Department of Education*, and most recently, 4-H.

Because coordinating such programs is time intensive, programs that have been able to find funding for a coordinator have greater impact. To address this need, plans are underway to explore grant funding to pay for additional *Farm*

Agriculture Education in Vermont: Facts at a Glance

- *Number of schools participating in a Farm to School program:* **35 schools in 13 counties are fully engaged in the Farm to School program although more than 100 schools participate in Farm to School activities.**
- *High school students currently enrolled in an agriculture or natural resources program of study:* **667 (as of 2009), an 11% decrease from 2004.**
- *Vermont youth who are members of 4-H clubs:* **2,000 (estimate)**
- *Vermont youth who are members of the Future Farmers of America:* **400-500**
- *Number of Vermont colleges offering a major in agriculture:* **4 offering bachelor's degrees, 1 offering 4 associate's degrees, 1 offering 6 master's degrees**
- *Number of agriculture majors offered at the undergraduate level:* **18 at the bachelor's level and 4 at the associate's level**
- *Number of master's degree programs currently offered in agriculture-related fields:* **6**
- *Number of master's degree programs in agriculture-related fields currently under consideration:* **2**
- *Number of undergraduates in Vermont colleges majoring in agriculture:* **1,255 (1,120 of whom attend UVM)**

to School coordinators through a program known as *FoodCorps* (a food-focused version of the popular and successful *AmeriCorps* program).

Farm to School programming seems to be reaching a critical mass, as more schools want to get involved. To better coordinate resources, provide technical assistance, and share best practices among programs, the *Vermont Farm to School Network* was recently formed. Vermont FEED is helping to provide staff coordination for this new network.

Another resource for elementary and middle schools is *NOFA Vermont's Farm to Community Mentor Program*. The purpose of the program is to expand agricultural awareness by developing a community understanding of agriculture and ongoing relationships among communities, schools, and local farms. Farm to Community Mentors are farmers and educators who facilitate links among other farmers, gardeners, educators, and children to reconnect communities to their local food.

Statewide projects of the *Farm to Community Mentor Program* include a farmer correspondence program, youth participation in farmers markets, and an active mentor program that establishes extensive relationships between schools and their farmers. In Hartland, Pomfret, and Sharon, Farm to Community Mentors have established an annual Farm Day in which local farmers go to school to share their knowledge and stories with students. Participating farms include *Cloudland Farm*, *Jericho Hill Farm*, and *Cherry Hill Farm*.[6] In Washington and Orange counties, mentor Kimberly Hagen connected farmers and classrooms through letter writing to help students to learn about the daily life of farmers. These letters led to farm field trips for students at Middlesex, Worcester, Cabot, and Bradford schools.[7]

Out-of-School Learning

Education also occurs after school and when school is not in session — on weekends and during holidays and summer breaks. In the case of food systems education, out-of-school learning is of enormous value. Many Vermont middle and high school students work on farms or in businesses to earn money while also experiencing firsthand the day-to-day challenges and decisions required for successful enterprises. Following are some examples of out-of-school food system education programs.

4-H (Head, Heart, Hands, and Health)[8]

The *University of Vermont's 4-H Youth Development Program* reaches nearly 6,000 Vermont youth between 5 and 19 years old both in school and after school, each year. Developed in partnership with the USDA and UVM Extension, 4-H provides life skills development for youth in subjects ranging from equine care to digital arts. The mission of 4-H and all of its programs is to empower youth to reach their full potential, working and learning in partnership with adults.

Although 4-H addresses a range of topics, Vermont 4-H continues to be a central force in supporting youth interested in agriculture and natural resources and reaches children of widely varying ages and geographical areas. All program or project areas are backed up with research-based curricula developed by land grant colleges based on an experiential learning model.

4-H delivers its programs in three primary ways:

- 4-H clubs, which offer opportunities to learn and explore, participate in community service, and engage in competitions or noncompetitive events such as serving on teen boards
- 4-H programs and projects, which are short term and can be part of after-school programs or summer camps
- 4-H-designed programming that provides enrichment within a school's existing curriculum

Currently, about 2,000 Vermont youth are active in 4-H clubs annually, with the majority of the 200+ 4-H clubs in Vermont focusing, at least in part, on agricultural or natural resources learning. Club members are predominantly female (75%), with 50% of the clubs focused on horses, 25% focused on dairy farming, and the rest focused on a variety of projects that include shooting sports, outdoor adventure, sheep, horticulture, and other types of farming.

4-H also partners with after-school sites and other organizations to offer programs that use 4-H curricula, 4-H educators, or both. Programs offered include GPS instruction, Acres of Adventures, Afterschool Agriculture, and many others.

4-H is now developing online youth farm safety modules that address farm safety and issues typically found on smaller, diversified farms. Ultimately, 4-H will be offering camps and safety trainings across the state. This curriculum can also be used in a variety of settings from school enrichment programs to out-of-school programs.

The 4-H Youth Agriculture Project matches young adults with summer employment experiences to teach them about food, nutrition, and food security issues in their communities.

4-H in Schools

Although a number of school enrichment opportunities exist across the state, the largest statewide in-school program that 4-H provides is focused on embryology. Over 100 elementary school classrooms use the embryology curriculum, which requires students to use math, writing, and science skills. Middle and high school versions of this curriculum are currently being piloted. In addition, 4-H and its partner organizations are developing a pilot that would engage high school students in raising chicks from the embryology courses to fully grown meat birds, processing them, and introducing the meat to the local food system (e.g., food shelf, farmers market), based on their own business plans. This program is being piloted in Middlebury and Brattleboro and has been informally titled *Chick to Plate*.

Another project under development, in partnership with *Grafton Village Cheese*, is a dairy and cheese-making curriculum that can be used as school enrichment as well as out-of-school programming.

Summer Camps

A handful of Vermont summer camps give youth the opportunity to participate in agricultural activities. Some are well established and offer residential or overnight programs, whereas others are strictly day camps. Current farm-based day camp opportunities include *Farm and Wilderness summer camps*, *Grand View Farm*, *Hildene camps*, *Lamoille County Nature Center*, *New Village Farm camps*, *Shelburne Farms*, *The Renaissance School*, *Green Mountain Farm-to-School* camps, and the *Green Mountain College Farm Camp*. There are fewer residential farm camps, but they include *Camp Sangamon* and *Farm and Wilderness* summer camps.

PHOTO CREDIT: Vermont Agency of Agriculture, Food and Markets

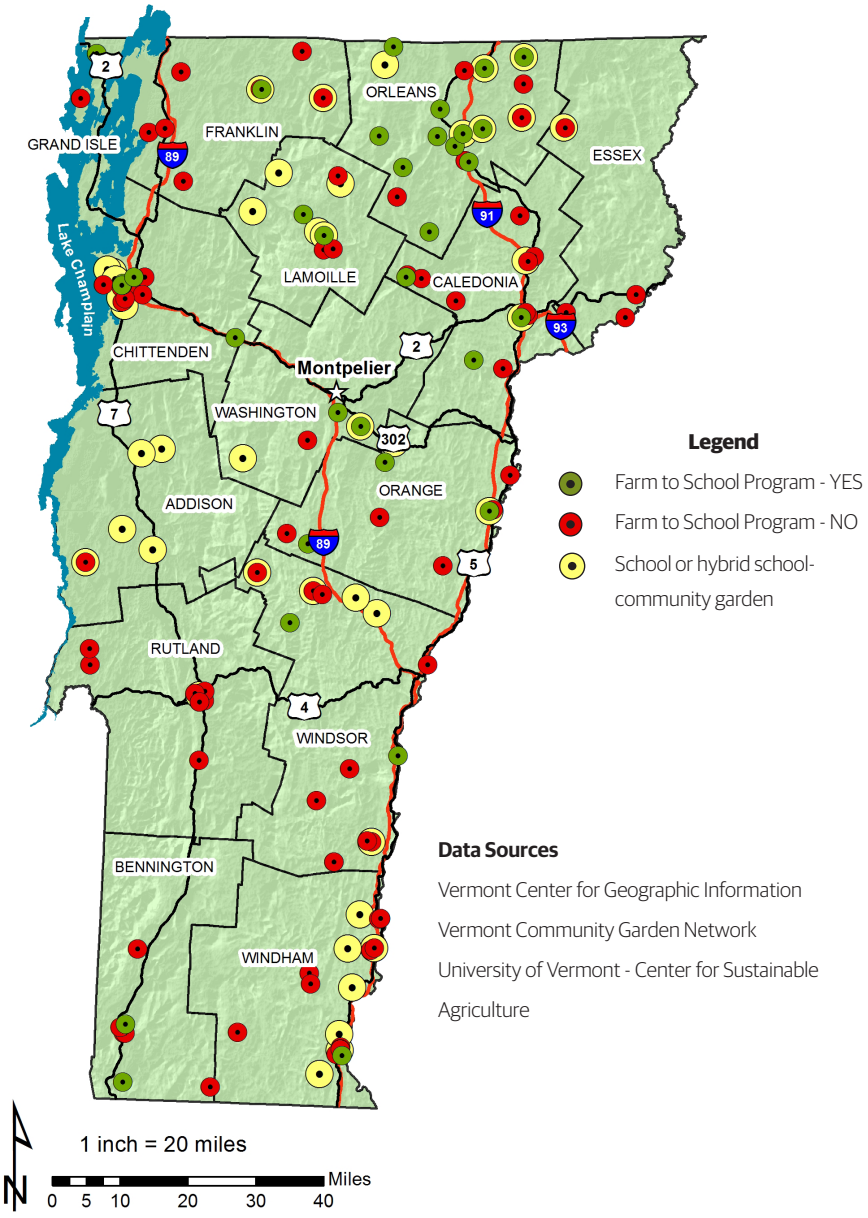
Agricultural education at Billings Farm.

Given the importance of the summer growing season to successful farming, summer camps is an area of opportunity ripe for expansion. Recommendations include affordable farm and cooking-related camps that use technical center facilities and high school students as paid counselors. Some of these camps could offset costs through the sale of CSA shares, food, and other products.

School and Community Gardens

In several Vermont towns, school gardens are called community gardens and include plots or raised beds that are gardened individually by families in the community. Most school community gardens have a food gardening component. Although many function as group garden projects from planting to harvest, others include garden camps, summer lunch programs, or summer recreational activities. Produce from school community gardens is harvested and eaten by participating students and their families, used in summer nutrition programs and for special events such as harvest dinners, and shared with the community (see Figure 4.2.3 for locations around the state).[9]

Figure 4.2.3: Farm to School Program and School-Community Garden



For the most up to date maps, please visit the Vermont Food System Atlas at www.vtfoodatlas.com.

Secondary Schools: High Schools and Career and Technical Education Centers

Currently, nearly all agriculture-related curricula for high school–age students are offered through *Career and Technical Education Centers* (CTE). Vermont public high school students can enroll in a one- or two-year course of study at a CTE center as juniors or seniors. Several technical centers offer one-semester courses in agriculture or natural resources for ninth- or tenth-graders as well. There are 17 CTE centers throughout the state, and every public high school in Vermont has a supervisory relationship with at least one. For some students, CTE centers offer their first opportunity to take courses directly relating to farming and food systems. School-organized cooperative work experiences during high school and postsecondary education blend education-based learning with workplace experience. These opportunities are widely available to students studying agriculture and food systems, and many believe they should be more available to students in other fields as well.

Career and Technical Education Center Food Systems–Related Programs

Most, but not all, high school–level agriculture and food systems education is provided through CTE centers. Nationally, the career cluster is called *Agriculture, Food and Natural Resources* and is divided into five career pathways (Table 4.2.1):

- Food products and processing systems
- Plant systems
- Animal systems
- Power structural and technical systems
- Natural resources systems

The programs in Vermont fit the national model but are organized in different categories: pretechnical foundation programs offered through the CTE center but taking place in the student's comprehensive high school; diversified agriculture; agricultural mechanics; forestry and natural resources; and horticulture science. Some faculty and students believe the system is not flexible enough to accommodate all the students' interests. To address this issue, some centers are developing modules within programs so that students can participate in more specific programs that fit their interests.

During the 2009-2010 academic year, the equivalent of 765 full-time students were enrolled in an agriculture, food, or natural resource program. Because most programs in CTE centers are half-day programs, those 765 full-time students translates into well over 1,400 students engaged in these programs.[10]

Table 4.2.1 provides an overview of the current CTE program offerings based on whether the program curriculum does or could be related to food systems work. All career and technical education programs included in this chart provide high school science credits. Additional high school credits toward graduation are sometimes provided based on the program or the individual case. Some programs offer honors credits if students perform a higher level of work both quantitatively and qualitatively.

In addition, every career and technical education center in the state offers at least one food-related program. Seven of the 17 career and technical education centers offer an option for college credits. Eleven of the 17 centers offer forestry and natural resources programs, whereas only three offer diversified agriculture programs. And 12 of the 17 offer some type of mechanical courses ranging from automotive and diesel power, to small engine and mechanical science.

Significant trends in program content among the CTE centers include an increasing focus on sustainability issues regardless of the program area, and a focus on local markets within the agriculture and horticulture programs. Curriculum trends continue to lag behind market trends in areas such as nonlocal market development, organic farming, value-added farming, aquaculture, and diversified farming.[11]

CTE administrators are increasingly interested in offering more college credit opportunities within their programs. Anecdotally, they believe that the college credits demonstrate a higher level of academic rigor and consequently attract students who are stronger academically.

Cooperative Work Experiences

In addition to focused, hands-on learning programs, most CTE centers also either suggest or require that students participate in work-based learning on a farm or at a food-based workplace. The purpose is to enrich students' experience by exposing them to the physical work as well as the business elements of these enterprises. Often, relationships developed during the work-based learning period extend beyond program completion with employers becoming part of students' support networks. *Hannaford Career Center* students have worked on methane digesters and milked cows at *Blue Spruce Farm*, and have worked with the *Middlebury Large Animal Clinic* and the *Morgan Horse Farm*. These experiences are crucial in helping students determine their interest and fit in specific career pathways.

At *Stafford Technical Center* in Rutland, students can apply and be interviewed to work for a local business such as *Central Vermont Public Service* (CVPS). If they are interested in working for CVPS, for example, they are required to complete an interview with the Human Resources Department, a hiring manager, and an employee from the department where they will potentially be working. If they are selected, they commence a yearlong internship in which they invest about 16 to 24 hours, two or three days per week. These students must still complete their classwork at Stafford while doing their co-op work experience. A number of students from the forestry and natural resources program and the hospitality/culinary arts programs have gone on to be hired as permanent employees upon graduation from high school.[12]

At *Windham Regional Career Center* (WRCC) in Brattleboro, students are placed on local farms where they concentrate in large animal science, plant-based studies, or farm management. Some WRCC students are working with the Scott Farm in Dummerston to help the farm market its products through its CSA. Other WRCC students work with local farmers and loggers to correct soil drainage and runoff problems on their farms and at their work sites.[13]

Entrepreneurial Experiences

Eighty-seven percent of Vermont's CTE programs operate greenhouses, gardens, or maple sugaring operations, or raise fish or animals. Students in most of the agricultural courses are involved creating pricing strategies for, participating in the development of, marketing, and distributing products they've directly been involved in producing. A majority of Vermonters who enter a food-related business are self-employed, making the business and entrepreneurial experiences provided by CTE centers even more relevant. Six of the 17 career and technical education centers are affiliated with FFA, which provides business skill and leadership development.

Table 4.2.1: Career and Technical Education Center Food Systems-Related Programs

	Mechanical Science/ Automotive Tech.	Culinary Arts	Forestry and Natural Resources	Diversified Ag and Natural Resources	Horticulture and Landscaping	Pre-Tech
Barre Technical Center	✓	3-6 college credits; on-site restaurant.				
Southwest Vermont Career Center (Bennington)	✓		✓ FFA affiliation.	✓ FFA affiliation.		
River Bend Career and Technical Center (Bradford)		Off-site restaurant.		✓		
Windham Regional Career Center (Brattleboro)		On-site restaurant.	✓ FFA affiliation.		✓ FFA affiliation.	✓
Burlington Technical Center		On-site restaurant apprenticeships.				✓
Cold Hollow Career Center (Enosburg Falls)			✓			
Center for Technology at Essex	Option for college credit; apprenticeships.		Option for college credit; apprenticeships.			
Green Mountain Technology and Career Center (Hyde Park)	✓	On-site restaurant and co-op.	✓			✓
Lyndon Institute Technical Center (Lyndon Center)	✓					
Hannaford Career Center (Middlebury)	Option for college credit; apprenticeships.	On-site restaurant.	✓ FFA affiliation.	Option for college credit; FFA affiliation.		
North Country Career Center (Newport)	✓		✓ FFA affiliation.		✓	
Randolph Technical Center	Option for college credit; FFA affiliation.	✓	✓ FFA affiliation.			
Stafford Technical Center (Rutland)	Option for college credit.	On-site restaurant; option for NECI credits, scholarship.	✓			
River Valley Technical Center (Springfield)		On-site restaurant; work co-ops.			✓	
Northwest Technical Center (St. Albans)	Option for college credit.	Option for college credit.				
St. Johnsbury Academy	✓	On-site restaurant; option for college credit.	✓			
Hartford Area Career and Technology Center (White River Junction)	Opportunity for paid internships.	Onsite restaurant.	✓ FFA affiliation.			

Future Farmers of America

In any given year, 400 to 500 agriculture students in Vermont high schools and technical centers are active members of Vermont's FFA. A few youth become involved in FFA as middle school students. Most CTE centers that offer agriculture or natural resources education also have FFA chapters. These chapters serve as a link between the national FFA association, which focuses on leadership, teamwork, and community, and local students interested in the field. FFA often provides high school students with their first working experiences in agriculture-related businesses. In fact, chapter members are required to participate in a Supervised Agricultural Experience and are paid for that participation. This connection among the technical center, the student, and an employer adds substantial value to the educational experience and serves as a first step for students in developing possible mentoring relationships.

Members of local FFA chapters also develop leadership skills so they can be active and useful community members as adults, as well as participate in competitions in their areas of interest to hone their skills and demonstrate their knowledge.[14]

Alternative Secondary Education Programs Grounded in Food Systems Education

There are several outstanding agriculturally-based alternative education options in Vermont. The *Vermont Youth Conservation Corps*, renowned for its summer conservation work and leadership programs, expanded its offerings to include the *Vermont Futures School Program*, an alternative path to graduation for students interested in a hands-on conservation and an agricultural curriculum. In the 2010 school year, the program had 50 students from *Woodstock Union High School*, *U-32 High School* (Montpelier), *Mount Mansfield Union High School*, and the *Center for Technology in Essex*. Students work in small teams to develop one value-added product per semester. The scope of applied learning includes writing a business plan; planting, growing, and harvesting produce; using the commercial kitchen at VYCC to make the products; identifying distribution outlets; and marketing.[15]

The *Mountain School of Milton Academy* is an independent semester-long program that provides high school juniors the opportunity to live and work on an organic farm in rural Vermont. Each semester the *Mountain School* enrolls 45 students from all over the country to take part in a rigorous and integrated learning experience grounded in farm-based work. This program, however, is not designed specifically for Vermont students and is selective.[16]

A recently developed program that is currently implemented only during the summer months is the *Strolling of the Heifers Beginning Farmer Apprentice Program*. The program was launched in 2009 with the goal of providing at-risk youth with employment on local family farms, giving them the opportunity to learn agricultural management skills and farm safety and at the same time providing labor to farmers who have difficulty paying for help. In 2009, the program placed 15 youth on five Windham County farms. This program involves an extensive collaboration with over a dozen organizations including public schools, technical centers, and state government agencies.

For the past 36 years, the *Smokey House Center* based in Danby, Vermont, has provided on-farm agricultural learning opportunities to high school students from the Rutland County school system. The programs helped thousands of disadvantaged young people in southern Vermont graduate from high school and develop the skills, habits, and attitudes they needed to become successful individuals. It was announced on October 4, 2010, that these programs would no longer be offered.[17]

Postsecondary Schools: Agriculture-Related Degrees from Vermont Colleges and the University of Vermont

Success in the food industry requires a broad range of knowledge and experiences. Farmers and processors must draw on business expertise, science-based research, and technology to be economically viable. Liberal arts colleges are beginning to provide food systems education grounded in a wide range of disciplines from anthropology to microbiology and from history to law. Food systems education opportunities differ between public institutions such as the *University of Vermont* (UVM) and *Vermont Technical College* (VTC) and private, independent colleges such as *Sterling College*, *Green Mountain College* (GMC), the *New England Culinary Institute* (NECI), and *Vermont Law School*.

The movement in food systems–related majors toward food business, food policy, and teaching is attracting a different kind of student than the traditional agriculture student.

The majority of students in Vermont postsecondary institutions majoring in some area of the food system come from nonfarming backgrounds, suburban communities, and outside Vermont. Both GMC and UVM have mostly women majoring in food systems–related degree programs, whereas Sterling and VTC tend to attract more men.

Enrollments in the *UVM College of Agriculture and Life Sciences* have increased 40% in the past five years as a result of both freshman enrollments and intra-university transfers. Research grants have increased by over 50% for both the *UVM College of Agriculture and Life Sciences* and the *Center for Sustainable Agriculture* as issues of sustainability, food safety, and obesity garner national headlines. GMC has just announced the addition of a new major: *Sustainable Agriculture and Food Production Systems*. *Vermont Law School* has recently announced the creation of the new *Center for Agriculture and Food Systems*. And VTC is entering its second full year with its first four-year degree in diversified agriculture.

VTC and UVM have a program, UVM/VTC FARMS 2+2 Program, that provides for up to 20 VTC graduates to transfer into a four-year program at UVM with a full scholarship. This program offers VTC graduates two more years of academics after receiving their two-year *Dairy Farm Management Technology* degree.

Research plays a crucial role in the successful development of any economic sector, and agriculture is no exception. With a land grant university (i.e., UVM) leading the way through extensive research, a newly announced commitment to food systems education, and a practical system for sharing research findings among Vermont producers and businesses, Vermont is well positioned to own the niche of sustainable agriculture in its educational system.

Of the 25 degree-granting institutions in Vermont, seven offer programs in agriculture education. Table 4.2.2 lists degree programs in agriculture, natural resources, and relevant sciences offered by Vermont colleges and UVM.

Colleges close to Vermont that students attend for agriculture and natural resources programs include *Paul Smith's College* (strong culinary arts and forestry departments) in New York state and *SUNY-Cobbleskill* (extensive agriculture program offering both two- and four-year degrees). The *Community College of Greenfield* (Massachusetts) also has articulation agreements with both GMC and *Sterling College* in its agriculture and natural resource programs.

Table 4.2.2: Food System Degree Programs at Vermont Postsecondary Schools

Associate's degree	Academic institution
Agribusiness Management	Vermont Technical College
Culinary Arts	New England Culinary Institute
Dairy Farm Management	Vermont Technical College
Diesel Power Technology	Vermont Technical College
Landscape Development and Ornamental Horticulture	Vermont Technical College
Bachelor's degree	**Academic institution**
Animal Science	University of Vermont
Culinary Arts	New England Culinary Institute
Diversified Agriculture	Vermont Technical College
Ecological Agriculture	University of Vermont
Natural Resources	Green Mountain College
	Johnson State College
	University of Vermont
Natural Sciences	Lyndon State College
Sustainable Agriculture	Sterling College
Sustainable Landscape Horticulture	University of Vermont
Graduate degree	**Academic institution**
Animal Nutrition and Food Sciences	University of Vermont
Plant and Soil Science	University of Vermont

Note: business programs and degrees were not included in the survey, although business education and experience are crucial to the long-term success of all agriculture-related careers.

The following sections include more detailed descriptions of some of these post-secondary programs.

Sterling College[18]

In 2005, *Sterling College*, the smallest liberal arts college in the country, evolved from a two-year into a four-year accredited college. Environmental studies form the core of *Sterling's* curriculum with around 30% of the total student population of 114 majoring in agriculture. Two years ago the college began offering a summer semester, and students and faculty believe it has led to deeper and more intensive learning , especially in the agriculture arena. At *Sterling College*, students not only work on the college farm, but also participate in the meal planning and provide nearly a quarter of all the food for the college's dining hall.

All full-time students are expected to work 80 paid hours each semester on campus. The value is that each student graduates with a work history, a resume, and a bachelor's degree. Eighty to ninety percent of *Sterling* graduates are hired into a field of their choosing.

More than half the student population at *Sterling* is male. More than half the college's student population is from New England, a quarter is from Vermont, and the rest is from outside New England. Many of *Sterling's* graduates go on to teach, work in government positions such as the USDA or the Forest Service, work for agriculture-related nonprofits, or go on to graduate schools. Most of the students are traditional ages but have come from very untraditional high school experiences.

Research at *Sterling* takes the form of "management economics," in which students spend a semester or a year tracking the impact and profitability of various practices in either livestock or vegetable production. Not only does this provide potentially valuable information for Vermont farmers, but it also teaches students how to test variables in their own operations. A current example has one student evaluating duck production to determine the viability of raising meat ducks (the outcome of which will be shared with the Intervale Center).

In the summer of 2011, *Sterling* will offer a new academic program called *Vermont's Table: Farming, Cooking, and the Rural Experience* that combines hands-on culinary training using locally sourced vegetables and meats with in-depth examinations

PHOTO CREDIT: Sterling College

Sterling College students slaughtering chickens.

of Vermont's most innovative farms, cheesemakers, and agricultural businesses. Participants in the food studies program will work alongside and shadow agriculture students on *Sterling's* diversified organic farm during these two 5-week summer sessions.

Green Mountain College

GMC added a major in *Sustainable Agriculture and Food Production* during the 2010-2011 academic year. The college hosts a 22-acre farm on campus that provides a living classroom for students. The college teaches agriculture from a liberal arts perspective using the complexity of food systems and food system issues to teach analytical thinking, problem solving, communications, and business.

Out of a total student population of 730, the faculty anticipates that 35 to 40 students will declare Sustainable Agriculture and Food Production as their major this year. Philip Ackerman-Leist, associate professor in Environmental Studies, attributes the growing interest in sustainable agriculture to a culture shift taking place in suburban and

urban America, where students perceive farming and food production as rebellious and counterculture. Seventy-five percent of GMC students interested in agriculture are females with suburban or urban backgrounds, mostly from the Northeast, from middle- to upper-income households. Very few come from a farming background.

GMC graduates generally stay in the Northeast, many in Vermont. Some of them work on neighboring farms in addition to pursuing their studies. Farmers teach part of the curriculum, generating important and valuable connections for these graduates. Many students go into farming, and some have started food processing businesses, including *Vermont Maple Granola*, *Vermont Bean Crafters*, and *Flavors from the Fields* (couscous and basmati rice mixes). Still others go into food policy–related fields (e.g., the U.S. Natural Resource Conservation Service), geographic information systems, or regional planning. GMC also has an articulation agreement with *Vermont Law School*.

Because of the relatively high tuition ($35,000 per year), GMC's administration has observed two trends: a growing number of students transfer from *Greenfield Community College* in Massachusetts (the college offers them University of Massachusetts tuition rates), and, bucking national trends, most students graduate within four years because of the tuition costs (the national average time to degree completion is 5.1 years).[19]

PHOTO CREDIT: Green Mountain College

Solar thermal high tunnel system at GMC.

GMC has a few applied research projects in progress including a project recently funded by the *Jensen Henman Foundation* to explore fossil fuel–free agriculture. They are currently testing two high tunnel systems[20] and are evaluating the long-term ecological viability of using draft animals on farms.

Both *Sterling* and GMC attract students from all over the country and abroad. Both colleges are also evaluating the addition of a master's degree program in the food systems arena.

University of Vermont (UVM)

The *University of Vermont* is one of more than 100 colleges and universities that comprise the nation's land-grant university system. A land-grant college or university is an institution that has been designated by its state legislature or Congress to receive unique federal support.[23] UVM has a long history of agricultural course offerings and degree programs, as well as first-rate research projects.

As Vermont's land-grant university, UVM offers an *Extension* outreach program throughout the state with offices in 11 counties. The *Extension* service provides timely, research-based information and education for the families, communities, and businesses of Vermont. Its programs cover topics from gardening to farm management, crop growing regulations, water quality, waste management, business start-up, youth programs, and leadership opportunities.

Since the early 1950s, UVM has operated a 97-acre horticulture farm, which gives students the opportunity to run their own farm and CSA, and the Cary Award garden, which features plants and vines that are ideal for Vermont landscapes and hundreds of specialty trees and shrubs including over 120 species of crabapples.

The *Paul Miller Research Complex* offers UVM students hands-on learning opportunities, including the *Cooperative for Real Education in Agriculture Management* (CREAM) program, a two-semester program in which students learn to manage a dairy herd, and the *Ellen A. Hardacre Equine Center*, which gives students the opportunity to bring their own horses to UVM.

UVM's College of Agriculture and Life Sciences (CALS)

The *College of Agriculture and Life Sciences* offers 15 majors and 17 minors. Currently, 1,120 students are enrolled, representing a 40% growth in enrollment over the past six years. The students are predominantly female (72%). This is attributed to two trends: more women are in higher education nationally, and the fields women are interested in are concentrated at the college. Students are evenly divided between suburban and rural backgrounds, and very few students are from farming backgrounds. Thirty seven percent of CALS students are from Vermont.

"I believe that the colleges in Vermont can and should work better together so that each institution leverages its strengths."

—Thomas Vogelmann, Dean of the College of Agriculture and Life Sciences

CALS has evolved with the changes in food and agriculture education. As a result, a small number of students go into farming businesses, while others go into a broad range of food systems work, including moving on to graduate programs. Those graduates that do go into business usually become entrepreneurs.

As mentioned earlier, UVM, in partnership with VTC, offers the 2+2 program, which provides a full scholarship to Vermont students who spend their first two years in the *Dairy Farm Management Technology* program at VTC and then attend UVM for the remaining two years. While at UVM, students are enrolled in courses that provide leadership training and business skill development.

Integrating Research into Learning and Implementation

Research projects are underway in every agriculture major offered at UVM. Undergraduate students are included in research projects exposing them to future job opportunities in lab work. Research grants awarded to CALS faculty have increased significantly over the past six years. As of the fall of 2010, each major had generated at least $1 million in research grants with four majors receiving over $1.5 million each.

An ongoing challenge at UVM is communicating research findings to farmers and food entrepreneurs. Until recently, most research findings were disseminated by UVM's *Extension* service through publishing, lectures, and field days. UVM *Extension* will soon make research findings available through Facebook and YouTube as well. To improve research collaborations inside and outside the university, the *Food System Research Collaborative* was launched by the *Center for Rural Studies* in early 2009. The primary goal of the *Collaborative* is to join on-campus and off-campus organizations in efforts to further food systems research and enhance linkages to the work on the ground in Vermont and beyond. Anyone can join the *Collaborative* to share research ideas, communicate research results, ask questions, and work with other members on new initiatives and projects.[21]

Following are examples of collaborations among the *Extension* service, CALS, and the *School of Environment and Natural Resources*:

- Under the direction of Dr. Heather Darby, UVM *Extension* agronomist and assistant professor, applied research is currently underway to determine best practices for the production of oilseed crops such as sunflowers, soybeans, and canola.
- Dr. Sid Bosworth, UVM CALS associate professor, is supervising research on the production of warm and cool season perennial grass biomass crops such as switchgrass, reed canary grass, and *Miscanthus*.
- Dean Mary Watzin and Dr. Anju Dahiya from the *Rubenstein School of Natural Resources*, Jeffrey Marshall from the *School of Engineering*, and Sandy Wurthmann from the chemistry department are each studying the production of microalgae as a biofuel feedstock.

UVM *Extension* invested nearly $7 million in applied research grants in 2010. Research funding increased by nearly 60% between 2008 and 2010. Most of the research funding is generated through a combination of federal and state grants and contracts. Research through the Extension service is generally market driven; that is, it is designed and implemented in response to requests from clients. Clients often include farmers, producers, bakers, and even distillers. Nearly all of the research is conducted in collaboration with farmers. Recent examples include a farmer trying to evaluate the demand for organic wheat, and schools that want information on local foods available to purchase as institutions.

Although much of UVM's research addresses a one-time need or question, some issues are researched on an ongoing basis (e.g., cover cropping); these projects not only continue to generate data, but also can lead to important precommercialization demonstration projects. Most research projects are evaluated through the lens of sustainability given its importance to the university and the inclusion of the *Center for Sustainable Agriculture* in the *Extension* service.[22]

UVM Center for Sustainable Agriculture (UVM-CSA)

Established in 1994 as part of UVM's Extension service, the *Center for Sustainable Agriculture* promotes understanding, innovative practices, and policies to advance sustainable food production and farming in Vermont and beyond. Its research is largely farm based and transferable to both farms and communities. Research subjects include winter grazing, deep tilling, and training cows to eat weeds. Research priorities within the *Center* often originate from community requests but are also influenced by the interests of individual professors, students, departments, and the *Sustainable Agriculture Council*.

Dairy Center for Excellence

In the fall of 2010, UVM announced the launch of the *Dairy Center for Excellence*. Funded through the sale of the university's dairy herd, the Center engages Vermont farmers as research partners. The mission is to increase the economic viability of Vermont agriculture through partnerships between UVM scientists and local private farms.

An example of current research is a recent $50,000 grant to isolate the highly efficient organisms that break down the manure in methane digesters, which may lead to improvements in methane digester performance. VAAFM has agreed to match the funding for this project. Another $200,000 has already been earmarked for additional dairy research on such topics as value-added farming options for dairy farmers, forage cropping, and a broad spectrum of animal science issues.

UVM's New Food System Spire of Excellence

UVM is currently developing a *Food System Spire of Excellence*, a transdisciplinary effort that combines teaching, research, and outreach to study local, regional, national, and global food systems. No other university in the country is pursuing a food systems initiative on this scale. According to UVM:

> *Already more than 100 faculty and 400 community partners are engaged with models and methods that show promise for revitalizing agriculture while improving people's diet, protecting environmental quality, and creating economic opportunity. The following four integrative domains of transdisciplinary research are proposed to more comprehensively pursue the goal of healthier food systems: 1) food, culture and health; 2) energy and food; 3) policy, ecology and land use; and 4) regional food chains.*[23]

University of Vermont and the Center for an Agricultural Economy Partnership

UVM and the *Center for an Agricultural Economy* in Hardwick are collaborating to expand and enhance the health and economic sustainability of rural communities and local food systems. This initiative, guided by a steering committee composed of members of both entities, identifies and promotes opportunities for partnerships between UVM faculty and students, such as internships, research, and community outreach.

Vermont Technical College

VTC is one of the five colleges in the Vermont state college system. It is the only technical college in the state and offers two- and four- year degrees. Its main campus is in Randolph, with a branch campus in Williston. VTC recently expanded its agriculture program to offer a four-year baccalaureate in diversified agriculture in response to student demand. Students can work with dairy cows from the last teaching herd in the state, pigs, and free-range chickens.

VTC offers Bachelor of Science, Associate in Applied Science, Associate in Science, Associate in Engineering degrees, and a Certificate in Practical Nursing. Majors offered are in a wide range of applied technologies and related fields. The college currently

offers three degrees in agriculture. The associate's programs are in Agribusiness Management and Dairy Farm Management Technology. The bachelor's program in Diversified Agriculture is in its second year.

Forty percent of the students in the agriculture program are female, and 85 to 90% are from Vermont. Thirty percent are expected to inherit farms, and only a small fraction have graduated from agriculture programs in Vermont's CTE centers. They tend to be first-generation college students with limited financial resources who require significant faculty support to succeed academically. VTC has a reputation for tailoring programs to students' personal goals.

The first graduates in the diversified agriculture program completed the program in 2011. These graduates should have developed the skills and experiences necessary to thrive on any type of farm, from vegetable to livestock. It is expected that most students will have farms with multiple income streams and will need business skills to assess which enterprises are profitable and which are not.

Vermont Law School's Center for Agriculture and Food Systems

The *Vermont Law School* (VLS) recently announced the opening of a Center for Agriculture and Food Systems "to support advocates, agencies, food hubs, incubators and farmers engaged in the creation of community-based agriculture systems in the United States and internationally. The new center will focus on legal and policy issues related to community-based agriculture, the regulation of food, the Farm Bill and agricultural subsidies, energy-efficient food production, energy independence for farmers and other issues key to retaining a successful working landscape for rural communities."[24]

The strategy behind the creation of the Center is to address the growing need for legal work that will support the changes underway in our food systems, something no other institution in the country is addressing. It fits well with the nationally recognized environmental law work that VLS currently offers because of the relationship between environmental issues and agriculture.

Courses such as the Ecology of Food and Agriculture have already been incorporated in the JD and master's programs at VLS, and there is a plan to offer a specialty JD in this area over the next few years. The Center will also provide assistance to organizations and individuals who need legal support for food systems issues from crafting documents to initiating policy changes. VLS would provide experienced faculty and students to address those issues. Their work would be funded through grants or fees for service. VLS will also serve as a national convener for conferences and initiatives tackling issues of agriculture and food policy and laws.[25]

New England Culinary Institute

Culinary arts play a crucial role in successfully building a sustainable food system. NECI, based in Montpelier, is a highly regarded culinary arts school that has taught students for over 30 years. NECI has approximately 640 students, most of whom hail from the Northeast. There is a mix of both traditional age students and nontraditional students (many students are between 30 and 50 years old and are changing careers). The student population is predominately male (70%), which is typical of culinary arts schools. To date, over 1,000 NECI graduates live and work in Vermont.

NECI student grinding meat.

PHOTO CREDIT: Philip Rowland

NECI offers a variety of certificates, associate's degrees, and bachelor's degrees in such areas as Professional Cooking, Culinary Arts or Hospitality and Restaurant Management. NECI has developed a bachelor of arts program with sustainability specializations that "teach[es] students how to source local foods, work in an environmentally conscious manner and address food access concerns, while operating successful small businesses."[26]

Enrollment is growing in both the 15-week certificate programs and the four-year baccalaureate program. However, the majority of students enroll in the two-year degree program. Internships play a significant role in the degree programs. At any given time NECI has 300 to 400 students placed in internships around the country.

Part of NECI's mission is to embrace local and sustainable cuisine by promoting the chef–farmer connection and modeling environmentally sensitive business practices. In the first half of 2010, NECI sourced 46% of its food locally, which included direct purchasing from dozens of local farmers.

NECI provides real world learning opportunities throughout the Montpelier area including two restaurants, a bake shop, and the food service at *National Life Insurance Company*, where 1,200 meals are served per week.

Graduates of NECI go into a wide variety of employment areas. Historically, most wanted to go into fine dining, but many now enter specialty areas such as product development, food technology, and food media. Many others move into the food service industry in institutions such as hospitals, cafeterias, corporate dining halls, and university food services.

NECI collaborates with CTE centers throughout the state, including hosting the Vermont Culinary Classic, in which culinary arts students from CTE centers compete. It also has articulation agreements with several technical centers so students in high school can earn college credit for some of their high school course work.[27]

ANALYSIS

Public schools in Vermont and around the country are going through agonizing changes. The demand for improved student performance has never been greater—driven by multiple factors ranging from the growth in jobs that require postsecondary education,[28] the lack of readiness among high school graduates for college-level learning,[29] the costs of higher education (which have been outpacing inflation for the past decade),[30] and international data that indicate that the United States is falling behind in the quality of its workforce.[31] It should be noted that many of the issues impacting Vermont's education system also effect food system education, including the recruitment, preparation, placement, and retention of high-quality teachers; funding for local programs; and finding ways to address the expectations of and need for broader accountability in all public schools, including testing in core subjects.[32] These factors have added pressure on state and local school systems to increase the rigor of their academic curricula. **At the same time, total enrollment at public schools in Vermont decreased 10.6% from 2001 to 2010**[33] and the future of Vermont's educational system has engendered considerable debate.

The F2P research team identified the following areas in Vermont's educational system that need additional resources and refinement to prepare Vermonters for careers throughout the food system:

- Lack of research coordination and dissemination among postsecondary institutions
- Limited breadth and quality of food system academic offerings at CTE centers
- Inconsistent investment in professional development among agriculture and natural resource teachers
- Restricted opportunities in work-based learning and education in the fields of food processing and marketing
- Underutilization of current infrastructure to capture student interest in food, farming, and the culinary arts
- Inadequate two-year education options in food systems and lack of flexible degree program between technical centers and a 13th year

- Little to no career counseling in middle and high schools
- Lack of clearly communicated career pathways in agriculture and food systems in middle and high schools.

Research

Four of the six Vermont higher education institutions with food systems programs conduct ongoing research projects of varying sizes and scopes. UVM, well known for its research, conducts extensive scientific research funded through federal and industry grants as well as on-farm and applied research funded through state and industry grants. Funding for both types of research has increased significantly over the past several years. *UVM Extension*, for instance, has realized a $2 million increase in funding for its applied research work.

Sterling College and GMC also conduct research, which is mostly applied, on-farm research. These projects are generally funded through foundations whose missions align with the projects. *Vermont Law School* has just begun to offer legal and policy research work to organizations seeking that support. National debate centers on the value of incremental research (i.e., making existing systems incrementally better) versus transformative research (i.e., changing entire systems). Discussions have been ongoing about how to use both types of research, with some suggesting that the need to improve research coordination and share findings among all Vermont colleges and UVM (e.g., encourage food system researchers to review research findings to date, identify research gaps, and determine high-priority research needs for the state).

Education

Vermont FEED, the *Burlington School Food Project*, *Green Mountain Farm-to-School*, 4-H courses, and *NOFA Vermont's* Farm to Community Mentor programs are bringing food, farming, and nutrition information into many Vermont schools. Food system education can and does cut across many academic disciplines including math, science, English, art, social studies, history, and more.

Respected food and nutrition curricula exist on both a national and state scale for most age groups. The *Vermont State Department of Education* has curriculum standards and grade expectations for Natural Resources and Agriculture (2004) for grades K through 12.[34] Providing adequate professional development to ensure that teachers are teaching agriculture education with the intention of meeting grade expectations will increase the rigor and ultimately deliver greater learning in this field and build on the other valuable elements of programs such as *Farm to School*.

Shelburne Farms has developed a collection of hands-on activities called *Project Seasons* for both farmers and teachers that offers professional development and incorporates lessons that meet Vermont Standards and Grade Expectations. This is the type of program that, with adequate funding and in partnership with the *Department of Education*, could deliver the training needed to improve learning and meet the needs of both schools and students.

Although there is always an opportunity to improve curricula and enhance learning through structural changes (such as offering cafeteria worker training and improving refrigeration equipment), reasonable education curriculum choices already exist. Extending the reach of these programs so that all Vermont schools may access them would have a dramatic and lasting impact on all Vermont communities (from children to farmers). Educators often lack awareness of the agriculture curricula that do exist, such as the 4-H elementary-level science curriculum on embryology.

Career and Technical Education Centers

Agriculture differs from many other content areas in that the farmers themselves offer unique value to the education process. Vermont institutions offering agriculture programs all incorporate farmers, but in some cases farmers struggle with how to best communicate their expertise and knowledge base in traditional undergraduate environments. Currently, most institutions use farm visits, on-farm work, research projects, and periodic programs to broaden student learning, but only occasionally are farmers brought into the classrooms to share that information. GMC, for instance, makes extensive use of on-farm learning, in some cases building it into more than half of its course curriculum.

Professional development opportunities for math, science, and agriculture teachers of all ages are available but often unexploited. More specifically, incorporating learning modules such as beekeeping, agritourism, orchard management, and food processing into existing programs is possible but rarely implemented.

Most growth in CTE agriculture programs is in the pretechnical or foundations courses. Those courses are currently offered to ninth- and tenth-graders and last only one semester. These courses give younger high school students the opportunity to explore the subject to determine not only if they are interested in the CTE center but whether this is a subject area they would like to pursue academically and possibly professionally. Providing increased access for younger high school students will increase the reach of food and agriculture curricula to secondary students.

As is true of all programs of study at CTE centers, teachers and students are under the perception that these programs have low academic standards and are simply places to "warehouse" poorly performing students. Although some technical center programs are less rigorous than traditional academic programs, the rigor has increased across the board and many more technical center students are going straight into college (two- and four-year colleges depending on the area of study).

With the exception of two CTE centers, *Hannaford Career Center* and *North Country Career Center*, enrollments in agriculture and natural resource programs have declined or stayed flat, with an overall decline of 11% statewide over 3 years.[36] Teasing out the reasons for these declines is extremely difficult. Issues from declining school budgets (which schools sometimes respond to by decreasing the number of students released to technical centers because their tuition follows them to the centers) to challenges facing dairy farms and the declining appeal of working on them make an accurate analysis difficult. Looking carefully at the centers in which enrollment has increased leads one to conclude that updated curricula, increased academic rigor, and access to college credit opportunities are possible reasons for student interest in agriculture and natural resource program areas.

Paradoxically, as education continues to endure challenging and often conflicting reforms, CTE centers offer some of the best resources for change. In career-focused learning, students can clearly articulate the connection between what they're learning in school and how they can use it in a job or career; courses are more experiential and hands-on; and the curriculum incorporates workplace experiences as part of learning. Experiential learning engages different types of learners rather than just those served by more traditional lecture-style teaching methods. Additionally, many CTE centers require students to develop portfolios of their work and accomplishments throughout their tenure in the program. Their portfolios provide a visual representation of their progress and development and help them apply to postsecondary institutions and find work in their field of interest.

CTE programs that meet the needs of students with a broad range of academic capacity are growing. A forestry and natural resources program at the *Hannaford Career Center* recently incorporated an honors component into its program. Students requesting the honors track must complete additional course work and assignments to be recognized as honors students. The hope is that this program will continue to attract both academically high-achieving students as well as students interested in becoming loggers.

Both traditional high schools and CTE centers struggle with demonstrating that much of their learning can be applied to a variety of careers in food systems work such as renewable energy development, entrepreneurship, business, and marketing.

Additionally, career counseling is lacking at all levels of education, disconnecting learning from everyday life and missing opportunities to engage experienced, successful businesspeople.

Most of the agriculture programs in CTE centers include strong science components such as plant, animal, and soil sciences. Combining that science focus with business elements and extensive writing and oral presentations could generate highly rigorous programs that would attract top-performing students. Currently, 6 of the 17 CTE centers offer agriculture or food systems programs that are eligible for college credits, which is a magnet for attracting some of the stronger academic students, increasing classroom rigor and improving career centers' reputations. A recent survey indicated that 55% of CTE center graduates taking agriculture-related programs go on to postsecondary institutions. Strengthening relationships between Vermont CTE centers and Vermont colleges that offer agriculture and food systems degrees would strengthen both the sending institutions and the receiving institutions by creating a more seamless education path and thus more knowledgeable and college-ready students.[35]

Students as Teachers

Teaching is the best form of learning and is empowering for young people of all ages. Middle and high school students could support food, farming, and other educational programs after school and during the summer months by providing child care, camp counseling, and teaching services. They could earn a stipend or hourly wage for their work, which would build independence, self-esteem, and a portfolio of work experiences.

Technology and Infrastructure

A message repeated often by Vermont's current Education Commissioner, Armando Vilaseca, is that one way to reinforce the value of Vermont's schools is to enhance their usefulness to Vermont communities. For instance, schools can and should serve multiple constituents—not just students and their teachers, but also seniors, athletic teams, clubs, and summer camps. Many schools go nearly "dark' after 3 p.m. and are unused most nights. Many schools are locked up throughout the summer months. Meanwhile, senior centers, camps, clubs, microbusinesses, and athletic teams seek access to temperature-controlled environments, communications tools (such as computers and libraries), gymnasiums, and commercial kitchens. Similarly, many schools, especially the rural ones, reside on fertile land that could accommodate summer working gardens. The state would need to support these expanded uses by streamlining regulations and underwriting some of the risks such as food safety, workplace safety, insurance, and utilities. The management costs of additional programs at schools could be partially offset through user fees and earned income.

Network Development

Improved networking and resource sharing is needed at all educational levels.

Preschool Age

Finding information about food systems education for preschool children is challenging because much of it is concentrated locally. Creating an online network of learning resources that parents and early childhood educators could easily access would be an inexpensive and valuable way to expand choices for this age group. Because preschool age children are highly impressionable, exposure to food education will trigger lifelong eating habits, including purchasing habits. Increasing the opportunities for preschool age children to learn about food and farming can lead to a new generation of smart consumers and successful workers.

Elementary and Middle School Ages

Schools often are not open during the summer months or in the evening when agriculture and food education programs could best use their facilities. Educators and administrators are often uninformed about and disconnected from these community opportunities. Building stronger relationships among school administrators, educators, nonprofit organizations, summer camp administrators, parents, farmers, and other community members could improve food and farming education through the middle school years at relatively low cost to taxpayers.

Often the greatest obstacles to progress lie in the human and information gaps within the system. Building and maintaining an inventory of available organizations and programs, human resources, existing and often underused infrastructure, curricula already written and tested, summer programs, and out-of-school opportunities would make these resources readily accessible.

However, along with inventory development is a need for human capital—someone to not only take inventory but maintain it, identify gaps and opportunities, seek expansion in areas of intense interest, and refer families to available opportunities. As an example, consistent, inclusive networking and communications between in-school programs and out-of-school programs is currently lacking.

Postsecondary Education

Each Vermont institution of higher learning plays an important and unique role in food systems education. UVM offers a wide range of degrees and programs and provides extensive research. VTC focuses on applied learning with its dairy farm and new diversified farm. *Sterling College* and GMC offer decidedly more liberal arts approaches to teaching food systems work, but each offers substantial on-farm learning opportunities as well. NECI offers culinary arts training grounded in a sustainable approach. Finally, *Vermont Law School* addresses legal and policy issues related to food

systems. Although some coordination among these five schools exists, there is no unifying organization or resource that currently fully leverages the strengths of each institution nor takes advantage of their geographic dispersion (which covers the entire state). Such an effort would better serve students academically and also increase the efficiency of applied research.

Parents and Other Stakeholders

Communicating broadly to parents, educators, administrators, school boards, and other stakeholders is crucial for all areas of education, and agriculture is no exception. This is especially true in Vermont where so many individuals and organizations can influence education priorities. Most school boards, administrators, and elementary teachers do not benefit from regular information sharing and trainings.

Financing

Postsecondary Education

Vermont students and their families incur 16% more debt for bachelor's degrees than the national average. Student debt in Vermont continues to grow with the average student debt reaching $27,786 for graduates of the class of 2009. This ranks Vermont the fifth highest in the nation for debt loads.[37]

Table 4.2.3: Tuition at Vermont Postsecondary Education Institutions

Tuition, room, and board (as published)	In state	Out of state
University of Vermont	$22,550	$40,406
Vermont Technical College	$20,725	$30,081
Sterling College	$34,100	$34,100
Green Mountain College	$38,090	$38,090
New England Culinary Institute	$34,400	$34,400

Debt loads are even more challenging for students in agriculture and food systems work given the barriers to successfully entering into those careers. Other barriers include limited land access, low wages, and high start-up and infrastructure costs for food-related businesses.

One and two-year degree options can help reduce total education costs and debt. However, Vermont institutions lack one- and two-year options in food systems education. SUNY-Cobbleskill and Paul Smith's College offer a wide range of degree programs and certificates in food systems education, and NECI offers a range of one- and two-year programs as well.

GETTING TO 2020: OBJECTIVES AND STRATEGIES

Reaching these goals will require not only adequate funding from both the state and federal governments but a genuine collaboration between state government and Vermont's public and private colleges. A welcome outcome of both adequate funding and collaboration could be a boost in Vermont's image as a place of outstanding food education. Higher education is already a significant portion of Vermont's economy in terms of revenues and jobs. The growing interest in food systems education, confirmed by growing enrollments in these programs, could further stimulate this already important sector—adding jobs, businesses, and revenue to the state.

Table 4.2.4: Objectives and Strategies for Food System Education

OBJECTIVE	STRATEGY
Research Strategies	
Validate the impact of in-school food education on academic outcomes. Validate the connection between in-school food education and out-of-school choices (activities, career choices, etc.).	Develop tracking systems in several school districts to confirm the connection between in-school food education and academic performance as well as the out-of-school activities students participate in. Based on outcomes, expand grant funding for Farm to School initiatives.
	Evaluate existing food education curricula and build a database of best practices (e.g. 4-H curriculum and others). Share the database with school districts.
Track the reach and impact of the Farm to School programs.	Break out the elements of Farm to School program into three sections: education (academic rigor/grade expectations), infrastructure, and training. Establish education criteria to track impacts within each section.
	Establish criteria for defining which Vermont schools can be considered Farm to School hosts.
	Survey public schools to provide a benchmark for current food education coverage. Conduct a survey every three years to update the benchmark.
	Establish an evaluation system for schools participating in Farm to School activities.
Improve research coordination and share findings among all Vermont colleges and the University of Vermont, annually.	Host a statewide annual gathering of all Vermont food systems researchers and stakeholder organizations to review research findings to date, identify research gaps, and determine the highest-priority research needs for the coming year or two.
	Encourage agricultural research providers to conduct ongoing reviews of their work with the goal of identifying patterns and opportunities for application to food-related businesses and farmers.
	Emphasize integrative models of research, taking the ecological, economic, and social impacts of agricultural practices into account.
Track and evaluate graduate success.	Establish systems for keeping track of graduate placements and initial destinations (e.g., remaining in Vermont).
Marketing and Public Outreach Strategies	
Generate community support for food and nutrition education.	Improve communication efforts to reach teachers, parents, administrators, select boards, school boards, guidance counselors, camp owners, media outlets, and others.
	Build and analyze a database of information linking food and nutrition education to student interest in agriculture and food systems studies.

OBJECTIVE	STRATEGY
Marketing and Public Outreach Strategies	
Build Vermont's reputation and marketability as the premier food education location in the United States.	Encourage coordination among institutions of higher education to collectively market outstanding food education opportunities in Vermont (NECI, *Sterling College*, UVM, GMC, *Vermont Law School*, VTC).
Improve the image of agriculture and food system education.	Retitle agriculture education as "sustainable agriculture and food systems."
	Continue to incorporate cooperative learning opportunities into sustainable agriculture programs.
	Continue to add modules of learning into existing sustainable agriculture programs such as biofuel and on-farm composting programs.
Education Strategies	
Expand the exposure of prekindergarten through 12-grade students to food system education.	Support the professional development of teachers to encourage them to incorporate intentionality and grade expectations into food and agriculture education. Refer to the 2004 *Department of Education* curriculum standards to ensure that food and nutrition education is embedded in the curricula and assessments for grades K-8.
	Develop financial projections to determine the level of funding needed for the rollout of a range of Farm to School curriculum and program components.
	Support workshops staffed by experienced Farm to School coordinators, teachers, and administrators that serve school volunteers and staff new to Farm to School programs.
Generate hands-on and applied food system learning opportunities in school, after-school and out-of-school programs.	Employ a part-time agriculture and food education staff person in each school district to strengthen and expand connections between school administrators and community resources and to create partnerships with 4-H, out-of-school, and summer camp programs, as well as *NOFA Vermont's* Farm to Community Mentors program. This position could be filled by an existing teacher.
	Encourage the housing of 4-H clubs and programs (during the summer and school year) at local schools. Have schools host 4-H Extension Coordinators to speak at School Parent Nights to recruit volunteers, and Farm Camp information sessions during the spring. Increase the number of 4-H and UVM Extension speakers and programs in schools.
Fully leverage the resources of Vermont's public schools to support food system education and engagement.	Support the expansion of local food purchases through school cafeterias, including some light processing (e.g., washing, cutting, light cooking, refrigeration, etc.).
	Promote and/or support the creation of working farms at high schools and CTE centers.
	Develop summer camp opportunities at high schools and CTE centers partially funded through CSAs. Consider high school students for counselor and paid staff positions.

OBJECTIVE	STRATEGY
Education Strategies	
Fully leverage the resources of Vermont's public schools to support food education and food system engagement.	Explore the viability of after-school programs that incorporate farm work.
	Support the streamlining of state regulations and the underwriting of some risks such as food safety, workplace safety, insurance, and utilities.
	Explore offsetting the costs of additional and varied programming at schools through user fees and earned income.
Improve the rigor of agriculture programs in both high schools and CTE centers.	Develop honors programs within food systems subjects for both traditional high schools and technical education centers.
	Train guidance and career counselors on the range of career opportunities in food systems including college pathways.
	Assist technical centers in building articulation agreements with in-state colleges to increase the number of food systems and natural resource programs that offer college credits.
	Develop a cadre of local businesses and food producers willing to enhance food curricula by becoming involved in course work, giving lectures, and providing out-of-school or experiential opportunities.
	Design food systems and natural resources programs that provide college prep credits in areas such as science, math, and English.
	Develop academic relationships with existing technical assistance providers such as *NOFA Vermont*, *UVM Extension*, and the *Farm Viability Program*.
	Identify opportunities for postsecondary institutions to work collaboratively with CTEs–including having postsecondary students teach, conduct fieldwork, and possibly research.
Expand food systems and natural resource offerings to 9th- and 10th-graders.	Develop 9th- and 10th-grade programs that expose students to CTE 11th- and 12th-grade programs.
	Provide food systems course offerings in high schools and incorporate field trips to CTE and production facilities.
	Introduce FFA programs, training, and leadership opportunities into 9th- and 10th-grade curricula.
Develop and promote professional development opportunities for math, science, and agriculture teachers to ensure that learning opportunities are fully exploited.	Identify existing professional development programs that have potential, or develop new programs using existing technical assistance providers and curriculum experts.
	Fund Farm to School professional development of educators, food service providers, and Farm to School coordinators.

OBJECTIVE	STRATEGY
Education Strategies	
Improve guidance counselors' understanding of career opportunities in sustainable agriculture and food systems.	Build and execute an outreach plan that supports improved understanding among guidance counselors. The plan must reach all relevant stakeholders.
Increase the availability of dual enrollment and college credits in CTE center food system programs.	Support CTE articulation agreements with higher education institutions to increase the number of high school programs that offer dual enrollment credit.
Increase farmers' involvement in the classroom in institutionally appropriate ways.	Develop a role for farmer involvement in teaching (and provide an honorarium for their time).
Support postsecondary transitions into food systems–related careers.	Support collaborations among colleges, UVM, and CTEs to facilitate transitions between CTEs and institutions of higher education and between CTEs and certificate programs.
	Embed food systems content into curricula that provide information about postgraduation support systems and organizations such as *UVM Extension*, *NOFA Vermont*, RAFFL, and *Farm Viability Enhancement Program*.
	Match graduates with mentors and apprenticeships prior to or immediately upon graduation. Mentors should include farmers, food entrepreneurs, policy makers, and nonprofit organizations.
Expand the availability of in-state two-year degree /certificate programs and certified apprenticeship programs.	Encourage colleges to offer two-year degree programs to reduce the time to graduation and the cost of higher education, particularly programs that prepare students for food-related careers such as processing and meat cutting.
Consider developing a certificate in organic farming.	Explore the demand for a degree in organic farming and consider offering this professional credential as part of an existing food systems education option.
Network Development Strategies	
Share educational resources among colleges invested in food systems work.	Support a number of colleges in providing infrastructure support for *UVM Extension* work in their regions by providing facilities, sharing training opportunities, and creating faculty partnerships. Encourage more resource sharing (e.g., guest speakers could be shared among institutions to reach the maximum number of students and faculty across the state).

End Notes

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CROSSCUTTING ISSUES

Food System Education

Credits

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Vermont Sustainable Jobs Fund

farm to plate
STRATEGIC PLAN

farm to plate
NETWORK

VERMONT
FOOD SYSTEM ATLAS