



Proceedings of the FoodFORWARD Research Symposium and Farm-to-Institution Summit

September 13-15, 2022

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Acknowledgments

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FOREWARD

On September 23rd, 2021, the Biden administration released a call to action underscoring the need for systemic changes in domestic and global food systems for feeding the world's population more sustainably, efficiently, and equitably¹. The statement reports, *"The United States is committed to developing innovative, inclusive, science-based, and creative solutions to food systems transformation. It is committed to leveraging the power of well-functioning markets at the local and international levels to bolster food security and sustainable food systems by expanding income opportunities, stabilizing food supply and prices, reducing food loss and waste, and improving dietary diversity and nutrition."* Since then, the national White House Challenge to End Hunger and Build Healthy Communities initiative was launched in September 2022 with aims to end hunger and reduce diet-related diseases and health disparities in the US by 2030 through 5 pillars of action². These initiatives are underpinned by a growing body of research demonstrating the inextricable links between health and food systems, and the need for devising multi-sectorial and multi-discipline approaches to ensuring that healthy foods are sustainably produced and accessible to everyone, everywhere.

Rural communities, especially those experiencing high poverty rates, are disproportionately affected by limited access to nutritious foods and the poor health outcomes that result in obesity, cardiovascular disease, diabetes, and other chronic, diet-related illness.

This trend is apparent in South Carolina, which has the 10th highest poverty rate in the US; 15 of the state's 46 counties experience persistent poverty³. Further, the national percentages of those diagnosed with diabetes or hypertension living in persistent poverty counties is 17% and 45%, respectively, compared to 11% and 38% for the state⁴.

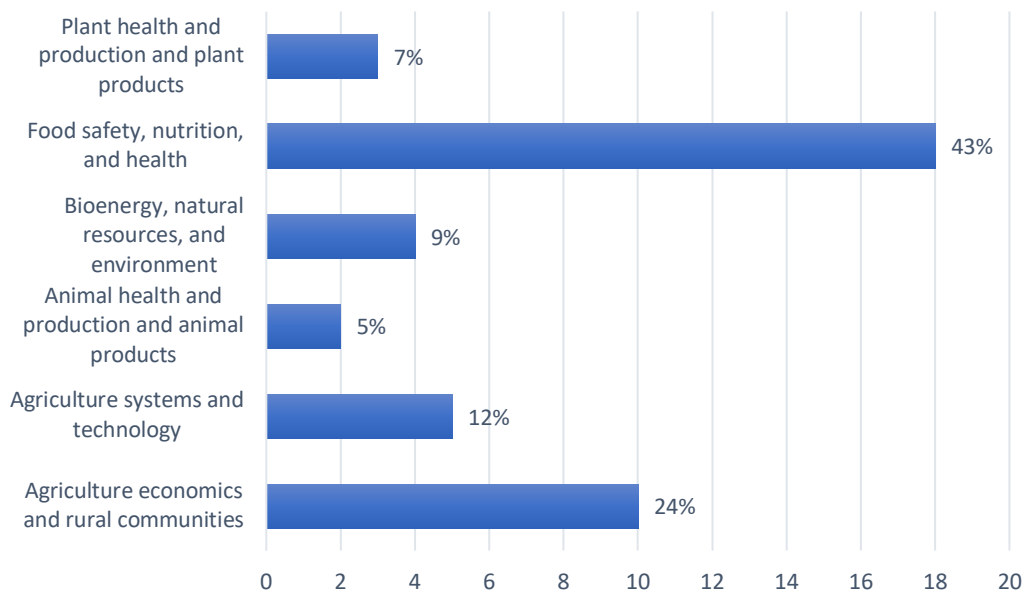
With these sobering statistics and challenges in mind, the question at the heart of planning for the convenings reported in the following proceedings is: *How can land grant academic institutions work across sectors and disciplines to optimize local food systems that better align agriculture with community health and well-being and simultaneously stimulate rural economic growth?*

The FoodFORWARD Research Symposium and pre-conference Farm-to-Institution (F2I) Summit were designed to bring together people working in every element of the food system to stimulate conversation towards identifying points of synergy and strategies for addressing this question. The three-day event occurred September 13-15, 2022 at Clemson University and drew participants from academia, Cooperative Extension, local food producers, food retailers, food service providers, government and non-profit entities. The proceedings herein provide the agendas, topics, abstracts, presentations, and biographical sketches of the presenters. Also presented are results from a pre- and post-symposium assessment designed to gauge the breadth and depth of food related research across the university and interest in sustained collaboration in the form of a working group and ultimately a food systems center or consortium.

Food Related Science Expertise and Interests: A Pre-conference Assessment

The FoodFORWARD symposium attracted a diverse array of expertise and interest in food related research across the Clemson University campus. A total of 168 people registered for the conference including faculty, staff, and students from 5 colleges representing at least 17 departments, several academic centers and institutes, and extension offices and Research Education Centers (RECs) across the state. Forty-two people registered to present oral research briefs or research posters which fell into the following categories indicated by the presenter in the registration form. Shown below, these categories represent the 6 priority areas defined by the USDA AFRI Foundational and Applied Science Program: plant health and production and plant products, bioenergy, natural resources and environment, and animal health and production and animal products. Sixty-seven percent of the presentations fell into two categories: food safety, nutrition and health; and agricultural economics and rural communities – with the former comprising the majority of the presentation topics.

Presenter Topics by USDA- NIFA Categories



To understand the landscape of food related research interest and engagement across Clemson University, including on and off campus affiliates, all registrants were asked questions in the registration form to assess: 1) Expertise and topics of interest for collaboration and 2) history and readiness for seeking funding in food related research. Figure 1 illustrates a broad and varied interest in the full spectrum of food system focus areas with seven areas appealing to 30-50% of the respondents. Of the 150 respondents, nearly half selected “food and nutrition security” and “health and nutrition” as topics of interest for collaboration (46% and 43%, respectively). Over a third selected “food policy” (38%) and “sustainable agriculture/climate

change” (36%), and nearly a third of respondents selected “Extension/Knowledge Transfer” (30%), “Food Culture” (30%), and “Natural Resources Sustainability” (28%) as areas of interest for collaboration. Regarding history and readiness for seeking funding in food related research (Table 1), a majority of respondents (68%) indicated being favorable to the possibility of applying for grant funding and 32% reported having past funding for food-related research. Fifty-nine percent of 66 respondents indicated they were currently conducting research in at least one of the food systems focus areas indicated in Figure 1. Overall, the pre-conference assessment shows that Clemson University includes expertise, interest and research activity across the entire spectrum of food system focus areas, and there is a strong desire to collaborate across multiple disciplines, especially in the areas of food and nutrition security, health, food policy, and sustainable agriculture and climate change.

Topics of Interest for Collaboration (%)

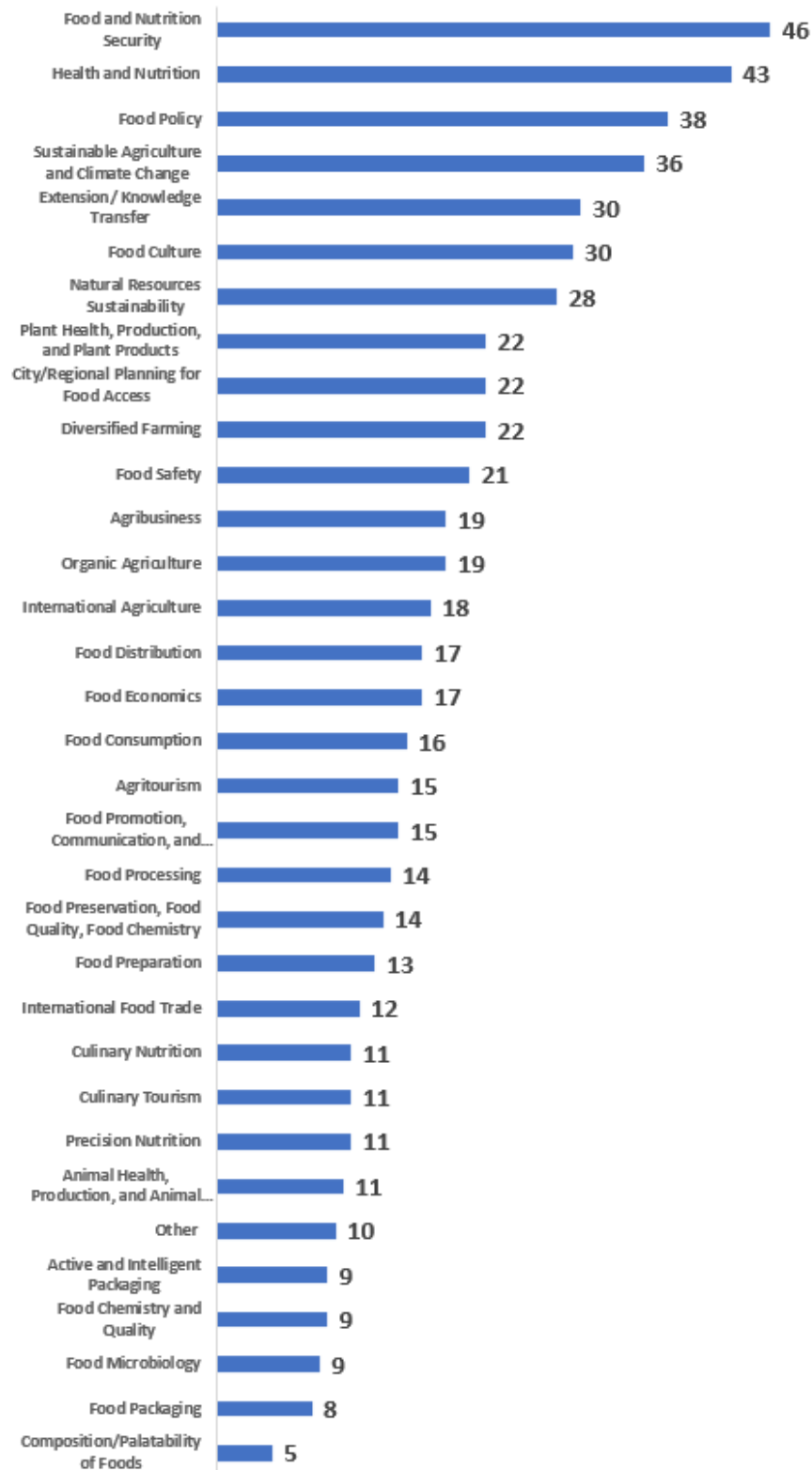


Figure 1. Research interest by category based on 150 respondents.

Abbreviated categories are as follows: "Animal health and production and animal products," Food Promotion, Communication, and Marketing." Other categories included: aquaculture, mariculture, pest control, technology in relation to food purchase and delivery, chronic disease, value chain coordination, youth, family and communities, online ordering tools for diners, biomaterials, fermentation and brewing science, consumer preferences for local foods, local food systems, rural entrepreneurship and community economic development, food marketing to the human senses, irrigation and water management, and FOG waste management.

Table 1: Summary of research history and interest

Questions relating to grant funding and interest in collaborating.	Number of Respondents	Response
Are you currently interested in applying for grant funding?	150	36% replied yes
		32% replied no
		32% replied maybe
Have you received funding in the past for food related research?	150	32% replied yes
		64% replied no
		4% replied maybe
Are you currently conducting research in any of the topics (as described in Figure 1)	66	59% indicated yes in 1 or more of the topics indicated
		41% indicated no or not applicable (N/A)

Farm-to-Institution (F2I) Summit: A FoodFORWARD Pre-conference Convening

The F2I summit took place on September 12-13, 2022. The purpose of the event was to discuss ways to equitably and sustainably source more local foods into college campus dining. The event drew 120 participants across a wide range of expertise including presentations by academic food system and agriculture experts, extension experts, food producers, corporate food service representatives, and health care providers. Presentations and discussions focused on the following themes: 1) how land grant institutions and extension can support local and regional food systems, 2) how local food can build healthy communities and increase food and nutrition security in the context of climate change, 3) building campus engagement, 4) barriers and opportunities for sourcing and procuring local foods for institutions, 5) barriers and opportunities for increasing supplier diversity and 6) Barriers, opportunities, and lived experiences of local farmers. A detailed agenda for this event is found in Appendix A and a recording of the event can be viewed at the following link: [Farm-to-Institution Summit 2022 on Vimeo](#).

FoodFORWARD Research Symposium

Introduction

The FoodFORWARD research symposium took place on September 15, 2022, in the Watt Family Innovation Center on the Clemson University Campus. The all-day event included four guest speaker addresses (keynote, a special topic, and two plenaries), an oral research brief session, poster session, and a rooftop networking session with an exceptionally curated menu of locally sourced foods at the end of the conference (Appendix B). Approximately 103 people attended the conference (61% of those registered); of these, 91 people attended in person, and 12 participated remotely. Worth noting, the symposium date was moved twice due to Covid. The remote link was shared with each of the six Clemson University Research and Education Centers (REC) located across the state. In addition, fifteen invited guests attended representing academia, government agencies, private sector, and non-profit organizations interested in foods systems. Among these honored guests were representatives from the other South Carolina Land Grant University, South Carolina State University.

Opening remarks and keynote address

Dr. Shelia Cotten, Clemson University Associate Vice President for Research and Development, and Dr. Leslie Hossfeld, Clemson University Dean of the College of Behavioral Social and Health Sciences, provided opening remarks.

Keynote address: Dr. Alton Thompson, Executive Director of the Association of 1890 Research Directors, provided the keynote address. Dr. Thompson set the stage for the day's presentations and purpose through his presentation, "Trends, Challenges and Opportunities in Sustainable Community-Based Food Systems: The Role of Land Grant Institutions," which is captured in the following abstract.



Dr. Thompson is a rural sociologist and expert in the fields of agromedicine, rural poverty and development, labor economics and the structure of agriculture. The Association of 1890 Research Directors (ARD) is a federation that coordinates research initiatives among the nation's 1890 land-grant institutions. 1890 land-grant institutions are 19 historically black universities established under the Second Morrill Act of 1890. In his role as executive director, Thompson develops the association's regional and national research priorities in cooperation with federal, state, and private partners, and promotes the 1890 regional research agenda within the national framework of the USDA-National Institute for Agriculture, other federal agencies, and the Association of Public and Land-Grant Universities. He also leads efforts related to legislative issues, strategic planning, and the appropriation of federal and private funds for ARD research. Thompson came to ARD in 2016 from Delaware State University, where he served as provost and executive vice president

for academic affairs. He also served for many years as a tenured professor and administrator at North Carolina A&T State University. He earned his bachelor's degree at North Carolina Central University and his master's and doctoral degrees from Ohio State University. Dr. Thompson's academic specialty is in the interface of statistics, research methods, demography, and rural sociology. His research has yielded 25 articles, seven book chapters and a book entitled "Quality of Life among Rural Residents in North Carolina: Community and Life Satisfaction." His research focus includes agromedicine, rural poverty and development, labor economics and the structure of agriculture and has resulted in more than \$15 million in extramural research funds. Thompson was inducted into the George Washington Carver Public Service Hall of Fame in 2020 and the USDA National Institute of Food and Agriculture Hall of Fame in 2008. He has served in leadership roles on the Board of Agriculture Assembly for the Association of Public and State Universities. He also serves on the board of directors of numerous businesses, organizations, and foundations.

Abstract: The philosophy of education at land-grant universities assumes the triumvirate of education, research and engagement would produce an improved quality of life, a more robust food system, and wealth-creating synergies disseminated to communities through Cooperative Extension. In a simpler age, it worked well. In today's globally based, technology-mediated and complex society, land-grant universities have a more important and transformational role in amplifying and broadening the impact of potential synergies through a vigorous and intentional engagement process in community-based food systems. Three key points form the basis of this presentation on sustainable, community-based food systems: 1) Community-focused food systems are geared toward: (i.) empowering community organizations to work with local residents to tackle food insecurity and health disparity – hence the nexus between food and health; (ii.) providing tools and training to stimulate participation in the local/community-based food systems; and (iii.) utilizing existing technical and financial resources and talents of land-grant universities to contribute to solutions and turn limited resources into tremendous opportunities to enhance local/community-based food systems. 2) Eliminating poverty and food insecurity will significantly improve health outcomes. When people are poor and hungry, the health disparity becomes magnified. When people have skills, training, education, and employment, there will be hope and incentive for everyone to build a stronger, healthier community together. It is an integrated, interdisciplinary and transdisciplinary approach that involves social networks, entrepreneurship, job creation, infrastructure investment (e.g., broadband and markets), and consistent information for education and training. 3) Other concomitant issues related to food systems (i.e., diversity and inclusion, climate change, the COVID-19 pandemic, environmental justice, political polarization, etc.) Based on a meta-analysis of scholarly works, decades of leadership experiences in food and agriculture and lived experiences, this presentation will elaborate more fully on these three points, with a particular focus on the trends, challenges, and opportunities of community-based food systems. Although this presentation will be slanted through the lens of agricultural and applied economics and rural sociology, the importance and significance of other interdisciplinary and transdisciplinary approaches will be recognized. Finally, the unique leadership role of land-grant universities in addressing the challenges and gaps in the food system will serve as a focal point for discussion.

Oral research briefs and poster presentations

Following the keynote address, research brief presentations commenced (summarized in Table 2) and the poster session opened and remained for most of the day (summarized in Table 3). Presenter abstracts and biographical sketches are presented in Appendix C.

Table 2: Research Brief Presentations (in order of presentation).

Title	Presenter(s)
<i>From Free Clinics to Farmland, Harvesting Relationships for Impact</i>	Hannah Roberts, Community Health Coordinator, Youth Learning Institute
<i>Eating Smart-Being Active Teaches SC Adults Cooking skills, Food Resource Management and Behavior Changes that Promote a Healthy Lifestyle</i>	<ul style="list-style-type: none"> • Marlyne Walker[†], RD, Rural Health and Nutrition agent; Expanded Food and Nutrition Education Program (EFNEP) • Tarana Khan, PhD, EFNEP State Director, Extension agent, Sandhill Research & Education Center • Rebecca Whitmen, EFNEP agent • Shana Madden, EFNEP Regional Coordinator, Upstate, Home & Garden Info Center
<i>Impact of Nutrition Counseling and Food Demonstration on A1c: Support for Veggie-Nutrition Programming Models in the Clinical Setting</i>	Brooke Brittain, RD, Associate Director of Food and Nutrition Security, Clemson Rural Health, College of Social, Behavioral and Health Sciences
<i>The Necessity for Science-based Home Canning Education in a Post-COVID Era</i>	Kimberly Baker, PhD, Food Systems and Safety Program Team Director, Extension specialist
<i>Health Extension Creates Sustainable Rural Food Access Improvements Through PSE Approach</i>	<ul style="list-style-type: none"> • Michelle Altman, Extension Area Coordinator, Rural Health and Nutrition agent • Weatherly Thomas, Rural Health and Nutrition agent • Wanda Green, Rural Health and Nutrition agent
<i>It's About More than Food: The Need for a Holistic Approach for Assessing College Food Insecurity and Hunger</i>	Catherine Mobley, PhD, Professor, Department of Sociology, Anthropology and Criminal Justice

<i>Can We Talk? Conversations with BIPOC farmers about Stress and Mental Health</i>	Ken Robinson, PhD, Associate Professor, Department of Sociology, Anthropology and Criminal Justice
<i>Identification of Critical Points for Bacterial Contamination in the Microbrewery Environment</i>	Alex Thompson, Food Systems and Safety Agent, Greenville
<i>Economic and Environmental Benefits of Sensor-based Irrigation</i>	Jose Payero, PhD, Assistant Professor, Agriculture Sciences
<i>Benchmarking Low-coverage Nanopore Long-read Sequencing for the Food Science Applications</i>	Juan Antonio Baeza, PhD, Associate Professor, Department of Biological Sciences, College of Science
<i>Reduced-immunogenicity Peanuts are Affordable Immunotherapy for Peanut-sensitive Individuals and a Source of Nutrition</i>	Sachin Rustgi, PhD, Associate Professor, Department of Plant and Environmental Sciences
<i>Nigella Sativa as an Antibiotic Alternative to Promote Growth and Enhance Broiler Health</i>	Vishal Manjunatha, Graduate student, Department of Food, Nutrition and Packaging
<i>Encouraging Best Practices for Fats, Oils, and Grease (FOG) Management Through Education and Outreach</i>	<ul style="list-style-type: none"> • Derrick Phinney, Program Team Director, Natural Resources Program, Dorchester County Extension • Susan Lunt, Water Resources Extension Agent, Pickens Co.
<i>Clemson Extension Weather Network: Building Resilience for Agriculture Production Food Systems</i>	Matt Burns, PhD, Division Director Agriculture and Natural Resources Field Operations
<i>Optimizing the Food Value Chain to Drive Circularity</i>	Anne Barr, Executive Director, Sonoco FRESH
<i>Farming Foundations: A New Course for Beginning Farmers</i>	Cory Tanner, Program Team Director – Horticulture, Field Operations
<i>Local Food Marketing Constraints and Cooperatives as a Potential Solution</i>	Steven Richards, PhD, Farm Business Management Associate Sandhill Research and Education Center
<i>Rising Production Costs and Other Challenges for Local Producers</i>	Kevin Burkett, Assistant Director Agriculture Tax School, Sandhill Research and Education Center
†Marlyne Walker sadly passed away since the completion of this document. Over the course of her career with Clemson University, Marlyne was recognized for her exceptional work and commitment in underserved populations and her dedication to helping people live healthy lives.	

Table 3: Poster Presentations (alphabetical order according to title)

Title	Presenter(s)
<i>Analysis of Wheat to Identify Grain Quality Traits and Reduced Immunogenicity Genotypes for Those Suffering from Celiac Disease</i>	Zachary Jones, Graduate Research Assistant, Plant and Environmental Sciences
<i>A Complex Takeout Remedy</i>	Nicole Weldy, MFA candidate, Department of Art
<i>An Interactive Food Access Map Tool for Linking Producers, Consumers, Health Care Workers and Food Researchers</i>	<ul style="list-style-type: none"> • Maya Gardner, Research Assistant, Department of Sociology, Anthropology and Criminal Justice • Sydney Ford, Research Assistant, Department of Sociology, Anthropology and Criminal Justice
<i>Building a Cool-season Oilseed Crop Canola Production in SC</i>	John W Park, PhD, Senior Scientist- Cotton Genetics and Brassica Oil Seed Crops Breeding PeeDee Research and Education Center
<i>Clemson Extension Weather Network: Building Resilience for Agriculture Production Food Systems</i>	Matt Burns, Division Director – Agriculture and Natural Resources, Field Operations
<i>Clemson Rural Health: Harvesting Healthcare</i>	Hailey Britt, Graduate Applied Health Research and Evaluation
<i>Eating Smart-Being Active Teaches SC Adults Cooking skills, Food Resource Management and Behavior Changes that Promote a Healthy Lifestyle</i>	Tarana Khan, EFNEP State Coordinator, Sandhill Research & Education Center; Marlyne Walker†
<i>Economic and Environmental Benefits of Sensor-based Irrigation</i>	Jose Payero, Assistant Professor, Department of Agriculture Sciences
<i>Enhancing Marbling Deposition</i>	Susan Duckett, Endowed Chair, Department of Animal and Veterinary Sciences
<i>Exploring Healthy Food Security in a Rural Food System Through the Lens of Multi-sectoral Stakeholders</i>	Caitlin Koob, Graduate Student, Department of Public Health Sciences
<i>Farming Foundations: A New Course for Beginning Farmers</i>	Cory Tanner, Program Team Director – Horticulture, Field Operations
<i>Identification of Critical Points for Bacterial Contamination in the Microbrewery Environment</i>	Alex Thompson, Food Systems and Safety Agent, Greenville
<i>Navigating Regulatory and Food Safety Requirements for New and Newly Established Food Entrepreneurs</i>	Adair Hoover, Food2Market Extension Associate, Field Operations

<i>Quinoa Initiative in SC – Building an Agronomic Potential of Quinoa in the Southeast</i>	Caroline Smith, Research Specialist, PeeDee Research and Education Center
<i>SC Ag + Art Tour</i>	Will Culler, PhD, Senior Extension Agent, Lexington Co. Coordinator, Director of the SC Ag + Art Tour
<i>The Effect of Pre-treatment and Freezing on the Polyphenol Oxidase Activity and Color Stability of Sliced Peaches</i>	Wesam Al-Jeddawi, Graduate, Department of Food, Nutrition and Packing Sciences
<i>Youth and Pollinators: The Future of Agriculture</i>	Ashley T. Burns, PhD, State 4-H Program Team Director, 4-H Youth Development

Special Topics and Plenary Presentations

Afternoon proceedings included a special topic presentation given by Carolyn Gahn, Director of the Farm-to- Institution Aramark Corp., and two plenary presentations given by Dr. Kim Niewolny, Director of the Center for Food Systems and Community Transformation at Virginia Tech, and Dr. Sandra Glover, USDA Director of Rural Development of SC. Presentation titles, abstracts and biographical sketches are presented below.

Special Topic: *Leveraging Public Private Partnerships to Support Food Systems Development*
 Carolyn Gahn, Director of Farm-to-Institution, Aramark Corp.



Carolyn Gahn is the Director of Farm-to-Institution for Aramark, one of the leading food service providers for universities, hospitals, and K-12 schools across the country. This role is part of the Global Supply Chain & Procurement team and in this function, Carolyn works to build scalable solutions for increasing institutional food purchasing from small farms and businesses. Carolyn started with Aramark as the Sustainability Director for the University of Kentucky dining services and in that role elevated the dining program to be one of the most robust farm-to-table dining programs on a college campus. Carolyn has spoken publicly at several conferences, including the Culinary Institute of America's Menus of Change Conference. She is the co-founder of

Sweetgrass Natural Foods which manufactures regional CPG specialty food products. She started her career as a community organizer with Community Farm Alliance and has worked on several diversified farms, including her own. She holds her MBA from Northern Kentucky University and her BA from the University of Kentucky. She serves on the board for the Organic Association of Kentucky and Good Foods Co-op in Kentucky. She lives near Lexington with her family and farm animals.

Abstract: This talk will review the topics and outcomes of the Food Forward Pre-Conference Convening, the Farm-to-Institution Summit, and discuss how public and private partnerships can be leveraged to build a healthy food system. We will review a case study for success and some of the fundamental food systems supply chain challenges that pinpoint where resourcing is needed.

Plenary: *Cultivating Connections for Sustainable Food Systems: Possibilities and Lessons Learned for Land Grant Universities*

Kim Niewolny, Ph.D., Associate Professor, Department of Agricultural, Leadership and Community Education, Virginia Tech



Dr. Kim Niewolny is an associate professor in the Department of Agricultural, Leadership and Community Education at Virginia Tech and serves as Director of the Virginia Tech Center for Food Systems and Community Transformation. Dr. Niewolny's work centers on the role of power and equity in community education and development with scholarly interests in participatory and cultural community development; critical pedagogy; multi-sector collaborations for sustainable food systems; and the political praxis of community food work. Current initiatives emphasize Appalachian food access and equity; new agrarian sustainability; agroecological knowledge, and the intersection of technology, farm workers, and disability. Kim also provides teaching leadership in the Civic Agriculture and Food Systems Minor and serves as Director of the Virginia Beginning Farmer and Rancher Coalition and Director of AgrAbility Virginia. She currently serves as the Past President of the Agriculture, Food and Human Values Society and has been a board member of the Virginia Food Systems Council since 2018.

Abstract: Drawing upon the experience of the Center for Food Systems and Community Transformation in the College of Agriculture and Life Sciences at Virginia Tech, this plenary will focus on the importance of a values-based and systems-approach for developing interdisciplinary partnerships and programming for improved collaboration among a diversity of stakeholders to address the complexity of food system issues with emphasis on social equity and community sustainability.

Plenary: *Vision for the Future: Growing Rural Opportunities at the Nexus of Agriculture, Community Health, and Rural Economic Development in SC*

Sandra Glover, Ph.D., USDA Director of Rural Development for South Carolina



Dr. Glover is currently a Distinguished Professor Emerita and adjunct professor in the department of Health Services Policy and Management in the Arnold School of Public Health at the University of South Carolina in Columbia, South Carolina. She has been at the forefront of Public Health Practice and Health Equity Initiatives locally, nationally, and internationally, publishing 100+ articles in peer-reviewed journals and presenting her findings to audiences at all levels. She served for several years as the first Associate Dean for Health Disparities and Social Justice in the Arnold School of Public Health and directed the School's Institute for Partnerships to Eliminate Health Disparities research portfolio that grew to \$35 million under her leadership. Dr. Glover was also Associate Director of the South Carolina Rural Health Research Center. She has worked tirelessly to increase minorities in the biomedical field as an advisor and mentor to students and junior level faculty at USC and in partnership with historically black colleges and universities across the country. A summa cum laude graduate of the School of Business at South Carolina State University, Dr. Glover received her MBA and Doctor of Philosophy (Ph.D.) in Management and Organizational Behavior from the Moore School of Business at the University of South Carolina.

Dr. Sandra H. Glover, a product of rural South Carolina, the Four Holes Community of Orangeburg County, never forgot her rural roots and has dedicated her life's work to improve rural communities and to elevate the voices of the disadvantaged, the disenfranchised, and the most vulnerable at the local, state, and national levels. In accepting the appointment as the State Director for Rural Development in South Carolina, Dr. Glover feels her work has come full circle, blending her banking career, her academic career, and her community activism, to create a culture of partnerships that will help build rural communities back better.

Abstract: Having spent most of her life in and around rural communities, Dr. Glover knows firsthand the challenges of growing our rural communities. She will use her background, experiences, and her work in health equity and community engagement to share her vision for rural SC. Dr. Glover's talk "A Vision for the Future: Growing Rural" will be presented through a health equity lens. She will share data on the state of America's rural economy and identify key opportunities at the nexus of agriculture, community health, and rural economic development in SC through USDA, Rural Development programs. Dr. Glover's goal is to elevate the voice of rural and reinforce the importance of providing rural communities with opportunities for economic growth while championing safe, healthy rural communities.

Closing

Closing remarks were given by Dr. Keith Belli, Dean of the College of Agriculture, Forestry and Life Sciences followed by a 1.5-hour networking session and poster session.

Conference Outcomes and Quality Measures

Several outcomes were measured to determine the success of the FoodFORWARD symposium in achieving 3 objectives. Attendees were voluntarily surveyed at the conclusion of the conference to learn, 1) awareness of food related research projects outside of their discipline, 2) willingness to collaborate, and 3) willingness to form and participate in an interdisciplinary team dedicated to sustained activities that foster cross-college and cross-sector collaboration. Summarized in Table 4, the symposium provided a successful platform for learning about new projects and opportunities for collaboration. Forty-six percent of respondents reported learning between 1-3 projects outside of their expertise and 52% reported learning about 4 or more. Thirty-eight percent attended for the purpose of networking and identifying possible collaborative opportunities and 26% attended because they were compelled by the goals of the conference. Support for sustained engagement is evident in 92% responding that they would like to receive information via a FoodFORWARD listserv and 70% would participate in a working group(s) that fosters food related initiatives and research. Seventy-six percent felt the symposium should be held every year while 24% preferred a two-year cycle. Conference quality measures indicated most respondents were very satisfied with the selection of speakers, topics, format and structure, and the overall experience of the conference.

Conclusions and Moving Forward

Overall, the pre-conference assessment shows that Clemson University has diverse expertise and interest across the entire spectrum of food system focus areas and there is a strong desire to collaborate across multiple disciplines, especially in the areas of food and nutrition security and health. These findings align with current high priority areas identified by federal, state and foundation sponsors which collectively seek a systems approach to improving community health and health equity through innovations in agriculture, sustainability, economic, social, and health practices and policies.

The substantial participation and interest by multiple stakeholders and experts representing each element of the food system lays the foundation for a robust and sustained engagement and opportunities for developing collaborative projects. Future events will focus on addressing specific topic areas in a work group format and leveraging expertise of each organization to create collaborative project plans and proposals for food systems research. A longer-term goal aims to establish a center or consortium that fosters novel and innovative research contributing to food, health, policy, and agriculture systems knowledge, supports community-based rural economic development, and serves as a clearinghouse for information dissemination.

Table 4: Summary of conference outcomes and quality measures.

Measures for gauging interest for a sustained cross-college conversation and collaboration about food related research	Number of Respondents	Response
Are you interested in being on a Clemson FoodFORWARD Listserv?	48	92% replied yes
Are you interested in participating in a group dedicated to facilitating multi-disciplinary food related research, outreach and education with the longer-term goal of forming a food systems center at Clemson University?	47	70% replied yes
		10% replied maybe; depending on scope, timeline and time constraints
How often should FoodFORWARD symposia occur?	47	76% every year
		24% every two years
Reasons for Attendance		
Opportunity to network/collaborate	55	38%
Goals of the conference		26%
Professional development		15%
Interest in guest speakers/presentation abstracts announced prior to event.		11%
Learning		
About how many research projects did you learn about that were outside of your discipline?		
1-3 projects	53	46%
4-6 projects		31%
7 or more projects		21%
Conference quality measures		
Overall conference experience	54	77% very satisfied
Conference speakers/presenters		76% very satisfied
Conference topics		70% very satisfied
Conference format/structure		69% very satisfied
Most cited comments for improvement	10	More time for poster viewing, fewer guest speakers, and more time for verbal research briefs

Appendix A
 Inaugural Farm-to-Institution Summit
 September 13-14, 2022
 Clemson University
 “Land Grant Local”
 FoodFORWARD Pre-Conference Convening

September 13 Agenda

4:30 – 6:30pm	<p>Hors d’oeuvres and cocktails</p> <p>Welcome</p> <ul style="list-style-type: none"> ○ Dean Leslie Hossfeld ○ Jack Donovan, Aramark CEO & President of Collegiate Hospitality <p>Fireside Chat</p> <ul style="list-style-type: none"> ○ Dr. Cindy Ayres Elliott, Footprint Farms ○ Dr. Jennifer Taylor, FAMU & Lola’s Organic Farm Moderated by Carolyn Gahn, Director Farm-to-Institution, Aramark
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September 14 Agenda

8:30 – 9:00am	<p>Breakfast and Networking</p>
9:00 – 9:15am	<p>Welcome from Clemson University</p> <ul style="list-style-type: none"> ○ Tony Wagner, Executive Vice President for Finance and Operations ○ Kathy Hobgood, Associate Vice President for Auxiliary Enterprises
9:15 – 9:25am	<p>Welcome from Aramark</p> <ul style="list-style-type: none"> ○ Dr. Matt Rogers, Regional Vice President
9:25 – 9:55am	<p>Land Grant Local: <i>Regional food systems and the role of land grant institutions</i></p> <ul style="list-style-type: none"> ○ Dean Keith Belli (College of Agriculture, Forestry and Life Sciences, Clemson) ○ Dean Leslie Hossfeld (College of Behavioral, Social, and Health Sciences, Clemson) ○ Dr. Marcus Coleman (School of Liberal Arts, Tulane & SERA-47 Chair)

	<p><i>Strengthening the Southern Region Extension and Research System to Support Local and Regional Food Needs and Priorities</i></p>
<p>10:00 – 11:25am (11:15-11:25 Audience Q&A)</p>	<p>Food Systems Leaders Panel: Building Campus Engagement <i>Building a foundation for campus & community engagement in food systems through bottom-up grassroots organizing and top-down strategic planning through academics and university initiatives.</i></p> <p>Moderated by: Dr. Catherine Mobley (Clemson)</p> <p>Speakers: Dr. Ken Robinson (Clemson); Whitney Barr (Spelman); Dr. Ken Kolb (Furman); Dr. Jennifer Taylor - (FAMU)</p>
<p>11:30 – 12:30pm (panel from 12:00-12:30)</p>	<p>Local Lunch: Chef Farm to Table Panel <i>What are chefs looking for when it comes to local? What are the challenges and opportunities for chefs to purchase and use local ingredients?</i></p> <p>Moderated by: Tarvarus Roussell (Aramark Regional Marketing Manager)</p> <p>Speakers: Chef Craig Fincher (Southeast Region); Chef Kyle Pafford (Clemson University); Chef Tonya Mitchell (College of Charleston); Chef Ralph Macrina (Bob Jones University)</p>
<p>12:35 – 1:45pm</p>	<p>Local as a Pathway to Healthy Communities <i>Discover how local food can be a tool to build healthy communities by addressing food access issues, food insecurity, and social equality and where local fits under the larger context of climate change.</i></p> <p>Speakers: Tom McDougall (4P Foods), Dr. Alice Ammerman (UNC Chapel Hill), Dr. Sarah Griffin (Clemson), Dr. Sam Baxter (Clemson), Dr. Michelle Parisi (Clemson), Brooke Brittain (Clemson)</p>

<p>1:50 – 2:55pm <i>(2:45-2:55 Audience Q&A)</i></p>	<p>BIPOC Sourcing and Supplier Diversity <i>Address the context of the specific barriers to entry that socially disadvantaged farmers and businesses face.</i> <i>Review procurement models that support and prioritize minority owned businesses and discuss the role of the institution in leading supplier diversity efforts.</i></p> <p>Speakers: Bill Green (Common Market); Jonathan Mason (Aramark Supply Chain, Supplier Diversity); Dr. Alton Thompson (Executive Director, Association of 1890 Research Directors); York Glover (Gullah Farmers’ Alliance, Clemson Cooperative Extension)</p>
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<p>3:00 – 3:55pm (3:45-3:55 Audience Q&A)</p>	<p>Farmer Roundtable</p> <p>Moderated by: Dr. David Lamie (Clemson)</p> <p>Farmers: Ross Taylor (Seaside Grown); Henry Jones (National Veterans Agricultural Association); Watson Dorn (Hickory Hill Milk); Dr. Jennifer Taylor (Lola’s Organic Farm)</p>
<p>3:55 – 4:30pm</p>	<p>Closing discussion and adjourn</p> <ul style="list-style-type: none"> ○ Carolyn Gahn ○ Dr. Marcus Coleman – SERA-47 ○ Dr. Mary Beth Johnstone (Clemson – Land Grant Local)

Speaker biographical sketches

Dr. Alice Ammerman is a Professor of Nutrition, Gillings School of Global Public Health and Director of the UNC Center for Health Promotion and Disease Prevention. With colleagues, she developed the “Med-South” diet which is the Mediterranean diet adapted to agricultural availability and taste preferences in the Southeastern US. Her research addresses the role of sustainable food systems in health, the environment, and economic well-being, emphasizing healthy food access. Dr. Ammerman teaches courses in Nutrition Policy and Public Health Entrepreneurship. She leads the Culinary Medicine program at UNC School of Medicine and uses social entrepreneurship as a sustainable approach to addressing public health challenges.

Whitney Barr is the Program and Garden Manager of Spelman College’s transdisciplinary Food Studies Program. She leads the edible campus garden, co-designs and implements strategic plans and grant initiatives, manages a growing cohort of food scholars, and co-builds campus- community partnerships. Whitney has ten years of experience growing and cooking diasporic foods. Additionally, Whitney has a BA in English from Spelman College, and she is a former Fulbright Researcher (Seoul, South Korea) with years of experience in food-focused social enterprise marketing and sales. Recently, her research has focused on designing racially inclusive, food-producing spaces. She holds a master’s degree in Landscape Architecture from the University of Georgia with graduate certificates in Sustainable Food Systems and Entrepreneurship.

Samuel Baxter, Ph.D., MPH, is a Postdoctoral Fellow in the Public Health Sciences Department at Clemson University. His research and work centers on neighborhood and social factors that influence cardiovascular health opportunities and outcomes. Dr. Baxter is currently a co-investigator for a CDC HOP-1809 project that utilizes policy, systems, and environmental change approaches to reduce obesity in rural South Carolina counties.

Dr. Keith L. Belli became Dean of Clemson University's College of Agriculture, Forestry and Life Sciences (CAFLS) Sept. 1, 2018. Under CAFLS' administrative structure, Belli serves as the chief academic and administrative officer and associate vice president for Clemson Public Service and Agriculture (PSA), where he collaborates with the Vice-President of PSA to advance the interests of both complimentary units. Before becoming Dean of CAFLS, Keith Belli was head of the University of Tennessee's Department of Forestry, Wildlife and Fisheries. Prior to joining the University of Tennessee in 2007, Belli worked at Mississippi State University for 18 years, transitioning from professor to the associate dean of the College of Forest Resources, associate director of the Forest and Wildlife Research Center and interim head of the forest products department. Belli holds a Bachelor of Science in forest science from Pennsylvania State University, Master of Science in silviculture from Michigan State University and a Doctor of Philosophy in forest biometrics from the University of Minnesota, all three land- grant institutions.

Brooke Brittain obtained a Bachelor of Science degree in Health Promotion from Coastal Carolina University, a Master of Science degree in Food and Nutrition from Florida State University and a Culinary Certificate from the University of South Carolina. Brooke has worked in community nutrition for seventeen years. She is a registered and licensed dietitian as well as a Certified Health Education Specialist and a Certified Lactation Counselor. Brooke is currently the Associate Director of Food and Nutrition Security with Clemson Rural Health. Through this position she designs and oversees program planning, implementation and training related to nutrition and health in rural environments.

Marcus A. Coleman is a Visiting Assistant Professor at Tulane University with a joint appointment in the Department of Economics and the Strategy, Leadership and Analytics minor. Coleman is an experienced educator whose career is defined by a mixture of agriculture, food system, and student engagement roles. Growing up in Louisiana's rural Mississippi River Delta region, Coleman was introduced early on to the disproportionate nature of the food system structure that often defines socially disadvantaged rural communities, which can lead to issues of accessibility, availability, and affordability related to food. These experiences led to Coleman's interest in fostering equitable and sustainable food systems via leadership development and community engagement that are inclusively beneficial to all – economically, socially, environmentally and politically. He received a Bachelor of Science in Agricultural Economics from Southern University, a Master of Science in Agricultural Economics from Michigan State University, and a Doctor of Philosophy in Agriculture and Extension Education from Louisiana State University.

Watson Dorn is a third-generation dairy farmer from Edgefield, SC. His family has been farming the same land since 1764. He holds a degree in Agricultural Education from Clemson. Watson is married to Lisa and they have two children. In February 2009, Hickory Hill Milk began bottling and selling directly to the consumer. In May 2020 their herd moved into South Carolina's first privately-owned robotic milking facility. They also supply milk for Clemson Blue Cheese.

Dr. Cindy Ayers Elliott is the CEO of Foot Print Farms, LLC, founded in 2010. The urban farms span 68 acres and feature fruits, vegetables, herbs and cattle. Foot Print Farms also focuses on agri-tourism for community development across the state, especially in the City of Jackson. Elliot participates with the

United States Department of Agriculture, Natural Resources Conservation Service (NRCS) to ensure her farm is productive and environmentally friendly. While she depends on her farm for sustenance, she also wants to use it as an educational tool to teach and develop new urban farmers about healthy eating and sustainability. Dr. Ayers worked many years in New York as an investment banker. In 2010, Dr. Ayers traded in her high heels for a pair of work boots! "I'm so proud to be a farmer and a catalyst for healthy change". Cindy has her undergraduate and graduate degrees from UMass Amherst and her PhD from Jackson State University.

Carolyn Gahn is the Director of Farm-to-Institution for Aramark. This role is part of the Global Supply Chain & Procurement team and in this function, Carolyn works to build scalable solutions for increasing institutional food purchasing from small farms and businesses. Carolyn started with Aramark five years ago as the Sustainability Director for the University of Kentucky Dining Services and in that role elevated the dining program to be one of the most robust farm-to-table dining programs on a college campus. Carolyn has spoken publicly at several conferences, including the Culinary Institute of America's Menus of Change Conference. She is also the co-founder of Sweetgrass Natural Foods which manufactures regional CPG specialty food products. She started her career in food and agriculture as a community organizer with Community Farm Alliance and has worked on several diversified farms, including her own. She holds her MBA from Northern Kentucky University and her BA from the University of Kentucky. She serves on the board for the Organic Association of Kentucky and Good Foods Co-op in Kentucky. She lives near Lexington, Kentucky, with her husband Jacob, daughter Ellie (7), son Finn (8), and farm animals.

Bill Green currently serves as the Executive Director of The Common Market Southeast, a non-profit food distribution organization whose mission is to bring fresh food from small to mid-sized family-owned farms to local communities through relationships with schools, universities, hospitals and community organizations. Previously, Bill served in executive leadership for The Kroger Co. in Atlanta, G.A., and Columbus, O.H. Bill is a graduate of Howard University and the University of Kentucky College of Law. Bill and his wife Kristy live in East Point and have three adult children, Taylor, William IV and Ethan.

Dr. Sarah F. Griffin is a Professor and the Interim Department Chair in the Department of Public Health Sciences in the College of Behavioral, Social and Health Sciences at Clemson University. Dr. Griffin has over 30 years of experience in public health. Dr. Griffin's research focuses on dissemination, implementation, and effectiveness of evidence-based approaches for prevention and treatment of obesity and other chronic diseases. Currently she is the lead evaluator for a 5-year Greenville Health Authority sponsored School-Based Health initiative addressing obesity and trauma in Greenville County schools. She is also the co-lead for a recently awarded seed grant with Prisma Health to develop and assess the effectiveness of Conversa, a healthy weight management program. She is also the Co-Principal Investigator for a Centers for Disease Control and Prevention 5-year High Obesity Prevention (HOP) initiative in S.C. focused on effects of efforts to increase healthy food access and walkability.

Dr. Leslie Hossfeld (Dean of the College of Health, Social, and Behavioral Sciences) is trained in Rural Sociology from North Carolina State University. She has extensive experience examining rural poverty and economic restructuring and has made two presentations to the United States Congress and one to the North Carolina Legislature on job loss and rural economic decline. From 2006-2015, Hossfeld co-founded and directed a 6-county food system initiative in Southeastern North Carolina focused on assisting socially disadvantaged farmers to build their farm businesses and enhance economic development through local food buying systems that included creating a USDA designated food hub. Hossfeld was founding Director of the Mississippi Food Insecurity Project and serves on the USDA Southern Extension Research Activity project to strengthen local and regional food needs and priorities in 13 Southern region states. Her current research focuses on multi-disciplinary strategies and collaborative partnerships to understand and alleviate persistent poverty in the Southeast, working to link U.S. local food systems research and initiatives to nutrition, malnutrition (obesity), health outcomes and health disparities, to develop policy coherence linking health and agriculture policy. Dr. Hossfeld is Dean of the College of Behavioral, Social and Health Sciences at Clemson University.

Henry Jones is a retired Army veteran after 23 years of active duty. He served as Logistic Administrator, Battalion Supply Sergeant, Property Book Officer and worked at Augusta Veteran Medical Center for five years before moving to Atlanta. He established several startup companies that become multimillion-dollar companies and he is the CEO of National Veterans Agriculture Association (NVAA Incubator Program) in Gray Court, S.C., which has been selected by South Carolina State University for its Beginning Farmers & Development Program teaching Aquaponic, Hydroponic (NFT RDWC) and Aeroponic Systems.

Dr. Ken Kolb is Professor and Chair of the Sociology Department at Furman University and a member of the inaugural Food Leaders Fellowship at the Aspen Institute. His most recent book, *Retail Inequality: Reframing the Food Desert Debate*, was published by the University of California Press. He has extensive experience conducting research at the neighborhood level and working with community groups to equip them with the data they need to press their political leaders for real reforms.

Dr. David Lamie is a Professor of Agribusiness and Rural Development with the Department of Agricultural Sciences. He is involved in the Clemson Agribusiness Extension Program team and is officed at the Clemson University Sandhill Research and Education Center. Prior to his position with Clemson, Dr. Lamie worked with the Illinois Institute for Rural Affairs at Virginia Tech and Purdue University in extension/outreach, research and teaching capacities. His program at Clemson currently focuses on emerging and small farms and local, regional and community food systems initiatives. He is involved in international level research on agritourism and is vice president of an international group of scholars focused on sustainable development. He also has experience with community, county, and regional level strategic visioning and planning, rural broadband access and effective use, use value taxation, and economic and fiscal impact assessment. Dr. Lamie holds a Doctor of Philosophy degree in Applied Economics from Clemson University and a Master of Science and Bachelor of Science in Agricultural Economics from Purdue University. He lives in Columbia with his wife of 25 years, Helene. They have two daughters; Margot (Junior at USC-biology) and Eloise (recent USC environmental science major; intern at U. Florida; invasive species). Dave and his family enjoy good food and travel.

Chef Ralph Macrina earned his degree from the Culinary Institute of the Carolinas where he now serves on the Hospitality Education Advisory Committee. He joined ARAMARK in 2004 leading the culinary efforts at Flour Corp, GE, and Furman University. He currently serves as Executive Chef at Bob Jones University. Married to his wife Michelle, they have a daughter who is a PR professional in Philadelphia and a son serving aboard the USS Ronald Reagan in Japan.

Jonathan Mason has worked at Aramark for eight years in various roles ranging from financial to operational analysis. He currently supports Aramark's global supply chain and procurement organization as the Supplier Diversity Manager for U.S. based Aramark Managed Services procurement. In this role, Jonathan oversees company efforts to meet small and diverse spend requirements by planning and executing supplier development programming, supporting sales and new business opportunities, and strengthening procurement relationships with minority vendors across various departments.

Tom McDougall is the founder and CEO of 4P Foods, a food hub based in the Mid-Atlantic, working with over 600 small food producers. As an advocate for equitable and regenerative food systems, Tom is recognized as one of the leaders in the National Food Hub network. In 2019, he helped co-found the Eastern Food Hub Collaborative, a network of mission aligned food hubs up and down the Eastern seaboard, for the sole purpose of regional collaboration and a more cohesive, decentralized food supply chain.

Dr. Kenneth L. (Ken) Robinson is an Associate Professor of Sociology at Clemson University and an Agribusiness Extension Specialist with the Sandhill Research and Education Center, Columbia, S.C. His teaching, research and outreach interests include rural sociology, entrepreneurship, sustainable development, and African American rural life. Ken was a research associate at Cornell University, Ithaca, N.Y., where he received his Ph.D. in Development Sociology. He is currently collaborating on a regional research initiative assessing farmer and producer stress and contributing factors to stress with priority toward socially economic disadvantaged farmers.

Dr. Matt Rogers has established himself as a leader in the collegiate hospitality marketplace. A food enthusiast and hands-on sustainability expert, he is passionate about utilizing local food systems to increase impact and social embeddedness. As Regional Vice President with Aramark, Matt provides operational leadership and client advocacy for 26 client partnerships in N.C., V.A. and D.C. He leads an organization of over 5,000 guest associates focusing on delivering the highest quality hospitality experiences to our guests. Another of Matt's strengths is his ability to regularly network, create and leverage community partnerships to help achieve, support and extend each institution's mission – including the establishment of grant funding to support higher learning. As an advocate for and steadfast believer in the importance of lifelong learning, Matt holds several degrees, including an MBA from Southern Wesleyan University, a BS in Food Service Management from Johnson & Wales University and a doctorate in Sustainability Education from Prescott College. Matt is a member of the Board of Directors of the Food Bank of Central and Eastern North Carolina, co-chair for the Build Nourish Empower Capital Campaign and a consultant for several local food hubs in North Carolina.

Tarvarus Roussell currently serves as Senior District Marketing Manager supporting 15 accounts across South Carolina and Georgia. She has been with Aramark eight years in marketing, working closely with operations, culinary, and support functions. In this role, Tarvarus supports marketing and innovation initiatives. Tarvarus is passionate about constantly enhancing the student experience and using food to bring everyone together. She is constantly working to educate students on our food story and purchasing practices, as understanding how to support local is an important priority for Gen Z and Gen Alpha. Tarvarus holds a bachelor's degree from Louisiana Tech University in Finance.

Ross Taylor, from Saint Helena Island, is a fifth-generation farmer on his family's 120-year-old tomato farm. With a strong background in farming, Ross strengthened his skills by receiving both a B.S. in Agricultural Economics from Clemson University and an MBA from the Citadel. Ross and his wife, Lisa, currently live on the family's Farm along with their two young boys, ages 3 and 1. With the help of a good buddy and fellow Clemson graduate, Will Collins, Ross found a way to capture waste tomatoes from his family's annual harvest by developing a bloody mary recipe and creating Seaside Grown in the process during the Winter of 2018. Today, Seaside Grown has expanded its reach and mission to provide other farmers the same ability to utilize produce too ripe for market, increasing their bottom line and bringing great tasting, sustainable products to folks in the Southeast.

Dr. Alton Thompson currently serves as the Executive Director of the Association of 1890 Research Directors (ARD), the official representative body of the food and agriculture research administrators of the 19 1890 land-grant universities. ARD's 'raison d'être' is to strengthen the research capacity within the 1890 system and to conduct and support research that builds knowledge in ways that respect and benefit the people in the 1890 region. Previously, Alton served as Provost and Vice President of Academic Affairs at North Carolina A&T State University, Delaware State University and the University of Maryland at Eastern Shore, and as the Dean of College of Agriculture and Environmental Sciences at North Carolina A&T State University.

Appendix B
 FoodFORWARD Symposium
 Watt Family Innovation Center
 Clemson University
 September 15, 2022

September 15 Agenda

8:15- 8:50 AM	Attendee check-in and poster set-up. <ul style="list-style-type: none"> ○ Poster presenters arrive at 8:15 a.m. <i>Pastries and coffee provided.</i>
9:00-9:15 AM	Opening Remarks <ul style="list-style-type: none"> ○ Dr. Shelia Cotten, Associate Vice President for Research Development ○ Dr. Leslie Hossfeld, Dean of the College of Behavioral, Social and Health Sciences.
9:15-10:15 AM	Keynote <ul style="list-style-type: none"> ○ Dr. Alton Thompson, Executive Director of the Association of 1890 Research Directors: <i>Challenges and Opportunities in Sustainable Food Systems: The Role Land Grant Institutions</i>
10:15-10:30AM	Break <ul style="list-style-type: none"> ○ Poster session open - 4th floor
10:30-11:30AM	3-minute Research Briefs
11:35-12:00PM	Special topic <ul style="list-style-type: none"> ○ Carolyn Gahn, Director, Farm-to-Institution Aramark Corp: <i>Leveraging Public Private Partnerships to Support Food System Development</i>
12:00-1:00 PM	Lunch <ul style="list-style-type: none"> ○ <i>Poster session open; Research and Education Centers (REC)</i> ○ <i>Virtual tours - main lobby.</i> ○ <i>Boxed lunch provided.</i>

<p>1:00-2:00 PM</p>	<p>Plenary</p> <ul style="list-style-type: none"> ○ Dr. Kim Niewolny, Director of the Center for Food Systems, and Community Transformation at Virginia Tech: <i>Cultivating Connections for Sustainable Food Systems: Possibilities and Lessons Learned for Land Grant Universities.</i>
<p>2:00- 3:00 PM</p>	<p>Plenary</p> <ul style="list-style-type: none"> ○ Dr. Sandra Glover, USDA Director of Rural Development for SC: <i>Vision for the Future: Growing Rural Opportunities at the Nexus of Agriculture, Community Health, and Rural Economic Development in S.C.</i>
<p>3:00-3:15 PM</p>	<p>Closing Remarks</p> <ul style="list-style-type: none"> ○ Dr. Keith Belli, Dean of the College of Agriculture, Forestry and Life Sciences.
<p>3:15-5:00 PM</p>	<p>Rooftop Networking Reception and Poster Session (4th floor)</p> <ul style="list-style-type: none"> ○ Poster session open until 5 p.m. ○ Cocktails and locally sourced hors d'oeuvres provided.

Appendix C

Abstracts

Research Brief Abstracts (in order of presentation)

From Free Clinics to Farmland, Harvesting Relationships for Impact

Hannah Roberts, RDN, LD; Kimberly Shaffer, Ph.D., CMPC; Sarah King, MPH.

Clemson University Youth Learning Institute (CU YLI) SNAP-Education was able to create impactful relationships between several Clemson organizations to utilize unused farmland to provide seeds for those in need. In collaboration with Slow Food Upstate and Clemson Free Clinic, the Clemson Organic Research Center planted regionally historically significant seeds (otherwise known as Ark of Taste) on a section of underutilized farm property. The Clemson Free Clinic was then able to distribute that produce through the Produce Rx Program. This program provides clients with produce bags along with recipes provided by SNAP-Ed and the story of the seed itself. In addition to the Produce Rx Program the seeds planted by Clemson Organic have also been distributed through Upstate Seed Libraries (Greenville and Pickens). CU YLI SNAP-Ed and Slow Food Upstate distribute the Ark of Taste seeds to patrons, in addition to onsite tastings and nutrition education. SNAP-Ed Health Educators use recipes created from students in the CU Food and Nutrition Department and produce sourced from the Clemson Organic Research Center to highlight these Ark of Taste seeds.

Eating Smart, Being Active Teaches S.C. Adults Cooking Skills, Food Resource Management and Behavior Changes that Promote a Healthy Lifestyle

Marlyne Walker, Dr. Tarana Khan, Rebecca Whitmen, and Shana Madden

The U.S. Department of Agriculture, Household Food Security in the United States report showed between 2017-2019, 10.9% of households were unable to provide adequate food for one or more household members due to a lack of resources. CDC State Nutrition, Physical Activity and Obesity Profile for South Carolina report showed 35% of adults are overweight, and 32.3% are obese. The Expanded Food and Nutrition Education Program (EFNEP) is a federally funded program delivered through Cooperative Extension Service that aims to assist limited-resource families in acquiring the knowledge, skills, attitudes, and changed behavior necessary to improve the nutritional health and well-being. EFNEP provides nutrition education in four core areas: diet quality and physical activity, food resource management, food safety, and food security. In South Carolina, experienced and trained nutrition educators teach an evidence-based curriculum developed by Colorado State University tailored to meet individual needs through a series of hands-on interactive lessons, delivered individually or to groups through partnerships with local community organizations. The learn-by-doing approach allows participants to gain the practical skills necessary to make positive behavior changes to lead healthier lifestyles. Clemson Cooperative Extension Service continues to positively impact delivering EFNEP in 18 counties in South Carolina. In 2021, SC EFNEP reached 396 families, and the outcome data showed improved diet quality, improved food resource management, and improved physical activity. Through an experiential learning process EFNEP adult participants increase their ability to select and eat healthier foods, stretch food dollars by managing food budgets, decrease foodborne illness, and increase physical activity.

Impact of Nutrition Counseling and Food Demonstration on A1C: Support for VeggieRX-Nutrition Programming Models in the Clinical Setting

Brooke Brittain

The purpose of this presentation will be to review two programs that are using nutrition counseling and/or food demonstrations and produce prescription and the impact it has on clinical measures. WISEWOMAN is a cardiovascular risk reduction program for low income, underinsured women between the ages of 40 and 64 years. The patients on our mobile clinics can have their lipid panel and A1c checked at their visit. Health coaching is provided by a registered dietitian for up to six sessions. After completion of three sessions patients can get their labs checked again. Early findings are displaying a reduction in A1c, cholesterol, weight, and blood pressure with an average reduction in total cholesterol of 13.6%. Veggie Rx is a produce prescription program for pre-diabetic or diabetic patients that offers the patient free fresh produces boxes twice per month for 6 months. The program incorporates group nutrition education and cooking demonstrations offered once per month. The program just launched in July 2022 at the Clemson Walhalla Clinic and will evaluate clinical measures along with behavioral measures through surveys. Both programs help decrease health disparities in underserved and underrepresented populations and help to inform for policies and best practices for health care.

The Necessity for Science-based Home Canning Education in a Post-COVID Era

Kimberly Baker, Ph.D.

The COVID-19 pandemic significantly impacted the popularity of home canning. Consumers had more time at home and were concerned about food supply shortages, which increased home gardening and canning. The increase in home canning further impacted the availability of home canning supplies and where consumers accessed home canning recipes and learning resources. Approximately 60% of consumers who recently completed a survey about food provisioning, use, and waste during the pandemic will continue food behaviors during the post-COVID era. Additional research on consumer behaviors has shown that consumers (new to food preservation) who have gained the most knowledge and experience during this time are more likely to have a longer-term behavioral change utilizing these skills. Clemson Extension's Food Systems and Safety Team provides only research-based home canning information and instructions and may be relied upon for up-to-date, safe, and accurate food preservation information. Standard formats used to provide this information include hands-on workshops, demonstrations, virtual programs, one-on-one consultations, and written publications. Since the COVID-19 pandemic began in 2020, home canning training and resources provided by the team have been accessed significantly more than in previous years, and this trend continues in the post-COVID era. This study aims to evaluate South Carolina consumers' level of knowledge gained in critical areas of home canning before and after attending a hands-on canning workshop in the post-COVID era. Study results will help the Food Systems and Safety Team assess participants' home canning knowledge and skills before training and after the successful completion of a workshop providing science-based home canning instruction. Study results will establish additional training and resource needs to ensure consumers produce safe home canned foods.

Health Extension Creates Sustainable Rural Food Access Improvements Through PSE Approach

Michelle Altman, Weatherly Thomas, Wanda Green

Rural residents often live farther from grocery stores, have less disposable income, and higher obesity prevalence than urban residents. Thus, addressing obesity in rural communities requires addressing rural food systems. Extension Rural Health and Nutrition agents worked to address obesity in three rural

counties with adult obesity rates greater than 40%. The objective was to use a policy, systems, and environmental (PSE) change approach to increase healthy food access in rural counties with high obesity prevalence at the systems-level. A food access assessment was conducted by telephone in 2020. Community members were randomly recruited and incentivized to complete a survey. Survey questions and responses were read aloud to participants over the phone and responses recorded. Results of the needs assessment were used to strategize methods for improving access and affordability of fresh fruits and vegetables. Extension agents also engaged stakeholders by leading rural health coalitions comprised of community members, faith organizations, businesses, and public health officials. Food access assessments showed 33.03% of respondents had easy access to affordable food, 56.56% had easy access to fresh fruits/vegetables, and 39.82% stated the pandemic changed access to healthy foods. Wholesale produce distribution and local produce production via community gardens were identified as food system strategies for improved healthy food access. Stakeholder engagement efforts resulted in the establishment of an active food policy council, creation of three new food access points, and installation of 12 community gardens. Through these avenues, 11,281 locally produced, fresh produce boxes equating to 112,810 pounds of fresh produce have been distributed to 7,050 households (4 people per household) to date. Extension Rural Health and Nutrition agents strengthened food systems in rural communities to expand healthy food access by introducing a wholesale distribution network and expanding locally grown vegetable production.

It's About More than Food: The Need for a Holistic Approach for Assessing College Food Insecurity and Hunger

Catherine Mobley, Ph.D.

Objective: To examine the relationship between childhood (ChFI) and college food insecurity (CoFI) and their relationship to several well-being measures. Participants: undergraduate students at a public university who responded to an online survey in fall 2021. Methods: Chi-square test to determine differences between food secure (FS) and food insecure (FI) students, binary logistic regression of ChFI and CoFI on student demographics, and ordinal or binary logistic regression for well-being measures. Results: Nearly 24% of students identified as FI. FI students were more likely to have experienced ChFI and to have lower scores on all of the well-being measures. Controlling for CoFI, students who experienced ChFI were more likely to experience lower scores on several well-being measures than students who did not experience ChFI. Conclusions: College student health initiatives would benefit from a holistic model that accounts for experiences with ChFI and its subsequent cumulative disadvantages experienced during college.

Can We Talk? Conversations with BIPOC farmers about Stress and Mental Health

Kenneth Robinson, Ph.D.

This presentation provides an overview of a USDA NIFA-sponsored project designed to examine stress and mental health issues among farmers and ranchers across the South. My research focuses especially on small-scale, African American, LatinX and other farm operators of color. We are collaborating with a consortium of southern, land-grant universities to interview farmers and ranchers to help develop and compile an inventory of state and local resources to serve as an assistance network for farm operators and their families who are facing issues related to financial crisis, land tenure and mental health. My presentation will highlight on-farm interviews with BIPOC farmers across the state.

Identification of Critical Points for Bacterial Contamination in the Microbrewery Environment

Alex Thompson

There are 8,884 craft breweries producing over 23 million barrels of beer in the United States as of 2020. These 23 million barrels of craft beer account for 12.3% of the United States beer consumption in 2020. The American craft beer industry is substantial and needs to protect its product from bacterial contamination. Overall, beer is a microbially stable product. Beer's pH, ethanol levels, CO₂ concentrations, the presence of hop-derived antimicrobial compounds, and low levels of O₂ make it a highly unfavorable environment for most bacterial species. Furthermore, the brewing process, which involves heat treatments and chemical sanitizers further protect beer from bacterial contamination. However, beer sometimes does become contaminated by unwanted bacteria. Primarily these bacteria are members of the Genera *Lactobacillus*, *Pediococcus*, *Pectinatus*, and *Megasphaera*. These bacteria contaminate beer due to a variety of factors that allow them to evade beer antibacterial properties or the process hurdles of the brewing process. Protecting beer from these spoilage organisms is crucial to maintain quality and shelf stability. Microbreweries and brewpubs are especially vulnerable to bacterial contamination due to the unique challenges they face. These challenges include the use of modular chlorobutyl hose systems and mobile pumps, the overall nature of smaller brewhouses and cellars exposed to the outside environment (such as opening tanks to pitch yeast, dry hop, or introduction of additions), and the proximity of the production and packaging areas to the public. Research was conducted to determine steps in the brewing process that bacterial species were most likely to contaminate the microbrewery and brewpub environment. Samples were collected from three breweries of similar size and scale in Upstate South Carolina, from eleven common locations throughout the brewing process and analyzed via HybriScan D Beer rapid molecular testing kits for the cell counts at each location.

Economic and Environmental Benefits of Sensor-based Irrigation

Jose Payero, Ph.D.

The irrigation team at Clemson University developed an affordable sensor-based irrigation scheduling system using low-cost open-source electronics, cell phone communication, and Internet-Of-Things (IoT) technologies. The system automatically collects data from moisture sensors installed on farmers' fields and transmits the data to the Internet in real-time. The data can be visualized online using a computer or free cell phone app. Farmers can use the site-specific real-time soil moisture information to make more timely and accurate decisions on when and how much irrigation is required. An On-Farm-Trial project funded by the NRCS-CIG program was initiated in 2020. The project's objective was to promote and demonstrate the sensor-based irrigation technology among South Carolina farmers and quantify its potential economic and environmental benefits. We conducted twelve On-Farm-Trials in 2020 and 2021 on local commercial farms. On each farm, two adjacent fields were compared; one was irrigated based on sensors and the other based on the farmer's practice. Suction lysimeters were installed in each field to measure water and nutrient leaching and quantify the environmental benefits of the sensor-based irrigation technology. Agronomic and economic data (i.e., crop yield, irrigation applied) were collected to quantify its economic benefits. Our results have shown that with few exceptions, the fields irrigated based on the sensor's data had higher net income and lower nutrient leaching than the fields irrigated based on the farmer's practice.

Benchmarking Low-coverage Nanopore Long-read Sequencing for Food Science Applications

Juan Antonio Baeza, Ph.D.

The potential of long-read next-generation-sequencing technologies to help food sustainability strategies still requires experimental work. In this study, I first tested whether DNA markers (mitogenomes) can be sequenced from long-read nanopore sequencing data exclusively. Second, I explored the accuracy of the long-read assembled genomes by comparing them to a standard reference mitogenome retrieved using Illumina sequencing. Third and lastly, I tested if the long-read assemblies are useful for DNA barcoding research. To accomplish these goals, I used the Caribbean spiny lobster *Panulirus argus* and the silky shark *Carcharhinus falsiformis*, two ecologically relevant species target of most lucrative fisheries. Using a MinION ONT device and various de-novo and reference-based assembly pipelines retrieved a complete and highly accurate mitogenome for the model species. Discordance between each of the long-read assemblies and the reference mitogenome was mostly due to indels at the flanks of homopolymer regions. Although, phylogenetic analyses using entire mitogenomes demonstrated that mitogenomes assembled using long reads reliably identify the sequenced specimen as belonging to the model species and distinguish the samples from other related species in the same genus, family, and superorder. This study serves as a proof-of-concept for the future implementation of in-situ surveillance protocols using the MinION to detect mislabeling in the model species across their supply chain. Mislabeling detection will improve fishery management in this overexploited species. This study will additionally aid with the transfer of genomics technology to low-income countries.

Reduced-immunogenicity Peanuts are Affordable Immunotherapy for Peanut-sensitive Individuals and a Source of Nutrition
Sachin Rustgi, Ph.D.

With its nutrient-rich kernels, peanut constitutes an optimal dietary option. Unfortunately, the peanut is among the nine primary sources of food allergy recognized by the U.S. FDA and a major cause of allergy-related fatalities. Population studies in the U.S. showed that peanut allergy affects about 6.1 million children and adults, and the number is rising. Raw peanuts and derived products lead to various allergic responses, most commonly immediate-onset anaphylaxis. Peanut allergy currently requires the complete exclusion of peanuts from the diet. Avoiding peanuts, other cross-reacting tree nuts, and legumes (foods with overlapping allergen profiles) limit the options to obtain proteins specifically in vegans and vegetarians, 14% of the U.S. population. Also, avoiding peanuts is not straightforward due to their ubiquitous presence in processed foods and unintended contamination. Four peanut proteins, Ara h1, Ara h2, Ara h3, and Ara h6, were identified as major allergens, as sera from 90% of patients in the U.S. respond to these allergens. Keeping in mind the benefits of peanut consumption, the fear of accidental peanut exposure among sensitive individuals, the social and financial burden of managing peanut allergy, limited therapeutic options, and the rise in peanut allergy diagnosis, we undertook two approaches to develop reduced-immunogenicity peanut genotypes. 1) Peanut germplasm screening for genotypes with reduced immunogen content to crossbreed them to develop reduced to non-immunogenic peanut lines. 2) Use a precise mutagenesis tool, CRISPR, to silence genes encoding major allergenic proteins. The outcome of either approach would be reduced allergen non-transgenic peanuts. These peanuts, once available, are expected to serve as a source of affordable oral immunotherapy to desensitize individuals with mild peanut allergy and reduce the fear of a severe reaction to peanut exposure among sensitive individuals.

Nigella Sativa as an Antibiotic Alternative to Promote Growth and Enhance Broiler Health
Vishal Manjunatha, Julian E. Nixon, Greg F. Mathis, Brett Lumpkins, Zeynep B. Guzel-Seydim, Atif Can Seydim, Annel K. Greene, and Xiuping Jiang.

The poultry industry is facing major challenges of coccidiosis and necrotic enteritis as severe diseases leading to high mortality and unacceptable growth without antibiotic treatment. The current study aims at using natural product of (black cumin) in poultry feed to inhibit coccidiosis and prevent or lessen necrotic enteritis in broilers. A study was conducted to identify a black cumin seed oil product with the highest anti-activity. The study consisted of 384 Cobb 500 male broiler chickens distributed randomly among treatments and compared different levels (1, 2 and 5 ml/kg) of black cumin seed oil in feed as the treatments for chickens challenged with *C. perfringens*. Broiler growth performance and disease outcomes were measured for the animal trial. Black cumin seed oil levels of 2 and 5 ml/kg were effective in reducing necrotic enteritis lesion scores and mortality with no significant impact on broiler growth performance. Further, cecal samples showed a decline in the number of vegetative cells and spores with increasing concentrations of black cumin seed oil treatments at the end of animal trial. In conclusion, there can be an alternative to commonly used antibiotic treatment in mitigating *C. perfringens* infection and mortality.

Encouraging Best Practices for Fats, Oils, and Grease (FOG) Management through Education and Outreach

Derrick Phinney, Susan Lunt

Fats, oils and grease (FOG) are abundant in foods and the cooking process for many facilities, restaurants and homes. When improperly managed, FOG can solidify and accumulate inside storm drains, sewer pipes, and septic systems leading to blockages, backups, pipe bursts and overflows. FOG issues can occur in residences and communities causing foul odors, localized flooding, road closures, and bacterial contamination in waterways. This can be very expensive for individual residents and the community to address. Clemson Cooperative Extension Water Resources Team approaches FOG education in S.C. communities by encouraging desirable behaviors through educational outreach methods. Widespread efforts include mass media campaigns (Can It, Cool It, Trash It commercial billboards), back-of-water bill reminders, rack cards, fact sheets, restaurant package materials, FOG lids, pot holders, and targeted programming. While it is difficult to evaluate and document the effectiveness of educational outreach on compliance of FOG programs, surveys and research concludes that educational outreach is the backbone of successful FOG waste management.

Clemson Extension Weather Network: Building Resilience for Agriculture Production Food Systems **Matt Burns, Ph.D.**

Successful food systems begin with the successful production of food products, often dependent on local weather conditions. Hyper-local weather data is critical to producing many food crops, but limited to many rural, highly productive agriculture areas. This project aims to establish a network of weather stations throughout the state of South Carolina, providing real-time weather data to producers, partners, researchers, and other professionals. A minimum of one station has been installed in 46 counties across South Carolina. Priority for installation was assigned based on feedback from the South Carolina State Climate Office regarding identifying rural geographic locations with minimal weather data reporting. Of the 51 stations installed, 42 (82%) were in proximity to production areas that contribute to a food system. While the presence of weather data is critical for food production decisions, decision aids and tool kits will be the key to building climate resilience. According to the Center for Climate and Energy Solutions, climate resilience is the ability to anticipate, prepare for, and respond to hazardous events, trends, or disturbances related to climate. The Clemson Extension Weather Network (powered by WeatherFlow) provides real-time lightning alerts, custom point forecasts by location, real-time rainfall start and volume, and temperature. Once the weather station infrastructure (stations and

website) is completed, the aim is to build calculators and alerts that will help growers make management decisions based off hyperlocal, real time and projected weather data. Forecasting and documenting drought, flood, frost and freeze, and other natural disaster events and effects on food system production will aid in building resilience to the food system.

Optimizing the Food Value Chain to Drive Circularity

Anne Barr

Sonoco FRESH takes a holistic approach to optimizing the food value chain - from food producers to processors, and packagers to CPGs, distribution and waste management. This presentation will provide an overview of Sonoco FRESH's structure and approach to engaging stakeholders across the value chain - from industry and academia.

Farming Foundations: A New Course for Beginning Farmers

Cory Tanner

Extension agents across South Carolina regularly receive questions from clients on how to start a farm. Most of these inquiries come from citizens with little to no farming experience. Successfully educating a client about the challenges and opportunities of starting a farming venture requires a lot of time, energy, and effort from the agent. Even after a phone call or two and multiple site visits, new growers still do not have a good grasp on how to start a farm. To provide these potential new growers with the basic knowledge needed to be successful, a team of Clemson Extension agents led by Zack Snipes worked with Clemson Online to develop a 14-module, asynchronous online course called Farming Foundations. The free course launched in 2022 and covers the basics of starting a farm. It is specifically designed to provide foundational information for fruit and vegetable production in South Carolina. Learning modules include land preparation, soil fertility, farm safety, tools and equipment, irrigation, and how to use Clemson Extension resources. Upon completion of the course, participants are instructed to complete a farm portfolio and schedule a time to present their plans to their local Extension agent. To date, over 460 people have enrolled in the class. It is unclear how many of these folks will become farmers, but we know they have an excellent foundational knowledge of how to start a farm. By lessening the knowledge gap between potential new farmers, and Extension agents, we should see an increase in successful farming ventures, a reduction in the time burden on agents, and ultimately an increase in the production of locally grown fruits and vegetables.

Local food Marketing Constraints and Cooperatives as a Potential Solution

Richard Stevens, Ph.D.

This presentation will give a brief summary of two years of research projects related to marketing local foods in South Carolina. These research projects are in the process of publication and are related to consumer preferences and marketing of local foods. Included will be the barriers to expanding local food sales and how cooperatives and cooperative-like business structures can be a high-leverage solution for overcoming these barriers.

Rising Production Costs and Other Challenges for Local Producers

Kevin Burkett

In a time when production, marketing, and business costs are rising, what can producers do to have a successful business model and maintain profitability? Weather, COVID-19, labor, and inputs have all

created obstacles for local growers in recent years. Support networks help growers face these challenges and find solutions. Extension works with farmers to help them produce and maintain crops, market crops, and successfully run their businesses. A spotlight has been put on local growers and agriculture and we want to continue to help these stakeholders succeed.

Poster Presentations (in alphabetical order of title)

Analysis of Wheat to Identify Grain Quality Traits and Reduced Immunogenicity Genotypes for Those Suffering from Celiac Disease

Zachary Jones

Wheat is a vital energy source for the United States population, as Americans consume approximately four percent of the global wheat production. With the steady increase in the U.S. population, the demand for wheat is also growing; on the flip side, wheat yield gains have not caught up with the demand. Increased incidences of celiac disease, wheat allergy (including baker asthma), wheat sensitivity, and dermatitis herpetiformis (10% of the U.S. population) triggered by the wheat and wheat products also have further limited access to this essential nutritional source. Hence, creating demand not only for more but also for safer wheat to feed the population. Plant developmental processes, specifically during grain development, can be altered to combat stagnated wheat yield gains and improve safety and nutritional quality. Hence, we adopted a two-pronged approach using genetic engineering and conventional breeding methods to aid those suffering from wheat-induced disorders. Utilizing the precision mutagenesis tool CRISPR, the genes responsible for gluten accumulation during grain development are targeted and edited, reducing wheat immunogenicity. The conventional breeding approach involves the analysis of three distinct populations of wheat (landraces, an abscisic acid mutant collection, and a D-subgenome specific nested association mapping population) for their respective protein content and composition to detect genotypes that are low in proteins that are responsible for the immune reaction sensitive individuals experience. Genotypes low in immunogenic proteins can then be crossed, and the resulting grains further analyzed for reduced immunogenicity. Based on earlier research, these reduced-gluten genotypes are expected to exhibit reasonable end-use performance. Further, these lines are expected to reach the consumers using the current infrastructure used to produce, process, or market the grains and products. In sum, these genotypes are expected to help meet the demand for safe grains and, when combined with other interventions, the demand for more grains.

A Complex Takeout Remedy

Nicole Weldy

Areas with little options for fresh produce, supermarkets stretching over 10 miles from rural communities, dollar stores barely passing as grocery stores – we live in a society with unequal access to farm picked produced and an abundance of fast-food chains. McDonald's in particular feeds 1% of the world population every day. A Complex Takeout Remedy questions the land placement of nutritious food access or the lack thereof concerning grocery stores,

supermarkets, dollar stores and restaurants. One's overall food intake health depends firstly on affordable access to nutritious fruits and vegetables. As seen in the working gallery proposal, the individual layers to the McDonald's Big Mac reside in separate mesh grocery bags hand crocheted by the artist herself. Irish crochet lacemaking originated from France to Ireland in the 1700s and became popular in the mid-nineteenth century by lower income families. Men, women, and children made lace in exchange for bread during the potato famine in 1845. When considering fresh produce as a luxury item like lace it made sense to impose an abundance of mass-produced restaurant ingredients in grocery style mesh bags. A handful of fresh produce such as oranges, avocados, and potatoes all are transported in breathable mesh bags but are not found in variety stores. The white walled gallery space originated as a pure space to clearly view artwork, new ideas and materials set before it. The blank canvas atmosphere of the space provides a point of departure for the possibly of creating of sculptures advocating for social justice. The materials fed into the creation of this body of work stem from questioning the land ownership of food access joints. Utilizing the architecture of the neutral gallery space the artist challenges fast food to explain itself in relationship to the ecosystem of food health and access.

An interactive Food Access Map Tool for Linking Producers, Consumers, Health Care
Maya Gardner, Sydney Ford

The Food Access Map project began in 2020 as an effort to combat rising levels of food insecurity in Upstate South Carolina. The College of Behavioral, Social and Health Sciences' Land Grant Local program worked to assemble a catalog of food resource providers with help from the United Way of Pickens County, Ten at the Top, Clemson's Joseph F. Sullivan Center interdisciplinary health center, and other local organizations committed to public health and community care. The project was expanded to include all 46 South Carolina counties in light of additional funding from the South Carolina Department of Health and Environmental Control (SCDHEC). Since its founding, the project has cataloged more than 800 food resource providers across the state, collecting 23 fields of data related to location, contact information, services, and eligibility requirements. Offices of the United Way, SCDHEC, and the Department of Social Services also appear on the map. Using ArcGIS, the catalog of food resource providers has been converted into a user-friendly online platform. Upon its official release in October, South Carolina residents, health care providers and food researchers will have the power to search for food resource providers by location as well as filter results based on personal needs related to eligibility requirements, services offered, and the application process. Both the Food Access Map and the catalog of resources from which it is built are valuable tools to increase community resilience, mitigate food insecurity, and facilitate opportunities for network building between organizations and professionals committed to public health.

Building a Cool-season Oilseed Crop Canola Production in S.C.
John W. Park, PhD

Canola is a brassica family cool-season crop which produces pods. Seeds are harvested from these pods and are crushed to generate edible canola oil and animal protein meal. Canola is a main source of vegetable oil across the world and is grown at scale to support global demands.

It is interesting to note that less than 20% of canola is produced in the U.S. to satisfy domestic demands this presents a huge opportunity for U.S. farmers to grow more canola. Canola production acreage has been expanding in the U.S. beyond the main canola growing regions to take advantage of this opportunity. One of the main challenges we have encountered is to find canola varieties that sustain a profitable yield potential and can withstand environmental constraints such as soil diseases and the variable climate. We have been investigating different varieties to identify potential candidates for producing high quality vegetable canola oil and excellent yield potential. A preliminary study has shown that canola can grow well during the winter and following spring seasons in the Pee Dee region. Continuous research should lead to an innovative future of canola production in the agronomic and industrial businesses in regions of South Carolina.

Clemson Extension Weather Network: Building Resilience for Agriculture Production Food Systems

Matt Burns

Presented as research brief and poster (see abstract in Research Briefs).

Clemson Rural Health: Harvesting Health Care

Caitlin M. Kickham, MS, APRN, FNP-C and Hailey Britt

Through Clemson Rural Health's mission to reduce premature mortality, decrease preventable hospitalizations and promote healthy behaviors, the interdisciplinary team at Clemson Rural Health provides comprehensive primary care services for farmworkers in South Carolina through their state-of-the-art mobile health unit fleet. Seasonal or migrant farmworkers are workers who travel across a wide geographical region over the course of the year to work on farms producing a variety of crops. Many of workers do not have a permanent residence which makes accessing health care difficult. Clemson Rural Health's mobile units travel to farms to provide workers with comprehensive primary care services during the months they reside in South Carolina. All of this is done with the hope of embodying Clemson Rural Health's vision to "improve individual and community health outcomes among underserved and rural communities throughout South Carolina by increasing access to quality health care and improving health equity through innovative, evidence-based approaches and strategic partnerships."

Eating Smart-Being Active Teaches S.C. Adults Cooking Skills, Food Resource Management and Behavior Changes that Promote a Healthy Lifestyle

Tarana Khan Ph.D., Marlyne Walker and Rebecca Whitmen

Food-away-from-home spending accounted for 55% of total food expenditures in 2021, compared to just 25% in 1970. Foods prepared away from home are higher in calories and lower in nutrients. Cooking skills among youth are declining. One out of every three children in South Carolina are obese. Twenty-three percent of youth in South Carolina live in poverty.

Youth who live in poverty are more likely to experience food insecurity which can result in poorer food and health choices and increased obesity risks. The Expanded Food and Nutrition Education Program (EFNEP) teaches youth the knowledge and skills they need to lead a healthier lifestyle through the Teen Cuisine Choose Health: Food, Fun and Fitness was developed by Virginia Tech Cooperative Extension Service for youth 6-12th grade and was developed by Cornell University to teach 8 to 12-year-old children. S.C. EFNEP adopted both curricula and trained EFNEP nutrition educators. Both curricula have a series of lessons consisting of a variety of activities focused on nutrition, food safety, food security, and physical activity. Nutrition educators offer programs in the community in a variety of settings, including Title 1 schools, churches, after school programs, community clubs, and local libraries. Both curricula use pre- and post-surveys to evaluate behavioral changes. In 2021, S.C. EFNEP reached 1,972 youth, and the outcome data showed improved diet quality, improved food safety, improved physical activity, improved food security, and improved food resource management. Conclusion: EFNEP follows a research-based learning model that allows the experienced and trained nutrition educator to impact the lives of those who need the information.

Economic and Environmental Benefits of Sensor-based Irrigation

Jose Payero

Presented as research brief and poster (see abstract in Research Briefs).

Enhancing Marbling Deposition

Susan Duckett, Ph.D.

Marbling or intramuscular fat (IMF) deposition in beef is a major determinant of carcass quality and value. Retailers and restaurants want more prime beef but only 5-10% of beef carcasses actually make the prime grade. Marbling deposition in cattle and its development is still not fully understood. Marbling is moderately heritable trait ($h^2 = 0.45$) and some breeds of cattle are known for high marbling deposition (i.e. Wagyu). However, management and feeding of cattle are also very important for enhancing marbling deposition but less is known about critical time periods of development. Research suggests that a critical time point in marbling deposition may be during late prenatal and early postnatal phase (-30 to 250 days of age). Our research examines how precision nutrition impacts marbling deposition in Wagyu-sired or Hereford-sired calves. Calves ($n = 34$; 20 Wagyu-x and 14 Hereford-x) were monitored for intramuscular fat deposition from May (~100 days of age) to weaning (~184 days of age) using real-time ultrasound. Corn supplement (0.5% of body weight) was offered to calves individually using the SuperSmart Feeder during this time. Biopsies were taken from the steer calves ($n = 16$) at the beginning and end of this phase to examine gene expression for key adipogenic and lipogenic genes and total lipid content. Calves that consumed the corn supplement were heavier at weaning by 30 lb. Ultrasound IMF levels were higher for Wagyu-sired than Hereford-sired calves at the start and end of this project and corn supplementation did not alter IMF levels. Gene expression analyses of skeletal muscle biopsies are on-going. Results from this research will advance our understanding of how marbling deposition proceeds and nutritional factors that impact carcass quality grade.

Exploring Healthy Food Security in a Rural Food System Through the Lens of Multi-sectoral Stakeholders

Caitlin Koob

The food environment significantly influences health and well-being. In fact, food proximity, access, and affordability are key domains of the social determinants of health. However, rural environments host environmental barriers that increase the risk of food insecurity among individuals in these communities. This study examined the disparities in food access and nutrition that are exacerbated by such barriers, as well as efforts to advance equity. Study objectives were to understand stakeholder perspectives on 1.) facilitators and barriers that influence food access and food security status, and 2.) potential interventions to promote equitable food access and security among rural community members. Rural health and nutrition extension agents identified stakeholders across three counties in South Carolina to participate in in-depth interviews (N=16). Community stakeholders represented diverse sectors relevant to food access, nutrition, and health, including schools, faith-based, and nonprofit organizations. Data was analyzed using inductive thematic content analysis to code interviews and identify key themes. The current episodic, crisis-like response to food insecurity and food access within these rural communities has the potential to maximize the reach of food resources and advance health equity through partnerships. Episodic food distributions heavily rely on uncertain funding, yet demonstrate significant community needs regarding food security. Partnerships, however, may efficiently address several barriers to food access through consolidated financial and capacity efforts. In doing so, partnerships may simultaneously increase the reach of food access efforts among subpopulations with currently unmet needs. Conclusion: Currently, when services are soiled, gaps in food and nutrition needs persist. Stakeholder insights suggest emphasizing partnerships, self-sustaining gardening, ongoing food distribution efforts, and workshops on nutrition education are promising methods to address identified barriers. Optimization of key facilitators can provide a sustainable approach to addressing high obesity rates and associated chronic conditions in rural communities.

Farming Foundations: A New Course for Beginning Farmers

Cory Tanner

Presented as research brief and poster (see abstract in Research Briefs).

Identification of Critical Points for Bacterial Contamination in the Microbrewery Environment

Alex Thompson

Presented as research brief and poster (see abstract in Research Briefs).

Navigating Regulatory and Food Safety Requirements for New and Newly Established Food Entrepreneurs

Adair Hoover

Clemson Cooperative Extension's Food2Market program aims to assist food entrepreneurs who are getting started in the food production business with the regulation and food safety requirements. The number of food entrepreneurs is rising with the popularity of buying and selling local foods and as farmers increase production and sales of value-added foods made from the crops they grow. Normally, food entrepreneurs know what food they want to make and sell but are unaware of the regulation and food safety requirements. In South Carolina, the South Carolina Department of Agriculture (SCDA) regulates approximately 200 wholesale food manufacturing firms. The South Carolina Department of Health and Environmental Control (SCDHEC) regulates approximately 22,000 retail food establishments, which include restaurants, cafeterias, grocery stores, and direct-to-consumer food sales. Additionally, an innumerable number of home-based food producers make and sell foods from their home kitchens under the home-based food production law.

A survey of food entrepreneurs, who have utilized the Food2Market program, will be conducted to determine the program's effectiveness and assess their current needs. The survey will evaluate the type of food(s) inquired about, regulatory authority (if applicable), Food2Market services used, current market status of product(s), and current regulatory and food safety needs. The survey results will be utilized to expand the strategic plan of the Food2Market program. Survey data will be analyzed and applied to help South Carolina food entrepreneurs successfully navigate the regulatory and food safety requirements of producing food for sale. This will help food businesses to succeed and ensure a safe food supply for consumers in South Carolina.

Quinoa Initiative in SC – Building an Agronomic Potential of Quinoa in the Southeast **Caroline Smith**

An ancient crop, quinoa is a highly nutritious food crop. It has superior quality and quantity of protein, minerals, and vitamins. With diverse origins, quinoa has been adapted well in different regions including North America. Although, most crops are native to the Andes Mountains of South America. We aim to identify quinoa varieties from coastal origins that have potential to adapt to the Southeastern region. Field trials will help determine which varieties can sustain winter frost and/or high temperature during spring season while producing profitable quinoa yield.

SC Ag + Art Tour **Will Culler, Ph.D.**

The South Carolina Ag + Art Tour is a free, self-guided tour of designated farms in South Carolina featuring local artisans at each site. During the tour, visitors can see first-hand where their food comes from, watch artists in action and purchase their works, and learn more about rural life. In 2022, over 100 farms across ten South Carolina counties from York to Charleston

participated in the tour. With over 80,000 tour visitors over the past 10 years, the tour has gone far in fostering food systems education through partnership and collaboration. As far as is known, this tour is the first grassroots agritourism product to cross county lines, thus promoting regionalism, which is also essential for effective food system planning. Social capital formation from one activity holds the potential to transfer to the other. Program Impacts include: 1) Economic development impact – direct local economic development impacts through tourist visitor expenditure. 2) Change in local food demand impact – increase in purchases of locally grown food through new producer-consumer relationships. Tour participants are linked from the website to encourage consumer-producer interaction. There are typically local food products as well as artisan-produced products offered for sale during the tour. 3) Risk management impact – the tour includes farms that have not historically implemented agritourism strategies in their business plan. Utilizing this business opportunity helps to reduce some of the financial risk associated with ag-based businesses. It allows for these farms to experiment with agritourism with a minimal investment. 4) Asset mapping impact – a product of the tour process is an asset map of agritourism assets that can be used to develop future marketing support programs, including for local food systems. 5) Community development impact – establishing county-level planning teams and a regional leadership team helps to ensure the sustainability of the program while providing a venue for communication and interaction of the agritourism community within each county.

The Effect of Pre-treatment and Freezing on the Polyphenol Oxidase Activity and Color Stability of Sliced Peaches

Wesam Al-Jeddawi

The present study was conducted to determine polyphenol oxidase (PPO) enzyme activity, along with changes in color and hydroxymethylfurfural (HMF) content in fresh and pre-frozen peach slices stored at different frozen temperatures (-7, -9 and -12 degrees Celsius) for 21 days. Previous research has shown that fresh and pre-frozen peaches (-7 and 12 degrees C) become discolored after two weeks of storage, and other intervention strategies to maintain quality are needed. To test the efficacy of pre-treatments and freezing for maintaining peach quality, fresh local peaches (F) were obtained and divided into four different treatments: (1) no blanching, no dipping in a mixture of (2% of L-ascorbic acid and 2% of citric acid) (N), (2) blanching in boiling water (96 degrees and 4 degrees C) for 1 minute (B), (3) dipping in a mixture of (2% of L-ascorbic acid and 2% of citric acid) for 3 minutes (AC), (4) blanching in boiling water (96 degrees and 4 degrees C) for 1 minute and then cooled in ice before dipping in a mixture of (2% of L-ascorbic acid and 2% of citric acid) for 3 minutes (BAC). After treatment, peaches were drained and packaged by treatment into Whirl Pak bags. One half of the samples from each treatment were pre-frozen (P) by placing them in an Ultra-low temperature freezer (-79 degrees C) until they attained a core temperature of -20 degrees C. After pre-freezing, samples from each treatment were placed into a freezer set to (-7, -9 or -12 degrees C) for 21 days. The other half of the samples from each treatment that were not pre-frozen were also placed into the freezers set to (-7, -9 or -12 degrees) for 21 days. Peach slices stored at -7 degrees Celsius showed significantly higher PPO activity and browning than those stored at -9 degrees C and -12 degrees C. Lightness (L*), yellowness (b*), chroma (c*) and hue (h*) significantly decreased

while redness (a*) increased during storage. When treatments were compared, peaches that were pre-treated with ascorbic acid/citric acid and then blanched before freezing had the least amount of discoloration and lowest PPO enzymatic activity. A positive correlation was observed between peach color parameters and PPO enzymatic activity. Non-enzymatic browning (HMF indicator) for blanched peach slices increased significantly more during storage than unblanched peach slices.

Youth and Pollinators: The Future of Agriculture

Ashley T. Burns, Ph.D.

Today's youth will play a critical role in solving global food supply issues. Pollinators, the animals that are responsible for pollinating plants, play an important part of agriculture. One in three bites of food comes from pollinators, and without them our world would look very different. Educating youth about pollinators and their habitat and providing them with hands-on learning opportunities is preparing the next generation of environmental stewards to confront some of the world's most pressing environmental and agricultural problems.

Biographical Sketches

Clemson presenters

Adair Hoover

Adair Hoover is the lead agent for the Food2Market program. The Clemson Food2Market Program exists to help people who want to make and sell foods in South Carolina with the food safety and regulations requirements. Our goal is to make this part of the startup process and as smooth and easy as possible.

Alex Thompson

Alex Thompson is a graduate of Clemson University with a B.S. in Food Science and Human Nutrition and a M.S. in Food, Nutrition and Culinary Science. He is currently working as a Food Systems and Safety Agent with Clemson Cooperative Extension. Alex's primary professional background is in craft brewing. He has worked as a brewer in an Upstate brewery and has also conducted research into bacterial contamination and prevention for microbreweries. He has a passion for food safety and microbiology, food chemistry, and fermentation science. Alex is also a United States Army Veteran and served in Operation Enduring Freedom.

Anne Barr

Anne Barr engages industry and academic partners in solving for safe, secure and sustainable solutions across the food value chain. Anne's corporate relations program secured high impact philanthropic investments in areas such as automotive engineering, packaging science, graphic communications, advanced materials and STEM education. Prior to moving to Greenville, South Carolina, Anne consulted to private sector and non-profit clients in Chicago. She also worked for more than eleven years in New York City in marketing, product development and manufacturing and as National Sales Manager for a division of U.S. Shoe. Before joining Clemson, Anne worked for the Greenville County Museum of Art as head of education, community programs and development. Anne holds degrees from Davidson College (B.A.) and Bank Street College of Education (M.S.Ed.) and was an exchange student in Japan in both high school and college. She is an active community volunteer and serves on the boards of several non-profits.

Ashley Burns, Ph.D.

Dr. Burns received her undergraduate degree in Animal Science and Dairy Science from the University of Georgia, master's degree from Kansas State University, and Ph.D. from Clemson University in 2011. She serves as the interim State 4-H Program Leader and works closely with Extension specialists, agents, and administration to provide statewide guidance and program development for 4-H. Her research interests focus on the impact of positive youth development programs on youth participants and adult volunteers, particularly those related to science and agriculture and natural resource areas.

Brooke Brittain

Brooke Brittain obtained a B.S. degree in Health Promotion from Coastal Carolina University, a M.S. degree in Food and Nutrition from Florida State University and a Culinary Certificate from the University of South Carolina. Brooke has worked in community nutrition for seventeen years. She is a registered and licensed dietitian as well as a Certified Health Education Specialist and a Certified Lactation Counselor. Brooke is currently the Associate Director of Food and Nutrition Security with Clemson Rural Health. Through this position she designs and oversees program planning, implementation and training related to nutrition and health in rural environments.

Caitlin Koob

Caitlin Koob is a doctoral student in the Applied Health Research and Evaluation program within the Department of Public Health Sciences at Clemson University. She is a graduate research assistant who has worked on the CDC's High Obesity Prevention project in South Carolina for the last two years.

Caroline Smith

Caroline Smith is a research specialist at Clemson Pee Dee REC in Florence. She graduated from Francis Marion University in 2021 where she majored in biology with an emphasis in Environmental Science. She loves playing the piano, running, biking, working in her garden, and being with her dogs. She lives in Florence where she grew up.

Catherine Mobley, Ph.D.

Catherine Mobley, Professor of Sociology at Clemson University, conducts research in the areas of engineering and STEM education, environmental sustainability, food and nutrition security, science identity, and applied sociology. Much of Dr. Mobley's research is interdisciplinary as she has collaborated with colleagues from across the University. She has more than 30 years of evaluation experience, conducting community-level assessments and evaluating collaborative research efforts. Dr. Mobley has also been involved in extensive applied work in the community, reflecting an explicit integration of her teaching, research and service endeavors. She holds a B.A. in Sociology from Clemson University, an M.S. in Policy Analysis and Development from the University of Bath (England), and a Ph.D. in Sociology from the University of Maryland.

Cory Tanner

As the Horticulture Program Team Director, Cory Tanner provides statewide programmatic leadership to Extension agents working in horticultural food crops (commercial fruit and vegetable production) and urban horticulture (school community gardening, consumer horticulture, and the ornamental nursery and landscape industry). He delivers educational programs and consultation services to landscapers and nursery professionals and shares home gardening advice, teaches Master Gardener lessons throughout the state, and writes horticultural columns and fact sheets.

Derrick Phinney

Derrick Phinney is the Natural Resources Program Director for Clemson Cooperative Extension providing statewide programmatic leadership to extension agents working in forestry, wildlife and water. He received both a B.S and M.S in Forest Management from Clemson University and is a registered forester. He has experience working in

land management and environmental regulations since 1998. He has worked with landowners on establishing objectives, writing and implementation of management plans, timber sales, reforestation, prescribe burning, cost share programs, GPS, GIS mapping and endangered species assessments. He has a vast background in freshwater wetlands and critical area determination and verification, restoration of freshwater wetlands and critical area, environmental permitting and storm water monitoring. He works closely within the biomass sector in regards to the use of wood pellets for energy production. The urban forestry market and interest has been growing over the last several years and his understanding and background has been increasing due to the new interest in our urban forest.

Hailey Britt

Hailey Britt is a Graduate Assistant working under Caitlin Kickham.

Hannah Roberts

Hannah Roberts obtained a B.S. degree in Dietetics from the University of Georgia in 2014 and completed her dietetic internship from University Hospital in Augusta, GA. She is a Registered and Licensed Dietitian Nutritionist. Hannah has worked as a Community Health Coordinator for Supplemental Nutrition Assistance Program (SNAP-Ed) at Clemson University Youth Learning Institute for 3.5 years. With this program she provided evidence-based nutrition education to families and individuals in six counties. In addition, she assists in policy, system and environmental (PSE) strategies in eligible sites with a goal of supporting healthy eating and active living behaviors for low income audiences. Prior to her work with SNAP-Ed, she worked as a Wellness Advisor for an employee benefits firm where she developed, coordinated, and maintained total wellbeing programming for clients to reduce health risk and medical costs. Hannah received the Education and Nominating Chair Award for Augusta Area Dietetic Association in 2015. She won the Outstanding Dietetic Intern of the Year for the Piedmont Dietetic Association (PDA).

John Park, Ph.D.

Senior Scientist, Crop Genetics and Breeding, Pee Dee REC.

Jose Payero, Ph.D.

Dr. Payero has a B.S. in Ag Engineering, an M.S. in Agriculture-Plant Science, and a Ph.D. in Irrigation Engineering. He has worked in research, Extension, and teaching in the Dominican Republic, Costa Rica, Australia, and the U.S. Since 2012, he has led the irrigation research and Extension program at the Edisto Research and Education. His work focuses on on-farm agricultural water management, including modeling and direct measurement of crop water use, crop response to water stress, irrigation scheduling, sensor-based irrigation automation, and the development of online decision support tools, among other topics.

Juan Antonio Baeza, Ph.D.

Juan Antonio Baeza is an evolutionary ecologist. He tests sex allocation and mating systems theories using invertebrates as model systems. He is also interested in understanding the role of the environment in determining the evolution of social behaviors within a phylogenetic framework. Most recently, he is developing genomic resources to help with conservation strategies in marine and terrestrial endangered species. He is an Associate Professor at the Department of Biological Sciences, Clemson University.

Ken Robinson, Ph.D.

Dr. Kenneth L. Robinson is an Associate Professor of Sociology at Clemson University and an Extension Specialist. His teaching, research and outreach interests include rural sociology, entrepreneurship, and African-American rural life. Dr. Robinson was a research associate at Cornell University, where he received his Ph.D. in Development

Sociology. Also, he was awarded a Fulbright Fellowship to examine small-scale, commercial agriculture in the economically disadvantaged, former homeland areas of KwaZulu-Natal, South Africa. Dr. Robinson is also a graduate of the University of Texas-Austin, where he was a student of the late Texas Congresswoman Barbara Jordan. Afterwards, he relocated to Washington, D.C., where he served as a Presidential Management Intern with the U.S. Department of Agriculture and as a Housing and Community Development Specialist in the Texas Governor's Office of State-Federal Relations.

Kevin Burkett

Kevin works as an Extension Associate for Clemson Agribusiness. Kevin has worked in Extension for a little over six years. Working with fruit and vegetable growers, he delivers research-based educational programs that enable South Carolinians to improve their quality of life and economic well-being. This includes farm marketing, financial analysis, enterprise budgeting, and tax education.

Kimberly Baker, Ph.D.

Dr. Kimberly Baker serves as the Food Systems and Safety Program Team Director and Assistant Extension Specialist with the Clemson University Cooperative Extension Service. She received a Ph.D. in Food Technology from Clemson University, is a registered and licensed dietitian, and a trained chef. Dr. Baker began working with Clemson Extension in 2007 as a Food Safety and Nutrition Agent in Greenville County. Dr. Baker is also a certified Seafood HACCP Trainer and Instructor, certified Food Safety Preventive Control for Human Food and Animal Food Lead Instructor, certified Produce Safety Alliance Lead Trainer and Dr. Baker enjoys using her professional expertise to teach about home food preservation, consumer food safety, and working with food entrepreneurs.

Marlyne Walker

Marlyne R. Walker, M.S., RDN. Marlyne R. Walker was a registered dietitian and Senior Extension Agent with Clemson University Cooperative Extension Service. She worked as an EFNEP (Expanded Food and Nutrition Education Program) State Specialist and Extension Agriculture Curriculum Coordinator. She received a Bachelor of Science degree from South Carolina State University and a Master of Nutritional Science Degree from Clemson University. Marlyne inspired people to increase their understanding of nutrition so that they could make healthy food choices and adopt a healthy lifestyle. As a trainer, she was known for her innovative ideas and creative learning activities that were hands-on, fun, and practical.

Matt Burns, Ph.D.

Dr. Burns currently serves as the Extension Beef Specialist and Division Director for Agriculture and Natural Resources under the Cooperative Extension Service. Extension programming focuses on increasing adoption of best management practices to decrease the effects of fescue toxicosis on beef cattle operations and using technology to increase efficiency within the agriculture industry. His programmatic responsibilities include Master Cattleman, Bovine Artificial Insemination School, and statewide beef cattle program development. Dr. Burns works with the Extension Agriculture Division (agronomic crops, horticulture, forestry and natural resources, livestock and forages, and agribusiness) to increase impact and team programming. His areas of expertise are beef cattle management, reproduction, and forage and reproduction interactions in beef cattle. Matt lives in Pendleton, S.C., on a small family farm operation with his wife Ashley and 8-year-old daughter Eleanor Grace.

Maya Gardner

Maya Gardner is a senior at Clemson University graduating this fall with a B.A. in Sociology, an emphasis in Criminal Justice, and a double minor in Political Science and Spanish. Maya was born and raised in Charleston, S.C., and looks forward to traveling home during the holidays. In addition to a diverse plan of studies, Maya has gained professional experience through her internship with the College of Behavioral, Social, and Health Sciences where she served as student lead for the Food Access Map project from January through May of 2022. During this time, Maya helped organize action by student workers and volunteers with the goal of contacting and verifying more

than 800 food resources from across the state. Before leaving the position, Maya prioritized the creation and organization of materials that would streamline the completion and continued maintenance of the Food Access Map. Following graduation, Maya plans to attend law school full-time. Ultimately, she aspires to translate closely held values of compassion and equity into a career in law that serves to protect and empower others.

Michelle Altman

Michelle Altman is a Rural Health and Nutrition Agent with the High Obesity Program (HOP) at Clemson University Cooperative Extension. She is located in Hampton County, South Carolina. Michelle encourages residents to increase community access to healthy food and activity. Michelle is a President of Hampton County Rotary and serves as Co-chairman of the ReDiscover Hampton Health Coalition. Prior to joining Clemson Extension, Michelle obtained a Bachelor of Arts in Secondary Education from Columbia College, an associate's degree in Health Science from the Technical College of the Low Country, and a M.Ed. in Education from the University of South Carolina. She worked as an educator and registered nurse in the Low Country for 25 years. With this background, Michelle is passionate for the health of her rural community. Implementing school gardens and produce distributions are a few ways she has contributed to citizens taking an active part in their health.

Nicole Weldy

Raised in Fishers, Indiana, Nicole Anne Weldy received her Bachelor of Fine Arts from Samford University in Alabama. Aspects from crafting structure her consumption of research and composition of her work. Researching the history of individual materials and practices, using the grid method to define a pattern, viewing parts individually and holistically are significant parts of her practice. Her current work combines craft, traditional art materials and technology. She is currently a second year Master of Fine Arts candidate at Clemson University with a focus in sculpture. While in school, Nicole has interned at the Birmingham Museum of Art and studied abroad in Spain, Portugal, London, Italy and Africa to immerse herself in the art world. In Africa, she led sculpture classes, helped create pinhole cameras and a dark room for children at the Mully Children and Family Foundation. In 2020, Duct Tape mailed her over 100 rolls of duct tape and sponsored her work showing the importance of art through the pandemic. Currently, Nicole is a beginning sculpture instructor and is expected to graduate with her master's from Clemson University in 2023, after which her goal is to teach at the university level, become a working artist and a gallery curator and residency director. Weldy's sculpture is often made from personal observations of common objects such as a broom, a purse, mesh grocery bags and sandwiches. All found objects she dislocates from their familiar function and animates in the white cube to derive a new perspective for creating sculptures that explore, expand upon, and question current systems and methodologies in life. The cultural baggage of her materials drive the finish look of her art pieces.

Sachin Rustgi, Ph.D.

Dr. Sachin Rustgi is an Associate Professor of Molecular Breeding at the Department of Plant and Environmental Sciences at Clemson University, a Faculty Scholar at the Clemson University School of Health Research, as well as Adjunct Associate Professor at the Department of Crop and Soil Sciences at Washington State University, Pullman. Dr. Rustgi's research primarily focuses on developing dietary therapies for individuals with celiac disease or allergy to wheat, or peanut, and novel strategies to mitigate the major insect pests or fungal pathogens of the primary South Carolina crops. His research has resulted in several high impact publications in internationally recognized journals, including the proceedings of the National Academy of Sciences, the Plant Journal, the Journal of Experimental Botany, and Plant Molecular Biology, to name a few. Additionally, Dr. Rustgi has authored or edited three books. Given his academic contributions, he was awarded the Faculty Excellence in Research Award of the Washington State University College of Agricultural, Human, and Natural Resource Sciences and invited to join the Wheat Initiative Expert Working Group on Wheat Quality for Processing and Health.

Steven Richards, Ph.D.

Dr. Steve Richards is a Senior Extension Associate with the Clemson Extension Agribusiness Program Team. Steve works with value-added agricultural businesses and has statewide responsibilities in agribusiness management, marketing, and finance. Steve holds a Ph.D. from Clemson University as well as a Master of Business Administration degree (MBA), and a master's in Agricultural Economics. His work experience began in quality assurance and production management for food processing firms in the Midwest. Next, he worked for Cornell Cooperative Extension, authoring many business planning workbooks and consulting with hundreds of agricultural businesses on topics such as profitability improvement, business expansion, business financing, and succession planning. Steve has consulted for Farm Credit East and worked with agricultural entrepreneurs in the Finger Lakes food, wine, and tourism region in his more recent roles. Steve has extensive experience working with local food entrepreneurs in South Carolina. He is the lead Agribusiness Team member in South Carolina for business planning curriculum and training. Currently, Steve teaches business planning courses for 30 to 40 entrepreneurs every year. Entities assisted include niche growers, value-added businesses, specialty crop growers, and businesses that provide healthy foods to communities in food deserts.

Susan Lunt

Susan received her Master of Engineering in Civil Engineering from The University of Virginia and her Bachelor of Arts in Geology from Case Western Reserve University. Most recently, Susan has worked as an educator teaching middle school, high school and college classes in Ohio. Prior to teaching, Susan served as an Environmental Engineer for the Goodyear Tire and Rubber Company and has previous experience working for the Ohio Environmental Protection Agency and Environmental Consulting Firms.

Sydney Ford

Sydney Ford is a Residence Life Coordinator at the South Carolina Governor's School for the Arts and Humanities. She graduated from Clemson University in the spring of 2022 with a Bachelor of Arts in sociology and minors in psychology and nonprofit leadership. Her previous work experience includes roles in public relations and marketing, geographic information systems, nonprofit management, student affairs, research, and program development.

Tarana Khan, Ph.D.

Dr. Khan is the program Team Director for Expanded Food and Nutrition Education Program with Clemson University Cooperative Extension Service. Tarana has been working with Clemson University Cooperative Extension Service for last twenty-two years. She develops strategic planning for EFNEP and interprets, sets, and applies policy and procedure. She ensures compliance with federal, state and university policies and procedures. She works with a team to plan and develop comprehensive issue based educational programming information in the area of nutrition, diet, physical activity and health for children, youth and adults. She also develops and maintains linkages with relevant individuals, agencies, organizations and other university units, within the state and nation to enhance the educational mission of the program.

Vishal Manjunatha

Vishal is originally from Bengaluru, India, and earned his Bachelor of Engineering degree in Biotechnology from Visvesvaraya Technological University in India. He moved to the United States in 2016 to pursue his master's degree in Food Science at Drexel University in Philadelphia, P.A. His master's thesis was titled 'Effect of cold plasma treatment on microbial load and quality of baby carrots.' Vishal's passion and strong desire for higher learning in food safety brought him to Clemson University. Under the guidance of Dr. Xiuping Jiang, he is currently working on his dissertation titled 'Exploring natural products for antibiotic free birds.' Vishal also mentors undergraduate

students in his lab and serves as the lead Graduate Teaching Assistant for Introductory Microbiology and Food and Dairy Microbiology laboratories in the Biological Sciences department. In addition to research and teaching, Vishal is actively involved with several professional associations such as Institute of Food Technologists (IFT), Professional Manufacturing Confectioners Association (PMCA), American Society for Microbiology (ASM), United Fresh Produce Association (UFPA), and International Association for Food Protection (IAFP). Further, he serves as the president of the Food, Nutrition and Packaging Sciences Graduate Student Association and represents the Food, Nutrition and Packaging Sciences department as a Senator at the Graduate Student Government. On a professional level, Vishal wants to pursue a career in food safety after graduation and believes that it gives him the opportunity to leave his mark not just on a company, but on the world. To get relevant industry experience in the field, Vishal interned as a Food Protection, Microbiology and Toxicology Intern at Lamb Weston in Richland, W.A. this summer. At his internship, he worked on several regulatory projects which aimed at controlling gluten allergens and carcinogens in frying oils.

Wanda Green

Wanda Green graduated from Coastal Carolina University with a BS in Health Promotion. Wanda is a health education specialist with a sincere passion for empowering communities through collaborations, coalition building, and increasing accessibility and sustainability. Her public health career expands over a decade in community engagement through partnerships, advocacy, prevention, education, and community-based research within rural communities. Under her leadership, a statewide faith-based health ministry successfully supported cancer research to alleviate health disparities among African American communities with higher cancer incidences and mortality rates. She has conducted numerous structured, facilitated workshops for community groups. Her current position with Clemson University Cooperative Extension, Rural Health team, focuses on increasing food accessibility and working with the community to help create new everyday destinations.

Weatherly Thomas

Weatherly Thomas is a Rural Health Nutrition County Agent with Clemson Cooperative Extension in the Pee Dee region of South Carolina. Previously, she was the Small Farms Coordinator at the S.C. Department of Agriculture and was the Executive Director of the S.C. Specialty Crop Growers Association and the S.C. Association of Farmer's Markets. Weatherly is well-versed in on-farm food safety and is a certified trainer for the Produce Safety Alliance's Grower Training Course on the Food Safety and Modernization Act. Weatherly also owns and operates Truluck Farms, a seasonal small produce farm in Florence County, S.C. She holds degrees from the University of South Carolina, the Savannah College of Art & Design, and Clemson University in journalism, film and television production, and agricultural education.

Wesam Al-Jeddawi

Wesam Al-Jeddawi is currently a Ph.D. candidate in Food, Nutrition and Packaging Sciences at Clemson University. His research was funded by the Electrolux appliance company which focused on the frozen preservation of salmon and peaches. He received a master's degree in food, nutrition, and culinary sciences from Clemson University in 2014 (Latin Honor: Cum Laude). His career niched at the interface of academia and food industries from 2008 to the present. He worked at the University of Baghdad from 2008 to 2016 as a lecturer for food microbiology, food and dairy industries, and meat processing. Then, he worked as a graduate teaching assistant, graduate research assistant, and product testing laboratory analyst for the Food2Market program at Clemson University from August 2016 to April 2018. He has held numerous leadership roles at DiscoverFresh Foods, Inc., (Formerly Duke Foods) from April 2018 to the present including director of quality assurance, food scientist and consultant, director of laboratory and scientific research, and currently, executive director of laboratory services. He is a member of the editorial board for the Journal of Food Research (The Canadian Center of Science and Education, Canada) and Advances in Science, Technology and Engineering Systems Journal (ASTESJ), United States.

Will Culler, Ph.D.

Will Culler is part of the Clemson Extension Agribusiness team where he serves as the Midlands Area Agent, Director of the SC AG + Art Tour, and Lexington County Extension Coordinator. He is responsible for supporting the expansion and growth of the agribusiness and natural resource base sectors in the midlands region and throughout South Carolina through development and implementation of programs targeted at agribusiness management and local foods systems development. Dr. Culler has overseen student-based research activities for agribusiness and tourism and maintains an active scholarly research agenda while compiling and maintaining a research library of resources and expertise. He holds a B.S. in Agricultural Economics, M.S. in Agribusiness, and Ph.D. in Parks, Recreation, and Tourism Management. He lives with his family in Chapin, South Carolina.

Zachary Jones

Originally from Florence, S.C., Jones graduated with a B.S. in Biological Sciences from Clemson University in December 2017. In May of 2022, he began his Ph.D. in Plant and Environmental Sciences at Clemson University under the advisement of Dr. Sachin Rustgi. His research focuses on deciphering the genetic regulation of immunogenic protein accumulation in seeds and developing reduced immunogenic peanut and wheat lines for those with food sensitivities. Additionally, he was selected as a Clemson University Graduate Fellow in the summer of 2022. Prior to beginning his Ph.D., he worked as a research specialist in Dr. Rustgi's lab for two years conducting research in molecular plant breeding and fungal and insect pest management.

Appendix D

Attendee Directory

First Name	Last Name	Professional Title	Professional Affiliation	email
Edoe	Agbodjan	Associate Extension Administrator	South Carolina State University; Extension	eagbodjan@scsu.edu
Tariq	Alam	Mr.	Clemson University; Plant and Environmental Sciences	talam@clermson.edu
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			and Packaging Sciences	
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			Family Innovation Center	
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			Biomolecular Engineering	
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Agribusiness	Alton Thompson, Anne Barr, Bailee Hawkins, Bill Whitaker, Caroline Smith, Chad Carter, Charles Santerre, Christopher Thomas, Dave Lamie, David Bahamon Pinzon, Jasanmol Singh, Julian Nixon, Kenneth Robinson, Kevin Burkett, Lane Glaze, Matthew Burns, Michael McManus, Mira Mihajlovich, Nathan Smith, Pavani Tatikonda, Shruthy Suresh Kumar, Sidney Schliesman, Sonia Salaria, Steven Richards, W John Park, Weatherly Thomas, Will Culler
Agritourism	Aby Sene-Harper, Ben Boyles, Bill Whitaker, Chad Carter, Charles Santerre, Dave Lamie, Edoe Agbodjan, George Dickert, Lane Glaze, Lisa Bundrick, Mandolin Bright, Mary Vargo, Mary Beth Johnstone, Matthew Burns, Michael McManus, Nicole Weldy, Pavani Tatikonda, Shruthy Suresh Kumar, Sonia Salaria, Steven Richards, Sydney Welch, Will Culler
Animal Health, Production, and Animal Products	Chad Carter, Charles Santerre, Christopher Thomas, Isabella Ellams, Jasanmol Singh, Juan Antonio Baeza, Julian Nixon, Lisseth Casso Hartmann, Matthew Burns, Michael McManus, Mira Mihajlovich, Susan Duckett, Sydney Welch, Vishal Manjunatha, Xiuping Jiang
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Composition/Palatability of Foods	Carolyn Gahn, Chad Carter, Holly Gillespie, Jasmine Frey, Mandolin Bright, Sydney Welch, Vishal Manjunatha

Culinary Nutrition	Carolyn Gahn, Chad Carter, Ellen Lawrence, Holly Gillespie, Iris McDuffie, Jasmine Frey, Kimberly Baker, Lane Glaze, Loria Cass, Lu Shi, Mandolin Bright, Morgan Stone, Pavani Tatikonda, Stacy Williams, Sydney Welch, Vishal Manjunatha
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Plant Health, Production, and Plant Products	Caroline Smith, Chad Carter, Charles Santerre, Christopher Thomas, Emma Mullane, Geisianny Moreira, George Dickert, Holly Gillespie, Hrishikesh Ingole, Jasanmol Singh, Johnson Toyinbo, Jose Payero, Juan Antonio Baeza, Lane Glaze, Mary Vargo, Matt Turnbull, Matthew Burns, Michael McManus, Morgan Stone, Morgan Tomlin, Pavani Tatikonda, Rosemarie Somers, Sachin Rustgi, Sarah King, Sonia Salaria, Swabir Alhassan Musah, Sydney Welch, Tariq Alam, Vishal Manjunatha, W John Park, Xiuping Jiang, Zachary Jones
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<p>Sustainable Agriculture and Climate Change</p>	<p>Aby Sene-Harper, Alton Thompson, Anne Barr, Calvin Paulsen, Caroline Smith, Carolyn Gahn, Catherine Mobley, Christopher Thomas, Claire Dancz, Cory Tanner, Dave Lamie, David Bahamon Pinzon, Edoe Agbodjan, Ellie Lane, Emma Mullane, Geisianny Moreira, George Dickert, Holly Gillespie, Jasanmol Singh, Johnson Toyinbo, Jose Payero, Juan Antonio Baeza, Justine Gradillas, Kevin Burkett, Kim Niewolny, Lisa Bundrick, Lisseth Casso Hartmann, Mandolin Bright, Mani Rouhi Rad, Marcus Coleman, Mary Vargo, Mary Beth Johnstone, Matt Smith, Matthew Burns, Michael McManus, Mohd Fazly Mail, Morgan Stone, Morgan Tomlin, Pavani Tatikonda, Pulong Ma, Sachin Rustgi, Samantha Porzelt, Shaw Hipsher, Shruthy Suresh Kumar, Sidney Schliesman, Swabir Alhassan Musah, Sydney Welch, W John Park, Will Culler</p>

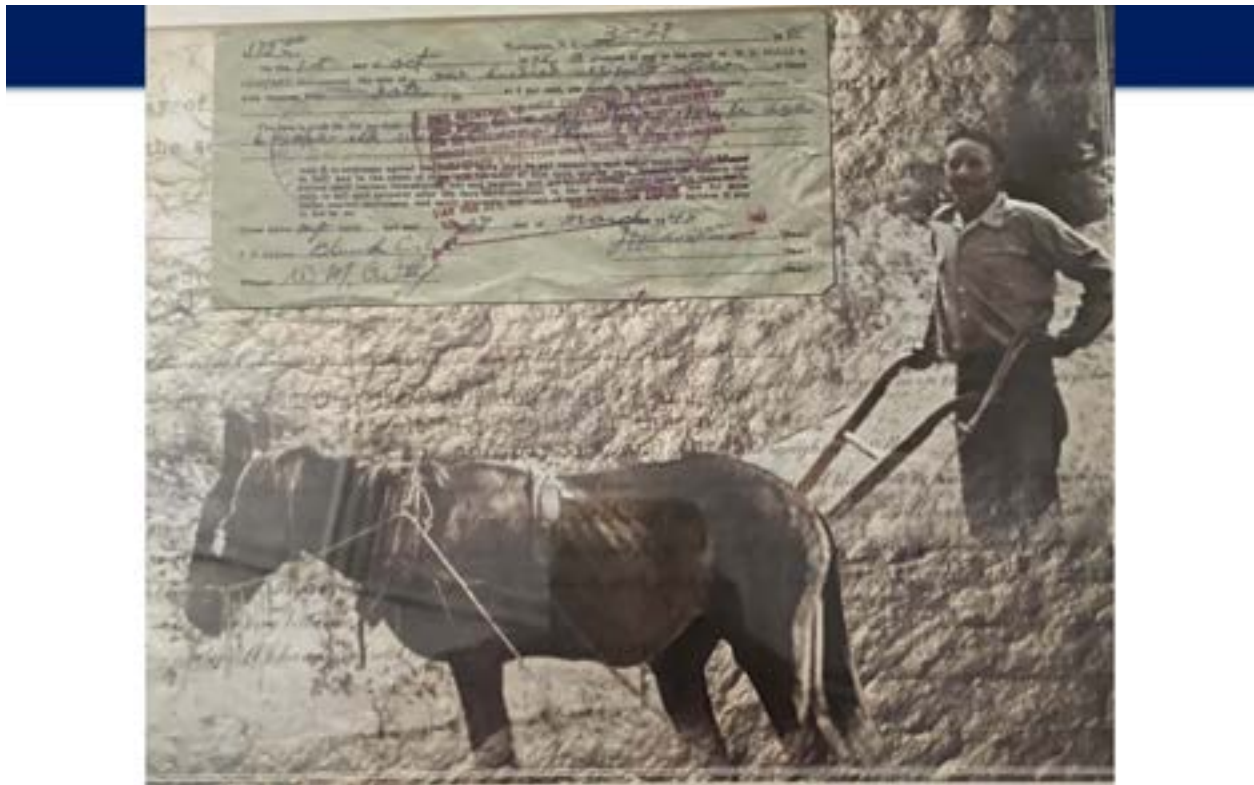
Appendix E

Guest Speaker PowerPoint Presentations

Trends, Challenges and Opportunities in Sustainable Community-Based Food Systems: The Role of Land Grant Universities

**Alton Thompson, Executive Director
Association of 1890 Research
Directors
Commissioner, Food Systems
Leadership Institute**

**FoodFORWARD Symposium
September 15, 2022**



Defining a Food System

- refers to the constellation of activities involved in the production, processing, transporting, and consuming food, plus all aspects of the human existence, behaviors, **decisions, values**, and impacts. (United Nations)
 - {Gardens...size of fields}
- The health of the food system is directly linked to the health of humans, ecosystems, the economy, culture and communities

An Oxymoron ??

- Not really...
- Poor, but food secure
- Community-based food system
- A Good College Incentive Plan

Defining a Sustainable Food System

- refers to a food system that delivers food security and nutrition and encompasses the goals of achieving social, economic, and environmental sustainability ([FAO](#), [United Nations](#))
- Elements include how we get from farm to fork, the processes and infrastructure supporting the transitions from farm to fork, and other intertwined systems within the food system
- Elements also include the management structure, operation strategies, decision-making processes and information exchange

Defining a Community or Local Food System

- Typically defined as a small number of intermediaries relative to conventional food supply chains, geographic proximity of producers and consumers, and **strong community connections**
- USDA/Rural Development defined locally or regionally produced agricultural products as those products travelling less than 400 miles between production and marketing
- However, there is no legal or universally accepted definition of local food

Ericksen's Conceptualization of a Food System

- Food availability
- Food access
- Food utilization

Ericksen's Conceptualization of a Food System

- **Food availability** has three elements: production, distribution, and exchange.
 - Food production is the set of on-farm activities and supporting activities transforming raw materials into crops and livestock for human consumption.
 - Food distribution is the set of activities by aggregators and intermediaries to process, package, store, and ship food products.
 - Food exchange is the set of activities by nations, firms, and individuals to trade food in markets or using contracts and make it available for consumers.

Ericksen's Conceptualization of a Food System

- **Food access** has three elements: affordability, allocation and preference.
 - Affordability is the resources of the consumers used to purchase and prepare the foods that they prefer.
 - Allocation refers to "when, where, and how food can be accessed by consumers."
 - Preferences are the specific wants, needs, tastes of consumer.

Ericksen's Conceptualization of a Food System

- **Food utilization** has three elements: nutritional value, social value, and food safety.
 - Nutritional value is the functional benefit that foods have to consumers through the provision of necessary macronutrients and micronutrients.
 - Social value is the cultural role that foods have in households, communities and nations.
 - Food safety refers to the fundamental quality and integrity of the food, which allows for utilization.

Key Trends in Food Systems

- Populations are increasingly urbanized, drawing them away from the sites of production and reducing consumer familiarity with the sources of their food
- Climate change and extreme weather events and disasters (*e.g. hurricanes, wildfires, water shortages, and extreme heat*) are changing where, what and how food is grown and distributed
- Millions of people in the United States and billions of people around the globe suffer from poverty and malnutrition, issues that are causing cascading shocks that reverberate throughout the system

Key Trends in Food Systems

- Historical and ongoing discrimination based on race, ethnicity, and other actual or socially constructed attributes, continue to impact who has the power in food systems
- Wealth in the form of land ownership is not evenly distributed. Some of the poorest and wealthiest people in the U.S. and the world are farmers. (*i.e. Homestead Act of 1862*)
- Technological developments and decreases in the cost of technology are increasing the use of sensors and other devices for traceability and the maintenance of food quality (*issue of scalability to small farms*)
- Ubiquity of mobile technology has changed the way people shop, eat, and communicate, creating new modes of interaction

Key Trends in Food Systems

- Our understanding of the relationship between food, nutrition, chronic disease and risk factors is evolving
- Attention to the root causes of food-related health inequities is deepening, and recognition of the social and cultural significance of food is growing.
- Increasingly, scholars are examining food environments to understand who in our community has consistent access to enough nutritious food for a healthy life (*i.e., food security*) and who is struggling.

Key Trends in Food Systems

- Concerns about personal health, food quality, corporate power, and local community vitality are causing consumers to continue to prioritize supporting community/local food systems
- The 'just-in-time' production and distribution systems that are known for their efficiency have shown themselves to not be resilient during the COVID-19 crisis, raising questions about the resilience/efficiency trade-off.

Key Trends in Food Systems

- Increased understanding of the importance of community food systems, food security and access issues, and growing advocacy and interest, has led to a food renaissance.
- In recent years, there has been a surge of efforts to expand healthy food retail, by improving healthy food offerings among retailers (e.g., grocery and convenience stores, attracting new healthy food retailers (e.g., grocery and food businesses), and expanding access to farm stands, farmers markets and mobile produce markets

Challenges and Opportunities

- **Challenge:** The Impacts of system-wide shocks, i.e., COVID-19 pandemic, climate change, (exacerbated for low income, minority and rural communities)
- **Opportunity:** Conduct ethnographic studies (*deep intensive interviews*) with community stakeholders and residents in urban and rural communities, particularly low income & minority persons, to assess their perceptions/experiences coping with these system-wide shocks
- **Opportunity:** Conduct survey research/needs assessment with community stakeholders and residents in urban and rural communities, particularly low income & minority persons, to assess their perceptions/experiences coping with these system-wide shocks

Challenges and Opportunities

- **Challenge:** The need to conduct interdisciplinary and transdisciplinary research and the associated Extension/outreach programs
- **Opportunity:** Food and agricultural administrators need to allocate additional resources (*and seek additional resources, i.e., NSF, NIH, DOD, etc.*) and reward the formation of integrated, interdisciplinary, multidisciplinary and transdisciplinary teams

Challenges and Opportunities

- **Challenge:** Need to enable producers, who have been underserved, marginalized and adversely affected by persistent poverty and inequality, access land, capital and markets
- **Opportunity:** USDA/FAS ...a funding grant opportunity designed specifically to move underserved producers from surviving to thriving. (*\$300,000,000/American Rescue Plan*).

Challenges and Opportunities

- **Challenge:** Many people have been historically excluded from food systems
- **Opportunity:** The calls for action on diversity, inclusion, equity and access have become louder, prompting increased support for research that addresses these topics in all contexts, including to food systems and the food and agricultural workforce

Challenges and Opportunities

- **Challenge:** Preparing students for the expansive array of diverse career in the food, agriculture, natural resources and human sciences across research, education and Extension
- **Opportunity:** USDA/NIFA NextGEN Program, Learning to Leading: Cultivating Generation of Diverse Food and Agriculture Professions (\$250,000,000/American Rescue Plan)...minority serving institutions and Insular Areas

Challenges and Opportunities

- **Challenge:** Political polarization in the U.S. has made policy analysis a political obstacle for scientists
- **Opportunity:** ??
- ?
- **Opportunity:** **Perhaps,** increased research at the university-level directed toward community-based participatory research, which engages missing or silenced voices in our research to help ensure our research is addressing communities' needs (*ethnographic approach*)

The Role of Land Grant Universities

- Three pillars drive the mission of Land-Grant Universities (LGUs) learning, discovery, and engagement. These mission areas often have a focus only on their local communities, although not exclusive
- LGUs have a unique leadership role in creating knowledge that will ensure equitable access to sufficient food and nutrition security for all people
- The time is right to create such a platform and LGUs, as the discoverers, analyzers and curators of information and data, should be the 'natural' leaders in this effort.

The Role of Land Grant Universities

- LGUs have more than a century of experience, broad-ranging subject matter expertise and are uniquely equipped to tackle food systems issues.
- LGUs have been powerful problem solvers and are recognized for outstanding accomplishments in local, national and global food and nutrition security.
- LGUs "should become **more fiercely land-grant** in their orientation; that is, they should work to more vigorously uphold their community-focused missions through teaching, research, and service-oriented activities." (Gavazzi and Gee, 2018).

The Role of Land Grant Universities

- Land-Grant Universities (LGUs) are uniquely positioned, in collaboration with public and private partners, to make critical contributions toward sustainably feeding an expanding population and to improve prospects for food and nutrition security for all.
- LGUs can do so through research and technological innovation; engagement with local communities and outside partners; and training students to be the next generation of problem solvers (*capacity and competitive funds*)

The Role of Land Grant Universities

- Land-Grant Universities (LGUs) are uniquely positioned to respond to the challenge of meeting local food and nutrition needs.
- Solutions to the problems associated with community-based food systems and food insecurity are attainable by employing LGUs learning, discovery, and engagement mission areas
- LGUs need to elevate community-based food systems and food insecurity to a Top Priority
- Align LGUs resources and structures for transdisciplinary approaches
- Enhance and build LGU-Community Partnerships (*community thought leaders as adjunct faculty*)

The Role of Land Grant Universities

- LGUs are currently strategizing and reorganizing, using **challenge-based approaches** to address critical societal issues.
- The **challenge approach** encourages coordination of disciplinary strengths and achieves commitment at a higher level to solving the most complex and pressing problems of a changing world.
- LGUs are beginning to move from discipline-focused research to transdisciplinary research—research conducted by researchers from different disciplines, working jointly to create new conceptual, theoretical, methodological, and translational innovations that integrate and move beyond discipline-specific approaches to address the higher level challenges of our time.

The Role of Land Grant Universities

Creativity, research and innovation are LGUs only competitive, sustainable advantage and will play a critical role in making our food systems future-proof .

Concluding Remarks

- Food is central to human existence.
- Robust food systems, including community-based food systems, enable productive and vibrant societies. Productive and sustainable agriculture systems lift people out of poverty and into food security while poorly functioning food systems create food insecurity that can ignite social and political instability.
- Finding solutions to achieve the challenge of sustainably feeding an expanding population and improve prospects for food and nutrition security for all is pivotal for human existence.
- Food security can be enhanced through community-based or regional food systems

Concluding Remarks

- There must be an integration of disciplinary strengths and mission areas (*research, teaching and Extension*) to unravel the complexity of interactions in the food system, including community-based food systems
- The transdisciplinary/challenge approaches to problem solving require the involvement of a range of expertise including the biophysical, medical, information technology, social sciences, and engineering.
- These approaches underpins opportunities discussed earlier and are critical to solving the challenges identified.

Concluding Remarks

- Land-Grant Universities have an important and transformational role to play to ensure sustainable food systems, including community-based food systems
- Because of the complexity of food systems, a more important role than in the past



Questions, Comments, Suggestions or Accusations



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FoodFORWARD 2022

Farm-to-Institution (F2I)

*Leveraging Public Private Partnerships to
Support Food Systems Development*

Carolyn Gahn, Director, Farm-to-Institution, Aramark



Aramark's F2I Enterprise Goals

What is Farm-to-Institution?

USDA Definition: "Farm to Institution programs give farmers and ranchers the opportunity to develop new markets and sell to local K-12 schools, hospitals, colleges, cafeterias or government agencies." [USDA link](#)

- Invest in local economies
- Foster diversity and equity within the supply chain
- Greater transparency within the value chain
- Better storytelling of local partnerships

Clemson Farm-to-Institution Summit

September 13 & 14, 2022

Goal: Convene Food Systems leaders to discuss the role of land grant institutions in supporting the development of regional food systems infrastructure and share best practices for how to best leverage the public/private dining partnerships on campus to build a market for local farmers and businesses and drive student engagement.

Topics: Land Grant Local, Healthy Food Access, Supplier Diversity, Chef & Farmer Panels

Themes:

1. Food is Culture
2. Healthy Food is a Human Right
3. Educating new eaters
4. Integrating a values-based food system into the veins of the university





Aramark Progress

- Development of an F2I Director position within supply chain
- Small farm questionnaire that can replace GAP certification
- Master Data enhancements to align with National Farm to Institution Metrics
- Small grower purchasing requirements within larger supplier contracts
- Evaluation criteria of new suppliers includes values-based metrics
- Ability to make purchasing commitments to farmers
- Grant opportunities for BIPOC agricultural programs
- Chef-led BIPOC purchasing programs

Example F2I programs at other institutions

- Whole Animal Programs at UK & University of Rochester
- Campus farm programs at UTenn, ECU, WKU, Mississippi State
- Supporting alumni-owned businesses in dining programs
- BIPOC farmer small grants and sourcing programs
- Regional sustainable seafood in the Northeast and Gulf



Case Studies

for food systems-focused partnerships



- Dining contract funded the development of the Food Connection for culinary education – Includes extension focus on specialty crop, mid-market farmers
- Dining contract has annual KPIs around local sourcing
- Outcomes have resulted in \$10 million spent with KY farms and businesses and many new farmers getting GAP certified



- BIPOC sourcing program provides pre-commitments to growers – exemplifies value chain partnerships
- Sustainable Food Collaborative engages university, community, suppliers, and Aramark towards same goals
- University has set strategic goals and committed \$ towards the procurement initiatives

Flow of Goods

Commodity Market



**Very efficient but less transparency
to identify the farm it came from**

THE COMMODITY MARKET IS
INHERENTLY **COST-BASED**

Flow of Goods

Local Market



Less efficient but more transparency

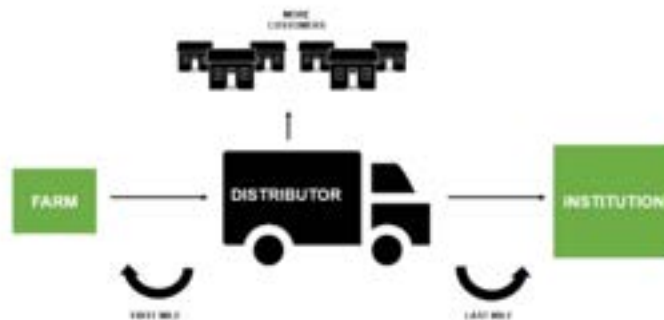
KEY POINTS:

- More expensive than commodity so the value has to be realized elsewhere (i.e. marketing benefits, customer engagement)
- Local system is more nimble – less steps means quicker to respond

THE LOCAL MARKET IS INHERENTLY
VALUES-BASED

IF WE CAN **QUANTIFY** THIS VALUE, IT CAN
CATALYZE PROGRESS AT THE LARGER
SCALE

Why are distributors necessary?



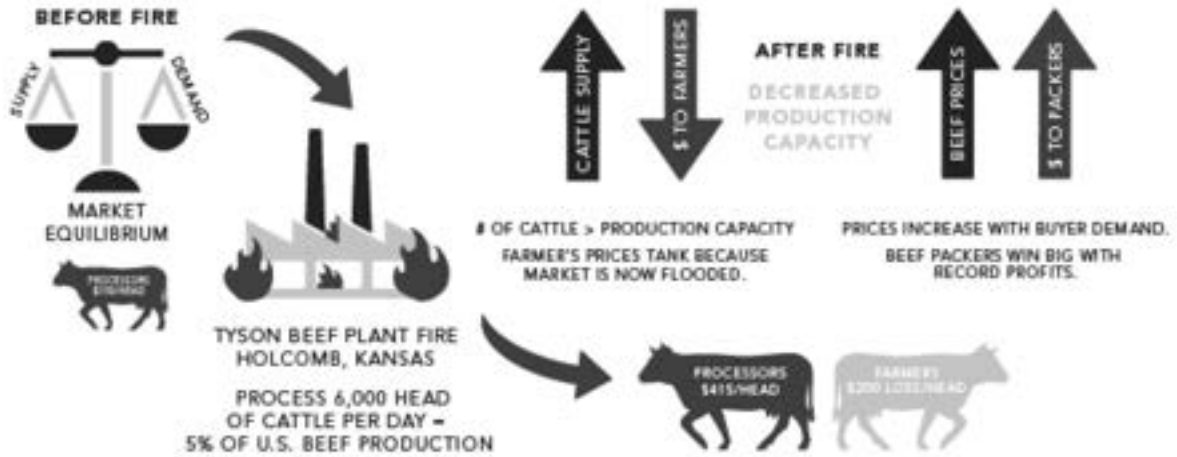
KEY POINTS:

- We can work with more farmers via larger suppliers vs going direct
- The farmers can then scale their business because:
 - They do not have to deliver their own products (they are not truckers)
 - They will have access to the full customer network of the distributor
 - They can sell a larger amount at one time

AMERICAN BEEF SUPPLY CHAIN



TYSON BEEF PLANT FIRE DISRUPTS MARKET



Questions?

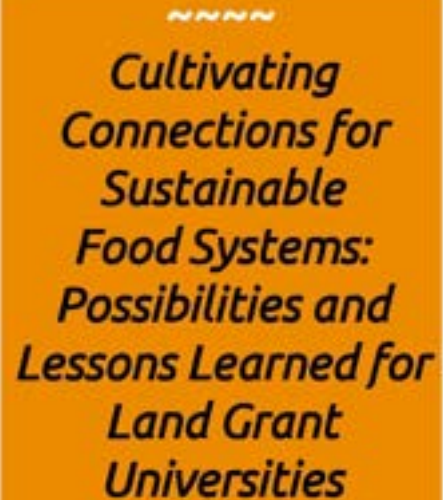
Food**FORWARD** 2022 Symposium



Kim L. Niewolny, Ph.D

Associate Professor

Dept. of Agricultural, Leadership, & Community Education
Director, Center for Food Systems & Community Transformation
Virginia Tech

An orange rectangular box containing text. At the top and bottom of the box are decorative wavy lines. The text inside is in a serif font and reads:

*Cultivating
Connections for
Sustainable
Food Systems:
Possibilities and
Lessons Learned for
Land Grant
Universities*

Food**FORWARD** 2022 Symposium



- "Setting the Table"
- Virginia Tech Center for Food Systems and Community Transformation
- Reflections

- Food movements have been growing for decades
- Systems approaches open up possibilities from farm to plate
- Values are foundational to inform the type of food system we envision, organize, and sustain
- Land Grant Universities play a role

~ ~ ~

Sustainable Food System Transformation

~ ~ ~

Renewed Call for a Just and Resilient Food System

biodiversity, climate change, health equity, land, labor, & more



How do we move toward a restorative food future?



What strategies make sense?

- agroecology from field to classroom
- food, farm, & health policy
- food & farm worker issues as public health and human rights concerns
- storytelling, network, & community-based approaches
- multi-sector & multi-racial coalitions

=====
**A social imaginary
for sustainable
food systems**
=====



**CENTER FOR FOOD SYSTEMS AND
COMMUNITY TRANSFORMATION**
VIRGINIA TECH.

FOSTERING A MORE EQUITABLE AND SUSTAINABLE FOOD SYSTEM IN VIRGINIA AND BEYOND



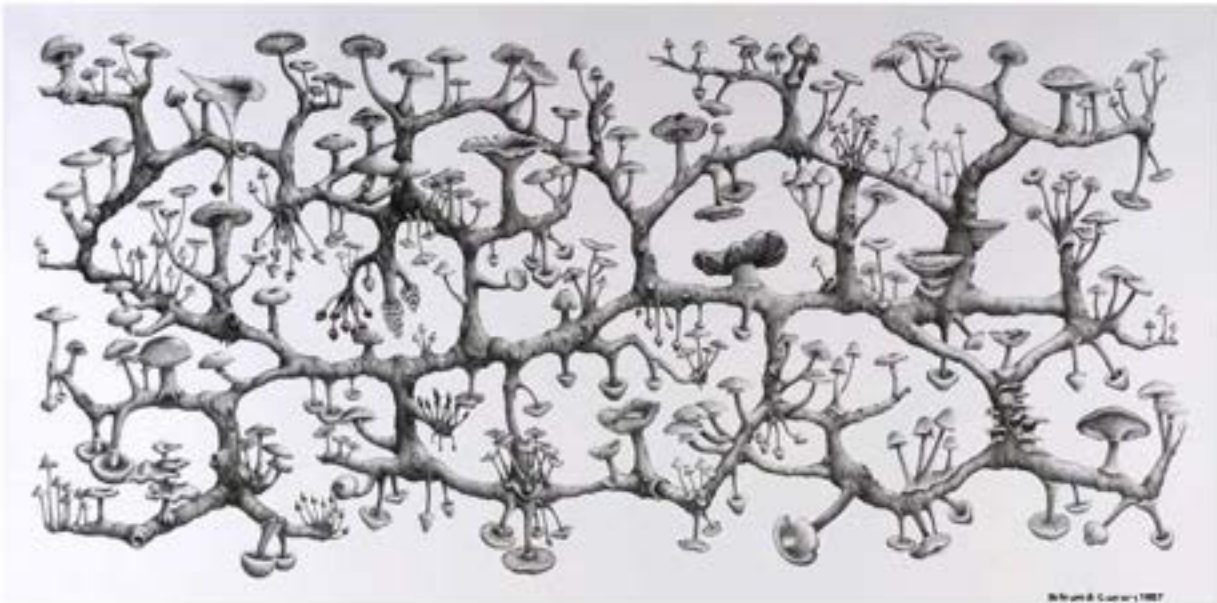
**CENTER FOR FOOD SYSTEMS AND
COMMUNITY TRANSFORMATION**
VIRGINIA TECH.

We work at the nexus of food, agriculture, & society

- SOCIAL EQUITY**
 - RESILIENCY**
 - FOOD ACCESS**
 - SOIL HEALTH**
 - SUSTAINABILITY**
 - FOODWAYS**
-

Our Aims

- Address food system complexities with emphasis on social equity and community sustainability through programs, outreach, and partnerships.
- Conduct community-based food systems research.
- Enhance existing and create new curriculum in food systems with community-university learning goals.





Community Food Work

- o farming systems viability
- o healthy food access
- o environmental sustainability
- o Fairness and social justice



Slocum, 2007



**Virginia Cooperative Extension Model
 Community, Local, & Regional Food Systems**



Projects & Programs



Soil, Conservation, and Place

Strong Farm & Food Future: Planning for a Collaborative Regional Food System in the Roanoke Valley with Stories of Community Food Work in Appalachia

4 the Soil: A Conversation

Southeast Regenerative Grazing Project

VCE Community, Local and Regional Food Systems "Coming to the Table: Potluck Series

Catalyzing Equitable Food Value Chain Coordination and Food System Development

Virginia Beginning Farmer and Rancher Coalition

COVID-19 and Food Systems Compendium

Racial Justice in the Food System Series

Soil, Conservation, & Place



Iris Wallace of Southern Exposure Seed Exchange



Renard & Chinette Turner of Vanguard Ranch



Denny Boyer of Four Winds Farm



Gerald Garber of Cave View Farms



Amy Hicks of Amy's Garden

Soil, Conservation and Place and Virginia Cooperative Extension's Youtube Channel
JAFSCD "rethinking farmer knowledge from soil to plate through narrative inquiry"

Funded by VT's Community Viability Foundation, The Agua Fund, and Virginia Cooperative Extension



4 The Soil: A Conversation

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THE REGION OF THE REGIONAL FOOD SYSTEM PARTNERSHIP

How do we define the region?

All the contiguous counties surrounding Roanoke City, including: Botetourt, Bedford, Franklin, Floyd, Montgomery, Craig, Roanoke, & Salem City

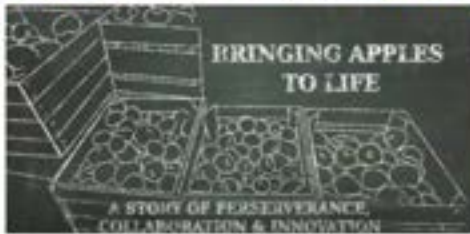


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Roanoke Valley Food Systems Partnership Project, USDA LFPP



VIRGINIA
MARKETMAKER™
Linking Agricultural and Seafood Markets



Catalyzing Equitable Food Value Chain Coordination & Food System Development



WEBPAGE LAUNCH

THE FOOD SYSTEM AND COVID-19

- Articles from The Center
- News Archive
- Virginia Tech Resources
- Partner Resources

JOIN THE CONVERSATION

VT
CENTER FOR FOOD SYSTEMS AND
COMMUNITY TRANSFORMATION
VIRGINIA TECH

COVID-19 and Food Systems Compendium

www.foodsystems.centers.vt.edu/COVID-19intheFoodSystem.html

[Center Articles](#)

[Food Systems Stories in the Pandemic](#)

[Resources from Local to Global](#)

[Virginia Cooperative Extension](#)

[News Archive](#)

Food Systems Stories in the Pandemic: Stories of Hope and Resilience



<https://foodsystems.centers.vt.edu/COVID-19intheFoodSystem/FoodSystemsStories.html>



WE INVITE YOU TO JOIN US IN
OUR 2020 SUMMER LEARNING CIRCLE SERIES

RACIAL JUSTICE IN THE FOOD SYSTEM

*Informed by themes from Food Solutions: New England's
21-Day Racial Equity Challenge*

JUNE 29

3:00-4:30 PM EST
*Getting at the Roots of
Whiteness and Anti-
Blackness*

AUG 13

3:00-4:30 PM EST
*Sovereignty and Self
Determination*

JULY 23

3:00-4:30 PM EST
*Structural Racism and
New Narratives*

SEPT 14

3:00-4:30 PM EST
*New Patterns,
New Visions*

<https://foodsystems.centers.vt.edu/events-and-speakers.html>

Cambium Collective



The Virginia Tech Center for Food Systems and Community Transformation & R.E.A.L. (Racial Equity in Agriculture Lab) present

Building Racial Equity in the Food System: From Individual Anti-Racism to Dismantling Institutional Systems

Two-Part Workshop

Building upon our summer Racial Justice in the Food System Learning Circle series, the Center will host Shanell Bingham, Michael Carter Jr., and Damon Cheva of R.E.A.L. to lead an in-depth, 2-part workshop on building racial equity in the food system from a critical pedagogy perspective.

March 31, 2021
10:30-12:30 & 2:30-4:30 EDT

Register here:
<https://tinyurl.com/3d7ct8ms>

Sponsored in part by the Community Change Collaborative of the VT Institute for Policy & Governance and the VT CALS Diversity Council.




THE RACIAL EQUITY IN AGRICULTURE LAB (R.E.A.L.) PRESENTS

BUILDING BEYOND NICE RACISM: CATALYZING INSTITUTIONAL CHANGE IN THE FOOD SYSTEM

The racial equity workshop is a 2021 response to the Black Lives Matter protests, offering the opportunity for a focus on how we can go beyond understanding of individual-level structural aspects of our food system. The workshop is designed to provide participants with concrete strategies and skills to help dismantle the status quo.

The two-part workshop runs from 10:30 AM to 4:30 PM on two consecutive days: 10/28 and 10/29. The schedule for each session is as follows:

- 10/28 (9:00 AM - 12:00 PM)
- 10/29 (9:00 AM - 12:00 PM)

There will be a break between the two sessions. The workshop will be held on Zoom. Registration is required. Register by October 25, 2021.

<https://tinyurl.com/3d7ct8ms>

For more information on support, contact: racialequity@vt.edu



Racial Equity in Agriculture Lab (R.E.A.L.)



INDIGENOUS COMMUNITY GARDEN FALL HARVEST GATHERING

TRANSFORMING OUR PLANT RELATIONSHIPS INTO RESILIENT, RELATEDNESS, AND MOVEMENTS

MONDAY, NOVEMBER 15, 2021

1:00 - 4:30 PM COOKING DEMO

Join Chef Michael and his team for a hands-on cooking demonstration featuring traditional Indigenous recipes and techniques. The event will be held in the kitchen of the Center for Food Systems and Community Transformation.

5:00 PM COMMUNITY MEAL

Join us for a community meal featuring traditional Indigenous recipes and techniques. The event will be held in the dining room of the Center for Food Systems and Community Transformation.

SPONSORS AND PARTNERS

Support this event by becoming a sponsor or partner. For more information, contact: indigenous@vt.edu



WE INVITE YOU TO JOIN US FOR A VIRTUAL CONVERSATION WITH

Nephi Craig

A chef from the White Mountain Apache nation featured in the film *Gather* for his work with Indigenous food sovereignty and revitalizing Indigenous foodways.

NOVEMBER 9, 2020 AT 5PM EST

REGISTER FOR THE EVENT
<https://vt.edu/indigenous/>

Enjoy a free screening of *Gather*

The film is available at the Virginia Tech Library. People with a VT PID can access it for free anytime at this link: <https://vt.edu/indigenous/>

A free community screening will be held on Sunday November 9th at 7:00 pm EST via the Zoom Webinar link: <https://vt.edu/indigenous/>

Brought to you by

- The Center for Food Systems and Community Transformation
- The American Indian and Indigenous Community Center
- Nature at VT

For more information or support, contact: racialequity@vt.edu



Native Foodways

EXPLORING THE ETHICAL POLITICS OF STORYTELLING IN COMMUNITIES OF STRUGGLE FOR SOCIAL CHANGE

Part of the First Annual Virginia Tech Ethics Week

In this virtual Learning Circle event, we seek to engage with individuals who are interested in the generative quality of narratives and storytelling, as a form of cultural work for social change in communities of struggle. In doing so we intend to speak up a critical space about the ethics and ethical praxis of storytelling and related forms of community cultural development.

April 7, 2021 5-6:30 PM EDT

REGISTER AT THIS LINK:
<https://tinyurl.com/3smo0ek>

For more information, visit The Center for Food Systems & Community Transformation website <https://foodsystems.cfm.cornell.edu/> for support email: service@cornell.edu

THE CENTER FOR FOOD SYSTEMS AND COMMUNITY TRANSFORMATION PRESENTS

Partners

- Agriculture
- Justice Project
- The Community Change Collaborative (CCC) of the Institute for Policy and Leadership
- The Center for Innovation
- The College of Agriculture and Life Sciences
- The School of Continuing Education

"PLANTING THE SEED"
FEBRUARY 2, 2022

Gain experience the cultural richness of social transformation through creative engagement and community weaving.

OPEN MIC EVENT 6-8PM
Hawthorn Theatre, Ruffolo Student Center

PRE-SHOW RECEPTION 5-6PM
Black Cultural Center, 124 Ruffolo Student Center

CREATIVE WRITING WORKSHOP 1-2:30PM
Virginia Tech's Blacksburg Campus

More details available on our website:
<https://tinyurl.com/vtpoetrycafe>

Cultural Community Development

Dr. Steven Cooper & Dr. Jennifer Gilberg
Associate Professor & Director of Center for Food Systems & Community Transformation
Significance in the Urban Landscape: Methods in Sustainability and Resilience

September 29, 2021 3-4 PM ET
Visit this link for details and registration: <https://tinyurl.com/3smo0ek>

Dr. Victoria Aguilera-Rodriguez
Assistant Professor of Food Systems & Community Transformation
The United Nations Food System Summit 2021: Understanding the Connections Between the Structure, Operational Process and Outcomes Related to Politics and Resources

October 27, 2021 3-4 PM ET
Visit this link for details and registration: <https://tinyurl.com/3smo0ek>

DR. NICK COPELAND
Assistant Professor of Food Systems & Community Transformation
COOPERATIVE EXTENSION AND THE CONING TRANSITION

September 29, 2021 3-4 PM ET
Visit this link for details and registration: <https://tinyurl.com/3smo0ek>

JENNY SCHWANKE & LAURA SCHNEIDER
Assistant Professor of Food Systems & Community Transformation
CULTIVATING COMMUNITY THROUGH FOOD AND GARDENING

September 29, 2021 3-4 PM ET
Visit this link for details and registration: <https://tinyurl.com/3smo0ek>

DR. GAZTE ABAYE
Assistant Professor of Food Systems & Community Transformation
TELLING AND FARMING: RESPECTING AN OCCUPATIONAL FOOD SYSTEMS SENSATION FROM FIELD TO KITCHEN

September 29, 2021 3-4 PM ET
Visit this link for details and registration: <https://tinyurl.com/3smo0ek>

DR. MAE HEY
Assistant Professor of Food Systems & Community Transformation
TABLE HOME, A FACILITATED DISCUSSION ON LAND CULTURE CLEANING

September 29, 2021 3-4 PM ET
Visit this link for details and registration: <https://tinyurl.com/3smo0ek>

Dr. Sarah Mwangi
Assistant Professor of Food Systems & Community Transformation
Program Food Security Status During the COVID-19 Pandemic: An Assessment by the Virginia Family Assistance Program

September 1, 2021 3-4 PM ET
Visit this link for details and registration: <https://tinyurl.com/3smo0ek>

Dr. Jessica Agnew & Dr. Heidi Hall
Assistant Professor of Food Systems & Community Transformation
Expanding the Use of Bioreactor Technology to Improve Food Security Through Household-Scale Organics in Protein Production

September 8, 2021 3-4 PM ET
Visit this link for details and registration: <https://tinyurl.com/3smo0ek>

Monthly Fellow Speaker Series & Learning Circles



"Five Articles Worth Reading" & News Archive
Food Systems Curriculum at Virginia Tech
Partners and Professional Societies
Food Equity & Justice Organizations
Bi-Monthly E-Update & Listserv

Resources



Eric Bendfeldt
Associate Director



Garland Mason
Center Associate



Kim Niewolny
Director



Katie Trozzo
Center Associate



Justice Madden
Graduate Fellow for Outreach



Nicole Nunoo
Graduate Fellow for Research



Kasey Owen
Graduate Fellow for Teaching



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- engage in critical inquiry
- embrace and uplift diverse forms of knowledge and ways of knowing
- prioritize the voices and experiences of the people and places most vulnerable in the food system
- More emphasis on generative—not extractive—approaches in our research, outreach, and education
- explore and catalyze the conditions for a more just and sustainable food system so that all may thrive
- Engage with sincerity, care, honesty, and humility

~~~~~  
**Land Grant  
Possibilities  
for Sustainable  
Food Systems**  
~~~~~

I have the audacity to believe that peoples everywhere can have three meals a day for their bodies, education and culture for their minds, and dignity, equality and freedom for their spirits.

Dr. Martin Luther King, Jr., remarks from acceptance speech of the Nobel Peace Prize, 1964

Thank you



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VIRGINIA TECH.

www.foodsystems.centers.vt.edu

@VTFOODSYSTEMS



Appendix F

Research Brief PowerPoint Presentations

From Free Clinics to Farmland, Harvesting Relationships for Impact

Clemson University Youth Learning Institute, SNAP-Ed

*Hannah Roberts, RDN, LD
Sarah King, MPH, CHES*



<https://clemsonnaped.com/>



Outcomes

Produce Rx
20 patients seen at
Clemson Free Clinic



Ark of Taste Seeds
11 varieties planted

Cross Collaboration
5 multi-sector partnerships formed



Seed Library Pop-Up
60 indirect contacts



<https://clemsonnapc.com/> 3

CLEMSON
COOPERATIVE EXTENSION

'EATING SMART-BEING ACTIVE' TEACHES SC ADULTS
COOKING SKILLS, FOOD RESOURCE
MANAGEMENT AND BEHAVIOR CHANGES THAT
PROMOTE A HEALTHY LIFESTYLE

Dr. TARANA KHAN
PROGRAM TEAM DIRECTOR, EFNEP
Ms. MARLYNE WALKER
CURRICULUM AND TRAINING COORDINATOR, EFNEP

Goals & Objectives

The Expanded Food and Nutrition Education Program (EFNEP) is a

- federally funded program
- delivered through Cooperative Extension Service
- aims to assist limited-resource families in acquiring the knowledge, skills, attitudes, and changed behavior necessary
- improve the nutritional health and well-being.

- EFNEP provides nutrition education in four core areas:
- Diet quality and Physical Activity
- Food Resource Management
- Food Safety and
- Food Security

Method

In South Carolina, experienced and trained Nutrition Educators teach '*Eating Smart Being Active*' (*ESBA*)

- '*ESBA*' is an evidence-based curriculum developed by Colorado State *and* tailored to meet individual needs in SC.
- a series of hands-on interactive lessons, delivered individually or to groups through partnerships with local community organizations.
- The 'learn-by-doing' approach allows participants to gain the practical skills necessary to make positive behavior changes to lead healthier lifestyle.

Plan, Shop, Save



Saving Money by Planning Meals



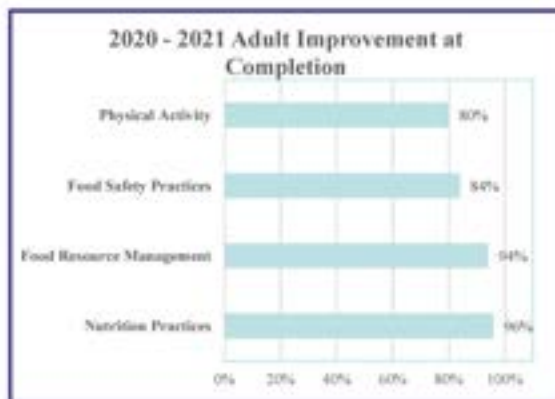
Lesson Activities:

Through the lesson activities, participants will:

- Make a grocery list for a recipe
- Identify the main parts of the Nutrition Fact labels
- Use unit pricing to compare the price of different food products
- Practice Food preparation and Food safety skills
- Practice Physical activities

Result

Clemson Cooperative Extension Service continues to positively impact delivering EFNEP in 18 counties in South Carolina. In 2021, SC EFNEP reached 396 families, and the outcome data showed :



Conclusion

Through an experiential learning process EFNEP adult participants increase their ability to select and eat healthier foods, stretch food dollars by managing food budgets, decrease foodborne illness, and increase physical activity.



CLEMSON RURAL HEALTH

Brooke A. Brittain, MS, RD, LD, CHES, CLC
Associate Director, Food and Nutrition Security

Impact of nutrition counseling, food demonstration and produce prescription on clinical measures

Methods

- **WISEWOMAN**

- Cardiovascular risk reduction program
- For low income, un-underinsured women 40-64 years of age
- Patients have their lipid panel and A1c checked at the visit
- Access to a health coach/dietitian for up to 6 sessions

- **Veggie Rx**

- Produce prescription
- 2 free fresh produce boxes per month for 6 months
- Patients are pre-diabetic or diabetic
- Group nutrition/cooking classes offered 1 per month

Outcomes

- **WISEWOMAN**

- 355 patients enrolled from Aug 2021-Aug 2022
- 150 completed 3 HC sessions
- 92 completed 2 HC sessions
- F/u labs conducted displaying a reduction in A1c, cholesterol, weight and blood pressure
- Avg reduction in total cholesterol 13.6%

- **Veggie Rx**

- 36 patients enrolled since July 2022
- Allotted 111 patients for the 1st year
- Clinical measures evaluated along with behavioral measures through surveys

Conclusions & Future Directions

- Individualized nutrition counseling and food demos are effective interventions for preventing and managing type 2 diabetes and related chronic conditions
- Adding prescription produce may amplify this effect
- Both programs help decrease health disparities in under-served and under-represented populations, and will inform policies and best practices for health care



The Necessity for Science-based Home Canning Education in a Post-COVID Era

Kimberly Baker, PhD, RD, LD
Assistant Extension Specialist
Food Systems and Safety Program
Team Director

Food Systems and Safety Agents:
Samantha Houston
Faith Isreal
Alex Thompson
Gayle Williford

To evaluate South Carolina consumers' level of knowledge gained in critical areas of home canning before and after attending a hands-on canning workshop post-COVID.

Method and Results

Standard evaluation given to home canning workshop participants to:

- Measure program effectiveness
- Measure knowledge/confidence gained
- Measure behavior change
- N=83; Workshops held Jan. 2021 to July 2022

***Confidence Statements:**

1. When to use boiling water versus pressure canners.
2. The risks associated with improper canning techniques.
3. The products recommended and/or available for canning (jars, lids, canners, etc.)
4. The proper way to handle canned foods during processing and storage.
5. Where to find trusted resources on food preservation.

Average Confidence Before and After Training



Outcomes and Opportunities

Outcomes:

- Home canning workshops provide participants with the knowledge necessary to can foods safely at home and they feel significantly more confident with these concepts after the training.
- Most knowledge gained:
 1. When to use a boiling water bath canner vs a pressure canner
 2. Identifying trusted resources

New Opportunities:

- Expand reach of workshops to stakeholders
- Utilize and evaluate different educational platforms to teach home canning
- Continue program evaluation and expand data collection to measure long-term outcomes.



COOPERATIVE EXTENSION
College of Agriculture, Forestry and Life Sciences

HEALTH EXTENSION CREATES SUSTAINABLE RURAL FOOD ACCESS IMPROVEMENTS THROUGH PSE APPROACH

Michelle Altman, Hampton County

Wanda Green, Lee County

Weatherly Thomas, Lee County & Marion County



COOPERATIVE EXTENSION

IMPROVING ACCESS AND AFFORDABILITY OF FRESH FRUITS AND VEGETABLES

OBJECTIVE

Use a policy, systems, and environmental (PSE) change approach to increase healthy food access in rural counties with high obesity prevalence at the systems-level.

METHODS

- Food assessment survey
 - Conducted via telephone
 - Incentivised
- Engaged stakeholders by leading rural health coalitions comprised of community members, faith organizations, businesses, and public health officials.



MAJOR OUTCOMES

- 1 county-based food policy council
- 3 new food access points
- Over \$400k awarded to community partners in food-related grants
- Installation of 12 community gardens

It's About More than Food:

The Need for a Holistic Approach for Assessing College Food Insecurity and Hunger

Catherine Mobley, Clemson University ~ FOOD FORWARD ~ SEPTEMBER 15, 2022

Deanna: A Focus on Isolation



That's why I would think food insecurity...in college, **you have to have a support system**, and then some people just don't have that. It's just a fact of life at that point. So, you **kind of have to just grind it out and see what you can get.**

Frances: A Focus on Dependency



I took the picture of the pie **because I was proud of making it....** but, once again **I am still dependent on someone else,** mostly. My community supplied most of the ingredients. So, **without that financial help,** I wouldn't have been able to make the pie. **It is a feeling of helplessness.**



Jenna: A Focus on Scarcity

The photo of the empty fridge is from my Clemson dorm room. I **don't have the time or money** to go to the grocery store. I occasionally cook for my boyfriend and his roommate, but they help buy the ingredients. The fridge reminded me of **how dependent on the dining halls I am**. If they don't open until late or close before I have time to get dinner, I'm out of luck **because I can't afford to eat out**. At this point in the semester, I am out of Paw Points.



NEXT STEPS

Programs and policies should address the holistic dimensions of college food insecurity.

Need to consider whether the USDA measure of food insecurity captures college food insecurity.

What else can we do to assess students' basic needs on your campuses? What should we do?

Can We Talk? Conversations with BIPOC farmers about Stress and Mental Health

by Kenneth L. Robinson, Ph.D.
FoodForward Symposium
September 15, 2022

This project was supported by the U.S. Department of Agriculture, National Institute of Food and Agriculture, Farm and Ranch Stress Assistance Network Grant.



Research Methods: On-farm interviews and construction of GIS mapping system

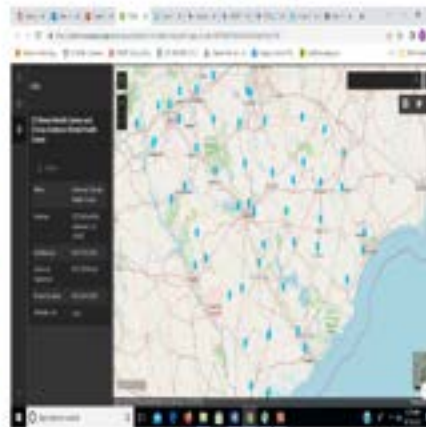
Clemson and SC State Extension
Farmer Stress Project

Sign up to be interviewed today!

Interviews conducted Summer 2022

A stipend will be offered to willing participants

This project involves interviewing farmers about financial crisis, land tenure, and mental health issues faced by farm families. Our goal is to better understand how financial hardship has impacted farms and farm families. Scan the QR Code to register for participation!



Online interactive GIS map of resources and services for farmers and ranchers: <https://arcgis.com/>



Major Outcomes: Creating New Opportunities and Addressing Challenges

▶ New Opportunities

- ▶ Strengthen and develop relationships with socially disadvantaged farmers
- ▶ Hear directly from farmers and build trust with them
- ▶ Develop inventory and network of regional stress and mental health services and resources

▶ Challenges

- ▶ Availability of reliable information on socially disadvantaged farmers
- ▶ Overcoming lack of trust among farmers of traditional institutions
- ▶ Designing programs and outreach activities that meet the needs of socially disadvantaged farmers

Identification of Critical Points for Bacterial Contamination in the Microbrewery Environment

Alex Ryan Thompson
Food Systems and Safety Agent
Clemson Cooperative Extension

Objectives:

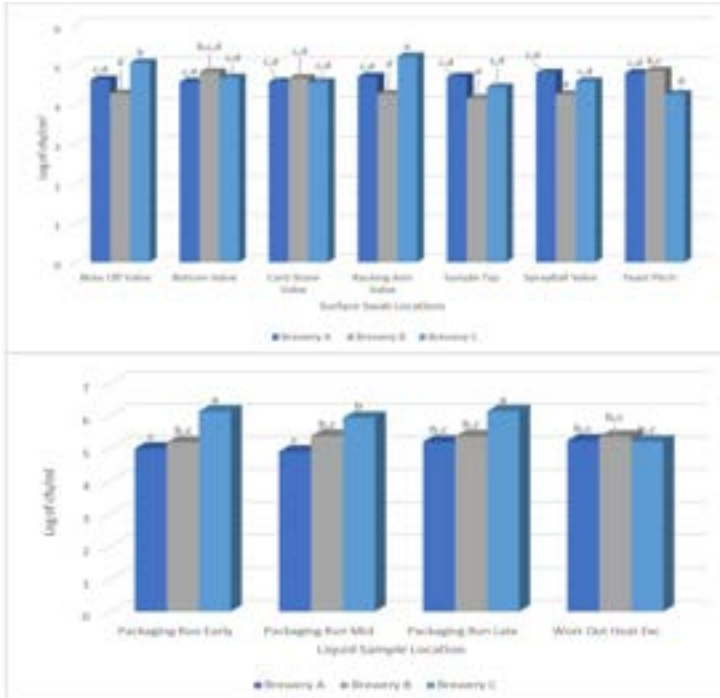
- 1) Identify where in the brewing process contamination is most likely to occur
- 2) Improve product quality for microbrewers by identifying bacterial presence in the brewing process

Methods

- Samples Collected from 3 Upstate SC Breweries
- Samples Collected at Various Points in the Brewing Process
- Used HybriScan Technology

Results

- Average Surface CFU/cm²: 56,968
- Average Liquid CFU/ml: 225,294



Discussion

- 1) Current CIP Practices Used by Microbreweries Do Not Lower Bacterial Counts to Spoilage-Free Levels
- 2) Microbrewery Products Contain Significant Levels of Spoilage Organisms

Going Forward

- Research CIP Improvements for Microbreweries
- Inform Public about Proper Cold Storage of Microbrewery Products
- Spoilage Organism Presence Does Not Equal Bad Manufacturing Process

Economic and Environmental Benefits of Sensor-Based Irrigation

José Payero (jpayero@clermson.edu)



Objectives:

1. Promote the use of sensor-based irrigation among farmers,
2. Evaluate its economic and environmental benefits

METHODS:

José Payero (jpayero@clermson.edu)



Objective 1:
Extension activities

Objective 2:
18 On-farm trials

OUTCOMES:

José Payero (jpayero@clemson.edu)

Table 1. Summary of economic assessment of soil moisture sensor-based irrigation management in South Carolina during 2020

Crops	Crop	Sensor Irrig.				Conventional Irrig.				Difference ¹ (\$/acre)	Difference ² (%)
		Total energy cost (\$/acre)	Yield (bu./acre)	Total gross income (\$/acre)	Net income (\$/acre)	Total energy cost (\$/acre)	Yield (bu./acre)	Total gross income (\$/acre)	Net income (\$/acre)		
1	Cotton	51.21	2282	2046.52	2095.20	5.86	1120	899.30	893.44	141.76	12.7
2	Peanuts	26.14	6052	1200.40	1174.26	11.28	5062	1012.80	1001.52	170.94	14.7
3	Soybeans	30.19	4000	3090.90	3099.81	43.38	1400	431.00	387.62	442.19	49.3
4	Peanuts	32.00	5074	1014.80	1004.80	9 ²	4176	825.20	825.20	189.60	18.8
5	Peanuts	21.97	5802	1240.40	1212.43	35.08	5476	1099.20	1064.12	47.28	7.4
6	Cotton	22.37	1800	1296.0	1273.63	21.34	1800	1296.0	1274.64	45.74	4.26

11.5% increase in average net income

Table 2. Summary of economic assessment of soil moisture sensor-based irrigation management in South Carolina during 2021

Crops	Crop	Sensor Irrig.				Conventional Irrig.				Difference ¹ (\$/acre)	Difference ² (%)
		Total energy cost (\$/acre)	Yield (bu./acre)	Total gross income (\$/acre)	Net income (\$/acre)	Total energy cost (\$/acre)	Yield (bu./acre)	Total gross income (\$/acre)	Net income (\$/acre)		
1	Corn	12.08	18175	1389.25	1271.07	36.04	12634	1300.23	1264.19	91.88	7.3
2	Soybeans	11.81	3505.8	762.52	750.71	37.06	3611.8	762.58	725.52	34.95	2.2
3	Corn	28.80	13846	1023.36	1286.55	24.38	12621	1236.08	1176.7	112.82	8.8
4	Corn	23.84	10827	1028.57	1004.73	28.36	12716.7	1227.79	1209.43	104.88	10.4
5	Cotton	44.25	3881	1558.25	1512.15	21.36	3881	1480.55	1408.19	170.96	6.8

We have gained experience in data monitoring to aid decision-making that can be used for other applications.

(Benchmarking) Nanopore long-read sequencing for Food Science applications (?)



J. Antonio Baeza
Dept. of Biological Sciences
Clemson University

jbaezam@clemson.edu





- | Most economically valuable fishery in the Caribbean.
- | Fully exploited or overexploited pops.
- | Supply chain mislabeling.
- | Ecologically relevant.



- | Overexploited populations [historically]
- | Illegally fished [present]
- | Supply chain mislabeling.
- | Ecologically relevant.



2^d Generation Sequencing Technology



Short-read sequencing

Illumina



3^r Generation Sequencing Technology



Oxford Nanopore Technologies
[ONT]



Pacific Biosciences
[PacBio]

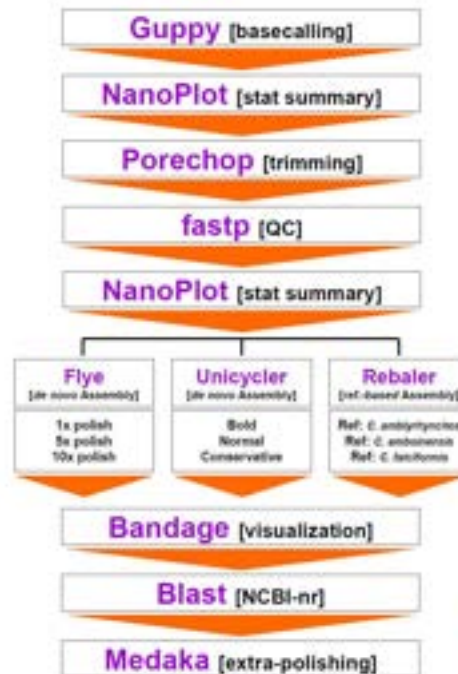


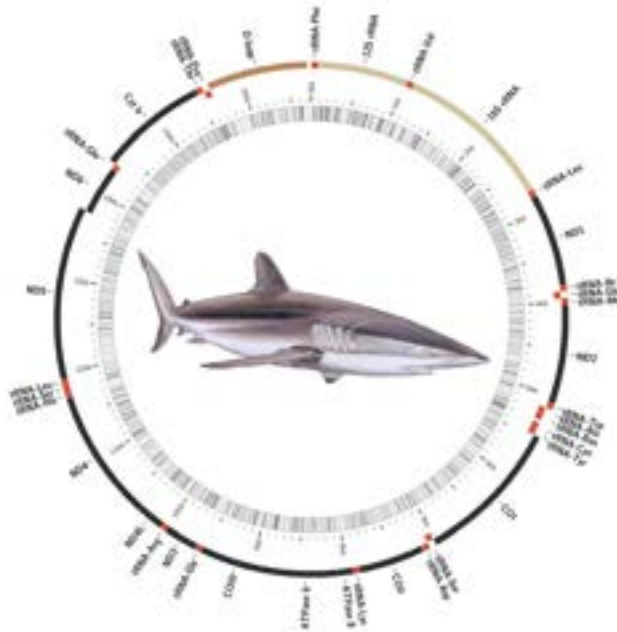
Testing whether or not complete mitochondrial genomes can be sequenced from *low-coverage long-read nanopore sequencing data exclusively*.

Long-read assembly

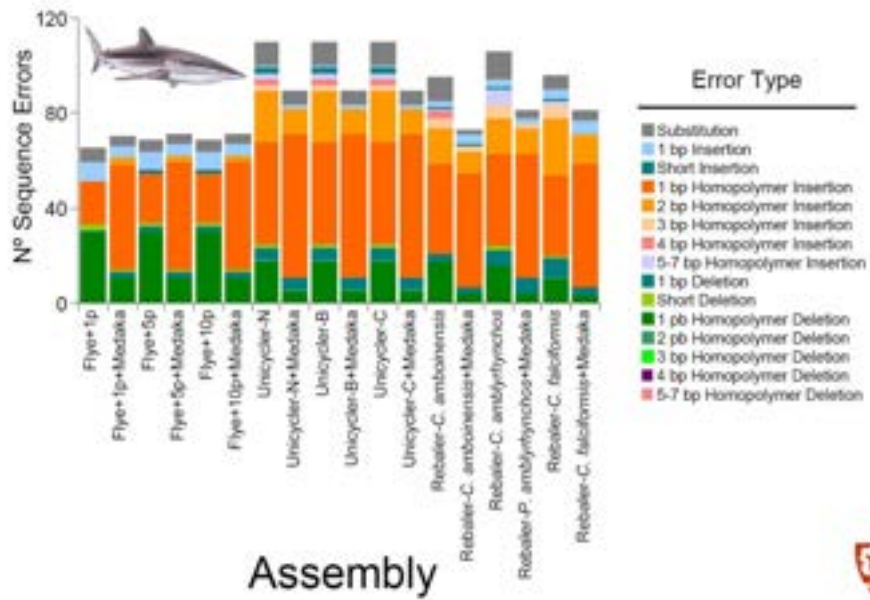


$n_{\text{reads}} = 50,780$

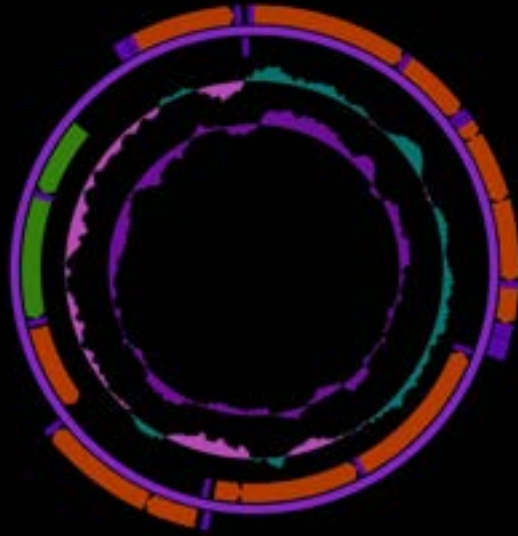




Long-read assemblies: quantitative analysis of error type

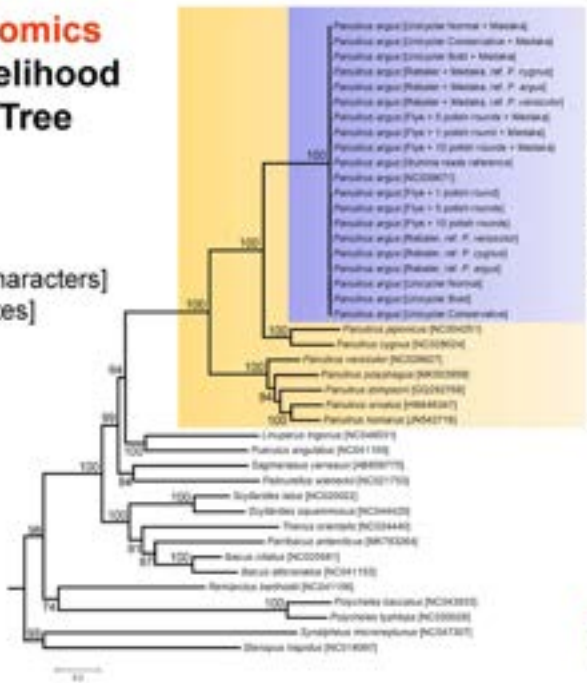


Long-read genome accuracy is very high, although not 100%



Mitophylogenomics
Maximum Likelihood
Phylogenetic Tree

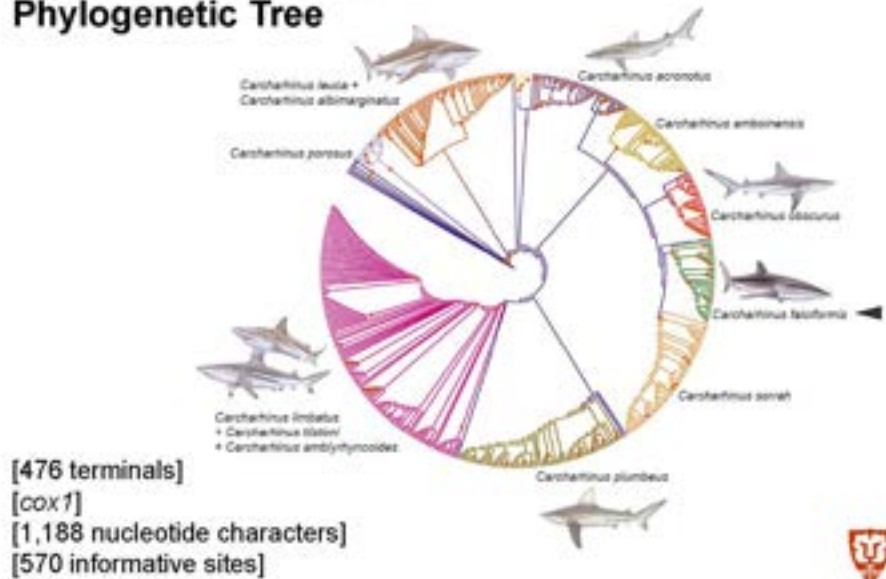
[42 terminals]
 [13 mtPCGs]
 [11,187 nucleotide characters]
 [6,340 informative sites]



Panulirus spp.



Barcoding
Maximum Likelihood
Phylogenetic Tree



proof-of-concept for future implementation of in-situ surveillance protocols using the MinION to detect mislabeling in fished species across its supply chain.

Transfer of genomics technology to moderate- + low-income countries.





- | Surveillance
Episodic?
Continuous?
- | Pathogens
Specific/General
- | Supply chain
mislabeling.
- | Quick
Inexpensive



(Benchmarking) Nanopore long-read sequencing for Food Science applications (?)



J. Antonio Baeza
Dept. of Biological Sciences
Clemson University

jbaezam@clemson.edu



Reduced-immunogenicity peanuts are affordable immunotherapy for peanut-sensitive individuals and a source of nutrition

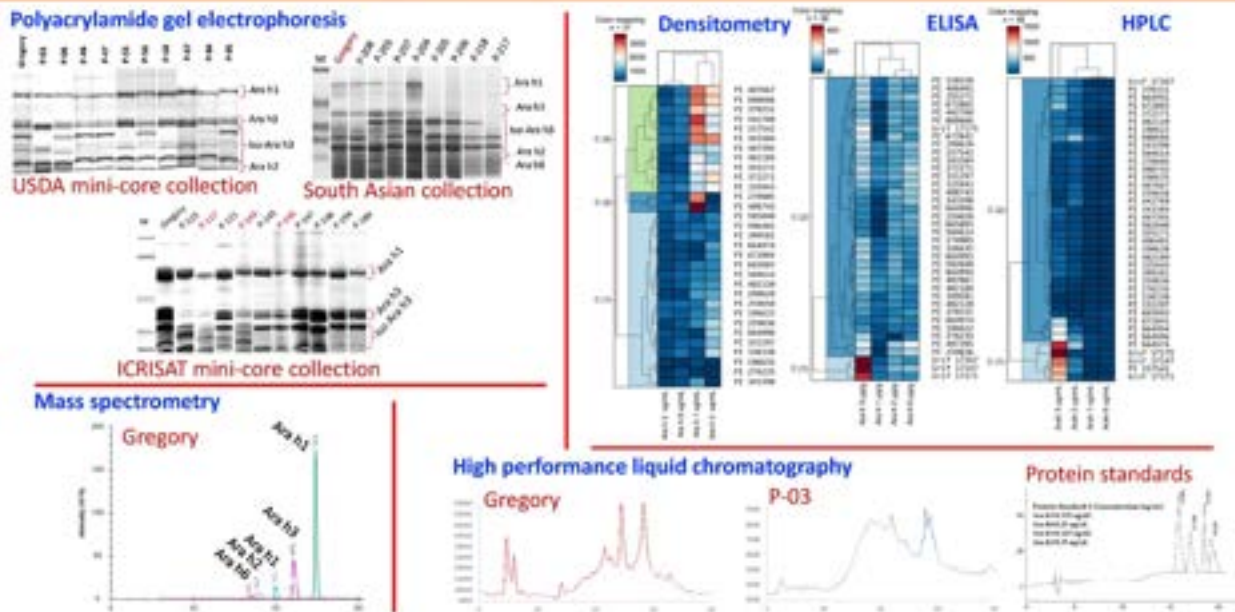


- Affect 6 million individuals in the US
- Cases on the rise, 0.4% of the US population in 1997 to 2.9% in 2021
- 4 peanut proteins, Ara h1, h2, h3, & h6, affect 90% of sensitive individuals

Goals are to i) remove immunogenic proteins, not peanuts, from the diet
 ii) develop reduced-immunogenicity peanuts into affordable oral immunotherapy

Sachin Rustgi,
 Dept. of Plant & Env. Sci.
 Clemson University

Reduced-immunogenicity peanuts via conventional breeding

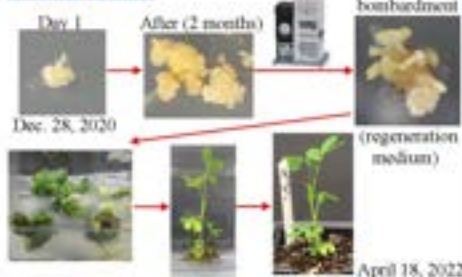


Reduced-immunogenicity peanuts via multigene editing

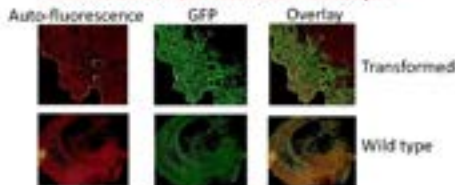
CRISPR/Cpf1 construct



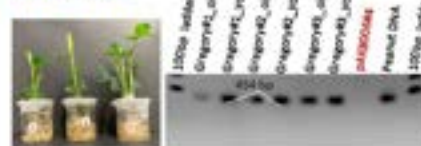
Biolistic deliver



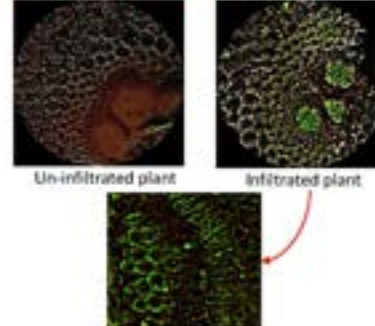
Callus sections under fluorescent microscope



Viral deliver



Petiole cross-sections under fluorescent microscope



Future

- Open for collaboration specifically for
- testing the developed material on human cell lines, model organisms, and human subjects
 - Accessing the social and commercial acceptance of the reduced-immunogenicity peanuts.

Acknowledgements



CLEMSON
UNIVERSITY

Nigella sativa as an Antibiotic Alternative to Promote Growth and Enhance Broiler Health

Vishal Manjunatha, Julian E. Nixon, Greg F. Mathis, Brett Lumpkins, Zeynep B. Guzel-Seydim, Atif Can Seydim, Annel K. Greene, and Xiuping Jiang

Vishal Manjunatha
Food, Nutrition, and Packaging Sciences, Clemson University

The Problem



Necrotic Enteritis (NE)

Current Solution



Antibiotics

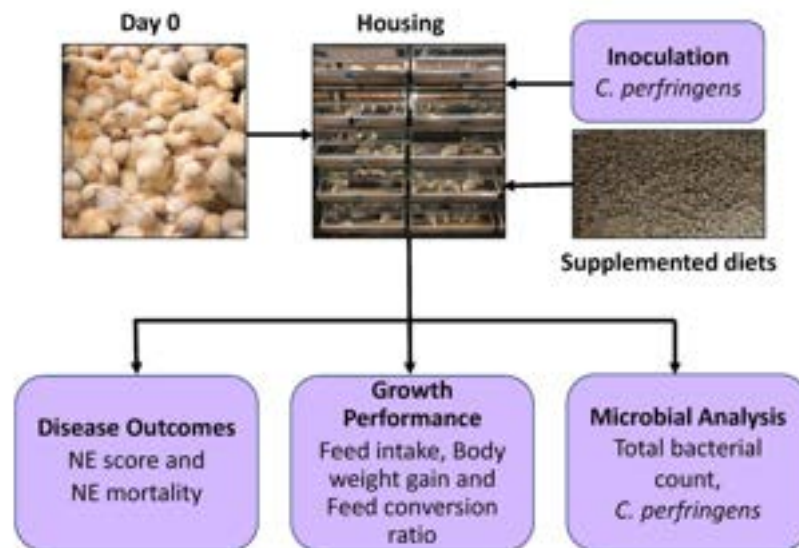
Proposed Solution



***Nigella sativa* (Black Cumin)**



Animal Trial Design

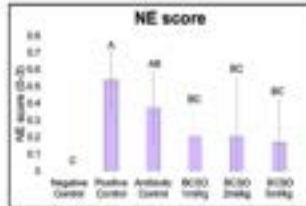
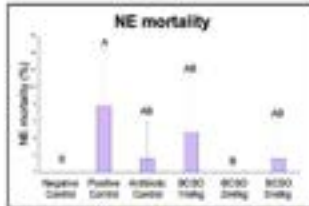


Results

Black cumin reduced death rate and intestinal scarring

Decline in disease causing bacteria

Black cumin can be a natural alternative to antibiotics



Vishal Manjunatha



Stop the spread of
Antibiotic Resistance



Choose **Antibiotic-free poultry**



Fats, Oils, & Grease (FOG)



Fats, Oils, & Grease (FOG)



**Can it
Cool it
Trash it**



**Fats, oils
and grease
clog drains!**





Guide To Materials
Restaurants

<p>1. Manager Checklist POSTER</p>  <p>Place somewhere that the manager frequently goes through, such as in all service back office.</p>	<p>2. Employee POSTER</p>  <p>Place near the back kitchen area looking out to the grease trap.</p>
<p>3. Signs POSTER</p>  <p>Place near the back kitchen area looking out to the grease trap.</p>	<p>4. SIGNAGES</p>  <p>Place on the outside grease trap when it is visible from when the door opens. Be sure signage is completely dry before posting.</p>  <p>Place near the kitchen sink that is connected to the grease trap. If possible, place near floor under bar and walkways. Be sure signage is completely dry before posting.</p>
<p>5. Refrigerator MAGNET</p>  <p>Place on the refrigerator or freezer in the kitchen.</p>	<p>6. Educational HANDOUT</p>  <p>Place your three handouts around for your staff to read and circulate throughout their day your staff learning. A FOG training video is also now available at the FOG website www.fogclear.com</p> <p>Thank you for continuing your efforts towards less runoff pollution and cleaner water. FOG can make a difference!</p>






CLEMSON EXTENSION WEATHER NETWORK: BUILDING RESILIENCE FOR AGRICULTURE PRODUCTION FOOD SYSTEMS

Burns, M.G., C. Thomas, Z. Snipes, B. Lanford, M. Smith

Why?

1

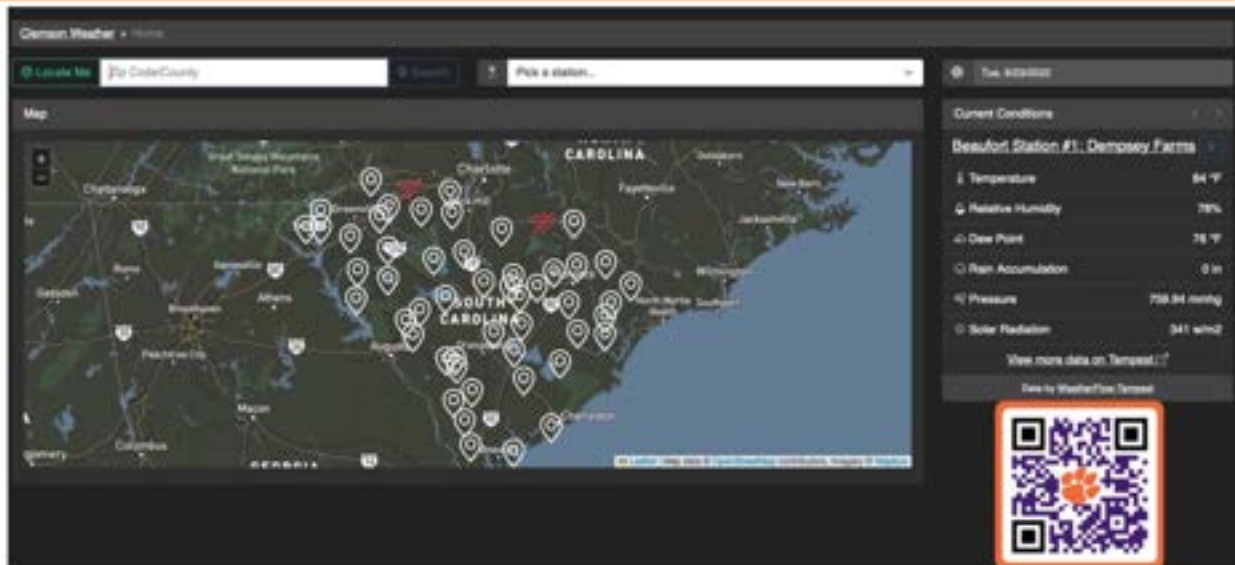
Address the need for increasing local weather measurements to assist with defining microclimates (aid in drought declaration, flood assessment, and long-term modeling forecast)

2

Increase weather awareness through youth curriculum development, producer education, and forecast modeling

3

Increase collaboration with SCDNR, South Carolina Climatology Office, SCFB, and other agencies who would benefit from this local source data





Safe. Secure. Sustainable.

Sonoco FRESH at Clemson University leverages academic resources and industry relationships to drive innovative solutions to ensure a circular pathway for the food value chain.



FRESH provides the framework for multi-disciplinary innovation and engagement with experts from Industry and Academia.





2019-2022 Research Project Awards

1. Feasibility Study of Nanomaterials-Derived Technology for Antimicrobial Packaging
2. A Social Media Analytical Study Exploring Public Sentiment Around Food Waste & Food Supply Safety
3. Biobased Plastic from Wood: Packaging Concepts for a Sustainable Future
4. Packaging System Using Chlorine Dioxide Sachets for Shelf Life Extension of Fresh Whole Strawberries
5. Packaging Innovation to Add Functional Properties to Paper Packaging
6. The Environmental and Societal Impacts of Home vs. Commercially Prepared Salads





Student Creative Inquiries and Research Projects

Fall 2019 & Spring 2020

Food Waste Recovery Initiative

Summer 2020

COVID Challenge: The Impact of COVID-19 on Packaging, Safety and Food Waste

Fall 2020

Sustainable Packaging:
Beginning with the End in Mind

Spring 2021

Sustainable Packaging:
Life Cycle Analysis with the End in Mind

Fall 2021 & Spring 2022

Zero Waste Events

Fall 2021 & Spring 2022

Zero Waste Event Case Study mentored
by WM and Aramark

Fall 2021 & Spring 2022

The Peach Package of the Future

2021-22

Masters Research Project

Optimizing Packaging Type for Peaches in
E-Commerce Environment

2022-23

Chemical Recycling



Food, Packaging & Sustainability Summit September 19-21, 2022

2022 Food, Packaging & Sustainability Summit

Strategies to Achieve Sustainability Targets

Highlights

Reimagining the Food System, Rob Dongoski, Partner, Food and Agribusiness, EY-Parthenon and EY

A Layer by Layer Look at Sustainable Packaging, Sun Chemical, Printpack, PSI

Technology Enabled Transformations, Moderated by Kathleen Cook, Principal, Product Innovation, Supply Chain Intelligence and Sustainability, IBM AI Applications, Donna Lanzetta, CEO and Founder Manna Fish Farms, and Donald Prater, DVM, Associate Commissioner for Imported Food Safety, FDA

The War on Food Waste, Panelists include Aramark, Verdant Technologies and Don't Waste Food SC

Faculty-Industry Co-hosted Breakout Sessions:

LCAs, Industry 4.0, Impact of KPIs in Capital Markets, Compostable Packaging

PepsiCo's Sustainability Platform, Rachael Lawrence, Sr. Director of Sustainability, PepsiCo Foods NA

What's the Right Way to Tell Packaging's Sustainability Story?

Suzanne Shelton, The Shelton Group

Operationalizing Walt Disney World's Sustainability Goals

Environmental Integration, Walt Disney World





Thank You For Your Support!

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864.607.3968

Farming Foundations: An online course

Objectives:

Increase local food production

Educate clientele about the realities of starting a food growing venture and available resources.

Increase public awareness of farming practices

Reduce time burden on Extension staff



Early Successes

Course launched in March 2022

To date, 505 individuals have enrolled.

Upon completion, participants develop a farm portfolio and schedule a meeting with their local Extension agent.

We are currently evaluating the course and will track new farm recruitment and sustainability.



Thank you for creating this course. It really helps rookies like me who have a little land and want to explore options for using that land.
- Anonymous Participant



COOPERATIVE EXTENSION
College of Agriculture, Forestry and Life Sciences

LOCAL FOOD MARKETING CONSTRAINTS AND COOPERATIVES AS A POTENTIAL SOLUTION

Steven Richards, Ph.D.
Senior Agribusiness Extension Associate

Research Objectives and Challenges

- I am a Member of Clemson Cooperative Extension's Agricultural Business Team
- My Specialty Areas: Business Plans & Feasibility Studies, Business Startups, and Food and Specialty Crop Marketing (Niche Products).
- Research Objective: **How to Increase Profitable Local Food Sales and Markets, Given that Local Products are most often Made and Marketed for Small, Niche Markets?**
- Challenges: Difficult to Research, due to Size and Lack of Published Data
- Opportunities: Some Niche Products Present Good Opportunities, Some Do Not

Local Market Research: Studies and Surveys

Emerging Markets, Feasibility Studies

Heirloom Rice Production	Pecans and Pecan Products	Small Ruminants (Goats and Sheep)
Bees (honey and other value-added)	Shellfish Mariculture (oyster and clam)	Slaughter Capacity for Local Meat Products
Local Foods Economic Outlook	Mushrooms, Cut Flowers	Butcher Training
	Commercial Fisher/Shrimper Training	

Market Research: Consumer & Producer Surveys

Consumer Preferences For Local Oysters (SC)
Livestock Producers and Local Protein Production (SC)
Local Meat Processor Capacity Interviews (SC)
Consumer Preferences for Local Proteins (SC)
National Restaurant Food Buyers Survey
Consumer Preferences for Local Clams (US East Coast)
Local Beef Branding Survey (South Carolina)
Barriers to Adopting Organic Agriculture (SC)

Local Market Research Findings

Top 3 Barriers to Increasing Local Food Sales:

Availability (Supply)
Cost/Price
Consistency (Quality)

Collaboration: One Solution to Increasing Local Food Sales

Cooperatives: business owned and run by its members and share its costs/benefits

Availability: Aggregates Supply from Multiple Producers

Price: Achieves Efficiencies of Scale through Shared Overhead Costs

Consistency: Agreed Upon Quality Standards at Cooperative Level

Help Forming a Cooperative? Have Questions

The SC Center for Cooperative and Enterprise Development

[SC Center for Cooperative and Enterprise Development | College of Agriculture,
Forestry and Life Sciences | Clemson University, South Carolina](#)

Thank you

Questions and Contact Information



Steven Richards, Ph.D.

- Director, SCCCED
- Agribusiness Senior Extension Associate
- Clemson University
- stricha@clemson.edu
- 315-573-8632 Cell

CLEMSON
COOPERATIVE EXTENSION

RISING PRODUCTION COSTS AND OTHER CHALLENGES FOR LOCAL PRODUCERS

Kevin Burkett
Extension Associate
Agribusiness

Local Farmers Must Be Economically Sustainable

Otherwise, they cannot exist as part of the local food system

Production is outsourced from any number of places / locations



Revenues Must Exceed Expenses

Must be able to calculate expenses

Must be able to capture revenues

\$5,000 expense



How to Increase Profitability



DECREASE
EXPENSES



INCREASE
REVENUES



COMBINATION OF
BOTH

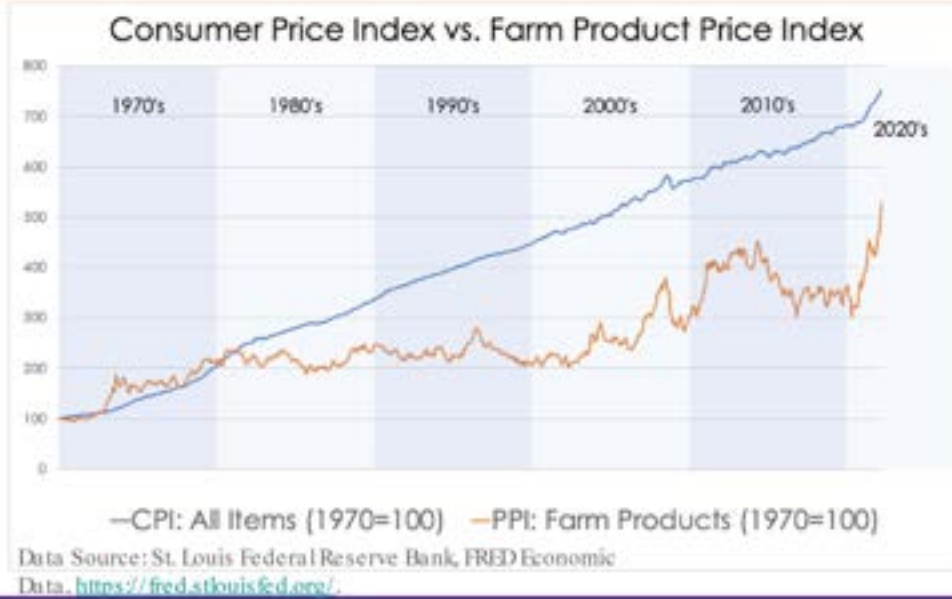
Challenges

Rising expenses

Lagging revenues

Incomplete financial measuring





Challenges

Marketing opportunities

High variability

Management



Local Farmers Must Be Economically Sustainable

Otherwise, they cannot exist as part of the local food system

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END NOTES - REFERENCES

¹ <https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/23/fact-sheet-biden-harris-administration-commit-to-end-hunger-and-malnutrition-and-build-sustainable-resilient-food-systems/>

² <https://health.gov/our-work/nutrition-physical-activity/white-house-conference-hunger-nutrition-and-health/make-commitment>.

³ Defined by the U.S. Economic Development Administration as 20% or more of the population living at or below the poverty level since 1980.

⁴Greenberg KP, Sarrica Barefoot B, Gaul K. (2021). 2021 South Carolina Health Professionals Data Book. Charleston, SC: South Carolina Office for Healthcare Workforce, South Carolina Area Health Education Consortium.