2018 New York Farm Viability Institute Annual Report

farm viability

NYFVI PRIORITIES
FARM-LEVEL IMPACTS
FARMER-IDENTIFIED NEEDS & OPPORTUNITIES
FARMER-BOARD & REVIEW PANELS

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2018 was my first full year as chair of this organization and I am pleased with our accomplishments. The organization has truly hit its stride.

In August, the board welcomed two new members, Dave Ryan was nominated by the New York Nursery and Landscape Association and Chris Kelder was nominated by the New York Farm Bureau. Dave replaced Bob Smith who has served on the board intermittently since its early days, and Chris replaced Eric Ooms who served two terms.

On behalf of the board and staff, I would like to thank Bob and Eric for their wise counsel and good humor. It has been a pleasure getting to know them both.

As of August 2018 the board members have all joined the board over the last 4 years. And while we may not have been here at the beginning of this organization’s journey, we are fully committed to its future.

We’ve seen firsthand the organization’s ongoing work to continuously improve how we serve New York’s farmers and research communities. Over the last four years the organization has:

- Worked with the New York State Department of Agriculture and Markets to jointly administer the annual competitive process for the USDA Specialty Crop Block Grant Program.
- Worked with NY Corn and Soybean Growers Association to administer their corn research spending.
- Evolved the Dairy Profit Team program to include “Topic Specific Teams” which are now helping nearly two hundred farms across the state.
- Streamlined the competitive grant program into a single “FVI” program.
- Explicitly encouraged more FVI proposals focused on accelerating the adoption of technology on farms.
- Reduced the upper limit on FVI proposals in hopes of being able to fund a few more projects.
- Expanded the online database to allow our producer review panels to read, score and comment on the proposals online.
- Worked independently, and in collaboration with other organizations, to identify the research and education priorities of beef producers, vegetable growers, grape growers, controlled environment agriculture growers, and dairy producers through surveys and focus groups.
- Built and strengthened relationships with a wide array of educational organizations and private businesses interested in working to advance the work of New York’s farmers.

The NYFVI board is confident that our organization’s programs are connecting research and education dollars with the priorities of New York’s farmers. The nomination process for board members from NY ag organizations; the structure of our RFP and scoring system, and our use of farmer review panels all ensure our program is designed to deliver results for New York’s agriculture community.

Thank you for your support.

Mike Jordan
Chair, New York Farm Viability Institute
Olde Chautauqua Farm
Farm Viability: Small Organization, Big Impact

At its core, Farm Viability’s mission is to help New York farms become more viable. We do this through strategic management of our grant program, seeking farmer input at every step in the process to ensure the projects we fund will create and share knowledge that will quickly and directly benefit farmers.

Farm Viability currently runs three programs and is managing around 75 active projects worth almost six million dollars.

Our core program, known as “FVI” is a competitive grant program. The request for proposals (RFP) opens in September, and the grants are announced in the spring following the NYS budget cycle. Projects are between $25,000 and $125,000 and have two years to complete their work.

The RFP is open to all organizations with ideas that will improve the economic viability of New York’s farms. It is not restricted to any specific commodity group, nor are the funds awarded by quota. This allows us to fund the work that is considered to have the most potential in any given year.

Our core program seeks to fund work that will create economic impact for New York farmers. A few years ago we developed five strategic priorities for our program. They help us consider how close to near term impact a project might be. Work in the “Improving Operations” and “Route to Market” priority areas should deliver a return within the life of the grant. Other areas, such as “Incubating New Ideas” are for earlier stage work. A full description of each of the five priorities accompanies the project lists throughout this report.

To evaluate how we and our projects are performing we track our “return on investment”.

As part of the final report, project leaders tell us:

Did the farms that participated in the project show an increase in gross revenue, a reduction in operating expenses or did they make new capital investments? If so, how much?

Now, we know that not every project is going to have a great pay-off, and that’s okay. Sometimes research needs to play defense against pests, and sometimes the work is at an earlier developmental stage. That said, overall the most competitive proposals are going to be the ones that are able to deliver and measure farm level economic impact.

So how are we doing? We think the system is working. For every dollar invested in a project that has completed, seven dollars and fifty cents has gone back to the agriculture community.

The total economic return from the last 14 years of funding is now just over 140 million. That’s why we have such confidence in our program.
A new statistic to share this year is a look at our active projects. This map is a snapshot in time as of November 1, 2018. It shows the 287 farmers from across the state that are actively involved in one or more of our currently active core FVI projects. The color highlights how many farmers in each county are part of one of the research projects we’ve funded. They might be an advisor to the project, or trials could be active on their farm. It’s important to note that this is not a map of where one of our projects educated producers — these are the farmers that are actively involved in the project.

In case you’re wondering what’s going on in Long Island — where we have 35 producers involved — it’s a wide range of work. GrowNYC is working with producers on how to expand into wholesale marketing, potato farmers are working with Suffolk County’s Nora Catlin to manage nitrogen, there are two projects researching vineyard management practices, a NorthEast Hops Alliance project working with a grower on developing NYS hop varieties, an IPM project working on pest management in Christmas trees, and a number of fishermen who worked with Suffolk County Cooperative Extension to build a program around increasing consumer demand for local fish. Also at Suffolk County is a critically important project by Faruque Zaman, at work to identify alternatives to chlorpyrifos. That story is on page 21.

NYFVI Dairy Profit Program
We also have a robust dairy program providing direct service to New York dairy farms on a wide array of topics. More information about it can be found on page 10.

Specialty Crop Block Grant Program
Since 2014, Farm Viability has worked in partnership with the New York State Department of Agriculture and Markets to administer the competitive grant component of New York State's USDA Specialty Crop Block Grant Program.

In 2018 the Farm Viability review panels scored and evaluated 20 proposals, seven were selected for funding. Currently, 18 specialty crop projects are being administered by NYFVI, utilizing funds from multiple Specialty Crop Block Grant years.

“Farm Viability’s focus on projects with shorter time frames to farm-level impact is what has allowed us to achieve a very impressive return on the State’s investment in New York agriculture. We do fund longer horizon work, but all else being equal the board will generally choose to fund work that generates near term results.”

Dave Grusenmeyer  
Executive Director  
NYFVI

287 farmers are actively involved in one or more of our FVI projects across 47 counties. They could be part of the project advisory board or the trials could be taking place on their farm. (as of November 1, 2018)
Proposal Scoring Criteria

1. Producer Involvement
   Is there confirmation that the barriers this project addresses were identified by farmers as high priority?
   Is there evidence that sufficient numbers of farmers are involved in at least some of the following activities: proposal development, project advisory committee, project implementation, outreach, and information dissemination, and project evaluation?

2. Relevance to NY Agriculture
   Is the problem, or opportunity that the project seeks to address a critical one for New York farmers?
   Will the project, as presented, effectively address the identified barrier or opportunity in a significant way for the betterment of NY agriculture?
   Does the project, as described, have a high probability of success?

3. Work Plan (Performance Targets, Milestones, and Activities)
   Are the performance targets specific, clearly stated, and measurable at the farm or enterprise level?
   Are the milestones measurable and when they are achieved will they move participating farm businesses toward the stated performance targets?
   Are the activities to be undertaken appropriate for reaching the milestones and achieving the performance targets?
   Is there enough detail provided to evaluate the rigor of the research design?

4. Outreach Plan
   Is there a practical and well organized plan for how the information gained from, or materials developed for, this project will be disseminated to the broader agricultural industry?
   Are the activities in the outreach plan likely to be effective in creating change?
   Is the outreach plan innovative?

5. Evaluation Plan
   Is there a clear and effective plan describing how individual farm or enterprise level impacts will be measured, collected, and verified?
   Is there a plan to track or estimate changes in the broader agricultural industry that resulted from the project’s outreach efforts?
   How much confidence do you have that the proposed evaluation plan can be successfully executed and will result in useful information?

6. Budget
   Is the budget reasonable and appropriate for the importance and value of this project to the crop it addresses?
   Is the total budget appropriate to the size and scope of the project?
   Are the individual budget line amounts reasonable and realistic?
   Are the justifications for each budget line clearly stated, adequate, and acceptable?
   If there are labor charges, do the tasks outlined justify the labor budget?

Project Team
   Are the descriptions of individual’s roles sufficient to understand what each will be doing in the project?
   Is it clear that the qualifications described for each individual relate to and match their role in the project?
   Are you confident that the combined knowledge, skills and abilities of the team are adequate to successful complete the project?
   Do you believe the size and diversity of the project team is appropriate to the size and scope of the project?

All our reviewers use our online system to read, score and comment on the proposals. Each of the numbered sections to the right is assigned a score on a five point scale. These scores are averaged for a composite score. The project team is a yes/no response. We also ask for an overall score, which includes the recommendation to “Do not fund”. All this information is aggregated for the review panel conference calls and discussion. It is also provided to the board of directors.
Application Design and Farmer Involvement. It’s Our Secret Sauce.

No one likes to hear about process. We agree that our projects are far more interesting. That said, we think it is our process—and its relentless focus on farmer involvement and measurable outcomes—that help us identify the projects with the most potential for impact.

Each project that is selected for funding has the support of farmers; either through hosting research trials, serving on an advisory committee or even the endorsement from NYFVI review panels. We think this involvement and input is critical to ensure that our funding dollars are put to the best possible use.

Our application, based on the Outcomes Funding Framework, asks potential project leaders to think first about the impact they intend to achieve and then work backward to identify precisely what they will need to do to make it happen. The framework requires applicants to define performance targets that identify what will be different at the farm level as a result of the project, establish milestones to achieve that performance target, and then describe the activities they will undertake to make it happen.

We also ask the potential project leaders to describe the problem or opportunity their work is designed to address, providing specific information about how they know this work is important to farmers, and who the farmer beneficiaries will be.

This ensures that as the board and review panels evaluate projects for funding, they are able to distinguish fairly easily among the group and identify the projects that have the potential to make a real impact.

Since our board and review panels are all farmers, they have “boots on the ground” knowledge of what’s important and can prioritize the projects that they find most relevant for NY farmers. So overall, for a proposal to succeed, it needs to define its relevance to a farmer’s bottom line, deliver a good value proposition, and be combined with an excellent work plan.

Since 2006, we have had over 500 potential project leaders participate in our Outcome Funding Framework grant writing workshops. While not all of those who participated have received funding, we hope that we have helped them improve every project they undertake.

NYFVI Farmer Review Panels

Farm Viability makes extensive use of review panels to evaluate, score, and rank proposals. Panel members are selected based on their ability to objectively evaluate proposals within their area of expertise.

Review panels for the 2019 grant cycle include:

- Apple
- Craft Beverages
- Direct Market
- Dairy
- Hemp
- Field Crops
- Fruit
- Goats
- Livestock
- Pollinators
- Sod
- Vegetable

If you are interested in applying to serve on a review panel, please email info@nyfvi.org or give us a call.
The 2019 RFP brought in a wide range of ideas and organizations seeking to help New York farmers. From blockchain to business plans NY farmers are fortunate to have so many passionate people hoping to help.

Many of the 2019 project applicants have ideas to help farmers direct market their products. This year we will use a review panel specifically for these as they often cross traditional commodity lines.

We also received several hemp proposals that warrant a dedicated review panel.

We were happy to see the number of proposals in the dairy industry double this year and hope to see more proposals in other livestock sectors in the future.

It’s worth noting that overall, our program is designed to respond to the proposals that we receive. Flexibility is one of the strengths of the organization. Since we don’t have quotas, we’re always able to simply prioritize the work with the most potential for funding. We’ve seen over time that our funding tends to reflect the size of the commodity overall.

The chart on the right illustrates how the funding for the last three years has been spent by commodity area.

The 2019 grant round was the second year we explicitly encouraged technology proposals in our RFP and we’re happy with the results.

Of the 46 proposals over 20% hope to use or develop technology in their work. This is a much higher number than we’ve seen previously.

We continue to believe that there are significant opportunities for more people and organizations with skills in engineering, data analytics, and software development to work on tools that benefit NY farmers. That’s why we’ve made introductions between ag researchers and SUNY University at Buffalo helping them tap into the State’s high performance computational consortium. And, it’s why we’ve made introductions from Rensselaer Polytech Institute to Cornell plant pathologists---so they can collaborate on opportunities to use UV light to fight pathogens.

This year we received two proposals hoping to develop weather tools for New York farmers. As a result, we’ve already introduced researchers at SUNY Albany’s Atmospheric Sciences Research Center to Cornell IPM faculty working in the same area.

We also engage on an ongoing basis to help start-up companies that are building tools for farmers to build relationships with people in our ag networks. We believe that their success is good for everyone. Late in 2017 we supported work at Cornell to validate the SomaDetect in-line milk sensor. In the 2018 grant round we were pleased to fund a proposal with Zymtronix, a startup based out of Cornell working in nanoparticles that is developing a new seed coating to prevent disease and reduce the need for pesticides.
New York is fortunate to have such a broad range of agricultural products produced in the state. One of the strengths of Farm Viability is our focus on funding the best proposals received in any given year. The chart above illustrates how the funds were awarded among commodity areas.

Projects in the “general” category help farmers in two or more commodity areas. Projects labeled as “niche” refer to the size of the market, for example the equine project funded with Jefferson County Community College.

In 2018, our farmer review panels and board of directors reviewed 42 proposals, and selected 15 for funding. The total award was $1.41 million among 8 organizations. A full list of the projects funded can be found on page 26.
Over the last few years, the Farm Viability TST program has picked up steam as educators from NOFA-NY, county extension offices and regional dairy and livestock teams have integrated the program into their approach. The idea is simple, educators identify a topic that is of strong interest to the dairy farmers in the region. They make a commitment to work with those farmers on that topic. Discussion groups can be used, but at least two opportunities for individual discussion about information specific to their farm must be part of the plan. The budget is based on the number of farms that commit to the program. Work should be completed within 15 months.

As of November 1, nearly 200 farms were being actively supported by the project.

At Farm Viability, we’ve been excited to see the work progress and it has made us interested in exploring other learning models to support New York’s dairy farmers.

Short descriptions of the work being done follow, and a longer story about how Betsy Hicks and Lindsay Ferlito used data loggers to drive home the importance of cow comfort can be found on page 12.

**Supporting Organic Dairies**

**Dairy Transitions Projects 1 and 2, NOFA-NY** The first project worked with 7 dairy farms to help them understand the certification process, plan for the necessary changes to comply and apply for certification. Of the 7 farms supported, 3 made it through the process and began selling organic milk. The farms that did not certify either could not afford the cost of organic grain while in the certification process, and/or could not find a processor for an organic product. The second project provided one on consultation to 6 farms. 3 farms were successful in completing the certification application with 1 additional farm planning to submit later in 2018. Due to market constraints, no organic processors are currently taking on new farmers. The first project completed in 2017, the second project completed in May 2018.

**Organic Dairy Grazing Project, NOFA-NY** This project works directly with fifteen farms, to create and/or improve grazing plans. Realistic assessments of cost/benefits of infrastructure improvements such as fencing and field conditions are also being discussed and evaluated. Additionally, three regional peer groups are being created to allow the farms to build their own advisory networks and continue to receive dairy grazing expertise as a group. Project completed in May 2018.

**Organic Dairy Managing for Success, CCE Cortland County** This project focused on enrolling organic dairy farms in the Cornell Dairy Farm Business Summary program (DFBS). The DFBS is a valuable business management tool to help farms look at their financial data. While the tool has value on its own, it is even more powerful when benchmarks can be created. The original goal was to enroll enough organic dairies in the DFBS so that organic benchmarks could be created. Although this was not attained, the project did provide direct support to 8 farms and helped them make strategic use of their data. Project completed in June 2018.
Improving Business Management

Business Management Action Teams 1-4, Pro-Dairy, Cornell, 20 farms were enrolled in one of two new BMATs to improve their business analysis and decision-making skills, resulting in improvements in their businesses and long-term viability. Farms were enrolled in the Dairy Profit Monitor program, and provided direct support. They met twice in-person with their farm groups during the first year to review their businesses, set goals for improvement, and reported on progress on those goals. The outcomes were improved business performance and decision-making skills for these dairy managers and owners. For one participant, the analysis and discussions around both the financial performance and management strategies of their operation has given them the tools to begin their long overdue succession planning process. The first project completed late in 2018. A second wave of 24 farms were enrolled to participate in two teams focused on the same topic. It is scheduled to complete in March 2019.

Improving Management of Hispanic Employees on Dairy Farms, WNY Dairy and Field Crops Team This project is working with six dairy farms to improve their Hispanic employee management. The farms are being educated as a group on broad topics, then provided direct support on their top three action items. Employee surveys have been taken to measure the current organizational commitment, with the hope is that a post survey shows improvements. Employee turn-over information was also collected. Typical action items include improving communication, helping employees understand their job descriptions, career paths etc. The project will complete in May 2019.

Helping Farms Improve Lameness

Linking Lying Time and Lameness, CCE Dairy and Field Crops Team, 2 Projects
This project worked with ten farms. Inexpensive activity monitors were purchased for the project leaders to use to assess lying time on each farm. Results were discussed with each farm and suggestions of modest improvements were made. Most participating farms indicated that they became more aware of risk factors for lameness in general, and specific things to watch for on their own dairies. The herd specific data presented offered valuable feedback on ways they can improve their specific situation, rather than just broad industry recommendations. This will make future changes to their operation more successful because the recommendations are tailored to their operation and management. The first project completed late in 2018. An additional 12 farmers have been enrolled to focus on the same topic. It is slated to complete in June 2019.

Increasing dairy farm viability by reducing lameness rates, CCE Oneida County
This project enrolled 5 farms in a program to reduce lameness rates. A combination of group education and on-farm visits has been used. Farms were taught locomotion scoring techniques and provided deep understanding on the factors that can cause lameness. Action plans were developed and the project leader continues to support implementation. The project completed late in 2018.

Helping Farms Become Active Participants in the F.A.R.M. Program

Management Protocols, Record Keeping, Cow Comfort and Animal Health, NNY Dairy and Field Crops Team, 2 projects
This project enrolled 16 farms to help prepare for active participation in the National F.A.R.M. program. Each farm participated in an on-farm evaluation which included an interview, document review, animal and facility observations. At the conclusion of the last evaluation all data was aggregated to provide regional values (all data) as well as individual farm data. Each farm received a report detailing what was observed on their farm and how this compared to regional values. Each farm also received recommendations specific to their farm. Additional direct support was provided to help farms implement recommended changes. The first project competed late in 2018, the second project has enrolled an additional 15 farms. It will complete in September 2019.

Precision Feed Management

Using forage quality to improve the corn silage (CS) hybrid selection process on dairy farms, CCE Dairy and Field Crops Team, This project enrolled 21 farms in three groups to learn how to use the differences in fiber digestibility of CS hybrids grown on their farm to select for higher performing hybrids in the future. Team meetings were held to review the overall results, and Extension specialists met individually with each of the farms to discuss the results of their analysis. Based on the results, educators were able to provide specific management recommendations for each farm. This project completed late in 2018. A second project working with ten Madison County farmers has just begun.
Data Loggers Make the Link Between Lying Time and Lameness

Uncomfortable cows tend to produce less milk. Comfortable cows lie down more than the others and are less likely to have problems with lameness. Betsy Hicks and Lindsay Ferlito with the South Central and North Country Regional Dairy & Field Crops Teams used data loggers, a simple device that captures the frequency of cow movements, in conjunction with cow and barn measurements to drive home the importance of cow comfort to NY tie stall dairy farmers.

Ten tiestall dairies (5 in Northern NY and 5 in South-Central NY) participated in the project. On each farm, the team used data loggers to definitively evaluate the lameness prevalence and lying behavior, identify the association between lameness and lying behavior with facility and management factors, help producers implement changes, reassess the dairies, and quantify the resulting reduction in lameness, change in lying behavior, and increase in profitability.

Through the use of data loggers Ferlito and Hicks were able to asses lying behavior in terms of daily lying time and minutes lying per hour. The project was based on European research that developed a method to detect lameness in tie stall cows, which includes watching cows while tied for: "regular, repeated shifting of weight from one foot to another; rotation of feet from the line parallel to the mid-line of the body; standing on the edge of a step; resting a foot; and uneven weight bearing between feet when moving from side to side". By using this information and tying it together with work done on freestall cow comfort and lameness, Hicks and Ferlito aimed to produce measurable farm level impacts through improving or refining existing production practices, leading to a reduction of lameness in these herds. Farms were given data and recommendations specific to their operations, as well as information on how they compared to the benchmarks created. Producers used this information to make changes that positively affected cow comfort and lying time.

While producers are facing extended low milk prices, farms have been unable to make significant capital investments in facility changes. However, several farms have made improvements as financially feasible. Some examples include several farms adding more bedding to the stalls, one farm purchasing a few new stall mattresses each month to spread costs out, and another farm purchasing a few fans and misters to improve heat abatement, lying time and cow comfort. Although some farms were unable to make changes, several indicated they now want to purchase new mattresses to improve cow comfort once milk price increases. Another herd indicated that they want to purchase shade cloth for pasture so that...
cows will be more comfortable on pasture and increase lying time while outside. Several dairies have barn renovations in mind, in terms of raising the neck rail and widening stalls, which are a large capital investment. These operations had their specific stall size requirements provided to them through the study, and will utilize these numbers when they are able to make these significant changes.

This project has served to improve the profitability, competitiveness and sustainability of the individual farms, as well as farms that attended outreach efforts. In addition, outreach efforts through conferences and webinars reached industry professionals that are utilizing our information.

Most participating farms indicated that they became more aware of risk factors for lameness in general, and specific things to watch for on their own dairies. The herd specific data presented to them offered valuable feedback on ways they can improve their specific situation, rather than just broad industry recommendations. This will make future changes to their operation more likely to succeed because the recommendations are tailored to their specific operation and management style.

“We’ve seen a lot of benefits with the cows lying down longer. To be able to see actual data, to be able to make decisions is great. These decisions help our cows, help our management and ultimately help us financially. Happy cows are healthy cows and they want to produce for you.”

Jessica Currie
Currie Holsteins

NYFVI Projects: Developing Human Capital

Strong management practices, and training and development of workers are critical in almost every industry. Farming is no different. Projects in this area of our portfolio strive to develop better managers and management practices, build business plans and ultimately, better bottom lines for all involved. Projects should deliver an impact in less than two years

Projects Completed 11/1/2017-10/31/2018
Teaching Farmers to Teach Others
NOFA-NY, $60,000

Dairy Workforce Online Educational Program.
Cornell University, $16,652

The blue band on the cow’s leg is the data logger that captures the animal’s movement.
Capturing the Power of Data on Dairy Farms to Reduce Antimicrobial Use

Since the 1970s it’s been a common practice on dairy farms to use “blanket” dry cow therapy; that is to administer antimicrobial drugs that prevent and treat costly mammary infections to all cows as they enter a dry off period. Although the practice may have been warranted as it began, animal care and the milking process have become much more sophisticated over time with many dairies keeping detailed cow specific records. Daryl Nydam DVM, PhD and his collaborative team have harvested the power of that data to predict which cows do—and don’t—need treatment.

The most common infectious disease of dairy cows is mastitis. Nationally 65% of antimicrobial drug usage on dairy farms is for treatment or prevention of mastitis and one-third of those antibiotics are used for dry-off treatment.

Working with New York dairy farms, Nydam has developed and tested a computer algorithm that will provide dairy farmers with the information they need to move to “selective” dry cow therapy (SCDT) protocols to prevent and treat mastitis. This approach can save farm managers $6 per cow across the milking herd and meet consumer demands for more judicious use of antimicrobials.

How does it work? Using a farm’s data, the prototype software applies a predictive SCDT model that sorts the high-risk cows from their low-risk herd mates. The farm data is accessed from widely used industry herd management tools Dairy-Comp 305 and Dairy Herd Improvement Association.

<table>
<thead>
<tr>
<th>Country</th>
<th>Use of Antimicrobials</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spain</td>
<td>100% cows</td>
</tr>
<tr>
<td>Canada</td>
<td>85% cows</td>
</tr>
<tr>
<td>Brazil</td>
<td>20% cows</td>
</tr>
<tr>
<td>Netherlands</td>
<td>No preventative use in animal husbandry allowed (2012)</td>
</tr>
<tr>
<td>Denmark</td>
<td>Very few herds (PCR approach) with prediction of only problem herds</td>
</tr>
</tbody>
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The new protocol is designed to maximize treatment of cows that exhibit clinical or subclinical mastitis and minimize unnecessary treatment of cows that will likely remain healthy throughout the dry period.

Using the algorithm tested by Nydam and coworkers, a herd using a SCDT protocol that has a somatic cell count of 200,000 or less and an adequate diet that maintains the immune system could expect to reduce antimicrobial use by 60% without adversely affecting production and clinical health outcomes.

In the validation of the model, Nydam was able to confirm that there was no increased risk of new infection in the dry period and similar milk production in the next lactation period among the SCDT group. There was also no increased risk of culling or new mastitis infection in the first 30 days after freshening.

Six New York dairies enrolled in the project and 600 cows were sorted according to the algorithm. Results were excellent.
NYFVI Projects: Incubating New Ideas

While most NYFVI projects are building from existing knowledge, sometimes there are projects that are focused on developing a new idea or technique. Work of this nature may or may not succeed, but have the potential to significantly alter the industry. These projects are likely to be high risk, and if successful take five or more years to reach mainstream adoption.

Projects Completed 11/1/2017-10/31/2018
Testing a Promising New Canopy Management Technique to Reduce Management Costs in Vineyards
Cornell University $112,547

Prior Year Awards
Integrating Spatial Maps to Use Variable Rate Technology in Mechanized Vineyards
Cornell University, $43,968
Application of electromagnetic electrical conductivity measurements for precision agriculture for NYS vegetable growers.
SUNY at Buffalo $84,840

“We changed our procedure to follow the selective algorithm for a more controlled treatment plan and reduced the number of cows treated without any negative effect. That represents savings in money, time and labor; reduces the risk of infection to our cows and lessens the opportunity for antibiotic resistance buildup.”

Doug Young
Spruce Haven Farm
Union Springs, New York

in most cases. Five of the six participating farms have indicated that they will continue to use the protocol in the future.

The ability to select only cows that need treatment in an accurate, fast and economical manner makes the practice farmer-friendly and likely to be adopted by New York dairy farms as it becomes available. The work is attracting significant national and international attention as farmers across the country and around the world seek new ways to manage their herd’s health.
Creating More Valuable Milk for New York Farmers and Processors

The cows on New York State farms must be happy, because they make really good milk. It’s tasty, nutritious and locally produced. In 2013 Martin Wiedmann had an idea to make milk even better. Now his team is helping the industry learn how to adapt their routines to make a more valuable, extended shelf-life fluid milk product.

Five years ago Martin Wiedmann, Professor of Food Science at Cornell University submitted a proposal to Farm Viability. He and his team wanted to understand the point of entry for sporeforming bacteria in raw milk, and to be able to associate each type with its deleterious impact.

This first project aligned with the Farm Viability strategic priority “Incubating New Ideas”. The board knew the work was at an early stage, but they also saw its potential. As the saying goes, “you need to measure to manage.”

At the end of that project, the team had identified management practices and spore sources that are important in the transmission of spores into bulk tank raw milk, including sporeformers that resist high heat pasteurization and can ruin milk powder as well as where in the supply chain it is introduced. Customers in many countries have limits for a specific group of sporeformers, known as “Highly Heat Resistant Spores”, so deeper knowledge in this area was critical for processors exporting milk powder.

In addition to the highly heat resistant spores, the team also learned what factors were important in the presence of anaerobic sporeformers in raw milk, which can cause cheese to “blow” in the aging process, creating waste in the supply chain.

However, the sporeformers that created the most interest were the psychrotolerant spores that proved to be capable of growing at low temperatures and spoiling fluid milk. These spores are capable of surviving HTST pasteurization and are responsible for nearly 50% of fluid milk spoilage.

Processors and dairy farmers both know that the dairy aisle has turned into a beverage aisle as plant based beverages have flooded the market. While consumers seek out these products for a variety of reasons, they do have one advantage: a longer shelf life than real milk that comes from dairy cows. Extended shelf-life fluid milk could become a new premium product. It will also help with logistics management as the industry adapts to online shopping.

In 2016, the next step was to learn how to cost effectively manage the spores through farm-level interventions. Wiedmann received a second FVI grant to continue his efforts. That project demonstrated that bulk tank raw milk spore levels can be reduced through specific
low-cost interventions at the dairy farm including personnel training on enhanced hygiene techniques as well as improvement of towel preparation protocols.

Wiedmann’s current project on the topic is to understand the impact of reduced spore counts on fluid milk shelflife (e.g., number of days of shelf-life extension) relative to the reduction in spore levels at the farm. This will allow a processor to establish a dollar value for specific spore counts. There will also be a farm level economic analysis conducted so a producer will understand the approximate cost of delivering a lower spore product.

The project is also using sophisticated data analytics to develop predictive tools for the supply chain to use to make data driven decisions, optimizing the product quality and economic benefits for all.

Processors have been following the work closely and two processors are part of the project’s advisory board. As the 2018 proposal was submitted, one business indicated formal support and willingness to pay producer premiums if the project demonstrated the value of the low spore raw milk.

The Farm Viability investment in this work has been approximately $350,000. 30 producers have been directly involved and many more have followed the study through presentations and outreach publications.

“As the winners of the 2017 Best Milk in New York State award, Stewart’s and our local milk producers are committed to providing the highest quality fluid milk to our customers. Stewart’s still offers a tiered quality premium to our local farms and provide support to achieve them through our certified milk inspectors and in-house lab. If the study shows that farm-level interventions can provide a longer shelf life to our product through low psychrotolerant spore levels in their raw milk, the information gained and shared should achieve higher quality payments. Stewart’s investment in quality at the farm level helps provide an award-winning product to our customers!”

Brett Abbey
Stewart’s Shops

NYFVI Projects:
Building Routes to Market and Improving Marketing Practices

Farms of all sizes benefit from increased access to aggregators and processors that add value to their products. And, for farms that sell directly to consumers, they must understand the most effective way to market their product. This group of projects work to build market share by increasing route to market opportunities, and improve profits by improving marketing expertise. The risk level for these projects is moderate, and they should be delivering a return on investment in their first two years

Projects Completed 11/1/2017-10/31/2018
Practical Tools to Help Small Scale Livestock Producers Develop Profitable Customers
CCE Tompkins County  $99,923

Equine Small Business Development
Jefferson Community College/ SUNY $7,480

Developing Comprehensive At-Market Sales Data Collection Systems for
Greenmarket Farmers
FARMroots, GrowNYC, $81,614.16

Supply chain analysis for emerging NYS malting barley industry
Cornell University, $33,190

Prior Year Awards
Scaling Up: Developing New and Additional Wholesale Enterprises with Greenmarket Farmers
FARMroots, GrowNYC  $123,944

Promoting Direct Local Seafood Marketing on Long Island through Community Supported Fishery (CSF) Programs
CCE Suffolk County, $64,977
NYFVI Projects:
Fostering Innovation in Agriculture

Applied research is a tricky area. While there is always valuable knowledge gained from testing in the field, sometimes what you learn is what doesn’t work well in specific conditions, or perhaps in New York overall. This group of projects is focused on learning how farmers can best adopt new production practices. The risks involved are moderate, and mainstream adoption of the practice is likely to be 2 to 5 years from demonstrated success.

Projects Completed 11/1/2017-10/31/2018

Alfalfa-Grass Management to Maximize Milk Production from Dairy Cattle
Cornell University $82,388

Site Trials and Producer Outreach to Demonstrate Suitability of Turkish Fir for Adoption for Commercial Christmas Tree Production in NYS
Christmas Tree Farmers Association of New York $59,428

Optimizing Precision Agriculture Technology Implementation in New York State
New York Corn & Soybean Growers Association $149,982

Alfalfa-Grass Management to Maximize Milk Production from Dairy Cattle
Cornell University $82,388

Onion Growers Can Reduce Rot!
Cornell University, $103,000

Developing a mechanical method to seed under-vine cover crops in vineyard Cornell University, $34,848

Optimizing Use of Native Persistent Nematodes for Biological Control of Plum Curculio in Organic and Conventional Apple Production Cornell University, $101,152

Equipping Apple Growers to Quantify the Role of Native Bees in Pollination
Department of Entomology, Cornell University $100,000

Using NDVI Images to Guide Selective Harvest in Wine Grape Vineyards
Cornell University $126,775

Developing a Sustainable Hops IPM Program from Greenhouse to Harvest.
Cornell University, $124,500

Effective Aphid Management in Greenhouse Crops by Optimizing Biological Control and Nutrient Inputs
Cornell University $132,858

Prior Year Awards

Winter Forage: Impact of Early Planting on Nutrient Storage and Spring Yield.
Advanced Ag Systems LLC $88,593

BMR Sorghum and Winter Forage for Double Cropping Advanced Ag Systems, $100,000

Insects On-Line: Forecasting insect management for nursery and Christmas tree growers
Cornell University, $70,665

Use of under vine fescues in Long Island vinifera vineyards to reduce production costs and environmental impact CCE Suffolk County, $61,028

BMPs for Long Term Profitable High Tunnel Soil Fertility and Health
NOFA NY, $116,126

Increasing producer profitability through farm level interventions designed for optimization of spore counts in raw milk Cornell University, $106,444

Insect-killing nematodes for biocontrol of greenhouse thrips and fungus gnats
Cornell University, $105,069

Selective Dry Cow Therapy: Increasing profits and decreasing antibiotic use.
Cornell University, $102,036

Improving Dairy Cow Health and Reducing Dairy Farm Labor Cost by Automating Health Monitoring and Management
Cornell University, $139,676

Improving Apple Grower Profitability Through Precision Management by Developing and Implementing a Smart App
Cornell University $127,297

Optimizing Variable Rate Seeding in NYS
Advanced Ag Alliance, Inc.$102,428

Biological Control of Corn Rootworm using Native NY Entomopathogenic Nematodes
Cornell University $99,979

Decision Agriculture: Managing Nitrogen and Yield in Corn and Forage Sorghum Utilizing Drone NDVI Imaging.
Cornell University $148,192

Trials to Reduce Onion Rot
Cornell University $119,715

Open Field Study with Avipel Shield Seed Treatment on Field Corn to Deter Birds from Feeding on Corn Seedlings
Cornell University $25,358
Hops: Growing for the Long Term Starts with Good Root Stock

Late in 2015, powdery mildew was found in a hops yard planted with modern varieties that were bred to be resistant to the disease. Steve Miller, supported by a Focus Grant from Farm Viability, sprang into action to help hops growers protect their investments.

Between 2010 and 2015 hop growers in New York had invested over $4.5 million dollars (not including buildings and machinery) to establish approximately 300 acres of hops. The discovery of a strain of powdery mildew not previously in New York was a significant event. This new powdery mildew was found at a recently established hops yard that had imported rhizomes from out of state. Steve Miller, then with Madison County Cooperative Extension and now Northeast Hops Alliance (NEHA) Executive Director worked with the grower, the out of state propagator, NYS Department of Agriculture & Markets, the Geneva Plant Pathology Lab and the USDA Hop Plant Pathologist to confirm his theory that the rhizomes were contaminated and develop a plan of action.

Miller was determined to prevent further contaminated stock from entering the State. He increased his work with New York based greenhouse businesses to grow clean plants for the hops industry and began an extensive grower education program.

While greenhouse grown plants are more likely to be correctly identified and disease free, they are also approximately three times the cost of rhizomes. Despite the cost, more growers have begun to use plants, rather than rhizomes to start and replenish their hops yards.

An exciting outgrowth of this project is the creation of a new tissue culture propagation facility in central New York, Pioneer Plant-Tech. Danuta Knuth, the owner, built a state-of-the-art lab and pest free greenhouse and is now producing top quality hop plants for the industry. This is a major competitive improvement for growers in New York as the plants are free of the primary diseases affecting hops, positioning growers with a clean start for their hop yards. Pioneer Plant-Tech is also able to apply various processes to clean up plants that are virus contaminated, and is working to develop a service to do this for growers who are selecting new varieties from the wild gene pool. These selections represent a potential new group of hop flavors for brewers and disease resistant varieties for the hop growers, giving them a competitive advantage over the Pacific Northwest growers that they currently lack.

Pioneer Plant-Tech, Inc.

"You have been such a motivating force in the promotion of hops growing not only in New York but in the Northeast and an invaluable help to our new business: Pioneer Plant-tech Inc. We are starting our second year as a clean plant facility for hops. Funding from NYFVI made it possible for us to obtain the information we needed to develop our business. With your encouragement we established a tissue culture facility and bio-secure greenhouses. Your referrals to experts in IPM, extension agents, Cornell Plant Pathologists (especially Dr. Marc Fuchs at the Geneva Experimental Station) and the Clean Plant Network kept us on the right track in establishing a facility we are proud to offer as a source for clean hops plants in New York, the Northeast, and Canada."

Danuta Knuth
Pioneer Plant-Tech
**NYFVI Projects:**

**Improving Operational Practices**

Sometimes it’s the willingness to do something differently that can put more money in a farmer’s pocket. These projects are focused on helping as many farmers as possible refine existing production practices, or learn how to implement a new process to improve their profitability. Some projects will utilize outreach and education to drive changes, others may use applied research to demonstrate the effectiveness of the proposed change. In any case, the risks are fairly low and the project should be delivering an impact in less than two years.

**Projects Completed 11/1/2017-10/31/2018**

- Improving Reproductive Management for Dairy Heifers to Manage Costs  
  *Department of Animal Science, Cornell University*  $75,000
- Improving Crop Quality and Production Capacity for NYS Hop Growers  
  *CCE Madison County* $29,771
- Using Precision Feed Management to Improve Profitability on Dairy Farms  
  *CNY Dairy and Field Crops Team, Cornell University* $100,000
- Improving Farm Viability and Soil Health For Corn Producers with Cover Crop Interseeding  
  *American Farmland Trust*, $52,579
- Minimizing Wildlife Impacts on Yield and Food Safety Risk in Vegetables by Utilizing Repellency Tactics  
  *Cornell University*, $74,534
- Corn silage hybrid evaluation :New tools to improve decisionmaking, forage utilization, and efficiency of dairy farms *Cornell University*, $148,570
- Sustainable Management of Root Weevil Populations for Improved Profitability  
  *Department of Entomology, Cornell University*  $49,236

**Prior Year Awards**

- Improving Milk Quality by Understanding Environmental Pathogens in Different Bedding Types  
  *Quality Milk Production Services, Cornell University*  $100,000
- Adoption of Controlled Release Nitrogen Fertilizer as a Best Management Practice in Potato Production  
  *CCE Suffolk County*, $90,620
- Increased Farm Profitability and Diversification Through Value-Added Forest Products  
  *CCE Chenango County*, $59,697
- Impact of normalized yield on fall and spring nitrogen recommendations for early planted winter forage  
  *Advanced Ag Systems LLC*, $57,757
- Adoption of Controlled Release Nitrogen Fertilizer as a Best Management Practice in Potato Production  
  *CCE Suffolk County*, $90,620
- Improving Farm Viability and Soil Health For Corn Producers with Cover Crop Interseeding  
  *American Farmland Trust*, $52,579
- Increased Farm Profitability and Diversification Through Value-Added Forest Products  
  *CCE Chenango County*, $59,697
- Increasing Dairy Farm Profitability by Reducing the Interbreeding Interval and Optimizing Conception Rate of Lactating Dairy Cows  
  *Cornell University* $110,953
- Optimize Selection/Management of Short Season Sorghum/Millet Varieties for NY  
  *Advanced Ag Systems, LLC*  $39,366
- Evaluation of Alternatives to Chlorpyrifos Insecticides for Controlling Cabbage Maggot in Brassica Vegetables  
  *CCE Suffolk County*  $38,135
- Development of Effective Spray Program for Post-Infection Fire Blight Management in Apples and Cost-Benefit Analysis of its Key Components  
  *Cornell University*,$149,950
Developing Alternative Practices for Pest Management in Cabbage

It's always good to have choices. That thought is on the mind of New York cabbage growers as their primary tool for battling cabbage maggots, the insecticide, Chlorpyrifos, is moving through its registration renewal process at the EPA. In 2017 Faruque Zaman began trialing alternative practices for both conventional and organic growers to ensure safe and efficacious choices are available for growers of this valuable crop.

New York farmers grow nearly 9,000 acres of cabbage worth approximately $48.6 million. These “cabbage patches” are found in Western NY as well as Long Island. Nationally, the State is third in cabbage production.

The challenge?
Delia radicum, better known as cabbage maggots. These pests feast on the roots of the plant, preventing it from reaching maturation. Since the mid 1960’s the industry has relied primarily on a single insecticide to fight this pest and help this nutritious vegetable reach consumer’s plates. Faruque Zaman, an entomologist with Suffolk County Cooperative Extension is passionate about identifying alternative treatments for New York growers.

In the 2017 growing season Zaman trialed a wide range of options: Four conventional insecticides were explored. Different application methods were also considered, with some insecticides applied directing spray to the soil and lower stems at the base of plants in the field or drenching the transplant’s rootball in the greenhouse prior to planting in the main field.

For organic producers, Zaman tested several approaches: a biological approach using entomopathogenic nematodes; a biological control pesticide certified for use in organic systems; and an exclusion netting technique.

In 2018, two additional variables were added to the trials to further explore promising candidates.

Findings after two years of trials indicate that at least two of the control techniques may prove efficacious. Work still remains for the team to collaborate with the manufacturer to register the products for use on Long Island as well as across the State.

Based on the first year results, Zaman was able to receive funding from both Northeast SARE as well as the IR4 program to continue this important work.

Key to the long term adoption of the techniques will be to develop a better understanding of the cost effectiveness of each approach.

Long Island grower Rob Nolan made the trip to Albany to speak at Farm Viability’s annual Taking Stock for Agriculture meeting.

At it he said, “Faruque’s work is critical to the success of my farm. I believe that the process the Farm Viability uses to collect grower input on the proposals truly leads to the most valuable work being funded.”

Rob Nolan
Deer Run Farm
Long Island, New York
USDA Specialty Crop Block Grant Program: Putting NYFVI’s Farmer Review Process to Work.

In 2018, the New York State Department of Agriculture and Markets continued to administer the USDA Specialty Crop Block Grant Program in partnership with NYFVI. The Farm Viability review panels scored and evaluated 20 proposals, seven were selected for funding.

**2018 Awards**

- Enhancing the Sustainability of Foliar Disease Control by Decision Support Systems for the New York Table Beet Industry
  *Cornell University, $99,551*
  *Cornell University, $97,567*
- Pathogenicity of New York State Fire Blight Bacterial Strains and Development of a Cultivar Set and Cider Apple Varieties for Fire Blight Resistance Breeding
  *Cornell University, $82,059*
- Refining Reduced Tillage Systems for Vine Crops and Sweet Corn on Muck Soils
  *Cornell University, $68,491*
- Management of Wireworms in Organic and Conventional Production Systems
  *Cornell University, $83,613*
- Diversifying New York’s marine aquaculture industry: Integrating sugar kelp into oyster farms
  *Research Foundation of SUNY, $99,928*
- Harvest and storage of New York’s SnapDragon® and RubyFrost®: Getting it right
  *Cornell University, $68,598*

**Completed Projects**

- Building the Profitability of the Table Beet Industry in New York State
  *Cornell University, $111,561*
- Business Tools to Stimulate Growth of New York State’s Year-Round Greenhouse Vegetable Industry
  *Cornell University, $105,568*
- Effective Spraying of Fruit Crops: Workshops to Improve Knowledge and Profitability Whilst Decreasing Spray Costs and Losses
  *Cornell University, $51,916*
- Integrated Management of Mealybugs and Leafroll Disease in Vineyards
  *Cornell University, $112,149*
- Increasing Yield by Controlling Leaf Mold in Tomato High Tunnel Production
  *Cornell University, $108,977*
- Measuring and Extending the Benefits of More Accurate Honeycrisp Harvest Predictions
  *Cornell University, $109,829*
- Living without postharvest chemical control of storage scald in apple fruit
  *Cornell University, $95,507*
New York State is ranked in the top 10 in the nation for dozens of specialty crops, from maple to grapes to cabbage, that contribute millions to our economy. Thanks to our long-time partnership with NYFVI, we have seen strategic and meaningful research and education projects come to fruition over the years. These projects are helping our farmers to overcome challenges, such as disease and pests, and to increase production.

Commissioner Richard Ball  
New York State Department of Agriculture and Markets
New York Table Beets: Growing Profitability for a Growing Industry

Health conscious consumers are driving demand for innovative, convenient products. Sarah Pethybridge and Julie Kikkert are helping NY farmers overcome production challenges to meet market demand so consumers can Eat Their Beets!

New York is second only to Wisconsin in the production of table beets. The processing industry, based largely around Seneca Foods plant in Western New York, is valued at $1.8 million, and the farm gate value of the beets grown by 246 farms across the state is estimated at $8.47 million.

At Farm Viability, we believe we’ve had a role in the exponential growth of New York table beets since 2014. In fact, we often tell this story in our grant writing webinar for potential applicants.

In 2015 Cornell Plant Pathologist Sarah Pethybridge and a Senior Extension Educator for the Cornell Cooperative Extension Vegetable Program and her colleague Julie Kikkert submitted a proposal to the Farm Viability Institute to develop solutions to manage weeds and disease in beets. Funding was denied.

Although it was a strong research plan and addressed known challenges for beet growers, it was a high dollar request and there just weren’t many acres of beets being grown. In addition, there was limited infrastructure for processing.

Three months later, Pethybridge and Kikkert successfully sought funding through the USDA Specialty Crop Block Grant Program (SCBG) which is administered by the New York State Department of Agriculture and Markets in partnership with NYFVI.

The difference with the second proposal? It included the news that Governor Cuomo had announced that Love Beets USA LLC, a joint venture between LiDestri Foods Inc of Fairport and the United Kingdom’s G’s Fresh Ltd, was coming to Rochester.

Ever since that first proposal was funded Pethybridge and Kikkert have been systematically working to develop solutions for the booming industry’s most pressing challenges.

The first project focusing on weed management and Cercospora leaf spot the predominant fungal disease affecting foliar health was completed this year. It optimized recommendations for weed and disease management in both conventional and organic production systems. Healthy foliage is essential at the end of the season with minimal competition from weeds to enable mechanized harvest.

Three New York growers participated as an advisory group for the project. 603 people attended presentations on the topic. Outcomes for the NY table beet industry include reductions in unwarranted fungicide usage, development of best practice fungicide resistance management guidelines, and improved profitability and sustainability.

In 2017, the team was successful in securing SCBG funding to trial novel seed treatments for early season disease.
control, and in 2018 they made the case for funding to develop a forecasting system for foliar leaf disease to help growers make judicious use of their fungicides.

The future remains promising for New York beet growers as Love Beets USA reports they are here for the long term. As reported on the Empire State Development website:

“We still haven’t tapped the full potential for this processing plant yet, its capacity, and our people,” says Stoklosa, Love Beets USA Managing Director.

“When we built this plant, we built it for four times the lines that we currently have in it, so the strategy is to be able to make products here in Rochester for distribution to the entire North American landscape, and not need to have another facility.”

This project was supported by the U.S. Department of Agriculture’s (USDA) Agricultural Marketing Service through grant 15SCBGPNY0023. Its contents are solely the responsibility of the authors and do not necessarily represent the official view of USDA, NYFVI, of the State of New York.
2018 FVI Grants Awarded

15 projects across 8 organizations were selected for funding and began work in April 2018. $1.41 million was awarded. Six of the projects will be working with new technology and/or increased data analytics.

Rapid and Cost-effective Pathogen Detection Assay for Fire Blight Management in Apple Orchards
*Plant Pathology, Geneva, Cornell University, $101,259*

Assessing spatial distribution of grape mealybug, fruit *lecanium* scale, ants and leafroll virus for targeted management strategies in Long Island vineyards
*Suffolk County CCE, $94,980*

On-farm spore interventions to produce value added low spore raw milk for production of extended shelf-life fluid milk products
*Milk Quality Improvement Program, Cornell University, $95,858*

*Nutrient Management Program, Cornell University, $143,092*

Using Statistical Pattern-Recognition Tools to Unveil Combination of Factors that Affect Corn Yield to Instruct Resource Allocation within a Field
*UB Digital Agriculture Team, SUNY at Buffalo, $140,246*

Determine if Sulfur is a Limiting Nutrient in Soil and New York Soybean Production.
*NWNY Dairy & Livestock Extension Team, Cornell University, $68,747*

Effect of Corn Plant Characteristics and Harvester Setup on Kernel Processing Scores and Starch Digestibility
*ProDairy, Cornell University, $78,659*

Quantifying benefits of biofungicides in vegetable disease management using novel disease detection methods
*Integrated Pest Management, Cornell University, $84,641*

Practical application of UV-light to suppress plant pathogens
*Lighting Research Center, Rensselaer Polytechnic Institute, $130,034*

A novel enzyme based seed coating to reduce damping off and black rot in vegetables: optimization on cabbage
*Zymtronix Catalytic Systems, Inc. $59,262*

Refining and evaluating NY adapted freshmarket tomato lines with combined resistances to bacterial and fungal diseases
*Plant Breeding and Genetics, Cornell University, $142,756*

Advancing New York's Hop Industry with Unique Varieties and Quality Assurance
*Northeast Hop Alliance, $33,342*

Development of Impatiens plants that are resistant to the devastating disease, Impatiens Downy Mildew
*Long Island Horticultural Research Center and Extension program, Cornell University, $139,253*

Investigating the true potential of the Industrial Hemp crop for New York State agriculture
*Morrisville State College, $57,155*

Understanding Cut Flower Production Costs
*Ontario County CCE, $12,330*