As happens with every annual report, our Food Science Extension team has provided us with plenty of new offerings in 2022, including new online courses related to cheese and yogurt; new information for the growing seaweed industry; and new equipment in the Fruit and Vegetable Pilot Plant, among other items.

As remarkable as these new accomplishments are, the breadth and success of Extension activities have been sustained for years, sometimes decades. The New York Sea Grant reached its 50th anniversary of supporting statewide fisheries and aquaculture; the Cornell Food Venture Center celebrated its 35th year by helping over 600 new food products enter the market; the National GAPs program completed its 24th year of providing up-to-date information to producers on fruit and vegetable safety through workshops and seminars. In total, these and other Extension programs reached over 11,000 participants in 2022, and no doubt there will be tens of thousands of new participants in coming years.

Reading this annual report was a reminder of our Food Science Extension team’s critical role in providing points of contact with the world – through new and sustained programming, this year and every year. We hope that you feel similarly proud, impressed, and – yes – happy when you read of their accomplishments.

Sincerely,

Carmen I. Moraru
Professor and Chair
Department of Food Science
Cornell University

Gavin Sacks
Professor and Associate Chair
Department of Food Science
Cornell University

"The happiest life has the greatest number of points of contact with the world."

Liberty Hyde Bailey, founder of the College of Agriculture & Life Sciences at Cornell University
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The Cornell Food Science Extension mission is to help farmers, food businesses and consumers in New York State and beyond produce safe, healthy and wholesome foods. Through delivery of events, courses, client-based services and applied research, the Food Science Extension Programs educate, serve, solve problems and apply practical information to help strengthen the food industry.

Celebrating Extension

HPP Validation Center’s 5th Year Anniversary
The High Pressure Processing (HPP) Validation Center’s ribbon cutting was held back on January 31, 2017. Financed through public and private grants from New York State, Wegmans, LiDestri, Suja and its manufacturer Hiperbaric, the HPP was installed in a biohazard level 2 facility. This has allowed researchers to study pathogen-inoculated foods in the pressurized system. The HPP Validation Center has completed 427 HPP pathogen validations since it opened.

Dairy Foods Extension Certificate Program 10th Year Anniversary
Launched in 2012, the Dairy Foods Extension Certificate Program has provided a standardized curriculum in dairy science, food safety and pasteurization with four specialized dairy processing tracks, including fluid milk, yogurt, cheese and ice cream. The Dairy Foods Extension team has delivered the certificate program through in-person workshops, self-paced online courses, and live teleconference workshops. To-date, the Dairy Foods Extension program has hosted 248 workshops with a total of 5,612 participants.

New York Sea Grant Celebrates 50 Years with “Bringing Science to the Shore”
The New York Sea Grant (NYSG), a university-based federal-state partnership program of the State University of New York, Cornell University, and the National Oceanic and Atmospheric Administration (NOAA), celebrated 50 years in 2022. The “Bringing Science to the Shore” campaign brought attention to the four areas it has focused on in the past, including healthy coastal ecosystems; sustainable fisheries, aquaculture, and seafood businesses; resilient communities and economies; and environmental literacy and workforce development. It also highlighted the NYSG’s future plans to impact the health and vitality of New York’s coastal communities, economies, and environments.
**2022 Highlights**

**Cornell Food Venture Center (CFVC)** launched a product development-focused consultation service. In addition, over half of the companies working with CFVC in 2022 were first-time value-added food producers.

**CFVC Fruit and Vegetable Pilot Plant** acquired a new 70L Terra Food Tech retort and anticipates that the reconditioned JBT Agitating Lab Retort will be back online in mid-2023. This new and updated equipment will allow the pilot plant in Geneva, NY to expand its product development capabilities.

**Dairy Foods Extension** now offers the Science of Yogurt and the Science of Cheese in a hybrid format, with online modules and a live session that may be attended in person or via Zoom. They also launched a High School Boot Camp Program, which aims to prepare job-ready high school students for careers in the dairy industry.

**Institute for Food Safety at Cornell University’s** online GMPs Part 117 course marked its fifth year of delivery in 2022. More than 2,300 participants have completed the course since it was launched in June of 2017.

**New York Sea Grant** worked to expand its training program to include seaweed specific food safety trainings to support an emerging seaweed industry in New York State.

**Produce Safety Alliance**, in collaboration with subject matter experts from land grant universities, hosted national listening sessions across the country on the proposed water rule (FSMA PSR Subpart E) in English and Spanish. The PSA also hosted office hours with extension personnel on the proposed water rule in English and Spanish with over 400 participants.

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**2022 by the Numbers**

**Total Events**
- 232 Events Delivered or Presented
- 11,243 Stakeholders Participated
- 65,427 Total Contact Hours

**Adult Education**
- 113 Courses Conducted
- 2,628 Attendees/Participants

**Client-Based Services**
- 1,630 Businesses Served
- 7,818 Services Conducted
- 7,311 Consultation Hours

**Applied Research**
- 106 Research Studies Assisted

**Program Growth**
- 7 New Extension Associates and Staff Members
The Institute for Food Safety at Cornell University (IFS@CU) takes a comprehensive approach to providing training and conducting applied research to support the food industry in reducing foodborne illness risks. With expertise in fresh produce, dairy, juice and food processing, the IFS@CU aids the food industry in complying with federal regulatory requirements in the Food Safety Modernization Act (FSMA) and addresses food safety challenges that stretch from farms to consumers' tables.

In 2022, the IFS@CU continued to deliver food safety curricula remotely with the on-demand and self-paced Good Manufacturing Practices (GMPs) Part 117 Online Course. Additionally, the IFS@CU’s series Food Industry Virtual Office Hours shifted its focus from assisting the food industry with COVID-19 to food safety current topics and issues. They hosted a total of 10 sessions in 2022 and discussed general food industry topics, such as food safety plans, whole genome sequencing and mental health awareness, as well as more specific topics targeting the dairy foods or produce industries.

Website: cals.cornell.edu/institute-for-food-safety
Contact: Nancy Long (foodsafety@cornell.edu)
The Cornell Institute for Food Systems Industry Partnership Program (CIFS-IPP) is a public-private partnership that facilitates and enhances the engagement of Cornell University faculty, staff, and students with industry scientists, technologists, and business leaders across complex global food systems. Bringing together expertise in scientific research, business economics, and industry practice, CIFS-IPP works to find solutions to today's food systems challenges and help shape tomorrow's discoveries.

A key accomplishment for 2022 was the program's corporate membership growth as CIFS-IPP welcomed three additional affiliate members. CIFS-IPP also joined with new industry and academic partners to launch and co-host a biannual conference focused on innovation in the alternative protein sector.

A continuing focus of the program's activities was on supporting the food industry in its ongoing talent development and recruitment efforts. CIFS-IPP held its annual Career Fair in September as well as other networking and workshop opportunities to help prepare students at all degree levels for industry careers through engagement with corporate recruiters, scientists, and business executives.

Website: cals.cornell.edu/cifs-ipp
Contact: Rajni Aneja (ra283@cornell.edu)
The National Good Agricultural Practices (GAPs) Program has helped to ensure the safety of fruits and vegetables since 1999, by working with growers and packers to reduce microbial risks during growing, packing, storage, and transportation. Through a comprehensive education and extension program, National GAPs Program personnel facilitate the development of farm food safety plans to increase understanding and implementation of GAPs, as well as how they align with FDA’s regulations under the Food Safety Modernization Act (FSMA) Produce Safety Rule and third-party audit requirements.

Program personnel focus on in-person and online training to small and mid-sized farm and packing house owners, farm workers, beginning farmers, socially-disadvantaged farmers, small processors, and small fresh fruit and vegetable wholesalers. In addition, National GAPs Program personnel conduct needs-based research including evaluating microbial risks associated with soil amendments and water used during fresh produce production. Supporting growers, packers, and farm workers to effectively implement food safety practices helps to keep safe and wholesome produce available for consumers and maintain farm economic viability.

Website: [cals.cornell.edu/national-good-agricultural-practices-program](cals.cornell.edu/national-good-agricultural-practices-program)

Contact: Michele Humiston (mmc15@cornell.edu)
The Produce Safety Alliance (PSA) provides fundamental, science-based, on-farm food safety knowledge to fruit and vegetable growers, packers, educators, regulatory personnel, and others interested in the safety of fresh produce. Established in 2010, the PSA is a collaboration between Cornell University, FDA, and USDA to prepare produce growers to meet the regulatory requirements in the Food Safety Modernization Act (FSMA) Produce Safety Rule (PSR). The PSA team trains and mentors PSA Trainers and Lead Trainers to ensure high quality courses are available globally so that growers can comply with the FSMA PSR training requirement in § 112.22(c).

In addition to its focus on effective training, the PSA team also provides technical assistance to growers and trainers. These efforts include the development of novel English and Spanish educational materials, supplementary training information, and one-on-one bilingual consultation. Helping the produce industry implement food safety practices protects consumers and ensures the economic viability of farms and rural communities. Recognizing that the produce industry is comprised of diverse growers from all over the world, the PSA team continues to expand accessibility to information through additional translations of its training manual. This includes Chinese, Portuguese, and Korean manuals, the development of illustrations for low literacy individuals, and updated policies that allow trainings to be extended to growers regardless of the language they speak or literacy level.

Website: calso.cornell.edu/produce-safety-alliance
Spanish: es.producesafetyalliance.cornell.edu
Contact: Michele Humiston (mhc15@cornell.edu)

The PSA hosted an Advanced Trainer Workshop in Geneva, NY in June 2022. This three-day workshop features lectures and hands-on activities designed to improve scientific understanding of the Produce Safety Rule to better train growers. For more information, visit: calso.cornell.edu/psa/advanced-trainer-workshop

*Note: the data below represents training activities conducted by the PSA team, along with their national and international cadre of trainers, as a cumulative total since September 2016.

3,889 Grower Training Courses Offered*
82,279 Participants
791,044 Training Hours

124 Train-The-Trainer Courses Offered*
3,513 Participants
63,836 Training Hours
Cornell Food Venture Center (CFVC) provides comprehensive assistance to new and established food entrepreneurs, processors and farmers to enhance food safety, satisfy regulatory compliance and promote economic development. Services include scheduled process and process review validation for processed foods, laboratory services and consultation for product safety and stability, reduced oxygen packaging hazard analysis and validation, heat penetration studies, food classification letters, and training.

In 2022, the CFVC worked with 668 food businesses to evaluate the food safety parameters of 2,000 samples and it approved 1,800 scheduled processes for food products. This paved the way for 1,478 new food products entering the marketplace, almost half of which were from first-time producers. In addition, the CFVC’s Small-Scale Food Entrepreneurship Guide for Food Ventures was viewed more than 2,300 times.

Website: cals.cornell.edu/cfvc
Contact: cfvc@cornell.edu
The CFVC Fruit and Vegetable Processing Pilot Plant is a recently renovated facility that has the perfect combination of established food processing and preservation technologies with innovative equipment to promote the development and production of healthy, high quality foods. With a variety of equipment available, the CFVC Pilot Plant provides clientele the ability to make their final food product prototype, from starting materials to the final packaged product, in one location. It also provides a unique setting to trial and compare different equipment and technologies to address quality and stability/shelf-life, and to determine the optimal manufacturing process. The CFVC Pilot Plant assists clientele with research and development, scale-up trials, and start-up runs.

In 2022, the CFVC Fruit and Vegetable Processing Pilot Plant conducted product trials with 35 different clients. In addition, Cornell faculty, staff, and students conducted a total of 17 research trials utilizing the state-of-the-art equipment located in the pilot plant.

Website: cal.s.cornell.edu/cfvc-pilot-plant
Contact: Roger Morse (rtml@cornell.edu)
Dairy Foods Extension’s mission is to provide comprehensive training and consulting to the dairy industry to assist in the sustainable manufacture of safe, quality dairy products. Courses provide training to dairy processors in vital topics including milk and dairy product quality and safety, basic dairy microbiology, GMPs, unit operations, sanitation, food safety plans, audits, and state and federal regulations. The program offers an extensive set of live and virtual workshops that lead towards certificates in fluid milk production, cheese production, ice cream production, and production of yogurt and other cultured dairy products.

In 2022, Dairy Foods Extension offered courses in multiple hybrid formats in response to changing industry training needs. They also launched a High School Boot Camp Program in June 2022. The Dairy Processing Boot Camp aims to prepare job-ready high school students for careers in the dairy industry.

Website: [cals.cornell.edu/dairy-extension](http://cals.cornell.edu/dairy-extension)

Contact: Louise Felker ([lmf226@cornell.edu](mailto:lmf226@cornell.edu))
The Cornell Dairy Plant is an IMS-rated, New York State Department of Agriculture and Markets licensed, Kosher certified facility with 4,760 sq. ft. of processing area and over 10,000 sq. ft. of climate-controlled refrigerated and frozen storage. Capabilities include: fluid transportation, raw and pasteurized fluid milk storage, a computer-generated batching system, HTST pasteurization, a homogenizer two-stage system, a cold milk separator, a yogurt room (minimum batch size 50 gallons), ice cream production and packaging (minimum batch size is 100 gallons), fluid packaging, and butter production and packaging (minimum batch size is 10 gallons).

In addition to producing products for Cornell and other campuses, the plant is designed to support Dairy Foods Extension efforts by providing a hands-on training facility to more than 200 industry professionals and students during an average year. Specific trainings that take place in the Dairy Plant include Dairy Science and Sanitation, Fluid Milk Processing for Quality and Safety, HTST and Vat Pasteurizer. Several university courses use the facility to host lessons, including Food System Approaches to Food Safety, Just Food: Exploring the Modern Food Systems, Unit Operations and Food Packaging, Food Microbiology, and Basic Food Science.

Website: cals.cornell.edu/cornell-dairy
Contact: cornelldairy@cornell.edu

120,145 gal. of Milk Bottled
100,038 lb. of Yogurt Produced
34,672 gal. of Ice Cream Produced
1,280 lb. of Butter Produced
7 Classes Used Facility for Lessons
297 Students
2 Workshops Used Facility for Demonstrations/Activities
60 Participants
The Food Processing Development Lab (FPDL) is a 6,000 sq. ft. pilot plant that serves as a statewide center for food and dairy processing education and training, product development, and cutting-edge food processing research. The facility is ideal for manufacturing test runs of new formulations, producing consumer samples, and testing the shelf-life of samples on a scale that mimics real production.

The FPDL is a licensed New York State dairy plant and meets all state and federal regulatory requirements for processing food for human consumption. It is equipped with a wide selection of pilot-scale equipment with capabilities including drying, evaporating, HTST and vat pasteurizing, separating, and packaging. The FPDL also maintains a cheese making area with various equipment. Experienced full-time professionals are able to assist in all aspects of development and processing. Specific workshops that take place in the FPDL include Introduction to Artisan Ice Cream and Frozen Desserts and the Science of Cheese.

Website: cals.cornell.edu/fpdl

Contact: Robert Ralyea (rdr10@cornell.edu)
The Cornell Sensory Evaluation Center has served the Department of Food Science, the larger Cornell Community and a variety of businesses, large and small, since the early 1990s. Its mission is to provide learning opportunities to students interested in the fields of sensory and consumer research, to advance research in sensory evaluation, and to help businesses develop and improve their consumer product offerings through consumer and sensory testing.

The Sensory Evaluation Center conducts contract sensory evaluation and consumer product testing for commercial clients. It also offers consultations and custom learning experiences in all matters related to sensory product testing. The Sensory Evaluation Center supports the Food Science Milk Quality Improvement Program through its milk sensory panel, the Dairy Foods Extension program through teaching sensory modules within Dairy Foods Extension courses, the New York State Dairy Industry by preparing defective milk kits and providing consultation services, and other Cornell extension programs (e.g., the Cornell Maple Program, and the Viticulture & Enology Program) through sensory product testing.

Website: blogs.cornell.edu/sensoryevaluationcenter
Contact: Alina Stelick (ap262@cornell.edu)

28 Businesses Assisted
207 Total Activities
7 Workshops Delivered
140 Participants
Cornell Craft Beverage Institute provides resources to help winemakers and cider makers with important decisions from fruit sourcing and fermentation techniques to quality assurance and regulatory compliance. CCBI staff deliver extension support and research-based innovations to benefit growers, producers and consumers.

In addition to training and workshops, the extension program also offers services through the Cornell Craft Beverage Analytical Lab. Services include chemical, microbiological and sensory analyses of juice, wine, cider, beer, and distillates for quality assurance, troubleshooting and regulatory compliance.

Website: cals.cornell.edu/cornell-craft-beverage-institute
Contact: Cortni Stahl (ckm53@cornell.edu)

CCBI works closely with the Vinification and Brewing Laboratory (V&B Lab) at Cornell AgriTech in Geneva, NY to distill, brew and vinify beverages on-site for research and industry trials. Here, a technician pours a craft beverage brewed in the V&B Lab.
The Cornell Microbial Food Safety and Quality and Outreach Program specializes in evaluating the microbial safety of fruit and vegetable processed foods and beverages. The lab offers services to conduct UV validations, product shelf-life studies, and microbiological analyses. In addition to analytical services, the team provides training and assistance to the food and beverage industries as well as state and federal inspectors. In 2022, the program provided client-based services to 426 businesses for a total of 480 consultation hours.

Website: blogs.cornell.edu/worobolab/worobo-service-lab

Contact: Ann Vegdahl (acv45@cornell.edu)
High Pressure Processing Validation Center

The High Pressure Processing (HPP) Validation Center conducts cutting-edge research and tests HPP-processed food products requiring a validation to establish processing conditions that meet regulatory requirements. HPP is a non-thermal alternative to thermal pasteurization, allowing food products to maintain sensory qualities and nutritional characteristics that are often diminished in heat-treated products.

The HPP Validation Center offers three types of customized services, including validation studies to provide HPP processing conditions that meet regulatory requirements for pathogen inactivation; physicochemical evaluations to detail color, texture and overall product quality after varying HPP treatments; and microbiological shelf-life studies to evaluate variable HPP treatments of packaged products for spoilage bacteria, yeast and molds.

Website: cals.cornell.edu/hpp-validation-center
Contact: Andy Humiston (gah78@cornell.edu)
The New York Sea Grant (NYSG), a cooperative program of Cornell University and the State University of New York (SUNY), is one of 34 university-based programs under the National Oceanic and Atmospheric Administration's National Sea Grant College Program. Since 1971, NYSG has represented a statewide network of integrated research, education and extension services promoting coastal community economic vitality, environmental sustainability, citizen awareness and understanding about the State's marine and Great Lakes resources. The NYSG: Seafood Safety Training program works with the seafood industry to promote safe, sustainable production of high quality seafood by providing training and resources for consumers, producers, processors and fishermen.

In 2022, NYSG hosted and assisted with eleven Seafood HACCP Segment Two courses and one Basic Seafood HACCP course. NYSG training efforts resulted in a total of 124 participants earning their Seafood HACCP training certificate.

Website: nyseagrant.org/seafood
Contact: Michael Ciaramella (mc2544@cornell.edu)