

Describe the issue or problem that the program addresses.

Row crops contributed over \$3 billion to North Carolina agricultural sales in 2021. Corn, soybeans, and small grains (wheat, barley, or oats) are grown in most counties in the state, with cotton and peanuts being confined to fewer, better-suited areas. In 2022, North Carolina agronomic crop producers planted approximately 4.6 million acres of row crops, with the highest acreage planted with soybeans, corn, wheat, and cotton ranked in order respectively.

Row crop producers face technological, biological, and environmental challenges that impact crop yield and ultimately the profitability of their farm operations. Technological challenges that can impact crop yields include decisions about which variety to plant, which fertilizers to use, and decisions about purchasing new products and adopting technology on the market. Biological challenges include the preventative measures producers take to prevent weeds, pests, and diseases from causing significant damage to annual yields. Producers use research-based information and experts for guidance and to diagnose problems. Producers face environmental challenges, including problems associated with soil erosion, soil fertility, and water quality as well as problems caused by a changing climate. They must address soil and water issues to prevent declines in production.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

NC State Extension specialists used applied research and on-farm and official variety testing to develop new varieties, products, technology, and research-based agronomic crop best management practices (BMPs) to support growth in row crop production and assist growers in addressing their technological, biological, and environmental challenges. Extension specialists and agents transferred knowledge of these innovations and practices to producers through Extension publications, websites, meetings, workshops and field days, research and demonstration plots, on-farm consultations, webinars, and videos. Educating growers on research-based best practices equips them with the knowledge to adopt practices that are correlated with increased yields.

- NC State Extension specialists disseminated new agronomic crop information and best practices through the publication of over 400 [Extension publications](#) to educate Extension agents, growers and members of industry.
- NC State Extension agents used **social media and mass media** to provide educational information to crop producers. Extension agents reached over 1.3 million growers through social media and websites and reached over 5.2 million producers through mass media such as television, radio, and newspapers. Extension specialists posted educational content on social media approximately 1,000 times reaching nearly 70,000 producers created 150 newsletters reaching over 10,000.
- NC State Extension specialists maintained 15 agronomic crops, pest, and disease [web portals](#) that were viewed nearly a half a million times during 2022.
- Extension agents delivered close to 2,000 **in-person and virtual training sessions** to over 40,000 growers on agronomic crops, and over 13,000 additional growers attended training provided by Extension specialists. Over 15,000 pesticide applicators received continuing education credits. Nearly 200,000 growers were provided with **technical assistance**.

In 2022, [NC State Extension](#) brought together growers, researchers, and agribusinesses to share research-based insights and provide continuing education credits through **field days, expos, and production meetings**. The [Northeast Ag Expo](#) was particularly successful, with Extension agents across 6 counties working with several partners to carry out and share variety performance research for corn and soybean crops. Expo participants represented over 690,000 acres and enjoyed an estimated \$6.5 million in added crop value thanks to education and resources provided by the Expo.

During the 2022 [Northeast Ag Expo Small Grains Field Day](#), 116 attendees were provided with education on grain marketing, profitable yield maximizing wheat management practices, and best practices for disease, weed, and nitrogen management. With help from local and state partners, the Small Grains Field Day helped growers representing 97,975 acres of cropland and 20,375 acres of small grains. Growers reported an average best practice adoption rate of 59% based on all information provided at the field day. When asked if they had benefited from previous small grains field days, growers representing a total of 10,625 acres reported an average yield increase of 6.7 bushels per acre, valued at \$569,855.

To support growers in 2022, Extension in Camden County created **research-based programs and educational materials** tailored to local agricultural needs, delivering these resources via on-farm consultations, two collaborative regional field days, production meetings, variety demonstration trials, pest monitoring, and the Camden Crop News newsletter series. By adopting Extension recommended best management practices spanning nutrient management, conservation, production, cultivar selection, pest management, business management, and marketing, growers increased their net income by over \$3.3 million. **As a leader in experiential education, NC State Extension equipped farmers to effectively transfer best management practices into practical applications.**

Herbicide resistant weeds are becoming a significant problem in the coastal plains of North Carolina. Extension specialists and agriculture agents have worked together to gather and provide meaningful management techniques to the agricultural community. Resistant weed management education for producers in Northampton County was provided through **production meetings, on-farm tests, newsletters and on-farm visits**. Follow-up survey results indicate twenty-three growers representing 22,990 acres adopted Extension recommended weed management practices for the weed marehail and estimated the value of the information gained at \$1,301,852 and twenty-five growers representing 26,460 acres adopted Extension recommended weed management practices for the weed palmer amaranth and estimated the value of the information gained at \$1,310,666.

In 2022, NC Cooperative Extension also enhanced soybean crop health and grower profits by **delivering new research-based insights** for insecticide application against stink bugs, a critical soy crop pest that caused over \$8 million in damages in 2017. Thanks to this Extension research being shared at numerous grower meetings statewide and via the NC State Extension web portal system, growers were able to avoid unnecessary sprays, reducing treatment costs and avoiding killing beneficial insects. Assuming that 15% of NC soybean acres were treated according to Extension recommendations, growers secured an estimated savings of over \$1 million. **NC State Extension provided solution-driven research and technology to empower growers to make better-informed weed and pest management decisions.**

As a result of NC State Extension programs, over **25,000 crop producers** increased knowledge, attitudes, and/or skills related to best management production practices; pest/insect, disease, weed, wildlife management; financial/farm management tools and practices; alternative agriculture, bioenergy, and value-added enterprises; and as a result of NC State Extension

programs, approximately **13,000 crop producers** adopted best management practices, including practices related to nutrient management, conservation, production, cultivars, pest management, business management, and marketing.

Describe how the target audience benefited from the program activities.

Variety selection is one of the most important decisions growers make every year. It can be challenging due to the abundance of varieties offered that are suitable for a wide geographic area. Growers look to Extension's **variety demonstrations** as their key source of local, unbiased information. The 8 Extension Centers making up the [Northeast Ag Expo team](#) coordinated 6 corn variety demonstrations in partnership with local growers and seed companies. Given that an estimated 85% of local growers utilize Northeast Ag Expo variety demonstration trials when selecting hybrids, and given that the top yielding hybrids in the trial increased yield by an estimated average of 7.4 bushels per acre, these demonstrations benefited approximately 64,000 acres, resulting in an added value of over \$2.9 million. In addition, Extension in Davie County planted a [corn variety trial](#) on a local farm, replicating the trial in four surrounding counties. Tests of 14 hybrids with diverse maturity dates revealed the top yielding varieties that could increase annual gross profits by over \$5.4 million countrywide, based on an estimated 7,000 acres of corn planted.

Cotton seed is one of the costliest inputs in cotton production with new varieties entering the market very quickly, with very little supporting data from the pre-commercial stages. To assist with variety selection, the [NC On-Farm Cotton Variety Evaluation Program](#) consists of 16 to 17 trials in producers' fields across the state annually. Growers are trained on how to manage each variety and in what scenarios or type of environment each variety should be positioned for maximum yield potential. The 2021 on-farm program resulted in an estimated economic impact of over \$31.6 million to over \$68 million, and the potential impact of the 2022 program is estimated at over \$20 million to over \$43 million. The estimated value of the [NC State Cotton Planting Conditions Calculator](#), which growers use to make variety decisions for their farms, is estimated at \$795,000 annually.

Web-based grains and cotton tools developed by Extension specialists provide varietal recommendations based on anticipated climatic stress, planting date, crop maturity, traits and more to enhance crop performance. Extension in Craven, Carteret, Pamlico, and Jones counties coordinated with NC State faculty to provide **training in the use of these tools**. This training and use of the tools helped corn and soybean growers representing an estimated 3,950 acres switch to a higher-yielding variety, a more suitable soil type, and/or an improved strategy for managing climatic stress. Using an average value increase of \$130 per acre, these improvements secured an additional \$513,500 annually for growers.

To help peanut growers compare data on variety performance, an NC State research group created a [web application](#) that offers over a decade of historic yield data for various peanut varieties across multiple locations, providing at-a-glance breakdowns of each cultivar's name, parentage, and genetic traits. This online tool is just one small part of [NC State's peanut breeding program](#), which is constantly working with Extension to deliver actionable, research-based approaches to crop protection, helping growers minimize losses and reduce the use of crop protection chemicals.

Each year approximately 41% of the 141 farms in Chowan irrigate their crops by pulling irrigation water from the Chowan River, Albemarle Sound, or small creeks and ditches that are connected to the River or Sound. As this water is brackish, the salinity in the water can sometimes spike, especially in years of dry weather. Salty water can cause significant damage

in the form of salt burn to the foliage and roots of sensitive crops like peanuts. It can also cause long-term damage to the soil and can decrease the water holding capacity and decrease subsequent crops ability to draw water out of the soil. Chowan has been in drought conditions since April 2022 which has caused the Salinity in the River and Sound to increase to levels not seen in years. The Extension agriculture agent has been **measuring salinity levels** in the water at different points in the River and Sound the county then **sends notices to farmers** about the salinity levels and how much irrigation water they can use, at the measured salinity, before they cause significant damage to their crops. As **peanuts** are the most salt sensitive crop to salinity that farmers are growing, most can irrigate only about two inches of water before they must wait for rainfall to mitigate the salt accumulation from their irrigation systems. Irrigating more than that can cause total crop loss. This program has saved approximately 1,353 acres of the 3,300 acres of peanuts from significant salt damage if not complete crop loss. At approximately \$450/ton and an average yield of 1.97 tons/a, this program has saved peanut farmers approximately \$1,199,434.50. **Empowering NC growers by providing on-demand information and tools to improve decision-making is just part of how we are growing the future of agriculture in North Carolina.**

North Carolina is the fifth-largest peanut-producing state. In 2021, North Carolina farmers grew 452 million pounds of peanuts on 113,000 acres. Estimating peanut maturity and digging at the optimal time is a pivotal production decision that impacts peanut profitability. Key factors such as weather, field condition, health of the peanut vines, and size of the grower's operation are accounted for when helping to determine this important decision. Flavor, grading, milling quality and shelf life all depend on peak maturity. Greater percentages of large or undamaged kernels mean crop premiums to farmers. But because the plant is an indeterminate grower all kernels do not mature at the same time. In addition, the kernels develop in pods that grow beneath the soil surface. Identifying optimal harvest maturity can be a challenge. Extension Agents across 10 counties helped peanut growers use a method called **pod blasting to test the maturity of their peanut crops**, ensuring optimal maturity at harvest and increasing yields by as much as 45 pounds per acre per day and enhancing shelf-life for roasted in-shell peanuts. Using a technique to remove the outer layer of the pod and grouping the pods together by color the best time to harvest can be estimated. Growers still have to make the final decision when to dig based on the weather, disease pressure, labor and machinery availability etc. Harvesting too early or too late costs the grower income. These efforts helped improve peanut yields across over 30,000 acres statewide, securing an estimated added value of over \$3 million. **Improving NC's agricultural economy through increased yields is just part of how we are growing the future.**

Describe how the broader public benefited from the program activities.

Nitrogen fertilizer is the costliest input in corn cropping systems. During 2022, global supply of nitrogen fertilizer was greatly influenced by European conflicts. This led to delays and supply shortages and record high fertilizer prices for growers across the country and in turn impacting food prices for the public. Since nitrogen fertilizer is a key component in the successful production of corn grain in North Carolina, it was essential that growers utilized their limited supplies efficiently to remain economically sustainability during 2022. Reducing nitrogen fertilization to corn not only protects the environment from unwarranted excess nitrogen that degrades water quality through eutrophication, but it also increases profit for the producer. NC State Extension researchers demonstrated that most grower nitrogen rates could be reduced by 25% without impacting yield. Therefore, to protect the environment and increase profit, growers need to reduce nitrogen rates to corn.

To reduce nitrogen fertilizer use while maintaining corn yields, NC State is developing new technologies to apply nitrogen fixing bacteria to the corn, providing some of the required nitrogen. Unfortunately, little to no work has been done to determine how effectively these technologies fix nitrogen under field conditions or their potential environmental impacts. To address this issue, Extension partnered with NC State researchers to conduct 9 field trials, 3 of which were highlighted at various expos and field days. At these meetings, over 500 corn growers were provided with data and education on how to maximize utility of these new technologies. The trials demonstrated that the studied bacteria can indeed fix nitrogen in NC corn fields. When used in the right environment and with the correct careful handling, the materials can save corn growers \$0.25 to \$0.50 per pound of nitrogen and reduce their carbon footprint and water contamination rates. Reducing the use of N fertilizer by 40 lbs per acre on 910,000 corn acres in North Carolina can significantly reduce the carbon footprint of growing corn and can reduce water contamination in this state. The field trials also revealed that growers in the Coastal Plain are less likely to see a significant impact from these technologies, thus by informing corn growers in this region of the limitations of this technology, an estimated \$500,000 could be saved in wasted equipment costs.

Agriculture Extension Agents in Craven and Pamlico Counties conducted replicated field trials in three counties. These trials were conducted over a two-year period (2021-2022) and examined the relationship between various nitrogen rates and yield, and their comparison to university recommendations tied to soil type and realistic yield expectations. University Extension specialists assisted with field trial harvest and with data analysis. Results were shared with growers and professional crop consultants through on-farm field events, during winter production meetings, and through regional news articles. From these efforts, Extension agents were able to demonstrate that corn nitrogen needs vary by location and soil type, and that growers who utilized university-based recommendations had the potential to lower excessive nitrogen rates and reduce cost if their current practices exceeded recommendations. As a result, 67% of growers surveyed during a 2022 winter production meeting expressed their intent to utilize university-based recommendations during the growing season, with 50% reporting the potential to reduce nitrogen inputs on marginal lands that have less yield potential. Additionally, several growers approached Extension agents during the 2022 season to discuss this research and made adjustments to current practices.

NC Extension Centers of Craven, Carteret, Pamlico and Jones Counties coordinated with NC State faculty to provide research data supporting reduced nitrogen rates to corn. Replicated plots were established in Craven, Pamlico and Duplin. Statistical analysis of harvest data from these plots showed no significant difference between 25% below the grower nitrogen rate and the grower's nitrogen rate. Rates 25% above the grower rate was only significantly higher at one location experiencing drought conditions. [Articles](#) addressing this issue were provided on Extension web pages and in newsletters. Based on survey results at meetings and in direct communications with growers, 63% of corn producers stated they would consider reducing nitrogen rates to corn. Personal observation and interviews with growers show that 18% did so in 2022 by reducing nitrogen rates 25% or more on 3,100 acres. Based on current nitrogen prices and a reduction of 25 lbs./ac of nitrogen on these acres, this saves \$75,000 for producers and reduces excessive nitrogen concentration to surrounding waters.

Nutrient pollution is a result of excess nitrogen and phosphorus into the air and water. A range of health effects has been associated with ingesting nitrate-contaminated drinking water including methemoglobinemia, various cancers, adverse reproductive outcomes, diabetes, and thyroid conditions. NC State Extension has developed new technologies, conducted field trials and producer training, that has led to corn growers reducing nitrogen rates ultimately resulting in

a reduction in grower dependence on fertilizer imports, lower food prices, reduced our carbon footprint and reduced levels of nutrient pollution. **Protecting NC's agriculture and environment through stewardship is just part of how we are growing the future.**

Professional Development & Multistate Activities.

The following **professional development workshops** were provided by Extension Specialists for Extension Agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- Brassica Crop Agent Training
- Considerations for Low Nicotine Tobacco Production
- Corn, Soybean, and Wheat Variety Placement
- Cotton & Peanut Agent Training Field Day
- Drones in Ag: Regulations, Technology and Uses
- Fiber Hemp Agronomics and Market Update
- Flue-Cured Tobacco Agent Training
- Grains Agronomic Program Team Conference
- Herbicide Injury Symptoms, Diagnosis & Response
- Micronutrients for Row Crops in North Carolina
- Peaches & Cream: Economic Updates for Specialty Crops & Dairy
- Planning a Successful On-Farm Research Trial
- Seedling Weed Identification for Row Crops
- Sensors, Data, and Controls for On-Farm Studies
- Technology Adoption and Open Source Tools for Soybean Producers
- The Unusual and Obscure: Weeds in Row Crops
- USDA Federal Regulation and Industrial Hemp Production in NC
- What To Do If You Suspect Herbicide Contamination?
- Winter Cotton & Peanut Agent Training

The following **Factsheets and Peer Reviewed Extension Publications** were developed by Extension Specialists for dissemination of research-based information to Extension agents, growers, and other stakeholders.

- [2023 North Carolina Agricultural Chemicals Manual](#) (AG 1)
- [North Carolina Soybean Production Guide](#) (AG-835)
- [Growing Cotton for Ornamental, Educational, Non-Commercial, or Atypical Commercial Reasons in North Carolina](#) (AG 923)
- [Utilizing the NC State University Cotton Planting Conditions Calculator and the NCDA&CS Cotton Seed Database to Make Wise Planting Decisions](#) (AG 924)
- [Utilizing the North Carolina Department of Agriculture and Consumer Services Cotton Seed Quality Testing Program to Make Better Planting Decisions](#) (AG 925)
- [Optimizing Floral Hemp Biomass through Proper Transplant Timing and Density](#) (AG 938)
- [Size Matters: Accounting for Hemp Seed Size When Calibrating Your Grain Drill](#)
- [Sting Nematode in Corn](#)

Extension specialists contributed to solving regional and national issues through **multi-state collaborative Extension efforts**. Some multi-state programs NC State Extension participated in included:

- SCC-33. National Variety Testing. Organized an in-person and virtual meeting in Fort Lauderdale, FL Feb 10-14, 2022 with over 40 participants
- Investigation of Alternative Energy Options for Flue-Cured Tobacco Barns collaboration with Virginia Tech Southern Piedmont Center, Blackstone VA.
- Collaboration for regional training for extension agents with flue-cured tobacco responsibilities across North Carolina, Virginia, South Carolina, and Georgia.
- Beltwide applied research projects concerning cotton seed quality along with our counterparts in other cotton producing states who are members of the Extension Cotton Specialists Working Group.
- Southern Cotton Growers Inc consists of members from each Southeastern states cotton boards to develop regional initiatives for cotton seed quality testing and ongoing research updates.
- Collaboration with Tennessee, Kentucky, Virginia, and Arkansas on the Multi-State Regional Soybean Database.
- National 'Science for Success' team comprised of University Soybean Extension Specialists from >15 states across the US who collaboratively deliver Soybean Best Management Practices to growers across the US.
- Collaborated with Virginia Tech and Clemson on peanut pest management and variety testing projects.
- Collaborated with University of Georgia on fertility and plant growth regulation projects.
- S-1084 focus on hemp (floral, grain, fiber) research and extension development.
- Multiple multi-state field trials, which were highlighted at Extension events. One trial, focused on understanding the genetics of flowering time in hemp, is a collaboration with Cornell. The second trial is a screening of newly developed fiber and grain genetics and is a collaboration with Cornell, University of Kentucky, Texas A&M, and the University of Florida.

Describe the issue or problem that the program addresses.

Fruit and vegetable production plays a key role in North Carolina's agricultural economy, with farm cash receipts for horticulture totaling more than \$1.4 billion in 2016. NC horticultural production includes a diverse portfolio of traditional and specialty crops, including sweet potato, tomatoes, cucumbers, blueberries, strawberries, and apples. In addition, North Carolina has a diverse turfgrass industry totaling 2,007,100 acres. Turfgrasses are maintained at single family dwellings, roadsides, parks, commercial properties, churches, golf courses, schools, airports, institutions, and cemeteries.

The world's population is expected to surpass 9 billion by 2050. To meet consumer demand, almost 50 percent more food, feed, and biofuel will need to be produced. Coupled with this, pressure is placed on horticulture producers because of climate change, soil erosion, pests, and diseases. To meet the challenge of feeding a growing population, research-based horticulture best management practices need to be developed and adopted in the production of fruits and nuts, vegetables, floriculture, herbs, mushrooms, turf, and other specialty commodities. Commercial growers need resources to navigate a broad range of challenges, including production costs, soil health and fertility, pest and disease management, and variety selection. In addition, home gardeners and landscape professionals need to learn and adopt practices that provide sustainable landscapes and conserve and protect environmental health. Private residents also need support to cultivate home and community gardens. Public outreach efforts are crucial to ensure that residents understand how horticultural practices impact food security, economic security, and environmental health.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

NC State Extension specialists used applied research, diagnostic testing, and variety performance evaluations to develop innovative products, technology, and research-based horticulture best management practices (BMPs) that support sustainable horticultural production. Extension specialists led applied research efforts to reduce plant diseases and pests through improved crop management, variety selection, and pesticide management. Extension specialists and Agents delivered information on these innovations and practices and promoted the adoption of BMPs through Extension publications, websites, meetings, workshops, seminars/webinars, videos, newsletters, clinics, consultations, community and demonstration gardens, certification programs, and public outreach efforts to support commercial growers, nursery professionals, resident gardeners, and landscape professionals.

- NC State Extension specialists disseminated new horticulture information and best practices through the publication of around 125 **Extension publications** to educate Extension Agents, producers, and members of industry.
- NC State Extension specialists maintained 20 horticulture **websites** that were viewed approximately 400,000 times in 2022 to disseminate up-to-date research-based information and best practices.
- 40,000 individuals attended training offered by Extension specialists, and 50,000 individuals attended consumer horticulture-related **training** provided by Extension Agents.
- 3,515 Master Gardener **volunteers** donated nearly 200,000 hours valued at over \$5.7 million, reaching over 187,000 NC residents.

In 2022, Extension expanded and enhanced web-based and on-demand education resources and tools, benefitting growers and the public at large. Extension in Chatham County contributed over 45 new articles to the [Growing Small Farms website](#). Since its establishment in 2001, this site has grown to over 500 pages and over 400 posts promoting agricultural literacy and highlighting local farms and farmer's markets. With topics ranging from pollinator gardening, to farmer education, to farm and garden tours, this site attracted nearly 240,000 visits in 2022, and its content was widely shared on social media.

In 2022, Extension continued adapting to the post-pandemic world and providing **media resources** to support rapidly growing consumer interest in horticulture. Extension in Guilford County cultivated a new partnership with local news channel WGHP Fox 8, delivering 8 weekly fall gardening episodes, each of which attracted an average of 32,000 viewers, with a total viewership of 256,000. In Henderson County, Extension worked with WTZQ Radio to produce a series of live weekly home gardening segments, eventually leading to the production of the Gardening in the Mountains Radio show and podcast that now airs weekly on Saturday mornings to an audience of as many as 10,000. This show has aired nearly 100 episodes to date, providing people with seasonal gardening tips. Edgecombe County Extension also made strides in radio outreach, promoting Extension and providing 4 to 5 themed horticulture broadcasts monthly, with topics spanning beekeeping, garden management, seasonal plant selection, and soil management. This local radio show airs on 2 stations in Rocky Mount and Sanford, reaching an estimated 20,000 to 25,000 people per day. **NC State Extension empowers individuals to make decisions by providing research-based information through media outreach.**

The [NC Extension Gardener Online Plant ID courses](#), offered in partnership with Longwood Gardens, encourage students to explore the world around them and gain a better understanding of plant identification. Students study 50 plants in each course and gain skills in finding and using different apps and websites, such as the [Extension Gardener Plant Toolbox](#), a tool that unifies information from plant databases around the world. This tool helps people select plants that will thrive in their yards while providing beauty and functional landscaping benefits. In 2022, Extension offered a basic botany course as well as 4 different 6-week plant identification classes, each focusing on different groups of plants. Of the 50 students who completed course evaluations in 2022, 87% reported a better understanding of plants, 63% reported more joy and confidence in gardening, and 54% felt better prepared to work with plants professionally or on a volunteer basis. A number of students have used these courses to jumpstart a transition to a green industry career or a graduate program, and many students report that these courses have helped them feel more connected to the natural world. Cooperative Extension also partners with the North Carolina Botanical Gardens to offer a 6-week online non-credit class in [Therapeutic Horticulture](#). Students learn to design therapeutic horticulture treatments and programs for diverse sites and participant populations. Traditionally, therapeutic horticulture training has been face-to-face and expensive, but this online, affordable course makes this training available to a wider population. **NC State Extension works with local partners to bring the many benefits of horticulture to an increasingly broad audience.**

To ensure growers and members of the community benefit from NC State's [blueberry breeding program](#), Cooperative Extension hosts annual field days and community events. One popular event which attracts 35,00 to 40,000 visitors each year is the NC Blueberry Festival in Burgaw, NC. Five blueberry producing counties in southeast North Carolina are represented at the event: Bladen, Duplin, New Hanover, Sampson and Pender as well as the NCSU Horticulture Crops Research Farm in Castle Hayne, NC. Although the NC Blueberry Festival and tours of the research farm were previously impacted by COVID-19 restrictions, in 2022, 110

festival goers participated in on farm tours of the research farm to get a behind the scenes look at the blueberry industry. Extension Agents shared historical information about the blueberry industry in North Carolina and southeast North Carolina, history about agriculture in Pender County, history of the land grant university system, Cooperative Extension and the research farm network in North Carolina. Participants met with Extension Specialists from the NCSU Horticulture Science Department, Blueberry Plant Breeders and Geneticists to learn about some of the research being done at NC State and the Horticulture Research Farm. Tour participants were able to taste a number of different blueberry varieties being tested at the farm, watch a mechanical harvester pick blueberries and see those berries cleaned and sorted by a small-scale cleaning and sorting machine, similar to those used by commercial farmers. **NC State Extension provides stakeholders with on farm experiential learning experiences.**

As a result of NC State Extension programs, over **425,000 participants** gained knowledge of landscape, turf, and garden best management practices, including pest and soil management. Over **100,000 participants** use Extension-recommended best management practices in landscapes, turf, and gardens; and nearly **55,000 participants** selected appropriate landscape plants after participating in Extension consumer horticulture programs.

Describe how the target audience benefited from the program activities.

Early spring frost and freezes are a common threat to fruit producers along the Eastern Seaboard. Small acreage growers are particularly vulnerable to weather-based threats. To provide timely freeze and frost prediction information for growers and Extension Agents, Extension specialists continued a popular **weather advisory program** that distributes crucial information through the NC State Extension [strawberry](#) and [grape](#) web portals, reaching an audience that stretches from the Mid-Atlantic to the Southeast. This program collaborates with AWIS weather services to obtain exclusive temperature maps, weather discussions, and forecast tables. This weather advisory program is currently attracting over 10,000 viewers per month to the NC State Extension strawberry web portal and 2,000 viewers per month to the grape web portal. Extension also educates growers on freeze and frost protection for strawberries and grapes through publications and webinars. Given that late spring frosts frequently lead to losses of 10–30% in strawberry and up to 100% in grape crops, these timely updates help growers avoid devastating crop and profit losses. **NC State Extension provided solution-driven research and technology to empower growers to make better-informed decisions.**

Grapevine viruses can lead to substantial reductions in yield and fruit quality in wine grapes and are among the greatest threats to the grape and wine industry worldwide. Grapevine virus symptoms are often non-specific and can be easily confused with the symptoms of other problems, such as nutrient deficiencies and physical damage. To address this problem, Extension partnered with NC State research programs, Foundation Plant Services at UC Davis, and the USDA-ARS in Davis, CA to **assess the distribution and severity of [common grapevine viruses in NC](#)** between 2018 and 2020. This joint effort also led to new identification and sampling guidelines and the development of a new virus testing program that dramatically reduces costs to growers (from \$800 to \$1,000 per sample to about \$150). As a result of this program, growers

are now more aware of the most common grapevine viruses in NC vineyards, and they can more easily identify and treat grapevine viruses in their vineyards.

Grapevine training and pruning is the most invasive and critical cultural management practice in a vineyard. Poor pruning can reduce longevity, yield, and fruit quality while making crops more vulnerable to disease. Since 2020, Extension has been partnering with an Italian pruning specialist to offer [virtual pruning workshops](#), bringing internationally recognized knowledge to NC growers. These workshops include 4 in-depth classes (each 3 hours long) in which real-world examples of pruning are discussed directly with a grower and an agent. These workshops are offered annually to growers in NC, GA, and VA, with growers reporting thousands of dollars of savings in maintenance and labor costs thanks to skills learned in the workshops. These workshops ultimately support a mindset shift in growers and agents, encouraging them to understand how pruning affects long-term vineyard longevity, rather than only focusing on short-term yield. **NC State Extension provided educational opportunities to facilitate the use and transfer of research-based knowledge of commercial berry, grape, tree fruit, and other fruit or vegetable producers to grow agricultural production.**

North Carolina is the second largest producer of pickling cucumbers in the United States. According to the National Agricultural Statistics Service, North Carolina has approximately 8,499 acres of cucumbers, 1,509 acres of melons, 2,514 acres of pumpkins, 2,531 acres of squash, and 5,498 acres of watermelon. [Cucurbit downy mildew](#) is a devastating disease in cucurbit crops and the number one threat to production, especially in cucumber. This disease must be managed with frequent and expensive fungicide applications to prevent devastating yield losses. The pathogen is prone to quickly developing fungicide resistance; thus, continued monitoring and identifying novel management strategies is critical to producers. NC State Extension specialists work closely with cucurbit growers, cucurbit packers, Extension agents, crop consultants, seed companies, and chemical companies to improve management of cucurbit downy mildew, resulting in the development of a **field biosurveillance system** that provides host risk and fungicide resistance information for precision management, **registration of novel active ingredients for chemical control** through collaborations with fungicide companies, and release of **2 commercial pickling cucumber varieties** with resistance through collaborations with seed companies. Extension also serves as a state collaborator for the **Cucurbit Downy Mildew IPM PIPE national alert system** and hosts **sentinel plots** on a yearly basis for pathogen monitoring. Extension efforts save growers approximately 4–6 fungicide sprays per year. Because fungicide sprays can be about \$30–\$50 per acre, per application, per product depending on the product, these efforts would translate into \$2.5 to \$6 million in annual savings for NC cucurbit growers alone.

The oomycete pathogen *Phytophthora capsici* can cause root, crown, and fruit rot in [cucurbit crops](#). According to the National Agriculture Statistics Service, North Carolina has approximately 8,499 acres of cucumbers (\$22 million value), 1,509 acres of melons (\$8.4 million value), 2,514 acres of pumpkins (\$6.8 million value), 2,531 acres of squash (\$7 million value), 5,498 acres of watermelon (\$30.6 million value), and 2,635

acres of peppers (\$26 million value). All of these hosts are susceptible to *P. capsica*. This pathogen is very aggressive, resulting in total field losses when the weather is favorable, host resistance is not available, it can become resistant to fungicides, and it can infest irrigation water from surface water sources. Several cucurbit and pepper producers have reported as high as 80% losses due to this pathogen despite having excellent practices as far as cultural options and fungicide programs. Better understanding of what was causing these extreme losses was needed. After visiting with affected growers and Extension agents, Extension suspected surface water used for irrigation was infested with *P. capsica*. Extension took water samples and determined that this was correct, then worked closely with each grower to **develop management strategies** compatible with their situation. Extension recommendations reduced fruit losses from 80% to 20% for 2 of the largest watermelon and squash growers in the state. In the cases of the watermelon (300 acres) and squash growers (120 acres), this translated into estimated NC grower savings of almost \$1 million and \$200,000 in watermelon and squash, respectively.

Continuing education for landscape professionals is vital to improving sustainability and reducing environmental impacts. In 2022, Cooperative Extension provided workshops, seminars, and professional talks to over 5,500 turfgrass managers on diverse topics, including management of warm and cool season turfgrasses, integrated pest management, pesticide and nutrient training, classroom training for turf and ornamental pesticide licenses, turf worker safety, and establishing turf for sediment and erosion control. All participants indicated that the knowledge provided would help them be more efficient and environmentally conscious in their turf pesticide and nutrient programs, 90% greatly increased their knowledge in pesticide application BMPs, 90% reported intention to use integrated pest management strategies, and 80% reported that they will change at least one management practice based on the education presented by Extension. **As a leader in experiential education, NC State Extension provided turfgrass managers and landscape professionals with best management practices, equipping them to make environmentally and economically informed decisions.**

Describe how the broader public benefited from the program activities.

Extension Master Gardener volunteers help their neighbors understand and use research-based information and practices that decrease the misuse of fertilizers, insecticides, and pesticides in gardens, home lawns, and landscapes; increase overall food production and availability; enhance wildlife habitats; and improve human health and wellbeing. Because of the work of Master Gardeners, more people are growing food locally, planting pollinator-friendly gardens, and creating resilient landscapes that help manage stormwater runoff. In 2022, Extension's Master Gardener program (EMG) continued to provide exceptional horticultural education to the general public. Statewide, 187,070 residents benefitted from the program's demonstrations, community gardens, workshops, and personalized consultations. Master Gardeners reported 192,346 service hours from 3,515 volunteers for the year, valued at an estimated \$5,760,763. In 2022, Extension Master Gardener Volunteers (EMGV) used demonstration gardens, plant clinics and sales, and a variety of other outreach methods to engage with consumers. These efforts contributed resources to local food systems while

empowering consumers to grow their own food, care for the environment, and develop a deeper understanding of a broad range of topics, including pollinator health, disease and pest management, plant identification, and stormwater management.

EMGV in Brunswick County hosted an open house at the Brunswick County Botanical Demonstration Garden, showcasing 15 vignette gardens and providing education on soil sampling, stormwater management, and the unique aspects of each garden. Around 200 visitors attended and received one-on-one assistance from volunteers and staff. EMGV interns also cataloged and QR labeled over 660 plants, ensuring that visitors to the garden could easily access information about each plant's characteristics and cultivation needs. At a demonstration garden in Vance County, EMGV partnered with the Extension horticulture agent to implement a comprehensive pollinator conservation education program, drawing attention to pollinator support plants and insecticide-free garden management and delivering an informational bulletin board, staffed information tables, radio segments, newsletter articles, garden tours, webinars, and more. These efforts reached an estimated 200 direct educational contacts and hundreds of indirect contacts through media outreach. Post-event surveys routinely indicate that these efforts inspire gardeners to reduce pesticide use and increase the use of native plants.

EMGV mobile plant clinics in Johnston County were particularly impactful in 2022. EMGV partnered with local businesses to hold 11 mobile plant clinics, offering research-based advice on growing food, landscaping, lawn maintenance, plant choices, integrated pest management, disease management, and proper use of fertilizers and pesticides. Five hundred and twelve people received advice at an estimated total value of \$25,600. These efforts also helped secure 1,057 new subscribers (a 73% increase) to EMGV's Gardener's Dirt Newsletter. EMGV in Johnston County also helped provide 140 visitors with gardening classes and workshops at local community gardens, producing 15,000 pounds (an estimated \$28,350 value) of fresh food for local soup kitchens and providing an estimated value of \$53,350 in gardening advice to an additional 1,067 community members via calls, emails, and walk-ins.

In 2022, EMGV plant sales provided opportunities to fundraise while delivering diverse educational opportunities to community members. Orange County EMGV conducted its first ever independent education and plant sale, attracting an estimated 750 to 1,000 participants who enjoyed 14 educational booths and activities and provided glowing feedback. In Pender County, EMGV held a plant sale that attracted around 700 community members and raised \$8,000 for outreach programs.

EMGV in Guilford County developed a series of educational programs called Grow With Us, offering in-person and Zoom-based classes as well as multiple online resources. Grow with Us served more than 1,538 people in 2022, with many participants attending more than one program and indicating that they shared what they learned with family, friends, and gardening groups.

To address growing consumer concerns over inflation and supply chain issues, Extension has empowered community members to grow their own food by distributing seeds. In Moore County, Extension Master Gardener Volunteers partnered with a local library to create a seed library, allowing gardeners to take free seed and bring saved seed back to create sustainability. With seed donated by a Master Gardener Volunteer, Extension established the seed library and created accompanying educational materials as well as a seed saving program. Between April and December of 2022, 247 people took over 1,000 packets of seeds from the library. Four local businesses have since donated to this cause. In Forsyth County, Extension's Community Gardening Program worked with Extension Master Gardener Volunteers to distribute seeds to 28 gardens across the country. At the 9 gardens reporting participation in this program, 114

people grew food at home, harvesting over 482 pounds of produce for household use and donating an additional 615 pounds to a local food pantry.

Master Gardener Volunteers also partnered with Habitat for Humanity in 2022, providing materials, homeowner education, and installation services to ensure that 6 homes had beautiful, sustainable, and resilient landscaping with native plants. Master Gardener Volunteers also held a plant sale fundraiser and “Ask an EMG” event at the Habitat for Humanity location in Southport, raising \$1,000 that went directly to Habitat for Humanity. **Master Gardeners connect their neighbors to horticulture through science-based education and outreach that empowers North Carolinians to cultivate healthy plants, landscapes, ecosystems, and communities.**

To help strengthen local bee populations and educate the public about how to support these critical pollinators, Cooperative Extension published a comprehensive, **peer-reviewed Extension guide** “[How to Manage a Successful Bee Hotel](#).” This document went online in July 2022 and received 1,325 hits by the end of the year. It also resulted in a presentation at the 2022 Extension Master Gardener College to provide “train the trainer” guidance in building and managing bee habitats. **By growing public awareness of the importance of pollinators and educating specialists and consumers in how to help them be at home in human-dominated habitats, Extension is building a more sustainable future.**

Professional Development & Multistate Activities.

The following professional development workshops were provided by Extension specialists for Extension agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- A Survey of Greenhouse Diseases in NC: Identification and Management
- Accessibility & Inclusiveness with the Ability Garden
- Basic Tree Risk Assessment & Structural Pruning
- Boosting Roots, Up and Down Strategies of Utilizing PGRs
- Certified Plant Professional Plant Identification Training
- Coleus Diagnostics and Production
- Eastern NC Nursery Conference: Red-headed Flea Beetle Research
- Flatheaded Appletree Borers Best Management Practices to Prevent
- Grapevine Cane Pruning
- Grapevine Pruning and Shoot Thinning
- Grapevine Pruning Basics
- Grapevine Spur Pruning Workshop
- Growing a Tropical Like Native Fruit - Pawpaw
- Herbicide Injury Symptoms, Diagnosis & Response
- Integrated Pest Management of European Pepper Moth
- Is Sesame Our Next Big Oilseed Crop
- Keep Christmas Trees Fresh: How to Answer Holiday Consumer Calls
- Managing Hard to Control Weeds (Moss, Liverwort, and Nostoc)
- Morphology and Identification of Grasses, Sedges, and Rushes
- Muscadine Pruning Workshop
- Must Have Greenhouse Gadgets and Apps
- Online Master Gardener Training
- Ornamental Horticulture
- Ornamental Nursery Production Tour
- Pests and Diseases of Nursery-Grown Ornamental Plants

Plant Problem Diagnostics
Rethinking the Invasive Conundrum
Spotted Lanternfly in PA Nurseries
Strawberry Production
Tomato Production
Turfgrass Disease Diagnosis & Management
Turfgrass Management and Fertility
Warm Season Turf Maintenance - Diagnosing Warm Season Turf Pests
What To Do If You Suspect Herbicide Contamination?

The following **Factsheets and Peer Reviewed Extension Publications** were developed by Extension specialists for the dissemination of research-based information to Extension agents, growers, and other stakeholders.

[2023 North Carolina Agricultural Chemicals Manual](#)
[2022 Southeastern US Vegetable Crop Handbook](#)
[2022 Integrated Orchard Management Guide for Commercial Apples in the Southeast](#)
[North Carolina Extension Gardener Handbook](#)
[2022 Sod Producers' Report for North Carolina](#)
[Preparing Nursery Plants for Winter](#)
[Irrigation Water Quality Problems](#)
[Biopesticides for Disease Management in Vegetable Crops](#)
[Tall Fescue and Kentucky Bluegrass Home Lawn Calendar](#)
[Tall Fescue, Hard \(Fine\) Fescue, and Kentucky Bluegrass Home Lawn Calendar](#)
[Prevention and Management of Soilborne Diseases of Ornamental Plants and Vegetables in the Greenhouse](#)
[Water Quality and Sprayer and Spreader Calibration](#)
[Water Quality and Professional Lawn Care](#)
[Water Quality and Commercial Lawn Care](#)
[Water Quality and Professional Turfgrass Managers](#)
[Screening Sesame for Resistance to Multiple Root-Knot Nematode Species](#)
[Fusarium Wilt of Blackberry](#)
[Exobasidium leaf and fruit spot of blueberry](#)
[Gray Leaf Spot of Tomato](#)
[Fresh-Market Muscadines: A 2019 survey to gather insights into important issues for growers](#)
[Strawberries: Late Planting and the Use of Floating Row Covers](#)
[European Pepper Moth in Nurseries and Greenhouses](#)
[Cream Leaf Blight in Turf](#)
[Management Guide for Sour Rot in North Carolina](#)
[Pine Bark Beetles](#)
[Black Rot of Brassicas](#)
[Oystershell Scale](#)
[Annual Ryegrass](#)
[Bahagrass](#)
[Bermudagrass](#)
[Buffalograss](#)
[Carpetgrass](#)
[Centipedegrass](#)
[Creeping Bentgrass](#)
[Fine Fescue](#)
[Kentucky Bluegrass](#)

[Perennial Ryegrass](#)

[Rough Bluegrass](#)

[St. Augustinegrass](#)

[Tall Fescue](#)

[Zoysiagrass](#)

Extension specialists contributed to solving regional and national issues through **multi-state collaborative Extension efforts**. Some multi-state programs NC State Extension participated in included:

- Southern Region Strawberry IPM Working Group
- Southern Region Veggie Crop Working Group
- Southern Region Steering Committee small fruit industries
- Southeastern Vegetable Extension Workers Group 14 institutions edit the Southeastern Vegetable Production Handbook, organize multi-state variety trials, maintain listserv, discuss vegetable production issues
- Great Lakes Hops Working Group Annual meetings, monthly discussions
- NCERA224. Extension and IPM for ornamental plants
- S1073 IPM and Biocontrol of pests on ornamental plants
- Collaboration with a team of 16 scientists across 15 universities to limit the impact of annual bluegrass; University of Georgia, Auburn University, the University of Tennessee and Clemson University to investigate pesticide environmental fate
- National Viticulture and Enology Extension Leadership Committee
- NCCC 212 Small fruits and viticulture
- Multi-state project focused on research and extension with the dollar spot pathogen.
- Turf multistate activities - University of Florida evaluation of new Bahiagrass varieties; Purdue University Bermudagrass Mite regional topics in warm and cool season grasses; Clemson University evaluation of Nematode and Take-all-root rot samples in warm season grasses; Virginia Tech University herbicide evaluation for warm season turf in the transition zone; University of Tennessee collaboration of bermudagrass varieties in the transition zone
- Regional Approach to Cucurbit Downy Mildew Prevention 29 states monitor downy mildew on cucurbit outbreaks, coordinate state activities, identify management solutions, and educate growers on disease management and identification
- Management of Endemic and Emerging Bacterial Diseases of Capsicum 4 universities and USDA-ARS Identify bacterial pathogens on pepper, evaluate alternative spray programs to manage diseases, identify novel sources of resistance, educate growers on management solutions
- Caneberry and Apple disease content for MyIPM App
- PathMap Fungicide resistance profile map in fruit crops app development: NCSU, USDA-ARS, PSU, MSU, Colorado State University, Cornell

Describe the issue or problem that the program addresses.

The food animal industry represents approximately 70% of North Carolina's agricultural economy with all 100 counties producing some type of animal-sourced product. North Carolina's hog and pork processing industry contributes more than \$7.1 billion in economic output to the state's economy and supports nearly 19,000 jobs. North Carolina has nearly 8 million hogs, 785,000 cattle, and 916 million broilers (chickens grown for meat). The state is ranked #1 for production of all poultry species and #2 for overall hog and trout production nationally. In addition, small ruminants remain a key source of meat for consumers. In fact, over the last 10 years, there has been an increased interest in small ruminant production, especially meat goat production.

Although NC may currently be a leader in supplying meat products, the world's population is projected to surpass 9.7 billion by 2050. According to the United Nations-FAO, global meat production will have to increase to 455 million tons (from approximately 350 million tons today) to meet consumption demands. Across the nation, farms and rangelands are being lost due to population growth and development, and our farms have contributed to environmental damage due to greenhouse gas emissions, fossil fuels, and other pollutants. Farms will need to implement climate-smart agricultural practices and find innovative ways to increase food animal production on less land. To help feed a growing population, NC State Extension needs to effectively transfer innovative technologies and research-based animal science best management practices developed by NC State researchers to food animal producers and industry representatives, effectively transfer new knowledge and skills into practical applications for food animal producers to adopt and empower producers to make better-informed decisions.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

NC State Extension specialists used applied research and on-farm testing to develop innovative products, technology, and research-based animal science best management practices (BMPs); support increased profitability of animal agriculture, equine, and forage producers; and address consumption demands and reduce environmental damage while protecting animal health and welfare. Extension specialists and agents delivered information on these innovations and practices to producers through Extension publications, websites, meetings, workshops and certification programs, on-farm consultations, webinars, videos, and newsletters. Extension also led the development of new disease and waste management plans as well as novel technologies to enhance animal health.

- NC State Extension specialists disseminated new animal science information and best practices through the publication of 85 **extension publications** to educate Extension agents, producers, and members of the industry.
- NC State Extension specialists maintained 20 livestock, aquaculture, and poultry-related **websites**. The animal agriculture production websites maintained by Extension specialists were viewed over 250,000 times disseminating up-to-date research-based information and best practices.
- Extension agents reached nearly 600,000 producers through **social media and websites** and reached approximately 12 million producers through **mass media** such as television, radio, and newspapers. providing animal and poultry science educational information.

- NC State Extension specialists produced 70 **on-demand educational videos** on animal and poultry science-related topics that were viewed 10,000 times.
- Approximately 25,000 participants attended **training** provided by Extension livestock agents, and an additional 10,000 participants attended training provided by Extension specialists.
- 65,000 individuals were provided with technical assistance through **on-farm consultations** provided by Extension livestock agents.

To support cattle producers in the face of out-of-date and closed livestock exchange facilities, Extension in Union County partnered with a cattle panel dealer to develop a **removeable cattle sale system** for the Union County Agricultural Complex. This system was designed based on feedback from local producers and tailored to the unique needs of the local community, and it was used for the first time in December of 2022 for a performance tested bull sale that grossed \$187,500 and attracted over 200 people. One producer described the sale set-up as “the best thing that has happened for the Union County cattle industry in a long while.” The system also received praise from consigners, and several other sales have reached out to secure dates for their events.

To help preserve flock health, protect natural resources, and maximize the agricultural value of poultry waste by-products, in Randolph County, Extension **built an advanced composting technology (ACT) system** and invited local growers to see the machinery in action, educating them about how ACT systems can improve the efficiency of composting. This field day demonstration attracted 20 attendees, including current and potential poultry producers, agricultural lenders, broiler company representatives, poultry Extension agents, and a local livestock agent.

To address a 2022 uptick in highly pathogenic avian influenza (HPAI) and mitigate harm to NC’s nearly \$40 billion commercial poultry industry, Extension collaborated with industry partners to encourage producers to establish and follow strict biosecurity protocols. Extension helped organize conference calls between producers and flock supervisors and a veterinarian, providing answers to pressing questions about the emerging situation with HPAI in and around NC and **providing advice to help keep HPAI out of commercial flocks**. These conference calls attracted an average of 40 participants each and reached 7 poultry complexes and over 280 flock supervisors. Extension also set up an [HPAI Educational Resources Page](#) on NC State’s [Poultry Extension](#) website, which received nearly 1,300 views in 2022. Extension remains in constant contact with the industry via email lists, providing education, HPAI status updates, and press releases, continuously strengthening **Extension’s relationship with industry and helping prevent potential devastation to NC poultry production**.

In Forsyth County, Extension held a webinar for livestock producers and provided **individual consultations** in person and via phone and email, providing education on best practices for forage fertilization and pasture management. A total of 497 livestock producers were reached through these efforts, and 68% of them completed a post-evaluation. Seventy-two percent of participants increased their knowledge of pasture and forage management, and 63% planned to adopt Extension recommended practices. **Helping farmers increase the efficiency of their forage operations so they can increase animal production is part of how we are growing North Carolina**.

As a result of NC State Extension educational programs and technical assistance, **6,975 producers** increased knowledge of pasture/forage management practices, **4,614 producers** increased their knowledge of nutrition and breeding, and **5,033 producers** increased knowledge of strategies for promoting animal health and welfare.

Describe how the target audience benefited from the program activities.

By using **value-added marketing channels** such as truckload sales, cattle producers can enjoy significant premiums. In 2022, Rutherford County Cooperative Extension and partners facilitated **truckload lot sales** for over 20 producers, helping them pool their resources to evaluate and process calves. About 1,250 calves were sold at premiums ranging from \$100–\$200 a head. At an average premium of \$150 a head, producers secured added profits of around \$187,500 thanks to these sales. In Duplin County, Extension partnered with producers and board members of the previously dissolved Coastal Carolina Cattle Alliance to revive this desperately needed service during a time of rising costs and shrinking profit margins. This revived program helped 9 producers from Duplin and surrounding counties sell 3 truckload lots of cattle (a total of 229 head) via **video auction**, allowing producers to get better value for their animals and strengthen the national food supply by shipping healthy, well-managed stock around the country.

Extension in Rutherford County partnered with a local veterinary clinic to hold a **breeding soundness workshop** for local producers. As a result, 2 bulls were found to be infertile, and the producers saved an estimated \$40,000 in lost income due to lack of calving. Extension in Warren County also provided **bull breeding soundness exams**, partnering with the NC State Veterinary School to examine 28 bulls, 4 of which were found to be unsuitable for breeding, preventing an estimated \$15,000 in financial losses. In Watauga County, Extension provided **education in disease prevention, nutrition, and bull breeding soundness as well as annual bull soundness exams**. Extension also worked with a local veterinarian to provide **free and reduced-cost vaccines and parasite control treatments** to producers. In 2022, 26 producers had bulls evaluated for breeding soundness, of which 9 were found to be unsuitable for breeding. Producers able to replace inferior bulls save an average of \$6,000 in losses per inferior bull by avoiding later born cows or open cows (cows without pregnancies), and the vaccinations and parasite control added an estimated value of \$100 to each animal. In Surry County, Extension helped beef producers enhance the effectiveness of natural breeding by delivering targeted **educational programming on the importance of bull selection** and providing **one-on-one selection assistance**. Based on Extension recommendations, 21 performance tested bulls were purchased, securing an estimated value increase of \$221 per calf produced. Given that each of these bulls will be mated to an average of 45 cows, producing about 945 calves, the total estimated increased value for the producer is over \$200,000.

To help 85 small beef producers enhance the genetics of their herds, Extension in Yancey County partnered with the Yancey County Cattleman's Association (YCCA) to provide **hands-on education in artificial insemination (AI)**. Ten producers learned the entire AI process, and Yancey Extension and YCCA worked together to secure specialized AI equipment. To date, 8 local beef producers have used the shared AI equipment, and several more have plans to begin an AI program. Using AI can generate profit increases of \$1,000–\$4,000 per producer per year due to higher quality calf production and elimination of the need to purchase and maintain a herd bull. Extension in Surry County delivered numerous **educational and certification programs** to help cattle producers earn more and save more. Based on producer evaluations, county-based research projects, and new marketing plans, purchasing plans, and best management practices adopted, the cumulative financial impact of these programs was over \$1.6 million in 2022. **NC State Extension provided cattle producers with technical assistance and training on breeding and other best management practices to increase the profitability of their operations.**

In 2022, Extension continued helping producers develop cost-effective, efficient, and environmentally friendly strategies for **pasture management**. Polk County Extension developed

an in-depth 6-week **pasture and forage management course** covering soil health and fertility, pasture ecology, forage variety selection, grazing management, and forage nutrition. The program was held in partnership with the Clemson Extension livestock agent in the area and brought in forage specialists from Clemson and NC State. Thanks to the information and hands-on training provided by this program, 21 farm owners or managers representing approximately 1,350 acres enhanced their forage management abilities. Most participants reported an increase in pasture productivity, with some reporting as much as a 50% increase in forage availability over the previous year. In a year when hay costs were at an all-time high, this increased productivity saved producers up to \$500 per 1,000 pounds of animal body weight and up to \$10,000 per farm.

Extension helped pork producers keep pace with complex and evolving environmental regulations for **waste management**, by providing assistance with a broad range of tasks, including sludge management, irrigation and litter calibration, record-keeping, manure sampling, general permits, and nutrient management plans. Extension in Bladen and Sampson Counties provided 90 producers with 282 total hours of **continuing education** and helped farms **perform sludge surveys** on 72 lagoons, submit approximately 1,300 lagoon samples to the NCDA, write **5 litter plans** for 924 acres and over 200,000 pounds of plant available nitrogen, and calibrate 4 equipment systems. Thanks to these efforts, producers saved nearly \$20,000 on surveys and calibrations and avoided hefty fines of up to \$25,000 per day for waste management violations. Randolph County Extension helped 5 poultry producers representing 2 companies across 4 counties **develop waste plans**, impacting over 600,000 birds, the annual production of 7,000 tons of poultry waste, and hundreds of acres of NC farmland, which were enriched with poultry litter. Duplin County Extension **helped local producers apply for the [NCDA&CS COVID Swine and Dairy Program](#)**, supporting 58 farms who lost production contracts and went months without income during the pandemic. By providing phone, email, and one-on-one assistance with the application process, Extension helped pork producers apply for over \$2.7 million in assistance covering lost income, lagoon closure costs, and barn renovation costs. Following Extension training and outreach efforts across the state, 2,003 producers increased their knowledge of animal waste management practices, 4,583 animal waste management credits were earned, 192 on-site sludge surveys or equipment calibrations were conducted, and 178 waste utilization/waste management plans were developed or updated. **As a leader in experiential education, NC State Extension provided information, training, and waste management plans for poultry and hog producers to increase profitability and improve environmental quality.**

Describe how the broader public benefited from the program activities.

Pandemic induced national meat shortages resulted in increased direct-to-consumer demand for local meat leaving farms and independent processors scrambling to respond. New entrepreneurs rush to open facilities while existing small processors expand, risking return on investment and efficiency challenges especially in a pinched labor market. To ensure that NC citizens enjoy consistent, affordable access to local meats, local processors need assistance tackling the complex problems they face. To address this, the **[NC Choices program](#)** has played a significant role in helping producers obtain funding from state and federal sources to more than double the total processing of NC animal products in the past 2 years, despite the challenges of the pandemic.

NC Choices worked with 20 inspected processors, providing peer-to-peer exchanges, in-plant assessment and training, regulatory support, and one-on-one assistance navigating grant and permit application processes. NC Choices also added a new processor training event in

partnership with the NC Meat Processor's Association, which included 98 independent processor registrants over 2 days. NC Choices played a significant role in developing educational programming and bringing in industry experts, including some from out of state, to address a variety of topics, including increasing plant capacity; safe, efficient, and equitable workforce development and expansion; and reducing processing costs and defects. Participants gave the training an average of rating of 4.5 out of 5 for effectiveness, and an average 4.5 out of 5 for their intention to apply what they learned to increase production or sales. In addition to this 2-day training, NC Choices leveraged Extension funds to provide 10 processor scholarships to participate in the Meat Processor Academy, a self-paced online course for independent meat processors who want to gain control of their efficiency, productivity, and profitability. The Meat Processor Academy was developed by the Niche Processor Assistance Network, an Extension community of practice groups working with independent processors. The academy includes 14 hours of training spanning business planning, lean manufacturing techniques, facilities management, financial management, human resources, and marketing strategies.

NC Choices also secured funding to expand [MeatSuite.com](https://meatsuite.com), a direct-to-consumer bulk buying platform that helps farmers expand their reach and connect with consumers. Buying locally strengthens regional economies, supports family farms, and provides fresh foods for consumers. NC Choices secured USDA funding for this expansion, which included new resources and training features on the site, such as a meat price calculator and text notifications for customer product questions. NC Choices also launched a series of trainings across the state, working with the NC Cattlemen's Association to bring MeatSuite.com to their annual conference and train their audience in the use of this digital resource. The site now has over 250 farmer profiles and has received 46,476 consumer site visits to date, 7% of whom click through to make purchases. **Extension partners with NC Choices to deliver education, technical assistance, networking opportunities, and direct-to-consumer engagement methods that benefit the public by promoting the growth, sustainability, and accessibility of NC's local, niche, and pasture-based meat supply chains.**

Extension empowered small poultry growers with technology resources, reducing processing and transportation costs. Union County Extension used grant funds to purchase a [mobile poultry processing unit \(MPU\)](#) to be used by local small farmers and compensate for the current total lack of poultry processing plants in NC. The MPU was advertised to producers, and Extension gathered feedback on their needs to purchase additional equipment and enable processing of turkeys as well. Eleven farms rented the MPU a total of 16 times in 2022, processing 926 birds, including broilers and turkeys. Producers were also provided with hands-on demonstrations of the MPU technology and presented with best management practices. Many renters raised broilers for the first time because of this unit and plan to raise more birds in the future. Prior to being given access to this MPU, Union County poultry producers had to travel 4 hours round trip to the closest facility in King's Tree, SC at an average cost of \$224 per trip. Harnett County, Extension continued using a mobile poultry MPU to deliver training to local small-scale producers. In 2022, 35 producers used the MPU, each processing an average of 75 birds across a 3-day use period. This equipment saved small producers an estimated \$13,375 in processing costs, enabling them to strengthen their operations and explore expanding into other areas of animal husbandry, including hogs, sheep, goats, and cattle.

Professional Development & Multistate Activities.

The following **professional development workshops** were provided by Extension Specialists for Extension Agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- Animal Ag Agent Training BQA Chuteside and Low stress handling
- Animal Ag Agent Training Dairy 101
- Animal Ag Agent Training Developing a Forage System
- Animal Ag Agent Training Precision Applications in Swine
- Animal Ag Agent Training Small Ruminant Facility/Nutrition/Grazing
- Aquaculture - Update on NC Industry and Opportunities
- Carbon Credits for Livestock Producers
- Demonstration of Real-time Assessment of Forage Nutritive Value
- Discover NC Dairy 360
- Pet Food Extension Agent Training
- Sheep Shearing Workshop
- Swine Industry Energy and Environment

The following **Factsheets and Peer Reviewed Extension Publications** were developed by Extension Specialists for dissemination of research-based information to Extension agents, growers, and other stakeholders.

[2023 North Carolina Agricultural Chemicals Manual](#) (AG 1)

- [IV. Fertilizer Use](#)
- [IX. Animal Disease Control](#)

[Biochar Production through Slow Pyrolysis of Animal Manure](#) (AG 919-06)

[How Does Nitrogen Move Through a Swine Farm with a Lagoon-Sprayfield System?](#) (AG 927)

[Pasture Grazing Heights for Rotational Stocking](#) (AG 939)

[Best Management Practices for Agricultural Nutrients](#) (AG 439-20)

[Raising Prices on Meat, a Pep Talk](#) (LF 019)

Extension specialists contributed to solving regional and national issues through **multi-state collaborative Extension efforts**. Some multi-state programs NC State Extension participated in included:

- NC1173. Sustainable Solutions to Problems Affecting Bee Health, which involves both research and extension collaborative projects.
- NC1211. Precision Management of Animals for Improved Care, Health, and Welfare of Livestock and Poultry. This group deploys a combination of engineering, animal science, and data science for the development, validation, and application of data, software, and controls to create usable information for assessments and improvements in livestock production and management. The 46 members of this group represent 21 universities, 5 companies, and 4 countries, further expanding collaboration network and program impact.
- NE1492. Multi-State Project. Enhancing Poultry Production Systems through Emerging Technologies and Husbandry Practices
- NE1941 Environmental Impacts of Equine Operations.
- NRSP8 National Animal Genome Program. The goal of this program is to sequence and annotate the genomes of all agriculturally relevant animals in the US (national consortium).
- NRSP9. National Animal Nutrition Program. Poultry modeling representative on the modelling subcommittee and Modelling committee - animal workshop.

- S1074: Future Challenges in Animal Production Systems: Seeking Solutions through Focused Facilitation
- S1069. Research and Extension for Unmanned Aircraft Systems (UAS). Aquaculture representative and tied in with work on autonomous vehicles in oyster culture (NSF/USDA funding) in parallel with multistate work.
- MeatSuite.com collaboration with Cornell University
- Niche Meat Processor Assistance Network, part of Extension Foundation Community of Practice
- Development of joint programming and fundraising through meatsummits.com with seven Universities and two partner organizations.
- Southern Regional 4-H Horse Program Committee
- Southern Regional 4-H Horse Championships Committee
- Eastern National 4-H Horse Roundup Committee
- American Dairy Science Association Extension Committee
- National Academies Sciences Engineering, and Medicine writing committee for Nutritional Requirements of Poultry.
- Supported NRCS agents in Vermont and North Carolina developing grazing plans for pasture-based pig production systems.
- Livestock and Poultry Environmental Learning Community (LPELC). This group oversees a monthly webinar series focused around environmental aspects of animal production and a biannual conference (Waste to Worth) which brings applied researchers and practitioners engaged in waste management and valorization in the animal industry sector.
- Traveled to Iowa, Indiana, Pennsylvania, and Kentucky to aid farming in dealing with HPAI outbreaks on behalf of the USDA.

Describe the issue or problem that the program addresses.

North Carolina remains the 9th largest state in the nation with 10.6 million residents. Between July 2021 and July 2022, NC had the 3rd highest rate of growth, adding 133,088 residents (a growth rate of 1.3%). Population growth and associated sprawling development contribute to agricultural and recreational land loss, deforestation, loss of biodiversity, increased stormwater runoff, encroachment on riparian buffers, increased surface runoff, and an increase in pollutants compromising the quality of our water, soil, and air. In addition, more people generate more waste. Litter accumulates in high-traffic areas, resulting in millions of dollars in annual government spending on roadside and community clean-up. The NC Department of Transportation reported \$11 million in costs for roadway clean-ups in 2020 alone.

North Carolina's forests are facing increasing native and non-native threats, from invasive pests to a rapidly changing climate. As current landowners age and transfer property to the next generation, new landowners are struggling to sustainably maintain forested areas. NC also faces a growing threat from pesticide pollution. Farmers and homeowners find themselves with banned, outdated, or unwanted pesticides that are hazardous to landfills and waterways. Pesticide applicators must comply with changing environmental regulations to protect the environment, ensure worker safety, and avoid hefty fines.

Climate change, deforestation, air pollution, water pollution, loss of wildlife, and natural resource depletion threaten our ecosystems, increase rates of disease, decrease security (food, water, air), raise sea levels and temperatures, and cause severe weather events. To sustain the quality and diversity of North Carolina's natural resources, conserve and protect the environment, boost sustainable energy, and mitigate climate change, there is a need for research-based natural resource stewardship and climate-smart agricultural and forestry best management practices to be developed, transferred to stakeholders, and put into practice.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

NC State Extension specialists used applied research to develop innovative products, technology, and research-based best management practices (BMPs) to protect forests, water, soil, air, and other natural resources. Extension specialists and agents delivered information on these innovations and practices and promoted the adoption of BMPs through Extension publications, websites, meetings, workshops, seminars/webinars, videos, newsletters, consultations, community and demonstration projects, certification programs, and public outreach efforts.

- NC State Extension agents used **social media and mass media** to provide new environmental and natural resource educational information reaching over 2 million individuals through mass media such as television, radio, and newspapers and another 150,000 individuals through social media and website posts.
- Environmental and natural resource topics were presented to 12,000 individuals who attended **training** provided by Extension agents and to an additional 18,000 individuals who attended training provided by Extension specialists.
- A newly formed team of Extension specialists and agents began development of a new **[Water Resources web portal](#)** to share information and resources on topics ranging from agricultural irrigation and wells to community stormwater and wastewater to ponds, streambank repair, and everything in-between.

Extension in Transylvania County worked with Conserving Carolina, AmeriCorps, and a variety of other community partners to host the sixth annual **Riverfest**. Approximately 800 local residents attended the event, enjoying live music, food, and engagement with a huge diversity of community partners committed to environmental education. Attendees learned about stream invertebrates, rain gardens, local bird populations, water quality, historical and current industrial water use, and much more. **NC State Extension's streambank repair efforts and public engagement sustain the quality and diversity of North Carolina's natural resources by protecting drinking water, increasing property values, spreading awareness of the importance of healthy waterways, and protecting recreational spaces for all North Carolinians to enjoy.**

Odor and pollutant emissions from livestock barns can cause conflicts between livestock producers and neighbors and can thus affect the sustainability of NC livestock production. Funding from USDA-NRCS allowed us to develop the **engineered windbreak wall-vegetative filter strip system**, a low-cost, retrofittable system that reduced odor emissions from livestock barns by up to 80%. Funding obtained from the NC Dept. of Justice to **build, monitor, and demonstrate the system on a broiler house** as well as **monitor and demonstrate the existing system on the swine farm**. Based on the data that we collected, in 2022, a full-day event was organized to make policymakers, producers, and integrators aware of the potential of this system in reducing emissions. The event, which also covered other aspects (e.g., waste management and renewable energy), was attended by 34 participants.

New Hanover County Extension, in partnership with the New Hanover County Arboretum, provided education and tours of a broad range of water quality and sustainability models, including a **rain garden, infiltration zone, cistern, permeable pavement, and a constructed wetland/bog garden**. In 2022, 150 residents and professionals were educated using these models, which have eliminated runoff into Bradley Creek. As a result of these efforts, Extension received the [Lower Cape Fear Stewardship Development Award for Outstanding Stewardship](#).

NC State Extension agents offered a variety of **programs** addressing issues related to environmental protection. As a result of this programming, 13,696 participants demonstrated increased knowledge of climate mitigation practices, and 3,677 participants expressed a willingness to adopt conservation actions (such as rain gardens, wildlife management, conservation easements, land trusts, and generational planning). **NC State Extension's leadership in experiential education has helped program participants put learning into practice by implementing sustainable practices to conserve and protect the environment.**

To protect North Carolina's forests, [NC State Extension's Forestry](#) program worked with multi-state partners to develop an **online course in prescribed fire** (controlled burning for forest management), teaching more than 570 individuals from around the world how to safely apply this technique to ensure that the millions of acres they own or manage remain healthy, vibrant ecosystems. Extension's Forestry program also educated more than 95,901 landowners, land managers, and other community members across the Southern US about the importance of prescribed fire in forest management, and 37 landowners and professionals learned practical skills to better protect the forests around their homes from wildfires.

Extension Forestry collaborated with multiple partners, including ForestHer NC, to put on multiple **in-person and online women-focused forestry education events** across Virginia and NC, including a chainsaw safety course and a women-in-fire training exchange. Post-event survey results from the chainsaw workshop indicate that 100% of respondents increased their knowledge on a variety of topics related to chainsaw use and safety. A 2-week fire training

event for female fire practitioners resulted in more than 50 participants from around the world increasing their awareness, knowledge, and leadership skills in this key aspect of forest management.

To replace damaged trees in the wake of severe weather events and ensure that tree populations continue to absorb stormwater runoff, reduce heat impacts, filter nutrients, build soil, and provide numerous environmental benefits to local communities, Extension in New Hanover County continued hosting the annual **TreeFest** event. With the support of many partners and sponsors, including the NC Forest Service and the Alliance for Cape Fear Trees, TreeFest 2022 gave away 5,500 bare root tree seedlings of diverse species to a total of 884 households. Extension staff also provided **technical guidance** on tree selection and **best management practices** for tree planting and care.

Forestry programs in 2022 increased the knowledge of approximately 115 Extension agents and agency partners on forest health through 3 workshops in the Carolinas. Extension Forestry also continued to conduct forest health programming to increase knowledge of invasive species, with efforts including 14 educational events, development of 20 Extension factsheets and articles, 30 media pieces, 41 social media posts, and delivery of over 600 native trees to replace invasive Bradford pear trees. These outreach efforts helped over 235,000 people increase their awareness of the impact of invasive species on local forests. **As a result of NC State Extension Forestry programs, new research-based forest conservation and climate-smart forestry information were transferred to stakeholders, empowering them to make better decisions to conserve and protect the environment.**

Describe how the target audience benefited from the program activities.

In 2022, Extension supported and led efforts to counteract the environmental effects of extreme rainfall, reduce stormwater runoff pollution from growing communities, and support urban sustainability and water quality. Wake County Extension trained and certified 5,465 individuals, including over 20 HOAs, in [stormwater control measure inspection and maintenance](#). Of the over 350 stormwater professionals certified each year in Extension workshops, over 95% report that the design, function, maintenance, and water quality protection effectiveness of their stormwater practices have improved as a result of their participation. Statewide, Cooperative Extension trained and certified 4,379 people in stormwater control measure inspection and maintenance. In addition, 18,504 participants increased their knowledge of best management practices for preserving natural resources, including practices associated with stormwater systems, septic system maintenance, erosion control, rain gardens, and forestry. **NC State Extension's leadership in experiential education equipped stormwater professionals to effectively transfer knowledge and skills into practice.**

Efforts of NC State Extension enhanced the quality and diversity of North Carolina's natural resources by conserving and protecting the environment and mitigating climate change. To address the growing need for qualified stormwater management installers in residential communities, Cooperative Extension presented a [Rain Garden and Water Quality Certification Workshop](#) in partnership with the Town of Sunset Beach; 30 participants received 3 hours of classroom training, followed by hands-on installation of a rain garden at the town hall. After the workshop, 22 people tested for and received Rain Garden and Water Quality Certification through NC State. In addition, the Town of Sunset Beach has installed a land commercial-sized rain garden that will capture and treat stormwater runoff from the newly built town hall. **In addition to protecting local water quality, this rain garden will provide a demonstration site to educate residents on stormwater BMPs.**

Stormwater wet ponds are among the primary means of stormwater control in most residential and commercial developments. Warm weather and nutrient runoff can combine to cause explosive growth of aquatic weeds, blocking storm drains, exacerbating flooding, preventing recreational water use, killing fish, and causing many other environmental problems. To help ensure proper [aquatic weed control](#), Extension implemented a **comprehensive education and technical assistance program** to assist professional landscapers and residents in the Cape Fear region. This program included **site visits** to stormwater ponds to provide technical assistance, **online classes** for Extension Master Gardeners and Extension Agents on aquatic weed identification and management, and **aquatic weed pesticide training** through the NCDA&CS. In 2022, 10 pond site visits were conducted through this program, and 29 residents, HOA officials, and landscapers were provided with technical advice. A regional Aquatic Weed Management and ID meeting was held for 35 Extension Master Gardener Volunteers and Horticulture Agents, and a 3-hour continuing education credit class on aquatic weed management and identification was provided to 11 local participants, 8 of whom received continuing education credits for NCDA Pesticide Licensing. These programs fulfill a critical need for expert stormwater pond management. **NC State Extension's trusted research-based technical assistance provided solutions to stormwater runoff problems, and as the leader in experiential education, Extension is providing opportunities for students to put learning into practice.**

NC State Extension collaborated with environmental advocacy groups and local and state government to provide online and hands-on certification workshops in areas impacted by streambank loss to reduce sedimentation and prevent nitrogen and phosphorus from entering streams and drinking water supplies. In 2022, 5 [streambank repair workshops](#) were held across the state with local partners, coordinating the efforts of over 259 participants to repair over 1,000 linear feet of streambanks during workshops. Surveys of local partners indicate that an additional 6,025 feet were repaired outside workshops. Streambank repairs installed since 2019 will reduce soil loss by 1,187 tons per year and prevent 1,865 tons of nitrogen and 1,831 pounds of phosphorus from entering waterways annually. In addition, a survey of realtors and property appraisers estimated that stabilizing and repairing streams increased property values by an estimated \$3,300,000.

Recent extreme events have revealed the vulnerability of the transportation system to flooding. Fully functioning transportation infrastructure is crucial to emergency response, commerce, and community functions. These incidents are likely to increase with climate change. It is important to predict where washouts are likely to occur prior to an extreme rainfall event so that safety alerts can be issued. Extension and NC State researchers partnered with a team from NC Sea Grant to develop and evaluate a method for identifying road crossings that are likely to be submerged or washed out during extreme weather events. This method is currently being tested in 3 NC watersheds, and it is being used to identify and develop upgrade **plans for routes resilient** to extreme rainfall, which can provide transportation pathways during or immediately after extreme flooding events. These efforts are paving the way to help NC DOT prioritize route upgrades so that commercial and residential drivers can have safe routes of travel, even during extreme events such as hurricanes.

Under Extension's direction, the [Center for Applied Aquatic Ecology](#) (CAAE), in partnership with local government, maintains a network of **real-time remote monitoring systems** (RTRMs) in 3 major potable water supply reservoirs in partnership with local governments. The RTRMs provide high-frequency data 24/7 as an early warning system to help water treatment plants safeguard drinking water for about 750,000 NC residents. In 2022, these systems collected more than 1 million data points, including data on pH, temperature, algae populations, and

concentrations of bacteria that are potentially hazardous to humans. Data summaries posted to the CAEE's website provided near real-time information to help water treatment plant operators optimize their filtration techniques cost-effectively. These data are also used by NC's environmental agency to improve the assessment and protection of these reservoirs. **As a result of NC State Extension's water monitoring programs, data on water quality was transferred to water treatment plants and other stakeholders, empowering them to make better decisions to ensure safe drinking water.**

Describe how the broader public benefited from the program activities.

NC State Extension provides content coordination for the [National Pesticide Environmental Stewardship website](#), providing access to information on proper pesticide handling. The site receives an average of 15,000 hits/month and is supported by the Center for IPM at NCSU. The site houses the National Pesticide Safety Education Month website. In addition, NC State Extension manages and hosts the [Pesticide Safety Education Program Improvement and Modernization Initiative \(PSEP-IMI\) Resources Website](#), a national repository of over 930 Land Grant University pesticide safety education resources created by pesticide safety educators or partners in affiliated programs at Land Grant Universities. A major goal of the PSEP-IMI is to strengthen Pesticide Safety Education Programs by improving the quality, consistency, and accessibility of applicator training materials and classes, as well as passing rates and scores on certification tests. This website helps achieve this goal by expanding the availability of educational resources to educators affiliated with Pesticide Safety Education Programs at Land Grant Universities. The NC State Extension [Pesticide Safety Education](#) web portal contains 245 individual webpages, including a "toolkit" for county pesticide coordinators that includes electronic media, educational resources, and instructional materials. The portal had over 27,000 visitors in 2022. **Providing current pesticide safety information to pesticide safety educators is one way NC State Extension is protecting the environment for North Carolinians.**

In 2022, Extension offered more [Pesticide Schools](#) than in any other year. In partnership with the NCDA&CS, Extension Pesticide Schools served a total of 1,455 attendees, garnering overwhelmingly positive feedback. For a majority of attendees, the Pesticide School is their first exposure to NC Cooperative Extension, and the schools energize them to become more engaged in Extension programming. In addition to their use in Pesticide Schools, Extension Pesticide Safety Education Program training manuals are used for horticulture class curricula at 36 NC community colleges. To support compliance with pesticide regulations, Cooperative Extension in Alamance County offered 12 classes to farmers, landscapers, and other clients, allowing 348 pesticide applicators to receive license renewal credits. In Harnett County, 10 pesticide training events were offered to 80 private applicators, allowing them to save over \$276,000 annually by applying their own pesticides. Pesticide Coordinators in Person, Granville, Vance, Wake, and Warren counties teamed up to provide in-person and Zoom-based training, ensuring that 219 attendees earned pesticide recertification credits. In Johnston County, Extension conducted 25 in-person training opportunities, providing pesticide safety recertification training to 158 private applicators, new pesticide safety training to 604 applicators, and fumigation training to 27 applicators. It is estimated that Johnston County growers saved over \$450,000 by learning to apply their own pesticides, and this program was able to recertify 100% of the private applicators seeking recertification. Statewide, 18,020 people attended over 1,850 hours of pesticide training that was delivered by Extension, including 15,734 pesticide applicators who received 6,842 continuing education and re-certification credits.

Providing effective, safe pest control within residential, institutional, and commercial buildings in NC is critical. As construction materials and techniques improve, they can actually create greater challenges in urban pest control, particularly control of subterranean termites, which cause an estimated \$2 billion in damages annually in the US. To address the need for safe, effective termite control expertise in urban settings, Extension led the [NC Termite Technician Training Program](#) in partnership with NC State, NCDA&CS, and the NC Pest Management Association. This program provides both classroom and hands-on training in all aspects of proper inspection and treatment for termites and serves pest management professionals across the state. After completing the program, participants have a clear understanding of NC regulations, the construction elements that affect termite control measures, calculations associated with termite treatments, and how to conduct a termite inspection. **Transferring research-based pest management strategies is just one way Extension is keeping our communities healthy and safe, protecting the environment, and reducing risk.**

To protect NC's natural resources, reduce hazards, and educate growers and the public about the importance of managing industrial and household waste, Extension led **trash pick-up, pesticide disposal, and pesticide container recycling initiatives** in 2022. In Nash County, Extension partnered with the NCDA&CS to hold a cost-free pesticide disposal day for farmers, safely disposing of 9,854 pounds of pesticides and 781 pesticide containers and saving growers \$49,270 while helping them avoid disposal hazard liabilities. In Northampton County, Extension partnered with the county landfill to grind up 20,955 pounds of plastic from pesticide containers to be used in recycled products. McDowell County Extension continued its Keep McDowell Beautiful program in 2022, partnering with local government, community, and conservation organizations to coordinate 55 volunteers and 275 hours of service. These efforts removed 1,340 pounds of litter and debris from Lake James, improving water quality and discouraging future littering.

In Wake County, Extension upgraded the [Compost Lab at NC State](#), installing 10 new compost bins, renovating existing composting areas, and setting up the worm barn to demonstrate 8 methods of composting using worms (vermicomposting). They also established 4 test plots to demonstrate the impact of varying levels of vermicompost application. During the **International Vermicomposting Conference**, over 150 attendees were able to view various methods of composting and vermicomposting to reduce organic materials going into landfills. The Compost Lab is now set up to offer training and demonstrations to the public, including schools, community gardeners, and professional composters. Given that just one home compost unit can divert 650 pounds of organic waste from the landfill, providing opportunities to teach composting techniques will continue to be vital to the protection of our environment. **NC State Extension's pesticide recycling and litter clean-up programs sustain the quality and diversity of North Carolina's natural resources by ensuring pollutants do not cause soil, groundwater, and surface water contamination.**

Professional Development & Multistate Activities.

The following **professional development workshops** were provided by Extension specialists for Extension agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- Agent Support Through the Water Resource Program Team
- Climate Resilient Practices...That Make Financial Sense
- County Extension Support Efforts for County Forest Landowner's Organizations
- Current Irrigation Topics in NC

- Deer Browse: Christmas Tree Research Implications for Other Crops
- Delivering Climate (Change) Insights for Extension
- Effectiveness of Agricultural Conservation Practices
- Innovative Stormwater Management Models
- Silvopasture Establishment and Management in NC
- Soil Health Management & Testing: Know-How for Sustainable Farming
- Staying Current with All Things Forestry

The following **Factsheets and Peer Reviewed Extension Publications** were developed by Extension specialists for dissemination of research-based information to Extension agents, growers, and other stakeholders.

[The Educational Needs of North Carolina's Forest Landowners](#)

[Educational Needs: A Survey of the Urban Wood Drying Community](#)

[Identification of Common Trees of North Carolina](#)

[Elm Zigzag Sawfly](#)

[Twolined Chestnut Borer](#)

[Beech Bark Disease](#)

[Biological Control of Emerald Ash Borer in North Carolina](#)

[Diseases of Ash Trees in North Carolina](#)

[Diseases of Dogwood in North Carolina](#)

[Common Disease Pests of Maple in North Carolina](#)

[Common Disease Pests of Oak in North Carolina](#)

[Insect Pests of Dogwood in North Carolina](#)

[Common Insect Pests of Oak in North Carolina](#)

[Common Insect Pests of Maple in North Carolina](#)

[Common Insect Pests of Ash in North Carolina](#)

[Callery Pear: 'Bradford' and Other Varieties and Their Invasive Progeny](#)

[Tree-of-heaven \(Ailanthus\)](#)

[What is Climate Smart Forestry? A Brief Overview](#)

[Zoning and Land Use Regulation of Forestry](#)

[Practicing Forestry Under Local Regulations](#)

[Let's Work Together in Addressing Environmental and Societal Issues: Guide to Engaging Stakeholders and Communities](#)

[Biochar Production through Slow Pyrolysis of Animal Manure](#)

[How Does Nitrogen Move Through a Swine Farm with a Lagoon-Sprayfield System?](#)

[Nowcasting and Forecasting Coliform Bacteria Contamination in Coastal Systems](#)

[Road Map to the Worker Protection Standard for Agricultural Pesticides](#)

[Mapa de la Ley de Protección al Trabajador para Pesticidas Agrícolas](#)

[Composting at NC Residential and Summer Camps](#)

[Manage Compost and Soil Contaminated with Broadleaf Herbicides in Residential, School, and Community Gardens](#)

[Managing Backyards and Other Urban Habitats for Birds](#)

[Reptiles and Amphibians in Your Backyard](#)

[Dairy Manure as a Fertilizer Source](#)

[Best Management Practices for Agricultural Nutrients](#)

[Soil Acidity and Liming for Agricultural Soils](#)

[Careful Soil Sampling—The Key to Reliable Soil Test Information](#)

[Muestrear el suelo cuidadosamente: la clave para obtener información confiable sobre el análisis de suelo](#)

[The Status and Trends of Wetland Loss and Legal Protection in North Carolina](#)

[Water Quality and Sprayer and Spreader Calibration](#)

[Water Quality and Professional Lawn Care](#)

[Water Quality and Commercial Lawn Care](#)

[Water Quality and Professional Turfgrass Managers](#)

[Irrigation Water Quality Problems](#)

Extension specialists contributed to solving regional and national issues through **multi-state collaborative Extension efforts**. Some multi-state programs NC State Extension participated in include:

- SERA3 Collaborative Integrated Pest Management Workgroup
- SERA5 Sweetpotato Collaborators Conference
- SERA6 methodology, interpretation, and implementation of soil, plant, byproduct, and water analysis
- SERA17 phosphorus management
- NC1186 Water Management and Quality for Ornamental Crop Production and Health
- NE2203 Legal Issues in Agriculture and Natural Resources
- NCERA224 Extension and IPM for ornamental plants
- S1073 IPM and Biocontrol of pests on ornamental plants
- Tactical Science Coordination Network (TSN) to enhance food security and biosecurity in U.S. agricultural and food systems
- Forest Pest Management certification manual for 7 participating southeastern states
- Webinar with U GA on red imported fire ants
- With the University of MD on solar development and decommission
- Southern Extension Weed Science Working Group.
- Appalachian Beginning Forest Farmer Coalition webinars, hands-on workshops, website with videos and extension leaflets supporting the growing forest farming community involves researchers, extension personnel from PA, OH, VA, NC, WV, KY
- Mid-Atlantic Soil Testing and Plant Analysis Work Group develop, adapt, and update soil and plant testing methods for over a dozen states in the United States
- Fertilizer Recommendation Tool (FRST) initiative over 37 land-grant university faculty, the USDA-ARS, NRCS, and FSA
- Science and Technology for Phosphorus Sustainability NSF Center, a multi-state project that includes about 40 researchers
- Clemson Extension to develop a Stormwater & Stream Monitoring short course
- Pesticide Educational Resources Collaborative (PERC), EPA, UC-Davis Extension, Oregon State University, to coordinate the development of pesticide-related educational resources

Describe the issue or problem that the program addresses.

Despite food safety communication efforts by many sectors, foodborne illness remains a significant health issue in North Carolina and across the U.S. The Center for Disease Control (CDC) estimates that as many as 48 million cases of foodborne illness occur annually, leaving 128,000 people hospitalized and causing 3,000 deaths. The majority of foodborne illness is caused by 31 major identified pathogens, including norovirus, salmonella, and listeria. Regardless of cause, foodborne illness costs society an estimated \$152 billion annually. Most estimates suggest that 70% of foodborne illnesses are acquired outside of the home. There are a multitude of opportunities for foodborne illnesses to be introduced into the food system, including poor sanitation during production and processing, unsafe storage and handling of raw products, improper washing and cleaning of equipment, undercooking, lack of proper chilling, and cross-contamination. Foodborne illness is nearly 100% preventable if safe food handling practices are applied from the time food is received until it is served, and if an outbreak occurs, the National Restaurant Association estimates it could cost an establishment \$75,000 in addition to posing a threat to public health. The best way to prevent food contamination and ensure food safety is through education and training. NC State Extension provides educational opportunities and resources for manufacturing of food products and the retail food industry.

Home food preservation continues to be an area of interest for North Carolinians wanting to take advantage of the abundance of available foods from home gardens or local markets. The local food movement and current economic situation have led to a resurgence in home food preservation as a viable alternative to contemporary food purchasing. When preserving, it is essential to employ evidence-based, research-tested strategies and methods to ensure the safety of products. Failure to adequately preserve foods can result in foodborne illness. Many families don't have the knowledge to safely preserve their food at home. The best way to prevent food contamination and ensure food safety is through education and training. NC State Extension provides a variety of opportunities to fill this educational need.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

NC State Extension specialists developed resources aimed at raising awareness of and preventing food safety hazards. Research informed food-safety information was delivered to members of the food industry and consumer alike by Extension specialists and agents through Extension publications, factsheets, website portals, videos, workshops, certification trainings, demonstrations, and consultations.

- Extension specialists maintained 12 **food safety websites** viewed over 75,000 times, made 1,200 **social media posts** viewed over 1.3 million times, and created 58 food safety related **social media images**.
- Extension specialists sent out over 40 **newsletters** reaching over 800,000 readers. In addition, over 100 food safety **videos** were created and viewed 1.2 million times.
- 1,400 individuals attended **food safety training** provided by Extension agents, and an additional 4,300 individuals attended training provided by Extension specialists.
- Food safety **technical assistance** was provided to 2,600 people by Extension agents and specialists provided services to an additional 1,550 clients.

Food-insecure families took charge of their food safety practices within the home after participating in the [Expanded Food and Nutrition Education Program \(EFNEP\)](#). Educators used Zoom, Facebook Live, Google sites, and phone communications to engage with 1,629 families and 13,029 youth, 74% of whom were enrolled in one or more food assistance programs. Eighty-six percent of EFNEP graduates improved their food safety skills.

The **NC Safe Plates** program team developed practical food safety training and educational materials for retail and consumers to impact attitudes, norms, and behaviors around food safety. In 2022, the [NC Safe Plates Food Safety Information Center](#) created 744 posts and 84 videos across Instagram, Facebook, TikTok, and Twitter, covering topics ranging from baked potato food safety to homemade infant formula to traveler's diarrhea. These social media posts attracted 1,217,334 views. These novel communication methods reached consumers far beyond what we would be able to accommodate in in-person classes and training. The NC Safe Plates team worked with the Wake County Public School System (WCPSS) on the **Kitchen Assessment Project**. WCPSS has 38 FCS programs in high schools across the county. Each school has at least 1 food lab, which includes 4-5 mini kitchens that students use to practice their skills. Between Fall 2021 and Spring 2022 the 38 FCS high school kitchens were assessed for safety including environmental safety, food safety, food preparation and equipment safety. Teachers were provided with a rubric for feedback and given a certificate with a letter grade to display in their kitchen. All kitchens received a letter grade 'A' to 'C' ranging from 99% to 77%. 26 food labs received a score of an 'A', 5 food labs received a score of 'B' and 3 food labs received a score of a 'C'. Extension in Columbus and Bladen Counties offered training in **Safe Plates**, Extension's evidence-based food safety program and resource for retail food professionals. A total of 50 individuals participated across both counties, and 31 received certification. Given that the average cost of a foodborne illness outbreak is \$75,000, if each participating establishment prevents just one outbreak, that is a total of \$2,475,000 saved. The [Safe Plates for Food Managers](#) course was launched online in 2021, allowing participants to attend 12 hours of instruction to pass a certified food protection manager exam. Through online training and collaboration with local Extension Agents, 329 participants received 3,948 contact hours to achieve this certification. Through a partnership with the NC Department of Public Instruction, Extension continued to support school foodservice handlers, managers, and child nutrition directors across NC. As a result of needs assessments conducted in previous years, two bonus modules for **Safe Plates for School Nutrition** staff were created to expand the course's depth on allergens and produce, 2 additional programs were launched to address emergency readiness and response, including maintaining food safety while children are sheltering at school due to natural disasters and responding to food recalls and foodborne illness outbreaks. Alexander County Extension offered **food safety training** to the local school system, providing two-day training on Safe Plates as well as the training required to become a Certified Food Protection Manager, a role critical to keeping school systems in compliance with the NC Food Code. The training was provided to 17 nutrition staff from the Alexander County School System, including 10 modules on receiving, storing, cooking, and cooling food as well as standards for health, cleaning, and pest and allergen management. Thanks to the hands-on training and real-world case studies provided with each module, all 17 participants passed the exam with an 80% or higher, becoming Certified Food Protection Managers. In addition, all of the participants stated that the Safe Plates training helped them develop a deeper understanding of the "why" behind food safety procedures. Many individuals reported that the interactions with the instructors and the case studies helped them pass the exam. In Rockingham County, Extension partnered with the Safe Plates team to provide a series of **virtual food safety classes**, serving a total of 43 participants, the majority of whom were international participants from Canada. The program was presented weekly at lunch time, and

the recordings were sent to those who were unable to attend the live session. These classes offered a unique opportunity to discuss differences in food safety systems between the US and Canada and ensured that the impact of Extension's food safety training materials spread across US borders. **As a leader in experiential education, NC State's Safe Plates program equipped food production managers and handlers to effectively transfer best management practices into practical application to build more resilient school food services.**

As a result of attending Extension programs over **22,500 participants** increased their knowledge of safe home food handling, preservation, or preparation practices and **2,750 food handlers** increased their knowledge and skills in safe food handling practices.

Describe how the target audience benefited from the program activities.

The [Entrepreneur Initiative for Food \(EI4F\)](#) program ensures individuals and firms transform agriculture commodities into safe, nutritious, value-added food and beverage products by classifying foods according to FDA standards and providing research-based processing recommendations. This program provided stakeholders with daily support via phone and virtual meetings, and provided consultations, education, and resources necessary for the success of their businesses. In 2022, EI4F provided 899 processing recommendation letters and 334 nutritional labels. **NC State Extension's extensive partnerships with agriculture, business, and industry resulted in the development of safe new food products.**

Both the implementation of the FDA's New Era of Smarter Food Safety blueprint and COVID-19 challenges have introduced **regulatory changes**, and regulatory staff need help educating food industry professionals in these changes. Extension partnered with STOP Foodborne Illness and Cultivate Food Safety to create a 4-hour virtual course to educate regulatory professionals on food safety culture. This course helped 1,001 FDA staff increase their knowledge of how to promote an effective, compliant food safety culture. **NC State Extension enhanced food safety through programming aimed at preventing food safety hazards during the food manufacturing process and fostering a culture of compliance and accountability.**

To promote food safety and sustainable economic development for NC, Extension partnered with NC State researchers to provide **critical technical assistance and education** across 3 major areas: scientific research, facilities and resources, and support for food industry businesses. In 2022, Extension developed and delivered an **alternative protein processing workshop** for 27 people and **food labeling and value-added food production workshops** for 187 people. Workshop participants reported being 2.5 times more confident about processing alternative proteins, 3 times more knowledgeable in conducting food safety programs, and 2 times more confident in following food labeling regulations. Through **direct consultation** with food companies, Extension also assisted with the development of a mobile processing facility, the expansion of a hot sauce producer in South Carolina, and the refinement of product concepts and a food production prototype for Cosmic Eats, Inc., a company that is working to deliver high-nutrition food products in a manner that is resilient against supply chain disruptions and other food security risks.

Hazard analysis and critical control point (HACCP) and food safety go hand in hand. The HACCP system uses a systematic, science-based approach to identifying specific hazards and control critical points in food handling to prevent food safety problems and reduce the reliance on end-product inspection and testing. This course allows local environmental health professionals to gain confidence in recognizing and approving specialized processes in a retail food environment while learning to build plans that are in compliance with regulations and

sustainable for their businesses. The Retail HACCP course for regulators and restaurant operators was transitioned online in late 2020. In 2022, 116 regulators and operators from across the US received 1,392 contact hours of instruction in retail HACCP.

Seafood HACCP plans are FDA-mandated for seafood processors and if a seafood processor does not have an HACCP-certified individual on staff, they cannot legally operate. In 2022, Extension provided 7 seafood industry personnel with training and certification in Seafood HACCP and assisted in writing or reviewing 20 HACCP plans for 8 companies. Additionally, 34 individuals were provided with information on obtaining HACCP training or implementing HACCP plans. **The HACCP training and assistance with plan writing, science-based technical advising, and quality analysis product tests were just part of how NC State Extension increased processors' knowledge of BMPs that reduce the likelihood of foodborne illness.**

Along with the need for HACCP-trained individuals, the seafood industry requires the development and innovation of new products and processes, testing services, and technical advice. The **Seafood Lab** has been an essential resource for seafood processors, providing **shelf life and quality testing** for 2 products and **cooking process validation** for 1 product. The Seafood Lab team also referred 7 people to the Entrepreneur Initiative for Food program for additional services, visited 6 seafood processing plants to assist with **preparation for FDA inspections**, provided **authority letters** to 8 companies, and provided **technical assistance and advice** regarding seafood science and technology to 100 individuals and companies through phone calls, meetings, and emails. As a result of this support for product testing and process validations, multiple NC food companies can now prepare products according to required safety specifications, and they have precise information about their products' quality and shelf life to make good decisions affecting consumer safety.

In 2022, Cooperative Extension continued efforts to strengthen aquaculture production by **delivering improved technology and best practices**. As part of Extension's Smart Aquaculture program, an **app that predicts weather-related runoff** impacting the safety of oyster crops was upgraded to provide 3–5 days of notice to producers so they have time to harvest or take other actions to reduce losses and enhance the value of their crops. A mid-sized oyster farmer who harvests approximately 20,000 oysters at an optimal time to secure optimal pricing could gain approximately \$6,000 in income by using this app, all while avoiding potentially severe health impacts to consumers. Extension researchers are also in the process of developing best practices for cultivating finfish larvae in the recirculating aquaculture systems that are used in industry to keep fish tanks clean. The best practices have nearly been completely developed under lab conditions, and upscaling for commercial development is ongoing. These best practices have the potential to improve larval survival by 30% or more. **Extension's food safety and processing programs provide education, one-on-one consultations, safety plans, and product development recommendations that enhance the safety, innovation, and profitability of NC food businesses.**

Describe how the broader public benefited from the program activities.

The recent economic downturn and growing interest in local and organic foods has brought renewed interest to home food preservation. However, food preservation is a science-based practice, and testing the safety of recipes can only be conducted in a lab with special equipment and trained food scientists. Surveys conducted by the National Center for Home Food Preservation revealed a high percentage of home food processors use practices that put them at high risk for food-borne illness and/or economic loss due to spoilage. Factors such as a

younger demographic and outdated and unreliable home canning practices lead to unsafe situations. Low and high acid foods are at risk for spoilage if not canned properly and Botulism is a risk for low acid foods that carries a 10-35% mortality rate for those infected.

Extension helped individuals and families increase their knowledge of food safety through a variety of educational programs, including hands-on workshops. [Home food preservation classes](#) were offered to home cooks through the Haywood County extension center. 69 participants were trained in safe home food preservation. Participants and their families benefit from the reduced risk of foodborne illness and food spoilage. Overall, an economic savings comes from money NOT spent on medical bills and spoiled food.

To help residents reduce their food waste and grocery bills while preserving their health, Extension in Beaufort County offered hands-on home food preservation training workshops in May and June of 2022, and libraries, community centers, and local community partners helped market the classes. Through these workshops, 97 participants learned how to prepare pickles, jams, and jellies, and they gained knowledge of pressure canning for low-acid foods, boiling water canning for high-acid foods, dehydration, and freezing methods of preservation. As a result of these workshops, 100% of participants increased their knowledge of best storage practices for canning, freezing, and dehydrating foods, 95% increased their knowledge of approved equipment for home food preservation, and 85% increased their knowledge of preparation and processing for pickles, jams, and jellies. Many participants expressed appreciation for the hands-on instruction method and practical demonstrations, and 100% indicated that the information provided was informative and easy to understand.

In Hyde County, Extension offered hands-on, in-person produce preservation classes throughout the year, teaching best practices through canning, pickling, freezing, and dehydration and reaching 71 direct contacts, 27 of whom were youth participants. In addition to the in-person classes, Hyde County Extension offered a kindergarten field trip to a local strawberry farm to ensure a memorable experience for the youngest participants. Pre- and post-evaluations provided by 63 participants reveal that 95% increased their knowledge of food preservation, where to find tested recipes, and pathogens of concern; 100% increased their knowledge of safe thawing methods and how to properly store and package home canned foods; and 87% increased their knowledge of approved equipment for home food preservation. Many participants reported feeling much more confident trying the methods at home thanks to the hands-on instruction.

To provide specialized support to immigrant families, Richmond County Extension partnered with Cornerstone Church to provide bilingual instruction in food preservation, offering handouts in both English and Spanish outlining recipes, easy-to-follow food safety notes, a condensed history of food preservation, and the differences between all the varieties of sweet spreads. The class was conducted in English and Spanish, and all participants gained hands-on experience from start to finish. Thanks to this class, 2 participants have begun collaborating to preserve strawberry jam for family and friends, and they are preparing to take more food preservation classes through Extension so that they can continue sharing what they've learned with other Spanish-speaking families in their community. One hundred percent of the participants indicated that they gained knowledge of safety practices for home food preservation, and many shared that they grew up watching their mothers and grandmothers use practices that would not be considered safe today.

According to the [US EPA](#), one-third of all food in the United States goes uneaten with 20.3 tons finding its way to landfills or combustion facilities. "Preventing food from going to waste is one of the easiest and most powerful actions you can take to save money and lower your

climate change footprint by reducing greenhouse gas (GHG) emissions and conserving natural resources.” In addition, by increasing consumer knowledge of safe food preparation and preservation practices NC State Extension is improving consumer health and reducing food-related illness. **NC State Extension is a reliable educational resource to teach food safety to consumers. Most people don't realize how much food they throw away every day — from uneaten leftovers to spoiled produce to parts of fruits and vegetables that could be eaten or repurposed.**

Professional Development & Multistate Activities.

The following **professional development workshops** were provided by Extension Specialists for Extension Agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- Boiling Water Can-Along
- Food Labeling Facts and Myths 2.0
- Food Safety? Food Quality? What's the Difference?
- Immersive Food Safety Training for Farmers Markets & Small Farms
- Overview of Home Processing Risks & Requirements
- Produce Safety Alliance Training
- Safe Plates for Farmers' Markets
- Safe Plates Home Food Preservation
- Safe Plates Retail Programs Training

The following **Factsheets and Peer Reviewed Extension Publications** were developed by Extension Specialists for dissemination of research-based information to Extension agents, growers, and other stakeholders.

[Basic Food Microbiology](#)

[Choosing and Using a Copacker](#)

[Considerations for Developing a HACCP Plan for Acidified Foods](#)

[Developing a Recall Plan](#)

[Extended Shelf-Life Refrigerated Foods](#)

[FDA Food Processing Facility Registration](#)

[Listeria](#)

[Refrigerated Foods: Some Rules for Processing](#)

[Scheduled Processes](#)

[The Questions on Salvaging Flooded Crops](#)

[Vinegar Making](#)

[Who Will Regulate My Food Business?](#)

Extension specialists contributed to solving regional and national issues through **multi-state collaborative Extension efforts**. Some multi-state programs NC State Extension participated in include:

- Food Safety Extension Network. The goal is to establish a consortium of institutions from the southern region to synergistically advance the science of consumer and retail/food service food safety and share expertise, training, and developed materials across the Land-grant system.
- Co-leading a multi-state Food Safety Extension Network effort with faculty at UGA to better share food safety resources and programming related to home food preservation, cottage foods and home-based businesses, and retail food safety.

- Immersive food safety training for farmers grant collaboration with Virginia Tech and RTI International.
- Food CoVNET collaboration with faculty at UF, UNL, and Rutgers.

Describe the issue or problem that the program addresses.

Obesity poses one of the most serious public health challenges of the 21st century. In 2020 North Carolina ranked 20th in the nation for obesity, with 33.6% of the population obese, and 11th and 12th highest for diabetes and hypertension, respectively. Through a healthy diet and physical activity, these chronic conditions are preventable. However, in North Carolina, nearly one-quarter (23%) of adults reported not participating in any physical activities or exercises, 42.3% consume fruit less than once a day, and 22.4% consume vegetables less than once a day. Children are following closely in their footsteps, with only 1 in 4 eating the recommended amounts of fruits and vegetables. In addition, over 1.2 million people in North Carolina are facing hunger, among them nearly 400,000 are children. Food insecurity significantly increases the risk of developing chronic diseases such as obesity, heart disease, Type 2 diabetes, and high blood pressure. It also leads to poorer mental health, delayed development in children and can negatively impact children's academic performance.

To help North Carolina reduce chronic disease risk and food insecurity, NC State Extension has promoted policies, systems, environments, and direct education that sustain healthy behaviors through the consumption of healthy diets, active lifestyles, access to nutritious food, and the achievement and maintenance of healthy body weights.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

To promote health and wellness, prevent chronic disease, and increase access to healthy foods, NC State Extension utilized multiple methods and empowered individuals and families to implement behavioral changes focused on healthy eating patterns and physical activity to improve overall health and to use learned strategies, skills, and resources to reduce the risk of chronic disease and illness.

- Over 8,000 **adults** attended **nutrition-related workshops**, and 4,500 adults attended **health and wellness workshops** provided by Extension Family and Consumer Science (FCS) agents. 4,700 adults attended **workshops related to cooking**, and 2,300 attended **food preservation workshops** provided by Extension FCS agents.
- 18,600 **youth** participated in **nutrition, cooking, and health** school enrichment programs, camps, clubs, and outreach activities.
- 1,800 hours of service were donated by **Extension Master Food Volunteers**, valued at \$54,000; and 8,700 hours of service were donated by EFNEP volunteers, valued at over \$260,000.

North Carolina's [Steps to Health](#) program is a comprehensive approach that impacts the health and nutrition of limited-resource residents by not only providing Extension-delivered direct education to food-insecure families and youth but also promoting systematic community changes to support healthy living. In 2022, Steps to Health reached 3,166 participants (2,795 youth and 371 adults) through 170 **direct education programs**. Steps to Health promoted **policy, system, and environmental (PSE)** change initiatives across 16 schools and 31 community sites, supporting change strategies that impacted 13,000 NC residents by increasing healthy food options, increasing physical activity opportunities, and encouraging healthy choices. In addition, **messaging** to support healthy eating and physical activity made

517,070 impressions on **social media** and 3,804,985 impressions through social marketing implementation of **digital advertisements** and a **text message campaign**. **Educational video shorts** featuring animated host avatars and based on Steps to Health's chronic disease prevention program **Take Control** were viewed 1,872 times. Across all adult programs, 57% of participants reported improving healthy eating behaviors, 56% reported eating more fruit, 51% reported eating more whole grains, and 46% reported improving their physical activity.

Steps to Health's [Color Me Healthy](#) program is a 9-session sensory-rich direct education program designed to improve fruit and vegetable intake and increase physical activity among 4 and 5 year old children in child care and preschool settings. It uses color, music, dance, and imaginary play to provide **opportunities for physical activity** and to **teach children about fruits and vegetables**. In Macon County, the Color Me Healthy program was delivered to children, using color, music, taste tastes, and other memorable sensory experiences to encourage them to build healthy habits. At least 387 educational contacts were made, and parents observed improvement in children's willingness to try fruits and vegetables and increase physical activity. In Lee County, Color Me Healthy was taught at 4 sites, reaching sixty-seven 4 and 5-year-olds. Lee County followed this program up with a [Farm to ECE](#) program, including the **installation of vegetable garden beds**, to continue the children's engagement in learning about and eating healthy foods.

[EFNEP, the Expanded Food and Nutrition Education Program](#), offers free nutrition classes to help families and youth cook healthy meals at home, be more active, save money on food costs, and handle food safely. In 2022, EFNEP programs across 40 counties served 1,629 families and 13,029 youth, 74% of whom were enrolled in one or more food assistance programs.

In Randolph County, Cooperative Extension was asked by a local TV channel (CW) to provide a **cooking demonstration for a morning show** called "Local Vibe." This segment included nutrition and cooking education shared by the local Family Consumer Sciences Agent, and it reached an estimated TV audience of 716,510, with segment videos on YouTube being viewed by 40–400 individuals and shows posted on social media reaching an average of 400 individuals. Viewers shared that they have made several of the recipes, and the videos have supported a 60.7% increase in engagement on Extension's Facebook platform in only a few months. **Through NC State Extension cooking programs, clientele used learned strategies, skills, and resources to reduce the risk of chronic disease and illness, and through local media outreach, residents have gained awareness of the resources and assistance that Extension can provide.**

As a result of NC State Extension programs, **60,000 adults and 75,000 youth** increased their fruit and vegetable consumption, **6,000 adults and 20,000 youth** increased their physical activity, **4,000 adults** consumed less sugar, and **4,000 adults** consumed less sodium in their diet.

Describe how the target audience benefited from the program activities.

To combat obesity rates and food insecurity in vulnerable local populations, NC State Extension in Pitt County created and implemented the "**Dinner in a SNAP**" curriculum, a 6-week program designed to provide nutrition, food safety, budgeting, and physical fitness education to limited resource families. Nine participants received cooking equipment, educational incentives, thermometers, and ingredients to make the recipes. Thanks to the program, the women with young children who participated all learned to read and understand food labels and make healthier choices for their families. They also learned new, healthier alternatives when cooking

recipes, and they have started to plan their meals using MyPlate as a guide. The “Dinner in a SNAP” program is being expanded into 3 additional counties.

Data from school height and weight checks showed that over 85% of students in one Richmond County elementary school were overweight or obese. This was especially concerning in a county where over 64% of youth live in poor or low-income homes. The **Steps to Health Program** was delivered to all 3rd grade students at this elementary school, and healthy snacks were provided along with all the curriculum, books, and materials needed to complete the classes. Each lesson contained a physical component, so the students were very active during the lessons. Recipes and nutrition guidance sheets were sent home to parents in both English and Spanish to reinforce what the students were learning in class at home. 85% of participating youth improved their fruit and vegetable consumption, 100% of youth increased their water intake, 100% of youth are more active as a result of the program, and 90% of youth are willing to try new foods. Across all Steps to Health youth programs statewide, 37% of participants improved their fruit consumption, 42% of 2nd and 3rd graders used nutrition facts labels to make food choices, and 30% of 2nd and 3rd graders drank less soda. **Through Steps to Health, a comprehensive approach to impact the health and nutrition of limited-resource NC residents, Extension delivered education to food-insecure families and youth while promoting systematic community changes to support healthy living.**

EFNEP partnered with the Clark Street Boys & Girls club in Vance County for students to learn healthy eating habits. At this location, 49 students participated in the 2-week, 6-session **Show Me Nutrition** program. Over the course of 9 hours of programming, participants learned healthy recipes for an appetizer, entrée, and dessert, utilizing each of the food groups from MyPlate. After completing the lessons, 64% of the youth increased the number of days they were physically active for at least an hour, 57% made healthier food choices while eating out, 40% improved reading of nutrition facts labels, and 35% tasted new foods more often.

Improving diet, increasing exercise, and promoting healthy lifestyles are top health concerns for Franklin County. Physical activity is important because it reduces stress and prevents disease and obesity. This academic school year, 381 youth participating in **EFNEP** classes set weekly goals and challenged themselves to **live healthier lifestyles**. Weekly goals they achieved included cleaning their rooms, completing 60 minutes of daily physical activity, completing household chores, and increasing fruit and vegetables consumption. In addition, EFNEP encouraged youth to complete the following activities as a family: cleaning household indoors and outdoors, walking the dog, riding a bike, walking to the mailbox, taking brain breaks in between TV commercials, raking the lawn, mopping the floors, vacuuming, and folding clothes. As a result of EFNEP programming, 381 youth were motivated to reach their weekly health goals, 352 youth increased their fruit and vegetable consumption, and 381 youth improved their physical activity. Youth also reported that maintaining a clean space helped them improve their attitude toward learning each day. Statewide ninety-seven percent of EFNEP participants improved dietary intake, 53% practice daily physical activity, 96% practice better food resource management, and 86% have improved their food safety habits. **NC State Extension's Expanded Food and Nutrition Education Program (EFNEP) empowered food-insecure families to take charge of their health and economic well-being by teaching families and school-aged youth how to provide nutritious, safe meals on limited budgets.**

In Chowan County, 30 percent of adults are obese, compared to the national benchmark of 25 percent. Contributing to this epidemic are poor nutrition and physical inactivity. Sixty-six percent of residents in Eastern NC consume fast food each week. More consume sugar-sweetened beverages daily (60%) than the recommended fruits and vegetables (18%). NC Cooperative Extension was asked to partner with Albemarle Regional Health Services (ARHS) on the

Albemarle Get Fit program and offer healthy cooking lessons using the [Med Instead of Meds](#) Extension curriculum. As a result, participants were educated on nutritious foods and how to prepare healthy recipes in the Med way in virtual "Cook Along" classes. Participants received a food kit that included all needed ingredients, and they logged on and cooked along with instructors. Participants were also encouraged to set health goals (weight loss, increase physical activity, healthier eating). As a result of these classes, participants learned hands-on healthy cooking techniques at home. Participants indicated healthy eating practices and lifestyle changes were made to reduce the risks of chronic disease. With these lifestyle changes and improved health, it is estimated that each participant could save an average of \$100 per physician visit. **Through NC State Extension nutrition programs, clientele used learned strategies, skills, and resources to reduce the risk of chronic disease and illness.**

Communities that create spaces for physical activity have healthier people with decreased risks of obesity, heart disease, and other chronic conditions that increase morbidity and mortality. Rockingham County's adult obesity rate (36%) is higher than the State rate of 31%. **A fitness class**, called PoundFit was presented over the course of 3 weeks to staff at Rockingham County Community College. The staff there typically have sedentary jobs that require very little physical activity, and their wellness director asked Extension to present some wellness programming for their staff. At the conclusion of the class, a client expressed that she used to be very avoidant of physical activity because she was intimidated and found it unappealing and that she now truly enjoys exercise and has committed to purchasing equipment to continue to participate in this activity as well as seeking out new ways to be physically active.

To help residents combat the dangers of a sedentary lifestyle, Extension Agents in Edgecombe and Nash Counties worked together to hold a **4-week walking challenge** for 118 participants. Each week had a special theme, and participants received a newsletter with tips on healthy eating, increasing physical activity, and fun facts about Edgecombe and Nash Counties. Participants logged a total of 10,416,855 steps, or 4,340 miles with an average participant step count of 226,454. Many of the walkers expressed that walking was a great way to start being more physically active. One participant shared that she lost 15 pounds during the walking challenge, and she continues to walk daily. Many of the participants formed walking groups and continue to help others increase their physical activity. **Through NC State physical fitness programs, residents have gained the skills they need to live more active, fulfilling lives and the confidence to share what they've learned with others in their communities.**

Describe how the broader public benefited from the program activities.

Despite widely accepted documentation that consumption of fruits and vegetables can improve health outcomes, many Americans are not eating the quantity of these foods that would bring on advantageous changes. In particular, those who have low food security are less likely to eat fruits and vegetables regularly. In North Carolina, food insecurity affects 1 in 7 people. People living with food insecurity also experience higher rates of diet-related chronic illness. To address the double burden of hunger and poor health, Extension as well as healthcare providers are looking for ways to connect their clients and patients with accessible and healthy food. In response, [PhytoRx](#), a **produce prescription program** that aims to connect providers, patients/clients, local food pantries/retailers and FCS agents, was created by Extension at the Plants for Human Health Institute. PhytoRx fills a knowledge deficit by training providers in how phytochemicals in specific fruits and vegetables affect patient health relative to particular diagnoses which allows the development of more comprehensive treatment plans. This collaborative program connects their patients with the education and research offered by NC Cooperative Extension.

The aim of the PhytoRx pilot program was to “prescribe” fruits and vegetables to a food insecure population, in a way that encouraged higher consumption, demonstrated ease of incorporation and motivated continued purchases for health benefit, not just sustenance or taste satisfaction. In addition to directing patients to fresh produce, the program included nutrition and health coaching, instruction on food preservation and preparation, and incorporation of locally grown crops. All the participants enrolled in this program reported trying new fruits and vegetables as well as increasing their daily and weekly consumption of produce. They also reported shifts in their view of produce and the potential benefits to their overall health. In addition, the barrier of transportation was removed by a partnership with United Way of Iredell County and the Drive United program. This enabled the clients to receive their weekly produce prescriptions via DoorDash delivery. This was a great way to increase food equity among participants and those who typically would never have the opportunity to have food delivered to their homes.

The framework and design of this program is in place and can be replicated throughout NC and beyond. This program is exclusive in its application to underserved communities. All healthcare providers can benefit from including PhytoRx into their practice. **In addition to increasing community knowledge of affordable produce options, this program provides evidence-based education to healthcare providers about how specific phytochemicals can improve a variety of chronic illnesses. This offers another tool in the medicine bag—one that doesn’t come in a bottle but can be found in the kitchen.**

Food insecurity is a problem facing families across the United States in both urban and rural communities alike. Seventy-two billion pounds of good food goes to waste each year in America, while at the same time, 34 million people face hunger. In Chowan County, 1 in 5 households are food insecure, and many families must pick between food and other household necessities such as gas, transportation, and medicine. The commercial horticulture Agent, in partnership with Chowan Farms, helped harvest the potato breeding trial in Chowan County. After harvest, the potatoes were taken to the [Vernon James Center](#) to be graded and recorded for research. Seeing the field still full of potatoes, the agent-organized a potato gleaning project to benefit the local community. The agent with the grower's permission organized Extension employees and master gardener volunteers to glean the remaining 12 rows of potatoes. It was a team effort to dig the potatoes and get them bagged up so that the food pantry could properly weigh and store them. The Agent and her team were able to donate over 600 pounds of potatoes to the Edenton-Chowan Food Pantry in Chowan County and the Open Door Food Pantry in Perquimans County. The food pantry often gets non-perishable food items but rarely gets fresh food. Averaging at 600 pounds of potatoes at the local grocery store price of \$1.18/lb, this project was valued as a \$706.80 donation to the food pantries.

Following the initial harvest and crop assessment of blueberries at the NCSU Horticultural Crops Research Station in Castle Hayne, the remaining blueberries can go to waste in the field yet many people face food insecurity and lack access to fresh, healthy produce. Extension staff from Brunswick, Pender, New Hanover, and Bladen Counties and 104 volunteers gathered at the research station to pick blueberries by hand. The volunteers were educated on the variety of blueberries and types of research conducted at the research station and learned about the importance of access to fresh produce for lifelong health and the role that the Food Bank plays in helping to deliver food to those that are in need. In total over the two gleaning days, 770 pounds of blueberries were harvested. These blueberries were given to the Food Bank of Southeast and Central NC in Wilmington where they were distributed to partner organizations that help our food insecure neighbors.

Rutherford County Cooperative Extension’s Farm-to-Pantry Project helped food insecure families in transitional living situations. These families received fresh produce and meats, but

they had no kitchens to prepare their food. To address this problem, Extension secured funds to purchase over 25 kitchen kits. These “kitchens in a box” included a slow cooker, electric skillet, cooking and food prep utensils, short-term cold storage solutions, dishwashing supplies, staple ingredients, and recipes. Extension Master Food Volunteers donated food, assembled kits, tested recipes, and conducted cooking demonstrations, ensuring that 22 families (47 adults and 35 children) learned to prepare healthy, low-cost meals at home. Preliminary survey results show daily or weekly use of the kits. **NC State Extension used innovative kitchen kits to deliver nutrition education and tools to families and community members and bring about behavioral changes focused on healthy eating patterns to improve overall health.**

Extension in Nash County combatted food insecurity for seniors by partnering with the Upper Coastal Plain Council of Governments to deliver 250 grocery boxes to Nash, Edgecombe, Wilson, Halifax, and Northampton Counties. The boxes included vegetables, grains, and protein products from local farmers and farmers market vendors. To date, over 14,228 produce boxes have been distributed to senior citizens in need through this program.

14.6% of children in Currituck County reside in food insecure households. To combat this problem, Currituck County Extension partnered with the Food Bank of the Albemarle, the local school system, and other local organizations to administer a weekend backpack feeding program during the school year. Extension staff and volunteers raised money through private donations, corporate sponsorships, and grants and handled the logistics of ordering food, maintaining inventory, and coordinating weekly deliveries. As a result of this vast collaboration, 21,210 meals were distributed to 110 of the highest need elementary students in Currituck County throughout 2022. **Extension has helped meet the nutritional needs of food insecure members of the community through facilitation of food donations while building robust local partnerships to address the growing problem of food insecurity. This is just one way Extension is addressing food insecurity in vulnerable populations and creating models for other communities working to overcome barriers to a healthy lifestyle.**

Professional Development & Multistate Efforts

The following professional development workshops were provided by Extension Specialists for Extension Agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- Development of Sweet Potato Nutrition Bar
- EFNEP-Snap-ED Training
- Harvest Health: A Produce Prescription Program
- Let's Get Physically Active with Programming
- Not Just FCS: Making Impacts with Steps to Health
- PhytoRx and Fruit and Veggie Prescription Programs
- Steps to Health Agent Training
- Steps to Health Community-Based Programming
- Steps to Health School-Based Programs

Extension specialists contributed to solving regional and national issues through **multi-state collaborative Extension efforts**. Some multi-state programs NC State Extension participated in include:

- Policy, Systems, and Environmental Change collaborative group with other Extension Health Specialists to discuss how to better implement PSE changes through extension across the U.S.

- Southern Region Health Specialists network.
- Faithful Families program has been implemented in 21 states across the U.S. In 2022, 7 new national facilitators were trained to use the program.
- Extension Health Leadership Committee.
- Appalachian Health Conference

Describe the issue or problem that the program addresses.

North Carolina has 2.3 million youth under the age of 18 (22% of the state's population). One quarter of those youth live in families that receive public assistance, and twenty percent live in poverty. According to a National 4-H Council commissioned survey to explore teens' perceptions and experiences around mental health, 81% of teens say mental health is a significant issue for young people in the U.S., and 64% of teens believe that the experience of COVID-19 will have a lasting impact on their generation's mental health. Today, 7 in 10 teens have experienced struggles with mental health; 55% of teens say they've experienced anxiety, 45% excessive stress, and 43% depression. Youth need supportive out of school programs with foundations in positive youth development for successful growth.

In addition, youth in North Carolina graduate at a rate of 86.3, and national reports continue to show that the United States lags woefully behind other nations in STEM (science, technology, engineering, and mathematics) education both at the elementary and secondary levels. Educators often report that students lack understanding and appreciation of the sciences. This creates a continual need to provide students and educators with educational enrichment activities.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

In 2022 Extension offered a broad range of in-person and virtual 4-H educational programming to help youth develop life skills that will prepare them for future success. These programs focused on civic engagement, healthy living, and STEM, and they included activities such as day camps and overnight camps, clubs, in-school and afterschool enrichment activities, hands-on projects, service activities, and online educational programs.

- NC State Extension agents used **social media and websites** to provide educational information to nearly 2 million youth.
- Extension 4-H agents reached 6 million individuals through various **outreach events** such as fairs, festivals, ag expos, livestock shows, and other community events.
- 3,400 **teachers were trained** on how to deliver 4-H STEM curriculum, and Extension Forestry facilitated 21 NC Project Learning Tree program workshops across the state, reaching 383 formal and nonformal educators.
- 84,000 hours were donated by **4-H volunteers**, providing opportunities for youth to work and learn in partnership with caring adults.
- 188,245 youth in North Carolina participated in one or more 4-H youth development programs during 2022. **4-H clubs** had 19,585 members. 1,149 youth participated in **overnight camping** programs, 137,415 youth participated in **school enrichment programs**, 46,788 youth participated in **special interest programs**.

Families today are farther removed from agriculture than they have ever been, and many youth are learning inaccurate information about agriculture through social media. To address this problem, Pasquotank County 4-H and local partners hosted a **Wake Up to Agriculture Day**. This educational program reached all 352 third grade students in Pasquotank County public schools, allowing them to visit interactive stations and learn about the importance of agriculture in their daily lives and agricultural careers available for them to explore as adults. Based on the success of this program, planning for next year's event has already begun, with plans to explore

expanding into private schools. An **Agriculture Awareness Day** was hosted by Extension in Wilkes County, with the help of students from East Wilkes High School, Wilkes Early College High School, and Wilkes Community College along with Master Gardener and other community volunteers, to educate third grade students about North Carolina agriculture. Approximately 450 third grade students attended the event. Students were excited to learn about the livestock and commodities produced in North Carolina. The hands-on stations gave students the opportunity to interact with livestock and other products that they may not have ever seen. Based on the evaluations, teachers and students alike found this event worthwhile and would attend again in the future. **Through STEM programs such as these, youth in North Carolina participate in hands-on learning experiences and increase their knowledge of agricultural literacy and where their food comes from to prepare for future success.**

Youth across NC also participated in [livestock](#), [poultry](#), and **small animal shows and judging; 4-H projects; and clubs** among many other animal science programs. Statewide, Extension youth animal programs had over 26,000 youth participants. By participating in showing livestock and other events, youth learned communication skills, work ethic, responsibility, and sportsmanship. These opportunities enabled the participants to meet and build relationships with youth with similar interests. The **NC 4-H Horse Program** has an estimated 5,400 registered youth participants, 75 horse program-focused clubs, and 230 registered volunteer adult leaders. The program hosted 50 different stakeholder interactions this year through **events, training, contests, and activities**, with an approximate total of 500 contact hours reaching 7,174 participants. Nine state contests were held, some virtual, some in person, and 909 youth participated in regional and national competitions. Equine specialists created 28 **videos** viewed over 1,600 times. The horse programs' 450 **social media** posts reached over 300,000 people. The Extension [Equine Husbandry website](#) reached 10,000 individuals over the course of the year. The NC 4-H Horse Program helps youth develop leadership abilities, build character, and assume citizenship responsibilities. **Involving youth in 4-H animal programs helped introduce and inspire youth to consider career opportunities in agriculture.**

In Catawba County, 4-H partnered with STEM West and the Catawba County library system to offer the 10-week **Lego Robotics program** to 81 youth in grades 2–4. Based on youth and parent evaluations, 55% of participants enjoyed hearing others ideas and learning how the robotics worked, and 81% of the parents reported that their children are more interested in STEM after attending the program and they saw an improvement in their child's ability to solve problems and work with others. In Cabarrus County, 4-H partnered with afterschool sites and Cabarrus and Kannapolis schools to deliver the **National 4-H STEM Challenge: Explorers of the Deep**. This program developed observational and critical thinking skills while empowering students to explore the relationship that all human beings have with the ocean, regardless of where they live. Four trainings were held to educate teachers with the 4-H curriculum kit, and grant funding from the Cabarrus 4-H Foundation supplied STEM Challenge kits to each participating classroom. Thanks to these efforts, over 7,000 students from across Cabarrus County participated in the STEM Challenge. **Engaging youth in STEM activities is just part of how we are growing future scientists.**

In Surry County, 4-H partnered with local schools to provide 149 youth in grades 6–8 with lessons on **soft professional skills**. Each set of lessons was tailored to learning objectives for each grade, with the aim to help students learn new soft skills and build on previous ones as they progress through their education. Surveyed participants reported gaining new life skills from the program, including improved self-confidence, self-motivation, organization, leadership, communication, and goal setting skills. **As the leader in experiential education, NC State**

Extension provided relevant opportunities for students to put learning into practice and develop personal and career-ready skills.

In 2022, Extension continued expansion of the [#PassTheMicYouth](#) program to encourage youth development of skills in civic engagement, critical thinking, and leadership. The program provides youth with **training and equipment to launch 7 podcasts**. The program website attracted over 20,000 visits and nearly 2,000 social media followers. In Wake County, 4-H provided 9 youth with a weeklong summer experience at the #PassTheMic Camp, hosted at NC State and the NC Arboretum. Through collaborations with community partners, local artists, and activists, youth created art pieces, professionally recorded podcast trailers, wrote spoken word poems, and shared their voices with community members in a showcase. Several of these youth have since continued to collaborate on podcast projects and have joined 4-H clubs. **NC State Extension is preparing youth to be future leaders.**

Describe how the target audience benefited from the program activities.

Expanding on a **school garden project** that began in 2021, Bladen County Extension delivered a 7-session program both in person and online over the course of 14 weeks, guiding 269 students through the process of planning their garden and teaching them about various garden design factors, such as sun exposure and water availability. Extension agents created a Google site containing pre-recorded garden updates from an Extension test garden; self-directed supplemental education content focusing on the plant life cycle, garden management, MyPlate and other nutrition concepts; and printable classroom worksheets to help students plant, maintain, and harvest their school gardens. Evaluations indicate that over 98% of students learned more about the plant life cycle, 99% learned how to choose a healthy diet using MyPlate as a guide, 96% learned how to read nutrition facts labels, and over 94% feel confident or very confident in their ability to plant a garden at home. **Statewide, 9,025 youth grew food by participating in Extension organized school or home garden programs.**

New Hanover County Schools (NHCS) generates excessive waste that could be diverted from the County Landfill. Cooperative Extension developed a pilot program in partnership with local partners to divert landfilled food waste through composting. The Garbage to Gardens program (G2G) intends to develop **food composting** at scale across NHC. At the two G2G pilot schools, 75%-90% of a school's average daily cafeteria waste volume was diverted from the landfill. 212 students at DC Virgo Academy composted 15,360 pounds saving 15 cubic yards of landfill space. Winter Park Elementary School composted 2,240 pounds on Waste Free Wednesdays, saving 2 cubic yards of landfill space. **If all 52 public and charter schools in NHC participate in G2G for one year, over 769,000 pounds of food waste could be composted, saving over 719 cubic yards of landfill space. Increased recycling rates are a direct impact of this program.** In 2022, DC Virgo recycled 5000 gallons of plastic and Styrofoam. Students at both schools received compost educational programming this year. Going forward, G2G will provide curriculum correlated across grade levels to support the learning objectives of the NC Standard Course of Study as well as developing student leadership opportunities. **4-H programs teach youth to be engaged in the world around them and provide them opportunities to take action to protect the environment.**

In Currituck County, Extension administers the **Community Service and Restitution (CSR) Program**, assisting young women and men in completing court-ordered community service hours and paying any required restitution. Placing youths in local businesses and organizations to complete community service has become increasingly difficult over the years because of insurance requirements, required supervision, and most recently, the COVID-19 pandemic. To tackle this problem, Currituck County Extension began building a **community raised bed**

garden through the CSR program, allowing youth to complete their hours while learning how to plant, tend, and harvest vegetables throughout the growing season. The most recent addition is a beekeeping program with 3 hives, with plans to expand by 3 more. In 2022, youth in the CSR program grew over 600 pounds of fresh vegetables for the Currituck County Senior Center and the Lower Currituck Food Bank. **NC Extension provides hands-on, experiential learning opportunities that help youth enjoy healthy lifestyles and avoid high-risk behaviors while contributing to their communities and developing knowledge of horticulture.**

To help local youth develop healthy coping mechanisms, Madison County 4-H teamed up with Madison Middle School health educators to incorporate a **positive stress management program** into health classes. Students were encouraged to use a positive, solution-focused approach to managing stress while learning to identify specific sources of stress and joy in their lives and develop tailored coping strategies. Through experiential activities, youth compared the physical, psychological, and social effects of healthy coping strategies with those of unhealthy strategies. Thanks to this program, 330 middle school students practiced healthy stress management strategies, including gratitude, deep breathing, and stretching. They also participated in group discussions and learned about mental health support resources. According to the teachers, this is one of the most memorable classes in terms of equipping youth with positive life management strategies and increasing youth understanding of the dangers of substance abuse. **NC State's 4-H programs supported students' mental health through stress management and mindfulness activities.**

In New Hanover County there are two alternative schools serving K – 12 students with behavioral issues. The **Ability Garden** provides gardening activities as a **therapeutic intervention** at both schools. Our activities are designed to build self-confidence, teamwork, leadership and promote delayed gratification while introducing basic gardening and environmental concepts. In the pollinator garden installed last year, there is a large amount of dollar weed that needs constant attention, surprisingly this is the most successful activity this year with the students. They work together in self composed teams to see which team to pull the longest root, our record to date is 6' 5." The teachers were amazed and conveyed that it was the first time the students had been able to work together this school year. Students who had been in physical altercations with each other were encouraging each other and working together to develop a plan to dig out the longest root and keep it from breaking. This reinforced the concept that in a therapeutic garden, it is the process of gardening, not the product, that produce the desired outcome.

In Onslow County, 4-H was able to revamp the **4-H Electric programs** that were previously paused due to COVID-19 restrictions. Hands-on electric workshops and demonstrations were delivered to 80 participants. In addition, 3 4-H teen leaders co-taught some of the workshops, partially fulfilling the requirements for them to attend the 75th Annual 4-H Electric Congress at UNC-Asheville, allowing them to meet peers from across the state and explore new potential career paths in electrical work. **As the leader in experiential education, NC State Extension provided relevant opportunities for students to put learning into practice and develop personal and career-ready skills.**

When the 4-H Embryology program, a popular program enjoyed annually by more than 56,000 young people, was canceled in April 2022 due to highly pathogenic avian influenza (HPAI), Extension specialists quickly teamed up to offer the **Hatch Butterflies** program as a safe alternative to 4-H Embryology. Through quick leveraging of financial support from Center for IPM, NC Cooperative Extension, NC 4-H, and Carolina Biological, over 230 butterfly kits were shipped to counties across NC. In Harnett County, 4-H adapted to the HPAI outbreak by partnering with the Harnett County Public Library to stream videos of a "virtual hatch," enabling

over 100,000 online hatch-cam video views across NC. Six hundred Harnett County 2nd grade students also experienced live butterfly hatches in their classrooms. Thanks to the 'hatch butterfly' program, spring season 2022 impacted by HPAI still allowed so many youth to witness another one of Mother Nature's magic moment as a butterfly emerged from a chrysalis. **Extension and 4-H rapidly adapted to emerging challenges in order to provide safe, science-focused school enrichment programs to youth, offering them opportunities to learn about science, technology, engineering, and math (STEM) through fun, engaging activities.**

Describe how the broader public benefited from the program activities.

Citizenship is one of the three mission mandates for North Carolina 4-H. According to National 4-H Headquarters (2011), Since its inception, 4-H has placed emphasis on the importance of young people being engaged, well-informed citizens. By connecting to their communities and community leaders, youth understand their role in civic affairs and expand their role in decision-making processes. Civic Engagement is a critical life skill for youth to develop to become competent, caring, and contributing members of their communities and society. In 2022, North Carolina 4-H focused on educating youth on the importance of voting. 4-H partnered with Durham County Cooperative Extension to expand their [Kids Voting Durham](#) program into a statewide [Kids Voting NC](#) program to create lifelong voting habits in children, increase family communication about citizenship, and encourage greater adult voter turnout. The program provides education as well as voting experiences. Youth who participate and vote through this program have a chance to cast their ballots, which are modeled after an adult ballot, and see the youth election results from their county on election night.

North Carolina 4-H offered this opportunity free of charge to any county that chose to participate. All supplies, including training materials, incentives, and voting supplies, were provided. Counties that decided to participate were asked to attend training sessions and provide evaluation data after the program. This program was marketed as a high-quality civic engagement experience and an opportunity to develop or enhance community partnership and support. Kids Voting NC offered 4-H programs the chance to participate at three levels. The basic level included having youth vote through an online platform. The service activity level included having the program delivered as an in-person service activity. The partnership level consisted of working with county partners to provide the program in as many locations and formats as possible. The 2022 program provided the basis for increasing the reach of participating counties in the 2023 municipal elections.

In this statewide program's inaugural year, 18 NC County 4-H programs participated, over 1,000 youth cast a ballot through the program, and 88% of youth participants reported that they would vote when they were able. At a local level, 171 youth in *Caldwell County*, cast Kids Voting ballots for federal, state and local races. This included the students of one civics teacher at West Caldwell High School, which partnered with 4-H to provide Kids Voting NC as a school-enrichment program. Kids Voting in *Cabarrus County* offered the basic level of participation which included 102 youth voting through an online platform, an in-person opportunity, or participating during an afterschool 4-H club meeting. *Rowan County* 4-H delivered the program as an in-person service activity at the Extension office. This building is a polling site, so some youths voted because they came to vote at our building precinct with their family. In contrast, other youth voters intentionally came to our site to vote due to our marketing strategies. A total of 37 votes were cast. Evaluation results collected through an online self-evaluation showed that 72 youth in *Forsyth County* cast a ballot in the inaugural year of this program. When asked how many of those who participated planned to vote when they turned 18, 88% of youth participants

responded that they would vote when they were able. The 4-H Youth Development Agent and County Extension Director in *Montgomery County* presented the program to local 4th and 5th grade students within Montgomery County. The program was split into an education session for students, and then a voting day session. During the educational sessions, students were taught how to make informed decisions before voting. In Montgomery County alone, Kids Voting NC was able reach over 100 students within two of our local elementary schools. Teachers reported that this program assisted with the NC State Standards addressed in 4th and 5th grades within their curriculum. In the future, Cooperative Extension in Montgomery County plans to work with our local Board of Elections to expand this program through 4-H to reach more youth on and around Election Day, with the hopes of encouraging more families to bring their youth to vote. In partnership with the *Lee County* Board of Elections and volunteer "poll workers" representing 4-H Clubs, Community clubs, and Homeschools, Lee County sponsored a voting booth during one week of the one-stop voting center. 36 young people voted during that week. Nine young people and four adults volunteered. Adult voters commented multiple times each night about how important our work was. *Richmond Kids Voting NC* 4-H was carried out with Board of Elections during early voting and implemented in kindergarten, 5th, 8th, 10th, and 11th grade classrooms. Lessons with little kids included what a citizen is and having the right to vote. Lessons for older youth included specific information on how to register, rights and responsibilities, candidate profiles, and duties of each elected office. When asked how many of those who participated planned to vote when they turned 18, 88% of youth participants responded that they would vote when they were able. 94% of teen participants had conversations with their family members about the election. Twelve youths participated and voted in *Camden County's Kids Voting*. Several parents and community leaders who attended early voting and witnessed our voting booth gave positive feedback about the program. One middle school teacher said that she would like to be involved next time we do Kids Voting in Camden County. As summed up by one youth participating in the program, "I was glad to participate in this program, as I felt important to have my voice heard even though I am not old enough to vote in the real election." **Kids Voting NC provides an opportunity for youth in North Carolina to engage in most basic act of citizenship by experiencing the electoral process and developing lifelong voting habits. Through programs like Kids Voting NC, Extension is empowering youth to create positive change for their communities and determining a better future for all North Carolinians.**

Professional Development & Multistate Activities.

The following professional development workshops were provided by Extension Specialists for Extension Agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- #PasstheMicCamp - Tailoring Curriculum to YOUR Community
- 4-H Broiler Project - From Egg to Chicken
- 4-H Curriculum Training 4-H Concept Mapping
- 4-H Curriculum Training Clover Quest: Cultivating Cloverbuds
- 4-H Curriculum Training Cooking Up Confidence: Science with Your Snacks
- 4-H Curriculum Training Embryology
- 4-H Curriculum Training Magic of Electricity
- 4-H Curriculum Training Mooving-Milk from Farm to Fridge
- 4-H Curriculum Training Power of Wind
- 4-H Curriculum Training Residential Camping
- 4-H Curriculum Training The Wonderful World of Bees
- 4-H Curriculum Training Winged Wonders
- 4-H Pathways to the Pack

- 4-H SPARK New Youth Development Professionals
- 4-H Volunteer Management 101
- 4H Dairy Opportunities
- Children and Youth Gardening Workshop
- Deer & Turkey & Oaks, Oh My! Youth Programs from Ext Forestry
- Digging into Farm to School
- Eco Tower: A teaching tool to engage youth with the environment
- EFNEP Teen Cuisine Training
- Engaging Youth & Families in Elections & Beyond
- Ignite The Spark! Rekindling your Volunteer Program
- It's More than a Curriculum: Learn Juntos 4-H and Best Practices
- Kids Voting Implementation Basics
- Kids Voting Listening and Learning Session
- Kids Voting Overview
- Leopold Education Project (LEP) - Educators Training
- Put A Ring On It: Engaging the NEXT Generation of Volunteers
- Supporting Latina/o/x Youth & Families
- The 4-H Thriving Model: Intentional Program Design
- Trauma-Informed Practices in 4-H Youth Development
- Using GIS to Engage Youth for Community Impact
- Working with Military Youth and Families
- Youth Stepping Fourward (a Pilot Program)
- Youth Storytelling for Social Change: Tools for Effective Delivery

The following **Factsheets and Peer Reviewed Extension Publications** were developed by Extension Specialists for dissemination of research-based information to Extension agents, growers, and other stakeholders.

- [Calf Care Guide for Youth](#) (AG 918)
- [“Se hacen puentes al andar”: A Resource for Parents & Caregivers of Latino LGBTQ+ Youth](#) (FCS 543)
- [“Se hacen puentes al andar”: Un Recurso para los Padres y Tutores de Jóvenes LGBTQ+](#) (FCS 543S)
- [Career Exploration in Elementary School](#)
- [Career Exploration for Teens](#)
- [Career Exploration by Children and Teens -- An Overview](#)

Extension specialists contributed to solving regional and national issues through **multi-state collaborative Extension efforts**. Some multi-state programs NC State Extension participated in include:

- Volunteer Conference of Southern States, a regional 4-H volunteer-led training. The conference features a hybrid delivery of more than 60 learning experiences over the four-day experience.
- Southern 4-H Volunteer Specialists Collaborative Team. Plan, program, and address volunteer needs in the Southern Region.
- 4-H Virtual “Ignite The Spark” Agent Training – Collaborated with Volunteer Specialists from the Southern Region to create, plan and implement a four-part training series aimed at helping 4-H Agents across the Southern Region reengage with and reenergize their local volunteer program.
- 4-H Military Partners Conference Planning. Multi-state team who planned and conducted the virtual 4-H Military Partners Conference.

- 4-H Military Working Group. Multi-state team working with the Department of Defense, Military Service partners, USDA, and the overall 4-H Military Partnership.
- 4-H 101: Fundamentals of 4-H Programming. Multi-state team developing an introductory online course for military-connected staff and volunteers delivering 4-H programming. The project includes staff from NCSU, Kansas State University, Colorado State University, University of Illinois, Purdue University, and Cornell University
- National 4-H's Access, Equity, and Belonging Committee for LGBTQ+ youth. Plan, develop, and implement resources for fostering more affirming spaces for LGBTQ+ youth within 4-H.
- STEMsatoinal Ag: The Virtual Farm collaboration too develop both formal and non-formal agricultural educational content for K-14 students that is appropriate for traditional school settings, as well as accommodate distance, in-person, and homeschooled children in 11 southeastern states.
- Southern Regional 4-H Horse Championships Committee Member
- Eastern National 4-H Horse Round-Up Committee Member

Describe the issue or problem that the program addresses.

Individuals and families in North Carolina face challenges to overall well-being. The state's population includes over 2.3 million children under age 18. Many young children's social, emotional, or mental well-being has been impacted by the pandemic. At the other end of the spectrum, North Carolina ranks 8th nationally in the number of people 65 and over. In 2020, one in six people were 65 and older. By 2031, there will be more people 65+ than children under 18. One in four adults over age 65 live alone.

The well-being of families is also impacted by where they live. Approximately two-thirds of American families live in a home with at least one health hazard. Further, 10.6% of housing in NC has the potential for elevated lead exposure risk. Radon exposure, the leading cause of lung cancer among nonsmokers and the 2nd leading cause of cancer among all individuals, have elevated levels across the state. Home hazards are also a concern, as 24.8% of adults aged 65 and older reported falling in 2017. About \$50 billion is spent annually on medical costs related to non-fatal fall injuries, and \$754 million is spent related to fatal falls.

Many families are also facing what seem like insurmountable financial challenges. In the 3rd quarter of 2022 total household debt rose by \$351 billion, or 2.2 percent, to reach \$16.51 trillion. According to the New York Fed, the 15 percent year-over-year increase in credit card balances was the largest in more than twenty years. A combination of factors including high inflation, pent up demand, and consumers settling back into pre-pandemic habits has resulted in a record rise in the rate of credit card debt. In 2022, North Carolinians owe \$33.8 billion in credit card debt. North Carolina households average \$7,752 in credit card debt. The average balance for the 1.3 million borrowers with student loans in North Carolina is \$36,293. According to the congressional Joint Economic Committee, prices climbed by 13.3% between January 2021 and July 2022, resulting in a \$717 increase in monthly expenses for the average American household. A survey conducted by the US Census found that in North Carolina, a reported 42.0% of adults find inflation "very stressful" and 26.5% find it "moderately stressful."

To help address the challenges facing individuals and families, NC State Extension family and consumer science programs empower individuals and families to build healthy lives and achieve optimal social and economic well-being.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

To support individuals and families, NC State Extension specialists developed and delivered in-service training, educational curricula, and materials to increase the knowledge and skills of Extension agents, thus increasing their ability to deliver subject matter content to target populations. Extension specialists and agents delivered educational content using programs, websites, social media, newsletters, and other methods to increase the knowledge and skills of the target populations.

- NC State Extension specialists maintain 6 **web portals** providing information to over 132,000 visitors on families and communities, financial management, healthy homes, and disaster preparedness.
- Extension agents delivered **in-person and virtual training** to 1,545 childcare providers, parents, and families, and another 1,400 individuals attended Extension workshops on budgeting/managing financial resources.

To help childcare providers and parents address “picky” eating patterns, Extension in Chatham County created a 3-part educational series, **Raising Good Eaters**. The series was viewed by a group of 13 childcare providers followed by a Q&A segment. 100% of series viewers reported that they gained the knowledge and the confidence to help children develop a healthy relationship with food. All the participants reported they would recommend the series to others, opening the opportunity to reach more childcare providers and parents.

To help parents in Durham County **navigate the complex new local public school enrollment process**, Extension delivered a webinar breaking down the current system, the proposed new system, charter and magnet school options, and the PreK system. To ensure that immigrant families received needed extra support, simultaneous interpretation was offered in Spanish, and heavy recruitment was conducted in the local Spanish-speaking community. Thanks to this program, 139 parents viewed the webinar and had the opportunity to personally ask questions about how to best manage school enrollment for their children.

The population of Hispanics in Durham is 14%. Of this population, 10% of adults 18 and older only speak Spanish at home. Many of the adults are new to the U.S school system and are not aware of all the services and rights their children have, or they do not know where and whom to look to for help. A 6-week program known as the **Latino Parent and Family Advocacy & Support Training (LPFAST)**, part of Durham Extension, gives parents the tools they need to support their child’s academic success and help them navigate the school system while making connections. The program covers areas for parent involvement, school structure, school communication, and accountability programs. **Extension empowered parents and other caregivers to ensure a bright future for children, delivering practical knowledge and skills so they can equip children with proper education.**

Skills, Opportunity, Awareness, Readiness (S.O.A.R.) is a community college program designed specifically for adults with intellectual disabilities. The focus of the program is on helping the individual become more independent and self-directing by acquiring basic literacy and life skills needed to function successfully in daily living. Cabarrus County Extension staff meet with the 22 students enrolled in the program at Rowan Cabarrus Community College monthly to bring a hands-on activity into the classroom and engage the students with real-world situations and life skills that can be transferred into their daily routines and jobs. Growth and increased knowledge in building relationships and confidence that is seen in various other parts of their lives was documented throughout the year for all participants. All students have demonstrated growth in fine motor skills, conversational communication, inquiry based questions, food preparation, knowledge about animal and human food and nutrition, and creativity within the cultural arts.

According to the Administration for Community Living, there are a significant number of grandparents and other relatives who are providing full-time care to their grandchildren unable to live at home with their biological parents. Even though the children benefit from being raised by relatives instead of becoming part of the Foster Care System, and the grandparents’ lives are enhanced by the experience, it is still challenging for caregivers to take on this role. Often caregivers are unable to address their own needs for health, finances, and self-care. Cleveland County continues to respond to this growing need by maintaining the **Broad River Grandparents Raising Grandchildren & Kinship Care Support Group (BRGRG)**. **Through this group, participants were provided with information and participated in discussions about parenting skills for different ages, budgeting, trauma informed care, strategies for managing stress at school and at home, managing holiday stress, family fun in the kitchen, tools to help prepare more family meals at home, ways to strengthen families through celebrations, and other topics.**

Individuals and families who may be eligible for the Supplemental Nutrition Assistance Program (SNAP) often do not apply due to barriers such as misinformation, application complexity, and a lack of understanding of the positive impact of SNAP benefits on family health and food security. The [More in My Basket \(MIMB\)](#) program educates families and assists with the SNAP application process. In 2022, MIMB continued effective remote outreach efforts, virtual interviews with media outlets, and educational messaging via the MoreFood.org website and blogs, Twitter, Facebook, and Google. To aid families with rising food costs, the “**Green Spring**” series outlined green vegetables that are easy to find and often available at lower cost during the spring in NC. Another series, titled “**Beat the Heat,**” featured warm-weather recipes and provided tips on staying cool during the summer. MIMB’s **Versatile Pantry** program includes recipe handouts, cooking classes, and workshops, and participants learn the benefits of stocking pantry staples and strategies for keeping a stocked pantry. In 2022, MIMB reached a total of 875,673 North Carolinians across all outreach methods. Highlights include print media and radio outreach to 630,384 people, assistance of 423 households and 1,094 individuals with SNAP applications, and outreach to an additional 240,942 individuals through social media, workshops, booths, and exhibits. **Extension helped hundreds of families and thousands of individuals access the resources and the knowledge they need to weather rising food costs and create resilient households.**

As a result of participating in NC State Extension programs, **7,400 people** gained knowledge and/or skills to increase family economic security. In addition, nearly **2,500 adults** increased knowledge of life skills, such as goal setting, stress management, self-care, and healthy relationships.

Describe how the target audience benefited from the program activities.

In Avery and Watauga Counties, the [EFNEP](#) program partnered with Intermountain Children’s Services’ **Head Start Program** to inspire low-income families to begin cooking with their children. Together the 2 programs sent a video to 4 Head Start Centers, providing over 40 families with an engaging **cooking demonstration** for a simple fruit salad that parents and children could follow at home. The families were also provided with all the ingredients to make the salad. All 40 families made the recipe with their children. Parents reported learning new cooking skills, and they reported that their children were more willing to sample a healthy dish that they helped prepare. **NC State nutrition education programs empowered families and childcare providers to take charge of children’s health and well-being by teaching how to help children build a healthy relationship with food.**

Durham County Extension offers a 13 session [Incredible Years Parenting workshop](#), facilitated by 2 Spanish Facilitators to help parents of children ages 3–5 navigate the tough challenges presented every day. The program has had many successes; one that stands out is a recent father who attended the parenting workshops after separation from the mother. Every week he would share a story about how he was implementing our suggested parenting strategies in different ways with his children during visitation. He was very successful in the way that he was able to recognize the challenges in his own life and use our parenting strategies to help him father his children in a way that was healthy for both him and the children. The father spoke about how he was able to now observe and differentiate parenting styles when he was out in public. This father’s bond with his children improved and he developed positive parenting skills.

Social isolation and loneliness pose significant health risks, especially to older adult populations. To reach isolated community members, Extension in Wilkes County provided **monthly virtual**

programming on a variety of topics, including nutrition and cooking skills, personal finance, and physical activity. A total of 12 monthly programs were provided to 578 participants in 2022. Of those who completed a comprehensive program evaluation, 80% reported intention to use effective skills for self-care, financial management, and keeping a healthy home. Participants expressed appreciation for the accessibility of the program, noting that it provided low-cost, easy recommendations. **Extension programming and local partnerships provide vital resources and support to populations particularly vulnerable to the mental and physical health risks of social isolation, including seniors.**

Many seniors struggle to navigate the ever-changing Medicare insurance market, but choosing a plan that best meets their individual needs can save them hundreds of dollars. To assist seniors with Medicare-related problems and guide them through the enrollment process, Extension in Currituck, Pasquotank, and Lenoir Counties offered the **Seniors' Health Insurance Information Program (SHIIP)** in 2022, helping 830 seniors save over \$536,000 in insurance and prescription drug costs by providing information and answers over the phone and in person. For many seniors, this support from Extension means the difference between being able to fill their prescriptions and going without their medication. **NC State Extension's technical assistance empowered seniors to make better-informed decisions, resulting in a healthier North Carolina.**

Older adults lack the level of digital media literacy necessary to navigate the world of technology. Seniors can save money when they properly understand the options available to fit their needs. The N.C. Cooperative Extension, FCS agent at the Burke County Center partnered with the Burke Senior Center to offer the Healthy Living for Seniors series. Participants signed up for **healthy living classes associated with technology and well-being**. Participants reviewed their current cable/internet bills to determine if they were using or needed the services they were currently paying for. During the workshop, the FCS agent learned a participant was paying for unnecessary services each month through the local internet provider and assisted the senior with learning current lingo associated with connectivity and available options to determine the seniors' need. The FCS agent scheduled and accompanied the senior to the local providers office to review and change connectivity plans. **Participants of Healthy Living for Seniors have gained an understanding of the technology around them and in turn have the tools needed to make informed decisions.** After the visit with Cooperative Extension, the participant saved \$60 a month on cable/internet. She plans to use the savings to become more involved in opportunities for personal growth in her community.

Many Union County senior citizens receive **Farmers Market Nutrition Program vouchers (WIC)** every year to purchase fresh locally grown produce from our local farmers markets. The Union County Farmers Market was not open for a weekday market this year, and many senior citizens rely on public transportation to get to the farmers market; this kept many senior citizens from being able to use their vouchers. In response, NC State Extension facilitated the process of **packing produce boxes** each week the market manager worked with the Meals on Wheels organization to get these items delivered to their recipients. Each week for 8 weeks, 10–15 \$21 boxes, which included a variety of freshly harvested seasonal produce with descriptions and recipe cards to help with preparing nutrient-dense meals, were put together. As a result, homebound senior citizens were able to access fresh local produce and use their WIC vouchers, and an estimated \$1,680–\$2,520 of revenue was generated for our local farmers and remained in our local economy.

As a result of **Extension programming to improve individual and family financial stability**, 7,409 people gained knowledge to increase family economic security (such as how to access SNAP benefits, SHIIP Medicare Part D, food cost management, and cost comparison skills),

1,588 people accessed programs and implement strategies to support family economic well-being, 1,154 people gained basic financial management knowledge (such as budgeting and record-keeping), and 582 gained knowledge in managing financial products and financial identity (such as credit/debt management, identify theft, credit scores, and avoiding scams). **The increase in individual knowledge gained from participation in Extension's financial management and support programs not only leads to an improvement in the financial condition of the individual participant but results in a ripple effect felt throughout the economy.**

The [NC Extension and Community Association \(ECA\)](#) is a statewide adult volunteer organization designed to connect families in need with a variety of resources, including food, clothing, scholarships, and books and toys for children. In 2022, the ECA provided families with over 770 pounds of food and raised \$10,000 in scholarship funds for community college students. ECA volunteers also facilitated the packing of Operation Christmas Child gift boxes for 52 children, sewed or collected winter clothing to donate, organized a children's book collection, and created handmade cards for the Boys and Girls Home of NC, a local agency for at-risk children. By organizing a variety of local events and fundraisers, including a pop-up Holiday Market, family-oriented holiday celebrations, and a book club, ECA volunteers formed new relationships and created a sense of togetherness within their communities. **Extension collaborates with community partners and volunteers to create a more secure, connected, and supportive social environment for families and youth.**

Describe how the broader public benefited from the program activities.

Breastfeeding rates are low in the United States, and infant mortality is higher than it should be. Health care providers, especially doctors and nurses, receive little education about breastfeeding and how to support the breastfeeding infant and the family. The [Maternal and Infant Lactation Knowledge \(MILK\) Research and Educational Group](#) addresses this issue in 4 ways: 1) training lactation consultants (IBCLCs), 2) training health care providers to become breastfeeding friendly, 3) training for the WIC program, and 4) running a breastfeeding support group. The first component of the program includes **training to lactation consultants (IBCLCs)** across North Carolina in underserved areas of the state. These IBCLCs are then able to provide breastfeeding support in underserved areas. A former participant identifies the broader impact of the program: "Obtaining my IBCLC through NC State's program has changed my life for the better. Not only has the program equipped me with a plethora of lactation knowledge, it also inspired me to pursue a career in nursing to help families on their breastfeeding journey from the very beginning. Without NC State helping me gain the IBCLC credential, I would not have had the opportunity to work as a new graduate nurse on a postpartum unit; this program has helped me get my foot in the door to the place that I believe will give me the best platform to use my lactation education to help all families." Another participant identifies the ripple effects of the training: "This program has provided me with a comprehensive understanding of breastfeeding as well as counseling skills, prenatal and postpartum care and community resources. I feel so confident in my practice as a dietitian and lactation consultant because of the individual and group support provided. I know that the providers I've worked with (OBGYNs, pediatricians, nurses, IBCLCs) have also appreciated updated information and best practices protocol for breastfeeding support."

The second program component is an **on-demand lactation program** which offers 2 breastfeeding courses that enable students worldwide to obtain 95 lactation education hours necessary to sit for the International Board Certified Lactation Consultant (IBCLC) exam. The target audience for the program is anyone hoping to obtain the IBCLC credential, but the

majority of the current population of students consists of healthcare providers currently serving patients in various medical backgrounds associated with maternal and infant care; these professions include doctors, nurse practitioners, physician assistants, nurses, dietitians, occupational therapists, speech language pathologists, and chiropractors. Students enrolled in the on-demand courses receive education to advance their own careers and better serve their patients, regardless of their area of work. Quotes from participants show how the broader public benefited from this work: "As a result of this course, I feel less stressed about infant sleep and will be able to convey this message to future patients. I will be able to explain the positive benefits of breastfeeding at night and how it supports sleep for the infant and the mother." Another participant stated that "Postpartum depression can manifest in a plethora of symptoms and just not the "baby blues" and it is far more common than I expected. PMAD or perinatal mood and anxiety disorders can manifest in psychosis or OCD and it is very imperative for the lactation provider to support and advocate for these patients because it can have devastating effects on the mother and infant and family if left untreated."

The third program component, **training for the WIC program**, is provided on the topics of breastfeeding and the components of human milk and breastfeeding support in rural areas of North Carolina. These trainings are taken by WIC peer counselors who then use this information to serve the participants of WIC in their county.

The fourth program component, a local **breastfeeding support group**, was restarted in the fall of 2022. The number of participants is gradually increasing, and the community is starting to build again. Most attendees are mothers and their babies from underserved areas in terms of breastfeeding.

Evidence of the health effects of breastfeeding continues to expand in terms of depth of understanding and quality of research. According to the [CDC](#), breastfed babies have a lower risk of asthma, obesity, type 1 diabetes, and sudden infant death syndrome (SIDS). In addition, ovarian and breast cancer, type 2 diabetes, and high blood pressure are less common among women who breastfeed. The CDC estimates that low rates of breastfeeding add more than \$3 billion a year to medical costs for the mother and child in the United States. Aside from health impacts, infant formula production has very high environmental costs. Breastfeeding, in addition to being the best infant feeding intervention, has very low environmental impact. Breastfeeding does not involve the use of grazing land for cows, does not require product transportation or packaging, and produces no waste.

The Lifelong Improvements through Fitness Together (LIFT), a 16-session in person exercise class with weightlifting, instructed by the Cherokee County FCS Agent, is an evidence-based program specifically for older adults to help them age in place and improve their strength, flexibility, and balance. The LIFT group was presented with [Med Instead of Meds](#) nutrition education at each of the one-hour sessions. Participants of the LIFT exercise program reported they had more range of motion in their joints, felt stronger, and had improved ability to do activities of daily life such as cleaning their house and climbing stairs. According to the National Council on Aging (NCOA), 1 in 4 Americans aged 65+ falls every year. Falls are the leading cause of fatal and non-fatal injuries for older Americans. Each year about \$50 billion is spent on medical costs related to non-fatal fall injuries, and \$754 million is spent related to fatal falls. In partnership with the Centralina Area Agency on Aging, Gaston County Adult Services, NC Cooperative Extension Gaston County Center provided the 16-hour Matter of Balance program to older adults from Anson, Cabarrus, Gaston, Iredell, Lincoln, Mecklenburg, Rowan, and Stanley counties. Program participants intend to help prevent falls over the next 6 months via installation of a handrail at home, home repairs to limit fall risk, talking with a physician about

medications, continuing physical activity classes, slowing down, and scheduling time for regular exercise.

Improvements through the Fitness Together (LIFT) strength training program helped 50 participants across 13 counties, providing workshops and weekly newsletters to help older adults stay active. Of the 10 participants who completed pre- and post-evaluations, 90% indicated that they will continue making daily physical activity a habit, and 70% reported improving their ability to perform daily activities, such as playing with their children/grandchildren.

The aging community in Swain County has created a great need to educate middle-aged to senior citizens with safe, effective exercise activities that get them outside walking with others for increased socialization and cardio. Walking and hiking are popular past times due to the scenic nature of the mountains; however, the walking is usually on trails that are uneven with steep slopes with lots of roots and rocks that create hazards, especially for the aging population. Two programs that teach walking with ski walking poles have helped people walk and hike with greater security in respect to balance, stability, and posture along with greater cardio fitness than regular walking: the Spring Smokies Ski Walking School for Swain County along with the weekly Walkie Talkies program. Suffering from balance issues, a Walkie Talkie participant shared how she was afraid to go for walks by herself. Once she was provided with the Nordic ski walking poles and taught how to properly use them, her confidence increased, and she was able to join the group for longer walks. She reported that she felt more stability in movement, and the walking poles helped her walk in a more upright position. **Through programs that engage seniors in physical activities that improve flexibility, strength, and balance, Extension is enhancing the quality of life and wellbeing of North Carolinians.**

Professional Development & Multistate Activities.

The following professional development workshops were provided by Extension specialists for Extension agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- Arthropod Pests In/Around the Home: Identification & Management
- Collaborating with WIC
- Enhancing the Head Start Partnership for Greater Impact
- Healthy Homes Trainings - Don't Let Storms Shut You Down: Portable Generator Safety
- How Financially Fit Are You?
- More In My Basket (MIMB) Agent Training
- NC Cooperative Ext Agents Role in Farm to Early Care & Education
- Promoting Healthy Eating & Physical Activity in Early Childhood
- Real Money. Real World (RMRM)
- Impacts of COVID on Food Insecurity
- Resilience - Food for All, Creative Food Access Rural Communities

The following **Factsheets and Peer Reviewed Extension Publications** were developed by Extension specialists for dissemination of research-based information to Extension agents, growers, and other stakeholders.

[Common Pantry Pests and their Management](#)

[Probando si su casa tiene radón](#)

[Removing Mold From Household Items](#)

[Preventing Mold in Your Home](#)

[Mold and Moisture Checklist](#)[Moisture Control and Prevention: Gutter Management](#)[Career Exploration in Preschool](#)

Extension specialists contributed to solving regional and national issues through **multi-state collaborative Extension efforts**. Some multi-state programs NC State Extension participated in include:

- Coordinating a webinar with the University of GA on red imported fire ants for extension agents and other related stakeholders.
- NCUE Annual Meeting Symposium Development and Multistate Project. Improving Pest Management in Low-Income Housing Facilities.
- Development of a Novel Tick Trap. Banfield Bio, University of GA, Texas A&M, NCSU Textiles Division.
- Polymeric Fibers for Tick Repellency. Banfield Bio, University of GA, Texas A&M, NCSU Textiles Division.
- Portable Generator Safety Training with University of Georgia Extension. This is a multi-state effort to address common issues for those in the Southeast.
- Disaster Preparedness Training with University of Georgia Extension and University of Florida, Institute of Food and Agricultural Sciences Extension. This is a multi-state effort to address common disaster concerns for those in the Southeast.
- Healthy Homes Partnership, a national collaboration between NIFA, USDA, and Extension. States in the partnership include North Carolina, Florida, Georgia, Alaska, Connecticut, Louisiana, Montana, Missouri, Tennessee, and Oklahoma.

Describe the issue or problem that the program addresses.

A growing number of farms provide direct-to-consumer sales in their local communities through farmers markets, CSA programs, farm stands, and other channels. The shorter the distance between the farmer's field and the customer's plate, the less transportation and fewer intermediaries required. This benefits both the farmer in keeping a greater percentage of their sales and the consumer in purchasing fresher food. As an added benefit, the money spent in the community stays in the community, supporting other businesses that offer goods and services and creating jobs. Agricultural lands have been irrevocably lost in recent decades due to residential and commercial development. NC State Extension Agents and specialists work with local communities to provide education and advocacy and preserve fertile agricultural lands in North Carolina that feed us and provide a host of economic, environmental, and socio-cultural benefits.

Consumer demand for local foods contributes to the creation of jobs and opportunities for farmers, business owners, and entrepreneurs that store, process, market, and distribute locally produced foods throughout North Carolina. Resilient localized food systems ensure a continual supply of safe, accessible food while supporting the economic vitality of farms of all sizes. There has been a renewed spirit for customers to purchase food locally and support local farms. Educating consumers about the importance and significance of agriculture is important to the continued growth of the local food economy. Engagement with local food systems increases grower profits, supports our agricultural economy, and provides critical education and awareness to the public regarding the importance of agriculture.

Many of North Carolina's 20,298 new and beginning farmers lack prior agriculture experience, but growing support for local foods and sustainability has driven the interest of a diverse group of young people to go into farming and associated food businesses. Small farmers can meet consumer demands, but they need training and education to achieve this. NC State Extension can provide training and resources to consumers to increase awareness and demand for local foods along with training and resources to producers to increase knowledge of how to produce and market local foods.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

The local foods program team developed and graphically designed resources for the [Farmers Market Donation Station](#) program including an Agent Guide, a Volunteer Guide, 8 appendices, marketing tools, and an online reporting tool. An information session was held for Extension agents to learn more about the program and find out what it would take to start a Donation Station in their county. There are currently 11 donation stations across the state, and additional sites are being considered. Statewide, 1,700 pounds of fresh local produce were donated to food pantry recipients, and 30 volunteers were trained to host donation stations at local markets. The local foods team also designed a comprehensive, user-friendly **Local Food Recipe Demonstration Toolkit** to assist agents as they implement local food preparation demonstrations in their county programming. Training on the new materials was offered to Extension agents. **Local food demand increased through partnerships and programs aimed at increasing the community's knowledge of and access to local foods.**

To provide an understanding about how their food is produced, and to grow dairy markets in NC, consumers need greater confidence about the wellbeing of cows on dairies and about the

safety and wholesomeness of dairy products. The [Discover NC Dairy](#) project curates a collection of 11 consumer **educational videos** on topics such as how cows are housed and fed and how milk is hauled and inspected. To support consumer education and local food awareness initiatives, kiosks were designed to make it more engaging for individual users to select their topics of interest and interact with the videos. Each kiosk includes a 32-inch TV on which the video is played and an iPad that allows the user to interact with the videos. One of these kiosks is on display at NC State's Howling Cow Creamery and Education Center, and these kiosks were used at individual events, attracting tens of thousands of views. The Discover NC Dairy videos were also used in a combined effort between NC Dairy Extension, The Dairy Alliance, the NC Pork Council, the NC Cattlemen's Association, the NC Soybean Producers Association, and the NC Farm Bureau to create a **Moovie Theater** during the NC State Fair. Socially distanced benches were set up in front of a 15-foot screen that played the videos, on a loop throughout the fair. Discover NC Dairy also introduced a **Barnyard Beango** game that required fairgoers to read through dairy farming and other farm facts to complete a bingo card in exchange for a prize. A child-sized table was also set up with USDA My Plate plates and plastic cling images of nutritionally important foods, including dairy products, so youth and their families could discuss the importance of healthy eating and learn how it connects to local farms from volunteers working the booth. **NC State Extension agents and specialists work with local communities to provide education and advocacy.**

As a result of Extension local foods outreach, technical assistance, and training programs, over **75,00 participants** increased knowledge of local food and agricultural systems, **180 local food value chain businesses** were created or supported by Extension programming or technical assistance, and over **400 new and existing access points** for consumers expanded or improved their offering of local fruits and vegetables as a result of Extension programming or technical assistance.

Describe how the target audience benefited from the program activities.

Operating in Cleveland County since 2010, [Foothills Farmers' Market](#) has become the cornerstone of a growing local food movement. Dedicated to continuous improvement, the market sought ways to engage stakeholders, grow the customer base, and increase sales for farmers. In line with economic development and local foods programming, NC Cooperative Extension assisted the market in **developing a strategic business plan**. To finance implementation of that plan, Extension secured funding through USDA for a 3-year marketing and promotion project. The scope of work was organized around 5 objectives that addressed staffing, branding, infrastructure, and food access issues. As a result of the project, 44 new farms and food-based businesses joined the market, increasing the vendor count from 75 to 119 (+59%). Customer foot traffic grew as well, with average weekly attendance increasing from 1,100 to 1,500 shoppers (+36%). Total annual sales rose from \$420K to \$750K (+79%), putting additional dollars in the pockets of growers. SNAP/EBT sales increased from \$4,970 to \$14,222 annually (+86%), and SNAP/EBT shoppers increased from 280 to 595 (+112%). Because of these results, vendors petitioned the market to operate year-round, an operational change that was implemented in 2022.

To increase access to fresh and healthy foods for older adults while diversifying farm-to-institution market opportunities for farmers and food hubs, the [Farm to Senior Services \(F2SS\)](#) program uses county-based senior meal services while supporting new and expanded markets for local food intermediaries and local farms in the surrounding community. This collaborative effort between Extension and the Center for Environmental Farming Systems (CEFS) has been piloted in 3 counties with funding from the USDA's Local Food Promotion

Program. Team members include Cooperative Extension, senior food services run by the counties or regional councils of government, local food hubs, county food councils, and area farmers. These team members work together to direct their county in supporting area farmers and increasing access to fresh, healthy local foods for older adults. To date, this program has supported a \$169,427 (over 100%) increase in reported local food purchases, distributed 3,745 local meals or food boxes to 5,613 older community members, and helped 78 farmers and food hubs increase their sales. Five food system interns participating in this program have helped increase local food sales through host food hubs and have reported increased knowledge of the challenges and benefits of local food purchased by senior services, the challenges farmers face in selling to senior services or food hubs, and career opportunities in agriculture and food systems.

Extension supported growth at the [Sanford Farmers Market](#) by organizing and managing the market and facilitating vendor meetings throughout the year to gather feedback on how the market could be improved. Extension also enrolled the market in the Senior Farmers Market Nutrition Program (FMNP) and trained vendors to accept vouchers. With Extension's support, the Sanford Farmers Market enjoyed a very successful year, attracting around 600 patrons per week on Saturdays and closer to 700 attendees during peak spring and summer months, over double the average foot traffic recorded the previous year. Based on 21 end-of-year surveys, 64% of returning vendors indicated increases in revenue from the previous year, and 71% of new vendors reported making a profit. Vendors also expressed appreciation for Extension's organizational and marketing support. By participating in the Senior FMNP, the market redeemed 1,200 vouchers for low-income seniors. Extension is currently helping the market transition into a non-profit corporation to further assist with its future growth. **Extension helped create stronger local food systems by building capacity for Farmers Markets.**

[Farm to Early Care and Education](#) (Farm to ECE) is often framed as a win-win for farmers and children under 5, creating a new market while increasing healthy food access. Since 2016, the Center for Environmental Farming Systems has partnered with county-based Partnerships for Children to convene a Farm to ECE Community of Practice that provides technical assistance to child care centers to purchase local food and conduct experiential learning. However, our program evaluation and research indicate that there are challenges to making Farm to ECE a profitable market for producers and food businesses. The principal issues are that child care facilities purchase low volumes of local food (due to small serving sizes and enrollment), and purchasing and delivery are decentralized. In 2021, the CEFS Farm to ECE initiative received a USDA Regional Food Systems Partnership Program grant to pilot, evaluate, and disseminate models of local food procurement that aggregate demand to address these challenges. The Year One evaluation revealed factors to consider as the program moves forward: (1) families with children in ECE settings did not sign up to purchase a produce box over the summer, as anticipated; (2) it is challenging to set up an ordering system that aggregates orders without relying on a third party to coordinate them. The initial findings also show some promising successes; for example, (1) small and family home centers in one county spent \$7,000 purchasing directly from farmers at farm stands and farmers markets, as well as purchasing local food at the supermarket, which was more than anticipated based on past projects; (2) a central kitchen that prepares meals for Head Starts, child care centers, and Meals on Wheels (serving seniors) made one purchase worth \$1,000 from a food hub that sells chopped and bagged local produce. To build off these successes, Extension is exploring more formal systems that would allow small centers to continue purchasing directly from farmers at wholesale rates with delivery. Extension also plans to support additional purchases from this and potentially other central kitchens that face similar challenges (understaffing, space limitations, and equipment failure) that make pre-chopped produce a prerequisite for local food

purchasing. Through this project, Extension engaged 2,163 stakeholders, and child care centers collectively spent almost \$20,000 on local food across 4 counties, supporting a total of 84 farmers directly and through food hubs. Healthy, local food was served to 1,278 children, 1,006 of whom receive federal subsidies, as well as 500 seniors. **NC State Extension developed and delivered research-based training and resources to increase the capacity of Extension agents, farms, schools, and childcare providers to grow farm-to-school programs.**

Describe how the broader public benefited from the program activities.

The Ashe County Farmers Market (ACFM) has been offering supplemental nutrition program access for several years, but despite this program, and despite a record-high number of market visitors in 2020, very few visitors used supplemental nutrition programs to purchase food from the market in 2020 or 2021. To address this problem and increase awareness of this vital resource for local food, Ashe County Extension partnered with the ACFM Community Committee by creating and executing a **consumer awareness campaign**. Extension created information resources, including a social media graphic and an interactive flyer, which was translated into Spanish. Hundreds of these flyers were distributed by Extension and ACFM members, the social media graphic was shared on Ashe County community social media groups and organization pages, and the market's **Double-Up Bucks** offering was promoted through notifications on the [Visit NC Farms app](#), informing consumers that for every dollar SNAP customers spend up to \$20, ACFM will double the value of their SNAP benefits when they are purchasing fresh produce. Thanks to this awareness campaign, compared to 2021, spending for various supplemental nutrition assistance programs increased from 100% to 811%, with the highest percentage increase in Women, Infants and Children (WIC) benefit spending. The success of this campaign after just one year demonstrates a clear opportunity to reach even more Ashe County residents. The ACFM is currently seeking financial backing to continue offering WIC and Senior Farmers' Market Nutrition Program (FMNP) benefits for the 2023 season. **With Extension's help, local agribusinesses are continuing to increase direct consumer spending at farms, narrowing the disconnect between consumers and the agriculture community.**

To educate residents and stakeholders about the importance of agriculture, Lee County Extension launched the first annual Lee County **ag week program, Farm Forward**. Kicking off at the season opening of the Sanford Farmers' Market, over 800 visitors learned about local agriculture and engaged with the people who grow it, making purchases directly from farmers. A stakeholder breakfast with economic development representatives, agricultural leaders, and policymakers highlighted the value of a robust, sustainable, and diverse agricultural economy across NC. Throughout the week, hands-on educational programs connected residents to farms and fields, with topics including blueberry and strawberry production and care, embryology, and landscaping. According to survey responses from program participants, there was a 58% increase in knowledge about local agriculture. **By partnering with local food markets to engage consumers and provide education surrounding the affordability, quality, and importance of local foods, Extension strengthens local food economies while empowering consumers to make informed decisions and become more food secure.**

In partnership with the Sanford Farmers Market, Extension in Lee County created a new local foods program called **Market Menu**. This **social media marketing program** releases [weekly recipes](#) based on products local vendors will have available at the market each Saturday. Included with the recipe is a vendor map with icons showing which vendors have the featured ingredients. This information was shared on the Sanford Farmers' Market Facebook page, through campaign newsletters, and on the Lee County Extension website, and paper copies

were provided at the market each week. In the first season of the Market Menu program, 34 recipes were shared, with a digital reach of 33,483. In addition, 41 new individuals signed up for Lee County's Food and Nutrition Newsletter, and a demonstration video for a featured recipe attracted over 6,000 views on YouTube. One market manager reported that a local meat vendor completely sold out of sausage one day because it was a featured ingredient in the Market Menu. Through the new "Market Menu" program offered by Extension at the farmers market, which promotes the use of local foods in healthy recipes, 85% of market patrons surveyed said they were more likely to buy the local foods featured in the Market Menu and prepare the featured recipes for their families. **Extension helped local vendors use engaging social media marketing strategies to draw new customers to farmers markets and increase profits.**

The [Union County Food Hub](#) was created in 2021 to connect farmers to local consumers and businesses, but as the program began to grow, it struggled to manage increasing traffic on its online platform, farmers began selling out of products, and other logistical issues made it difficult for consumers and local restaurants to access local food through the market. To address this problem, Extension added more pick-up locations and times, switched to a new online platform, and hosted surplus produce sales from local farmers markets at the Food Hub. Extension also worked with current farmer vendors to increase the quantity and variety of crops they grow. With these improvements, the Food Hub is now receiving 50 or more retail orders weekly, over 60 farmers are participating, and the Food Hub has generated an estimated \$180,000 in annual revenue for local farmers. The changes to the online platform vastly improved the shopping experience, required fewer hours to manage updates, and enabled the creation of multiple sites for different customer bases (e.g., wholesale versus retail). Thanks to the improved ability to meet restaurant needs, 40 local restaurants are now participating in the Food Hub, and restaurants have become more aware of the local supply of high-quality farm fresh goods the Hub provides. Extension's local foods website and social media platforms have been used to highlight each of these businesses as they continue to support the local food movement, and in turn local residents have sought out these community-minded businesses to support them. The Food Hub has quickly become a means to connect local farmers to consumers and restaurants. **Extension helped agribusinesses take advantage of low-cost marketing opportunities that keep pace with rapidly evolving technology.**

To help Wake County residents access fresh local produce, Extension leveraged American Rescue Plan dollars to award \$36,766 in **mini-grants** to 7 farmers markets across the county. Many of these markets enjoyed more than doubled market attendance and record-breaking SNAP sales, and all but one reported improvement in the diversity and quality of their vendors. In addition, local food pantries expressed gratitude for the new supply of fresh local foods. In total, the markets made an average of \$10,610 in SNAP/WIC/Senior Market Voucher sales, provided \$6,436 in match funds, purchased \$8,036 of excess produce from farmers, and donated 5,744 pounds of produce to local food pantries. **By growing local farmers markets and food hubs, Extension helps new farmers enter local markets while increasing community access to fresh, healthy local foods and providing spaces for people to gather and mobilize behind local food system initiatives.**

Professional Development & Multistate Activities.

The following **professional development workshops** were provided by Extension specialists for Extension agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- Agritourism: Enhancing Educational and Marketing Impacts

- Crafting an Agritourism Spotlight
- Building a Food Hub: From Dream to Reality
- Extension Local Food Program 101
- Growing the Local Food Supply Chain: NC Farm to Senior Services
- NC Cooperative Ext Agents Role in Farm to Early Care & Education

The following **Factsheets and Peer Reviewed Extension Publications** were developed by Extension specialists for dissemination of research-based information to Extension agents, growers, and other stakeholders.

[Raising Prices on Meat, a Pep Talk](#) (LF 019)

[Online Sales Platforms for Direct to Consumer Sales](#)

Describe the issue or problem that the program addresses.

North Carolina's community wellbeing is built on a foundation of inclusive, empowered leadership and productive decision-making. NC has vast untapped potential and resources in its leaders, organizational governance, community decision making, and collaborations. Today's communities face issues too complex to be solved by community leaders using methods that preserve the status quo. Communities need diverse leadership with new and innovative ideas. NC communities face intricate issues like economic mobility, bridging the rural-urban divide, and reconnecting to our communities that require engaging increasingly diverse community members to serve as a resource to address these challenging issues. It also requires building leadership capacity and working alongside these community leaders to implement change. Communities can build capacity for civic dialog on complex issues and make leadership groups more productive and inclusive to create opportunities for partnership and collaboration and optimize community wellbeing. Extension must help communities adapt to rapidly evolving needs by developing its staff, community leaders, and partners to amplify the capacity of NC's leaders, organizations, and communities to ensure sustainable and equitable prosperity for all North Carolinians.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

To support leadership and volunteer development, NC State Extension specialists and agents strengthened communities by increasing the knowledge and skills, overall numbers, and diversity of community volunteers and leaders by providing general leadership development, facilitation skills, volunteer training, communication, assessing personality types, and increasing diversity, equity, accessibility, and inclusion within community groups. To support organization and community development, Extension specialists and agents built organizational capacity to accomplish goals through training and technical assistance in strategic planning, governance, and facilitating complex decision making. To support partnership and collaboration development, Extension agents worked with community groups and coalitions to increase collaborative practices and provided training and technical assistance to increase knowledge and skills in partnership development and maintenance, working with difficult people, fiscal and project management, and avoiding turf issues.

Describe how the target audience benefited from the program activities.

NC is a racially and ethnically diverse state; roughly 10% of the state's population is Hispanic/Latino. But Latinos face challenges associated with economic stability and access to education and healthcare. To address these challenges, Extension worked to build capacity to effectively engage with Latinos and other diverse audiences. Since 2020, Extension has led the [Extension Farmworkers Health and Safety Program](#) aimed at preventing the spread of COVID-19 in the agricultural community by **supporting educational and vaccine events**. In 2022, this program expanded to 2 western counties, Henderson and Ashe, and a team of 5 educators provided 65 **on-farm training sessions** to 2,248 farmworkers, 48 growers, and 13 farm labor contractors.

Extension also advised the leadership team of the [Juntos program](#) on engaging with youth and families. By providing **feedback and recommendations** for revising the middle school family

engagement workshop curriculum, Extension helped the Juntos program leaders better engage with and meet the needs of Latino families with school-aged children.

In 2022, Extension partnered with Cape Fear Latinos and the New Hanover County Government to host a **Cape Fear Latino Festival** at the New Hanover County Arboretum. This provided a platform to enhance connections with and support for the local Latino community in southeast NC. This event featured Latin-inspired dance, music, entertainment, vendors, and food trucks and hosted the first local Latino pageant. Over 3,000 people attended and were able to explore the distinct but similar cultures of Mexico, Puerto Rico, and El Salvador, to name a few, all while becoming more familiar with New Hanover's Cooperative Extension Center and Arboretum. Attendees were also able to connect with various non-profit organizations, discovering resources and opportunities that they may not have had access to in the past due to language barriers or other social barriers. Proceeds from the event will be used to provide programming, assistance, and resources to the local Latino community. **Through a variety of efforts, NC State Extension supports programming designed to meet the unique needs of limited-English speaking and culturally diverse populations while building more equitable, connected, and inclusive local communities.**

The COVID pandemic eliminated in-person meetings for at least a year in many communities, and Cherokee was no exception. But unlike most of the state, Cherokee does not have widespread internet service, making in-person meetings crucial for communication and education. The **Revitalization of Traditional Cherokee Artisan Resources** (RTCAR) initiative is a multi-year program designed to assist the Eastern Band of Cherokee Indians (EBCI) in restoring the traditional Cherokee balance between maintaining and using natural resources. **Artisan Listening Sessions** for EBCI artisans to voice their needs were created, and the **RTCAR Advisory Council** was reintroduced to educate non-profit partners about the needs of EBCI artisans. Results have been very positive. The listening sessions have drawn an average of 7 attendees per quarterly meeting, and the Advisory Council has had an average of 4 organizations attend per monthly meeting. In the short term, artisans are now able to voice needs (Artisan Listening Sessions) to a neutral party in Cooperative Extension, and nonprofits better understand the needs of artisans (Advisory Council).

In the wake of COVID-19 and earlier organizational challenges, Durham County's Extension Advisory Council was struggling to thrive. To help **revitalize the advisory council** and ensure that it equitably reflected the Durham County population, Extension helped the Council launch an open community application and extensive promotions through Extension programs, social media, and county information outlets. To recruit Latino community members, Extension supported translation and interpretation efforts as well. As a result of this collaborative effort, 25 people applied to serve on the Advisory Council, and Durham County successfully recruited a racially and socioeconomically diverse group, including formal and informal community leaders, parents, county partners, and more. Seventeen new members were selected from the applicants, including 3 who identify as Latino, 2 of whom are active Spanish-speaking parents in Extension programs.

Extension also supported diversity and inclusion efforts in Durham County by **helping a steering committee** select the new "backbone team" to coordinate and support implementation of a new Early Childhood Action Plan (ECAP) for the community, [Grown in Durham](#). Together with a small team of steering committee members, Extension launched a process to select the new backbone team. There was a heavy focus on ensuring the team recruitment was as inclusive as possible; to this end, all materials were available in Spanish and English, interested groups were able to apply for some or all parts of the roles, and recruitment prioritized groups with lived experience associated with community engagement and power sharing. After a

thorough application and review process, the Grown in Durham Steering Committee voted to select the Durham Collective for Early Childhood Equity, a group of community leaders, as the new backbone support team. This team brings lived experience and content expertise in areas such as culturally affirming learning environments, reproductive justice, language justice, and violence prevention. The County approved funding and a contract for this team, which is among the first of its kind in Durham County. **As a leader in capacity building and community engagement, Extension helps local organizations build inclusive leadership teams that cultivate stronger, safer, and more equitable communities.**

The Riverview Community Center and the Creston community it serves are often overlooked in Ashe County due to their isolated location. A Riverview Community Center board member reached out to Ashe County Cooperative Extension to request help engaging with the community through the Center. In 2022, Extension helped deliver a variety of workshops and events at the Riverview Center, including food safety and home food preservation training. Ashe County 4-H also fielded questions about opportunities for local youth and homeschool groups at the Center. As a result of this collaboration, ties between Creston, the Riverview Community Center, and Ashe County Cooperative Extension continue to grow, and Ashe County 4-H has expanded its reach into Riverview, attracting new parent volunteers and new youth enrollments in summer events and partnering with homeschool groups to deliver enrichment activities throughout the year. As the partnership between Riverview Community Center and Ashe County Cooperative Extension grows, so does the potential for both organizations to build and maintain a thriving community through mutual support and research-based education. **Extension cultivates and expands local partnerships to ensure that communities thrive, providing the expertise needed to obtain funding and resources that revitalize community programming.**

Describe how the broader public benefited from the program activities.

Approximately \$60 million in American Rescue Plan Act (ARPA) funds are flowing into Durham County to aid in pandemic recovery with broad criteria for how these dollars are allocated. Durham County leadership staff reached out to Extension for help fleshing out specific categories for a large ARPA request for proposal (RFP). Using community and staff engagement findings as a foundation, Extension delivered specific language for 4 of the 7 RFP areas, and Extension staff reviewed, scored, and made recommendations about the proposals received. As a result of Extension's assistance engaging the community around ARPA priorities, over \$6 million in funding was recommended by staff. Many of these projects support smaller, community-rooted organizations, which is a core priority for Durham County.

The Pamlico County Commissioners expressed their desire to hold a commissioner's retreat. Commissioners were faced with long-term planning issues and needed an opportunity to address concerns, formulate questions, identify short-term and long-term needs/goals, and begin to prioritize these needs/goals to aid in budget development. Because Extension personnel had facilitation skills that would benefit this activity, Extension was asked to work collaboratively with the county manager to develop a facilitation plan to address commissioners' needs. A single day retreat was held, with all 7 county commissioners, the assistant and county manager, the finance director, and with Cooperative Extension serving as the group facilitator. County administrators shared requested information with commissioners and addressed questions, and Extension assisted in developing a written record for additional needs for information. Extension also facilitated a needs assessment for all county departments and prioritization of those needs into short-term and long-term action items. As a result of this activity, county commissioners were able to identify additional information requirements for

future planning, and action steps were taken to answer these questions. In addition, a prioritized list of needs was generated to assist commissioners in budget development for the current fiscal year and into the next 3–5 years.

According to the April 2021 Currituck County Department of Travel and Tourism [First-Time Visitor Study](#), “over one-half (57%) of the first-time visitors (to the Currituck Outer Banks) plan their travel at least six months in advance and twenty-nine percent, three to five months in advance.” Repeat visitors to the Currituck Outer Banks may book their stays up to one year in advance. The last strategic plan developed for Currituck Travel and Tourism was in 2017. The director of Currituck Travel and Tourism approached the Director of the Currituck County Center of NC Cooperative Extension to facilitate an updated strategic plan. The County Extension Director (CED) convened a group of tourism staff, advisors, and constituents for a ½ day, facilitated session. With the assistance of some pre-work, the group conducted an assessment of the current strengths and weaknesses of Currituck tourism, refined a 3–5-year vision for tourism development in Currituck, and identified strategies to support the vision. As a result of this effort, a plan was completed that will guide Currituck Travel and Tourism staff and advisors for the next 3–5 years. Ten key goals were identified, and concrete action steps were developed to move these goals forward. Participants were provided with an exit survey to evaluate the value of Extension facilitation services. One hundred percent of respondents rated the value of these services as good or excellent and felt that their ideas were heard and considered. Ninety-five percent felt that the session achieved the results intended. Many participants requested additional sessions to dive deeper into various topics and ensure that the process continues to move forward.

In Rutherford County, there is both demand and support for a community-based food system that fosters a thriving agricultural economy and ensures equitable access to healthy and affordable foods for all residents. Cooperative Extension in Rutherford County has been the lead agency for many years in facilitating community partnerships around local food work; however, a more structured coalition was needed for greater community impact. To strengthen and build a more sustainable food council, Cooperative Extension agents led council members through a strategic planning process utilizing resources from NC Community Food Strategies. In addition to strategic planning, the council also conducted 3 listening sessions and a strengths and opportunities survey to gather input from the community on current strengths, needs, barriers, and opportunities for growth. The strategic planning process resulted in revising the council's mission, vision, and core value statements, setting overarching goals, and developing a shared leadership structure to ensure the sustainability of the council in the future. The data gathered from the community survey and listening sessions has been compiled and is currently being used to guide the council's work. Each of these accomplishments has made our council more robust and cohesive and provides the foundation needed to successfully address the needs of the community.

Guilford County has a history of food insecurity and has received national attention for its high food insecurity rate. Staff from the NC Cooperative Extension Guilford County Center convened meetings around the development of a food security program and county-wide food security plan. Four meetings were held with stakeholders and community partners to draft and revise the plan with direct input from community-based organizations and grassroots community leaders. When the Food Security proposal was presented to the Guilford County Board of Commissioners by the County Extension Director, it was coupled with statements of support from 5 recognized community leaders and 3 organizations, which demonstrated Extension's intentional involvement of the community in developing the program plan. As a result of the partnerships established prior to approval of the Food Security Program funding, NC

Cooperative Extension Guilford County Center is well positioned to begin convening an official program advisory council and begin the work to improve food security for Guilford County residents.

Yadkin County's Professional Development for Health Services Operations Team provides oversight and support for the Department of Human Services. They are often the first faces people see or the first voices they hear on the phone when DHS is contacted. To operate effectively, this group must communicate efficiently and appreciate each other's roles on the team. To enhance this work culture, Cooperative Extension was invited to facilitate a retreat meeting for the group. The county Extension director facilitated the group of 9 health services operations professionals. The goals of this meeting were to ensure participants knew the importance of their roles on the human services team, get to know their team members' personalities through True Colors, and develop strategies to work together and have fun at work. As a result, the team developed a strategic plan on how to work well together and have fun doing so. The plan was dual-faceted because it also addressed how to engage customers and provide excellent customer service. The Yadkin County Extension Service will continue to provide this facilitation service to the community.

In the Fall of 2021, the Caswell Local Foods Council restructured, and Extension was asked to be involved with the leadership of the council. A deep examination of the operation of the food council was needed, particularly regarding attendance at the farmer's market, which the food council operates. Caswell County Extension, along with the local food council, met with vendors and producers from the region, developed plans to manage the farmers market, and agreed to extend the operation later into the fall. A partnership with a local health collaborative was formed to provide farmers' market vouchers to food-insecure residents in the Caswell community. Extension agreed to provide training and information booths throughout the market season and to provide information on nutrition, gardening, and growing produce. Cooking demonstrations that highlighted the produce that was available at the market that day were added. Through the collaboration, over \$2,200 in market vouchers were redeemed, and 100 community members were reached weekly from mid-April through late September. Over 2,100 people attended the market, and there were gross sales of \$28,000 from the weekly average of 12 local vendors. **NC State Extension professionals are helping to build stronger communities by serving as facilitators for community engagement in collaborative efforts to address issues facing their local communities.**

Professional Development & Multistate Activities.

The Cooperative Extension System is challenged to recruit and retain a high-performing workforce to provide effective informal education to the nation's families, farmers, youth, and communities. To meet this growing need, 26 Extension interns representing 11 colleges and universities served across NC. Among surveyed interns, there was a 31% increase in interns who described themselves as "very or extremely interested" in pursuing a career in Extension, a 31% increase in interns who described themselves as "very or extremely interested" in working in a rural NC county, and an 11% increase in interns who described themselves as "very or extremely interested" in pursuing a graduate degree in Extension education. Among County Extension Directors, 100% indicated they would participate in the internship program in the future, and 90% reported gaining new knowledge or skills from their intern.

To strengthen Extension leadership development, 31 agents attended a statewide **NC Association of Community Development Extension Professionals (NCACDEP)/ Community and Rural Development (CRD) training**. During this 3-day training, agents

received professional instruction in facilitation, storytelling, economic development, and many other diverse areas of CRD work.

To help Extension agents improve their facilitation skills in both in-person and virtual environments, the NC Cooperative Extension Master Facilitator team provided an in-service training called “**Connections that Work.**” Approximately 40 Extension personnel throughout NC learned tools and techniques that they can apply immediately in any environment, including skills to motivate a group, build consensus, maintain focus, foster a sense of ownership, and inspire action.

In addition, the following **professional development workshops** were provided by Extension specialists for Extension agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- Belonging and Community Panel: DEIA Practices in Extension
- Maximizing Hybrid & In Person Facilitation
- The Quest for Partnerships: Threading the Maze to Get There!
- Using Systems Thinking to Create Change

Describe the issue or problem that the program addresses.

North Carolina is changing rapidly. Changes in state demographics, shifts in living patterns, and the influx of migrant workers create a need for health and safety education and financial literacy and planning. The agriculture industry generates roughly 17% of NC's workforce and gross state product. The NC Department of Commerce estimated that there were over 67,000 migrant, seasonal, and H2A farmworkers in the state during the peak season in 2022. NC ranks fifth in the number of farmworkers holding an H2A temporary agricultural visa. NC's vital agricultural workforce is a vulnerable group that faces risk factors such as low socioeconomic status, limited access to health care, unique health risk factors (e.g., pesticide exposure, adverse weather events, stress-related mental health challenges), and culture and language barriers. The COVID-19 pandemic heaped more challenges on this already vulnerable community.

Rural stress, broadband connectivity rates and utilization, and the number of communities needing upgraded infrastructure and services affect the state's opportunities to attract new businesses and residents. NC State Extension helps strengthen NC's infrastructure and resilience to build on technological opportunity and address demographic changes, workforce health and safety issues, and consumer demands to build the future economic, health, and social wellbeing of NC communities.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

To support leadership and volunteer development, NC State Extension specialists and Extension specialists and agents provided training and technical assistance to support workforce physical and behavioral health and safety, as well as reduce farm stress and support rural wellbeing. Extension agents provided training and participated in committees to plan for and build and support local infrastructure, including farmers market relocations, agricultural center planning, greenway development, smart growth, and broadband access and utilization.

To combat the health inequities experienced by agricultural workers and their families, Extension researchers published a **literature review** on the subject and curated a list of over 700 health **education materials** for agricultural workers and their families. Extension conducted **focus group** discussions with community health workers who serve the agricultural workforce across the state, publishing the findings in articles in the *Journal of Agromedicine*, the *Health Information and Libraries Journal*, and the *Journal of the Medical Library Association*. In addition, Extension distributed **educational content creation technology** to community health workers, including ring lights, tripods, megaphones, TVs, tablets, projectors, and audio PA systems; created 8 **videos** (4 each in English and Spanish) on searching for and evaluating health information online; created 3 **health education videos** on TikTok; and provided 5 **webinars** to over 150 participants on technology and agricultural worker education materials, finding online health information, and designing educational materials. Extension also supported diverse community partners by providing **Chromebooks and hotspots** to facilitate health education. In 2022, Extension research findings regarding health education for agricultural workers were presented in a 3-hour interactive **workshop** at the East Coast Migrant Stream Forum, reaching dozens of clinicians, administrators, and community health workers from across Eastern NC and beyond. Extension also collaboratively developed the first **bilingual flip-**

chart on digital literacy, which focuses on free smartphone apps to help workers access information that will help them maintain their safety and health.

To build and strengthen relationships with the farming community while providing educational programs to enhance agriculture worker health and safety, Extension developed the [Farmworker Health and Safety Comprehensive Program](#). Since launching in Wayne County in 2014, the program has expanded to 8 additional counties. The program employs a regional model with 5 components based on lessons learned and past program successes: (1) farmworker training, (2) farm labor contractor workshops, (3) community educational events, (4) a sustained Farmworker Partners Coalition, and (5) Extension cross programming. Through this program, farmworkers receive the **training** they need to be in compliance with good agricultural practices (GAPs) and worker protection standards. During the COVID-19 pandemic, the program was adapted to prevent spread in the agricultural community. A COVID-19 awareness piece was added to the farmworker training, and the program team developed the educational tool [Me Informo y Decido](#) (Get Informed and Decide), a COVID-19 **prevention and vaccination guide** tailored to the unique needs of agricultural workers. The program also partnered with the NC Department of Health and Human Services (DHHS) to **distribute PPE and COVID home test kits** to the agricultural community via County Extension Centers. Through these partnerships, 3 **farmworker fair events** were hosted, providing 637 attendees with agricultural health and safety resources and education.

In 2022, the Farmworker Health and Safety Program provided 68 **on-farm training sessions** to 2,248 farmworkers with the support of 48 growers and 13 farm labor contractors. GAP Connections also invited the program to present at their annual farmworker training, attracting 174 attendees across 2 locations. To increase farm safety and productivity, the program offered 2 **Spanish Pesticide Applicator Schools**, serving a total of 47 farmworkers across 2 counties. The participants achieved a 34% pass rate, which was an increase from the 26% pass rate in 2021. Along with the Spanish Pesticide Applicator Schools, the **Farm Labor Contractor (FLC) Workshops** were brought back for the first time since before the pandemic, helping a total of 29 participants keep pace with ever-changing rules and regulations in agriculture. A 2022 survey of 334 Farmworker Health and Safety participants achieved an average of 90% correct answers for COVID-19 related questions, suggesting that this program was very effective in teaching farmworkers important safety information related to the pandemic. In partnership with stakeholders, the Farmworker Health and Safety Education program also developed a **digital literacy curriculum for agriculture community members**, with a focus on keeping this population informed on health and safety and helping them access resources through smartphones.

In its first year of operation in Henderson County and Western North Carolina, the Farmworker Health and Safety Program completed 12 **on-farm trainings** attended by 167 farmworkers. The training consisted of WPS pesticide safety, COVID updates and protocols, and heat stress awareness and safety. All the trainings were conducted in Spanish. At the training and subsequent **farm visits**, individual, specific translation/training was also provided. COVID test kits were provided to all participating farms. Six **fire extinguishers and first aid kits** were also delivered. Based on follow-up surveys, the training was 100% helpful; the visual aids/flip charts used were very helpful; the presentation was interactive and impactful; the trainings helped build relationships between growers/supervisors and farmworkers; the workers did implement WPS training in their work days; PERC, WPS, and displays/signs were appreciated and used; the COVID test kits were helpful, used, and protected privacy; the COVID training was informative and timely; the heat stress training was informative for workers and growers; and all said they would like more trainings in 2023. NC Cooperative Extension also worked with 14 organizations

and their representatives to organize a Farmworker Fair held at the Hola Carolina Cultural Center in Jackson Park. Over 100 farmworkers and their families came and celebrated at the first Farmworker Fair and visited the booths filled with information and fun activities for farmworkers and their families.

Alleghany County, NC and Grayson County, VA are both rural counties with many small family farms. Keeping farm workers safe is a priority for the whole community. Many farm workers in both counties only speak Spanish and need information that can be translated. Many organizations come together every fall to offer **farm safety training**. Farm workers are split into groups and visit a variety of different stations. A total of 783 farm workers from 4 different farms attended the event. The stations were interactive, allowing farm workers to ask questions at any point. Local stories of farm accidents were shared about people in the community that failed to use safety precautions on the farm. Each 20-minute rotation is an education that could save their lives. There is no way to assign a dollar amount to the value of this event, but informal interviews with farmworkers indicated a significant increase in knowledge on preventing accidents and recognizing safety issues. **As a leader in experiential education, Extension works with researchers and community partners to develop and deliver effective, evidence-based programming that safeguards the health and safety of NC's agricultural workforce while addressing social inequities experienced by Spanish-speaking immigrants.**

Describe how the target audience benefited from the program activities.

Watauga County Cooperative Extension has worked with county government, consultants, and nonprofits (NC Choices) to develop a plan for the construction of a new **High-Country Kill & Chill Processing and Livestock** facility, to be sited on the county's existing landfill property and to develop a public-private partnership with a locally established small-scale processor. Extension worked with the High Country Council of Governments and other partners to write, develop, and submit 6 different grant proposals to fund the project. The proposed High-Country Kill & Chill Processing and Livestock Center will expand critically needed capacity of red meat processing in Western NC and help establish the broader "High-Country" as a center in the eastern US for breeding, growing, and processing premium high-quality meat products. This project prioritizes agricultural and economic development for livestock farmers and the business community in the area, which will be significant. The regionally-centered slaughter & packing facility will benefit producers in our region's agricultural economy, many of whom transitioned from tobacco production in rural, economically distressed areas of the western North Carolina mountains. Watauga Butchery, the intended tenant of the kill and chill facility, was established in 2020 in response to the COVID-related shortage in local processing, in an existing custom facility which lacks an inspected kill floor for USDA slaughter. To date, the project has been awarded almost \$2.3 million in grant funding from Golden LEAF, Tobacco Trust Fund, Appalachian Regional Commission, and the NC Ag Development Trust Fund. The county also committed \$500,000 in American Rescue Plan funding for the project. Reconstruction is scheduled to begin in 2023.

To increase market value and open new marketing channels for quality hay and straw produced on farms in Cleveland County, NC State Extension collaborated with the Cleveland County Economic Development Partnership on **equipment and infrastructure improvements** to a local hay and straw reprocessing agribusiness and the surrounding area that were needed. These enhancements were projected to strengthen the farm economy, protect and preserve farmland, and help sustain small family farms in the region. NC Cooperative Extension collaborated with the Cleveland County Economic Development Partnership to apply for funding

from the NC Agricultural Development Program to cost-share with Toluca Grain & Hay on these improvements. The agribusiness partner financed construction of a new \$305K processing building, and NCADFP funds (\$42.5K) aided in the purchase of a 21-pack Bale Baron (costing \$98K), a system that accumulates and packages small square bales into uniform bundles secured with twine. The bundles can be handled multiple times in and out of storage and retain their original shape. The bundle is specifically designed to fit into van trailers and onto flatbeds and can be loaded/offloaded mechanically. This benefits the processor, the farmer, and the customer. NC Cooperative Extension supported the project by providing **technical support and educational programs** that help farmers improve hay and straw management and marketing strategies and help educate consumers about hay quality. Thanks to the efficiency of mechanization and improved facility layout and design, Toluca Grain & Hay reprocessed approximately 300,000 bales of hay and straw during year 1 of the project, supplying more than 150 feed stores, building and landscape contractors, hardware stores, and livestock producers with products for end use or resale. Reprocessing services were provided to 7 local hay growers, helping them double the value of their farm-raised forage crops.

Special Operations Civil Affairs soldiers are deployed to help indigenous populations rebuild and improve their quality of living in war-torn regions. These soldiers are often called upon to help in the area of agriculture. Civil Affairs soldiers come from various backgrounds, but few have agricultural backgrounds. The military looks to Cooperative Extension to provide basic agricultural training for these soldiers to ensure they will have agricultural knowledge before being deployed. Cumberland County Cooperative Extension partners with Civil Affairs Special Operations soldiers from Fort Bragg to provide a **2-week agricultural training**. The training course consists of an overview of agriculture and agricultural practices, followed by **visits to local farms** that are of a scale that the soldiers will most likely encounter during their deployments. At the farms, the soldiers interact with the farm owner and engage in farm activities. As a result of the agricultural training, 20 Civil Affairs soldiers reported they doubled their agricultural knowledge. The military leaders stated the training Cumberland County Cooperative Extension provides the Civil Affairs units will be very useful on their future deployments. Soldiers gained valuable knowledge and engaged in hands-on activities, ranging from properly taking soil samples to working with dairy goats.

To address food access and food insecurity challenges and strengthen Randolph County's local food system, **a food hub and commercial kitchen space** were added to the future Farm, Food, and Family Education Center. To identify how these spaces needed to look for the county, tours were completed at various food hubs and commercial kitchen spaces across the state from Asheville to Durham. Architects, community stakeholders, and Extension agents visited these locations to ultimately determine what would work best for Randolph County. The food hub and commercial kitchen plans have been completed under the Design Development phase. These facilities will create a space for local (within 100 miles) producers, business owners, etc. to make and sell their products in a comprehensive way. It enables Extension to reach underserved areas of the community and assist residents through various programs for individuals that receive federal nutrition benefits, low-income families, and food insecure individuals. As a result, the local food system will become stronger and more resilient, eventually decreasing the overall food insecurity in the county.

Describe how the broader public benefited from the program activities.

Twelve percent of the Wake County population, including 37,000 children under the age of 18, is food insecure. Many residents lack access to fresh produce and nutrient dense foods. Lack of

access is a complex issue impacted by a broad range of factors, including inadequate income, lack of reliable transportation, and lack of grocery stores in urban and rural areas of the county.

In 2022, Wake County Extension continued its partnership with the [Tangelo](#) Mobile Grocery App and The Produce Box, a local food hub, to pilot a local food grocery delivery program. Once on the app, residents complete a social risk screening, and then redeem their food benefits for nutritious, fresh, culturally relevant food delivered to their doorstep twice a month. “Many of the participating households reside in food deserts – places where it’s tough to find fresh, affordable food,” said Wake County Board of Commissioners Chair Matt Calabria. “This new program will allow us to overcome food deserts, transportation barriers and other hurdles that have historically prevented people from accessing nutritious food. The healthy food will come directly to them.”

Wake County Extension secured \$250,000 American Rescue Plan dollars to support the pilot program, which partners with local farmers and farm aggregators to build and deliver fresh produce boxes to food insecure individuals. The program operates using a mobile app, and it is as simple as signing someone up with their email to set-up monthly deliveries. The app also tracks dietary improvements in users through in-app surveys, and it offers agents the opportunity to share important health information through the app.

The **Tangelo grocery delivery pilot** resulted in the delivery of 50,792 pounds of fresh, local produce. Of the 500 clients served, 93% accessed information on the local EFNEP program and important information on COVID-19 testing sites and vaccines. In addition, users enjoyed a 21% improvement in overall dietary quality and an estimated net healthcare cost savings of \$571,710. Wake County has secured an additional round of funding to operate the program in 2023, with plans to expand the utilization of Black, indigenous, and people of color (BIPOC) farmers and to take advantage of Tangelo’s new ability to accept SNAP EBT benefits through in-app purchases. **Extension helps communities implement new technology and innovative service delivery platforms to create efficient, easily accessible solutions to food insecurity and health inequities.**

Professional Development & Multistate Activities.

The following **professional development workshops** were provided by Extension specialists for Extension agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- All About Broadband and Digital Skills
- Connecting about Connection (Broadband)
- Internet Connectivity for Farms with Migrant Farmworkers
- Farm Stress Resources
- Understanding Farm Stress: Behavioral Well-Being - The Key to Healthy Farmers
- NC AgrAbility Ambassador Training

Describe the issue or problem that the program addresses.

The well-being of North Carolinians is determined in large part by local economies. Vibrant local economies have an engaged workforce with a sense of opportunity, thriving downtowns with many local businesses, and high-quality economic development planning that builds on local assets. In NC, small downtowns are building local identities to attract new businesses through placemaking and asset assessment. In the past 30+ years, over \$2 billion has been invested in North Carolina communities to spur economic development through downtown revitalization. This investment has increased the number of new businesses and new jobs. Communities investing in their downtown districts have also seen increased community pride, a greater commitment to historic preservation, and greater support for locally owned businesses. However, there is much more work to do, especially in the rural portions of the state, which have experienced a loss in small businesses over the past 2 decades. North Carolina is facing increasing economic, social, and environmental pressures. As the lifeblood of local economies, businesses and communities need expert guidance, education, and planning to thrive. NC community leaders and businesses also need to be empowered and educated to create more inclusive, equitable businesses, public services, and community engagement initiatives.

Describe how the major activities helped achieve or make significant progress toward, the program goals and objectives.

NC State Extension specialists and agents enhanced workforce skills through technical skills training and certified career pathways, created and expanded strategies to grow local job opportunities and businesses, and assessed employee needs to improve employee work experiences and business profitability. To support rural development, Extension specialists and agents supported local development committees and the teaching of local economic development assessment and planning, presentation of workshops on developing and improving agritourism and other tourism businesses, use of tourism marketing platforms and small scale manufacturing. To support economic development strategic planning, Extension specialists and agents led workshops on community assessment and asset development, worked with local planning groups to develop and implement missions, visions, and strategic plans, conducted workshops on building planning groups, and educated target groups on wage policies and practices to improve the quality of life for all workers.

In 2022, Extension delivered numerous workshops to help growers build more profitable, resilient farming operations. In Chatham County, Extension delivered a 2-hour **Sales and Property Tax Issue Webinar** for 76 participants, all of whom received a recording of the webinar and an extensive list of resources on the topics. In a post-webinar evaluation, 100% of the responding participants said they increased their knowledge, and 100% said the knowledge gained from the webinar would allow them to make informed tax and business management decisions that will benefit their farms. Participants expressed appreciation for the clear, easy-to-understand explanations and real-world examples provided. Chatham County Extension also provided 107 participants with a 2-part webinar on the Schedule F tax form, which can be especially complicated for beginning farmers. Thanks to this webinar, participants learned what is and is not classifiable as farm income, what expenses can be deducted, how to calculate depreciation and handle the sale of business assets, and how to keep records correctly. Participants received a recording of the webinar and an extensive list of resources. In a post-webinar evaluation, 100% of participants reported increasing their knowledge, and 95% said knowledge gained from the webinar would allow them to make informed tax management

decisions that will benefit their farms. Chatham County Extension delivered a 2-hour **Farm Tax and Business Info 101 Webinar** as well, providing 132 participants with information about topics such as tax ID numbers and farm numbers, farm business structures, and how to identify oneself as a farmer for tax purposes. A post-webinar evaluation revealed that 98% of participants increased their knowledge, and 89% would be able to make better tax and business management decisions as a result of participating.

In Montgomery County, Extension delivered a 2-part mini-series for small farmers, reaching a total of 540 growers via in-person and online instruction and video distribution to an NCDA e-mail list. In this series, growers learned how to utilize online marketing through Google and social media platforms, how to take advantage of direct sale opportunities and use point-of-sale (POS) systems, how to navigate diverse business and legal issues, and how to take advantage of grant programs and other resources. Thanks to partnerships with local organizations, participants heard directly from people already involved in the agriculture industry, including individuals from NC State, the MCC Small Business Center, Carolina Farm Credit, and the Montgomery County Farm Bureau. After attending, 2 new local farmers stated that they feel more confident beginning their businesses. One participant is a veteran who inherited a family farm, a topic covered during the workshop. Two additional farmers who started in the last 5 years also attended and reported that they have a better understanding of the services available to them, and they feel more confident in their understanding of business terminology.

Agritourism operations are increasing in and around Stokes county as agricultural producers look for ways to diversify their operations and increase profits. Stokes County is positioned very nicely in the state to attract many visitors. Many of our new agricultural operations need assistance with developing agritourism operations. A large majority of entrepreneurs, as well as existing operations, need assistance with increasing production, marketing, and legal guidance on interpreting agritourism laws. In partnership with Forsyth Tech Community College, Stokes County Center, Stokes County Cooperative Extension provided a **half-day workshop on agritourism** in April 2022. Topics included discussion about farm liability, value-added product production, and grant writing basics. Twenty five participants attended the workshop with an overwhelmingly satisfied response. Based on the evaluation results, participants had requested to receive more educational information and workshops on agritourism. Together with Forsyth Tech, Stokes County Cooperative Extension will be offering a second annual agritourism conference in January 2023. Additionally, because of the evaluation feedback and a desire to increase agricultural awareness, as well as economic development, an 8-week agritourism short course will be offered at the community college this winter.

The dairy market is particularly volatile, and the beverage milk market in particular suffers from large swings in supply and demand. To address this problem and help local dairy producers expand their businesses, Extension developed and delivered **educational and financial resources for value added dairy (VAD) producers**. Through the Dairy Business Innovation project, COVID release funds, and diverse local and state partnerships, Extension efforts resulted in over \$3 million in funds being awarded to NC producers and the start-up of 3 new VAD operations in 2021–2022. Within hours of posting a list of local VAD farms to Extension social media channels, the post received over 1,000 engagements, and producers reported an increase in sales in the days following. In July 2022, Extension hosted the 3rd Annual VAD Conference in Raleigh, attracting over 70 attendees from across the country and connecting them with current on-farm processors, milk cooperatives, large-scale dairy processors, economists, and dairy food experts. The success of this conference has led to its replication in KY and TN.

New and beginning farmers often lack the financial and marketing training they need to put together a formal farm business plan. To address this problem, Extension's [NC Farm School](#) program helps aspiring, new, or transitioning farmers build profitable businesses. In 2022, NC Farm School programming in Davie County provided 31 farmers with business education spanning goal setting, resource evaluation, sound financial management, and effective marketing strategies as well as field trips to see working farms. Participants also received one-on-one consultations with specialists in agricultural business development, marketing, and production system evaluation. Eighty-five percent of the attendees graduated from the course, and 83% of participants who responded to the post-evaluation had created a written business plan, 62% had created a written marketing plan, 96% had found new marketing opportunities, and 71% had created an enterprise budget. When participants were asked how much they expected their gross farm income to increase as a result of participating in NC Farm School, the projections ranged from \$1,500 to \$20,000 annually and averaged \$8,722 per year. **Extension leverages local resources and partnerships to provide growers with accessible, immediately actionable insights and education they can use to launch new farming operations and make existing operations more profitable.**

Describe how the target audience benefited from the program activities.

Swain County is a major destination for tourists. The Great Smoky Mountains provide outdoor recreation such as fishing, hiking, camping, Great Smokies Train rides, and whitewater boating. Being a service-oriented economy relies heavily on good customer service, whether it is restaurants, lodging, and/or businesses like stores that cater to tourists and residents alike. To help develop the service industry in Swain County, Extension delivered Qualla-T Customer Service and Hospitality workshops ("Qualla-T" being derived from the Qualla Boundary of the Eastern Band of Cherokee Indians). The training teaches skills in professional communication, teamwork, handling difficult customers, and developing a positive workplace culture. A total of 68 employees became certified in "Qualla-T Customer Service and Hospitality," and 90% rated the workshop as "excellent." **As a result of Extension customer service training, visitors to Swain County receive customer service that matches the natural beauty of the area.**

The **Vacationer Supported Agriculture** program that commenced in 2018 with funding from USDA and was sustained through 2022 through a grant from the NC Tobacco Trust Fund Commission connects vacationers in NC beach communities with local food through an **online ordering system**. Produce bags are delivered to convenient pickup sites or delivered directly to vacation homes, with add-on options like eggs, flowers, shrimp, and some meat. Twelve markets are served through 4 farmer aggregator groups. For the 2021 and 2022 season, the Vacationer Supported Agriculture program served 10,685 people and sold 35,501 lbs of produce generating \$237,751 (including \$27K in mini-grants). The program was successful in creating 5 permanent and 22 temporary jobs, sustaining 7 jobs, and upgrading skills for 28 workers.

To connect beginning farmers with land access opportunities and other NC Cooperative Extension resources, Extension continued the **NC FarmLink** website, which allows users to search for information related to farm leases and rentals, find local farmers, get assistance selling farmland or transitioning farmland ownership through legacy planning, and more. With over 70,000 hits on this website, NC Farmlink serves as a first point of contact for new and aspiring farmers searching for land. NC Farmlink helps build a resilient agriculture industry where farmers have affordable options for accessing farm and forest land to create sustainable farm operations; where landowners have viable opportunities for keeping their land in farming;

and where agriculture continues to be an integral part of our economy, environment, and communities across North Carolina.

To promote economic development and address the limited food options on the Qualla Boundary, Extension's Eastern Band of Cherokee Indians (EBCI) Center recruited families and individuals who previously operated food booths at local events to find entrepreneurs interested in expanding into more permanent food operations. After holding an initial community interest meeting and several follow-up meetings, Extension worked with Empowering Mountain Food Systems, the EBCI's Sequoyah Fund, and the New Mexico Street Food Institute to run a 4-day **Food Truck Boot Camp** featuring trainings tailored to the needs of existing and potential local businesses. All of the EBCI members from the community interest meeting attended the 4-day training and reported significantly increasing their knowledge across all focus areas. Four EBCI tribal member food trucks are currently in operation, 2 of which started after developing a relationship with Extension. In addition to EBCI community members, over 40 individuals representing businesses from across Western NC attended the boot camp.

The **Entrepreneur Initiative for Food (EI4F)**, ensures food businesses transform agriculture commodities into safe, nutritious, and value-added food and beverage products. The mission of EI4F is to help small food business owners and prospective entrepreneurs make informed decisions leading to more significant economic development and job creation. These goals are met by offering testing services, creating nutritional facts panels, consultations, and education. EI4F receives food samples created by entrepreneurs for testing (pH, water activity, Brix), classifies the food according to FDA standards, and provides research-based processing recommendations. We meet with our stakeholders daily by phone or virtually to provide consultations, education, and resources necessary for the success of their businesses. In 2022 we provided 899 process recommendation and testing letters and 334 nutritional labels.

NC State's **plant food processing program** has the mission of supporting the food industry and promoting sustainable economic development for the state of North Carolina and beyond. Our efforts involve finding rational solutions from lab scale to pilot-industry scale processes and utilizing residual bioactive compounds for their subsequent incorporation into food products for preclinical health studies. NC State University plays an important role in the North Carolina economy in training and employment for food entrepreneurs. It provides critical technical assistance and education across 3 major metrics: (1) scientific research (2) facilities and resources, and (3) services for businesses in the food industry. We engage in scientific research, technical support services, and food business consulting. This has allowed the program to broaden its Extension impacts because research interests coincide with identified Extension needs within the food industry. For example, there are strong intermixing research and Extension components included in the active USDA-funded grant: Moving American Elderberry into Mainstream Production and Processing. In this project, we investigate innovative ways to upcycle secondary streams of the food industry, such as elderberry pomace, to create functional ingredients. **Extension provided technical support and developed and delivered workshops and bootcamps tailored to meet the needs of new and existing local food entrepreneurs, promoting economic development and expanding consumer choices.**

According to the Department of Veterans Affairs, nearly 200,000 soldiers transition out of the military each year, with many choosing to live in rural areas. Many of these veterans decide to enter the agricultural industry, including those with little to no agricultural experience or knowledge. To help these veterans, Extension in Cumberland County partnered with Fort Bragg's Career Skills Program and various local and state partners to deliver a 5-week **Soldier to Agriculture Program**. During their time in the program, soldiers learn about working in agriculture and visit agricultural enterprises. As a result of this course, 8 veterans are now better

prepared to enter the agricultural industry, and 3 additional classes are planned for 2023. NC Cooperative Extension also partners with the Center for Environmental Farming Systems to administer **Boots on the Ground**, a veteran apprenticeship program that connects returning service members with farming operations seeking new workers. By providing 12 months of hands-on job training and related technical instruction and providing pay, this program allows veterans to transition into agriculture. This program stands out among similar offerings, most of which only offer short-term or online instruction rather than in-depth, paid, on-the-job experience. Extension Agents help apprentices in this program succeed by introducing them to farmers, conducting workshops, and providing supplemental education. **As a leader in experiential education, Extension is helping former members of the military transition to a career in agriculture and run profitable, sustainable operations.**

Describe how the broader public benefited from the program activities.

Nationwide, farmland continues to be converted to non-farm uses such as commercial and residential development. **North Carolina is second in the nation in amount of farmland lost.** Loss of farmland reduces our capacity to produce food and other agricultural products and affects rural communities and farm enterprises. The Orange County community and rural development agent co-leads a subcommittee of the Orange County Agriculture Preservation Board to **analyze farmland loss and to develop prescriptive measures** to reduce that loss. In 2022, the subcommittee analyzed trends and prepared maps in preparation for draft farmland loss-reduction methods for consideration by planners and elected officials as they consider policy actions to address the issue in 2023.

Due to the influx of housing developments, large and small businesses, parks, and existing right-of-ways, it is estimated that Nash County agriculture will lose 11,500 acres of farmland to development by the year 2024. NC Cooperative Extension, Nash County Center has provided farmers and ag businesses opportunities to **participate in the planning process and have their voices heard**. As the Nash County Land Use Plan was being updated in 2022, NC Cooperative Extension brought together the Agriculture Advisory Board, Soil & Water Advisory Board, Farm Service Agency Advisory Board, and Farm Bureau Board to develop a statement with recommendations for the Land Use Plan. The statement provided by the 4 advisory boards brought awareness and acknowledgement to the Voluntary Ag District program within the Land Use Plan and provided a public hearing, allowing public comment for the citizens.

Issues surrounding development, landowner rights, conservation, preservation, government zoning and land-use regulations, and taxation all go hand-in-hand with land ownership. These are all challenges across the state, however, Moore County is unique because, as many counties are losing farms, the recent Farm Census indicated that Moore County grew its number of farms from 713 to 733. At the same time, the spill over from Fort Bragg and the continued growth in the tourist industry has seen an explosion in development that often encroaches on farms and forest acreages. A **Land Use Summit** was designed and presented to Moore County landowners to educate them on matters that affect their land use. Extension legal and economic specialists discussed the importance of estate and land succession planning, and how landowner rights and liabilities affect their goals and responsibilities. Moore County officials from the County Planning and Tax Departments, the Soil & Water Conservation District, NRCS, and the Clerk of Court addressed landowner questions relating to land use, zoning, conservation, land transfer, and tax structures. Professionals from the Forestry Service and Duke Power explained matters pertaining to land management, easements, and rights of way. Summit attendees indicated that 60% plan to establish long range financial plans, with 47% planning to establish a family succession plan; 27% of landowners plan to maximize

current agricultural operations by utilizing cost share opportunities available from NRCS programs; and 27% plan to create forestry plans for managing and averaging woodland profits. These results indicate that rural landowners who create plans to preserve their families' agricultural heritage or reach their financial goals will have an impactful influence on how local planning departments develop policies that balance the need for growth with the need to retain productive agricultural land and open spaces.

To preserve and enhance the value of agricultural production in Chatham County, Extension partnered with the Chatham County Soil & Water Conservation District, the Chatham County Board of Commissioners, and a Chatham agricultural preservation and development trust fund to establish a **Farm/Working Lands Protection Program**. In October of 2022, the Chatham County Board of Commissioners voted unanimously to establish the first-ever county-based trust fund aimed at supporting agricultural preservation and development within Chatham County. This fund will be established with over \$800,000 in seed funding from tax revenues and will be funded in perpetuity to support agricultural preservation and economic development throughout the county. This fund will protect the county's beloved green spaces and rural character while providing greater access to local food and serving as a foundation for agricultural conservation throughout the region. **NC State Extension supported farmland protection efforts to stimulate economic development, support rural businesses, and prevent sprawl as well as maintain food security, preserve open space, maintain heritage, and safeguard natural resources for the benefit of all North Carolinians.**

Professional Development & Multistate Activities.

The following **professional development workshops** were provided by Extension specialists for Extension agents in 2022 to facilitate the use and transfer of new research-based knowledge:

- Agricultural Economic Issues and Updates
- Agricultural Labor Outlook
- Agritourism: Enhancing Educational and Marketing Impacts
- Building Successful Multi-farm Collaborations
- Crafting an Agritourism Spotlight
- CREATE BRIDGES - Supporting Retail, Hospitality, and Tourism
- Cultivating Successful Farm Successions and Transitions
- Strengthening Retail, Accommodation, and Tourism
- Tourism in Your Community

The following **Factsheets and Peer Reviewed Extension Publications** were developed by Extension specialists for dissemination of research-based information to Extension agents, growers, and other stakeholders.

[Legal Issues Surrounding Due Diligence for Solar Development](#) (AG 895-03)

[Present Use Value: Transferring Property Enrolled in Present Use Value Property Taxation](#) (AG 895-04)

[Option Agreements for Purchase of Land](#)

[Limited Liability Companies: Operating Agreement Components and Sample Language](#)

[An Explanation of Ownership Rights in Property](#)

[The Last Will and Testament: A Primer](#)

[The Basics of Trusts in Farm Succession Planning](#)

[The Verbal \(Statutory\) Farm Tenancy](#)

[Tree Fall Liability: Who Is Responsible for Property Damage?](#)