

## Report Status: Approved as of 07/08/2022

### Contributing Organizations

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Prairie View A&M University

### Executive Summary

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#### Overview

The Cooperative Extension Program (CEP) staff of perceptive administrators and leadership, innovative specialists, and dedicated county agents have evidence of improving the quality and quantity of their diverse program participants. Learning from the pandemic transition, CEP has embraced the best practices to maximize the greatest impact in the Texas counties where we serve. Along with its growth, CEP will continue to connect with families and stakeholders while adjusting to the increasing demand for specialized: information, training, and services. Unrelenting in its urge to reach the limited resource clientele in our Texas counties, CEP will expand in the different languages and highlight its positive impact in making improved changes for all Texans. In 2021, CEP recorded; 174,408 Educational Contacts; 168,400 were classified as 'other' contacts, 7162,765 Virtual Contacts, and there were 966 Media Posts. We were awarded significant external funding and in-kind services to advance the issues as identified by county stakeholders in order to successfully address topics facing youth, families, farmers, producers, landowners, and small business owners. Expansion into 6 additional counties has increased our ability to offer relevant educational information and resources to underserved audiences. New partnerships (25) in urban counties have resulted in recruiting new youth and adult participants. A mobile application was created as a tool to support participants with diabetes while promoting self-care management. The mobile application, attached to the "Live Well, Eat Well, and Be Active with Diabetes (LEAD) curriculum, is also a tool to track critical data that would extend to medical practitioners and caregivers. The LEAD curriculum reached 1,248 participants and reported 500 downloads. The Community & Economic Development unit led 60 trainings across the State in small business start-up, business financing, business planning, and State contract opportunities through the Businesses In Development (BID) training series. Given the number of individuals unemployed due to the pandemic, skill trade training was offered by the CED unit in selected rural counties. Certification training was available for adults in high demand jobs such as: welding, construction, electrical, and nursing. Follow-up data revealed that 303 participants received certifications and 145 registered apprentices are currently employed through employee partnerships. Our staff assisted individuals with 504 program funding to refurbish homes for families and seniors with USDA low interest mortgage financing. Also, assistance was provided to help families dealing with a aftermath of disasters by linking them to resources: to secure furniture, food, water, clothing, shelter, and pay utility bills. In order to address current and emerging issues in areas of renewable resources, farmers, ranchers and landowners, received assistance to develop forest management plans. To combat childhood obesity in Texas, extension agents from 13 Texas counties collaborated with 44 faith-based and community partners to implement Heroes 4-Health. There were 50 teen ambassadors who played a major role in reaching 1395 youth. In response to the COVID-19 pandemic, a virtual and self-paced "4-H At-Home Garden Series" was launched to provide gardening projects regardless of where they live or how much space they have, and most importantly, from the comfort and safety of their homes. Youth participants received free gardening supply kits to go along with the program through drop-offs to sites or by mail. Face-to-face programming was also conducted during the Fall 2021 semester. With the recruitment of 8 adult volunteers to assist in teaching the lessons, we were able to reach a total of 265 youth (ages 8-18) in underserved communities across Texas. Using the Junior Master Gardener curriculum, we created a 6 lesson video series through a county YouTube channel at [4-H at Home Garden Series Lessons](#). Prairie View A&M served as the lead institution (El Paso county and Cass County) partnered together with Langston, the University of Arkansas at Pine Bluff, Central State, West Virginia State, and North Carolina State University to reach over 1,000 youth with the 2021 4-H Ag Innovators Experience (presented by Bayer). Result demonstration field days educated and trained agricultural producers on crop production systems that helped maximize production levels and increase farm profitability. Education programs included urban agriculture, backyard garden, agriculture enterprise, and pollinator garden. As a result, 166,000 individuals in Texas were engaged. The AgNR unit conducted more than 20 education programs on Beef Cattle Production and Management, Increasing Small Ruminant Production, Nutrition Management, Pasture &

Hayland Management, and External and Internal Parasite Control through our Livestock Management Program reaching 650 producers.

Researchers in Animal Systems used goats, cattle and poultry to conduct original studies in ruminant nutrition, reproductive biology, growth and development, functional genomics, and meat science. Studies in the Plant Systems included medicinal plants, purple sweet potato, Texas hemp characterization and germplasm management, new plant species, pollinator-friendly plants, new crop varieties and underutilized food crops. Research conducted in Social Sciences and Allied Research include: family and community wellbeing; health disparities; food security/insecurity; small farms/ranches profitability; and, quality of life. Our Food Systems unit address: real-world challenges in food security and safety; healthy foods; bioactive antioxidants; dairy chemistry; structural-functional relationships; rheological modeling; and, the microbiome. Research in Natural Resources and Environmental Systems (NRES) embraced the critical issues that encompassed: remote sensing; climate change monitoring; water resources management; soil health; smart technologies (drones, sensors); organic amendments; and also microbiome.

Despite the challenges caused by COVID-19, the researchers have made significant progress towards achieving the overall aims and the long-term goals of our projects. The rigor of the research is increasing as we complete additional studies and generate reliable results which will be used to develop science-based solutions for the real-world problems in the US and around the globe. Research on germplasm development yielded new knowledge on: production of selected medicinal plant species; crop plants (including industrial hemp); purple sweet potato; and, under-utilized crop plants (grown as specialty crops). In the critical issue of environmental management, we ascertained the patterns of nutrient dynamics within and below the rootzone of collard greens grown under different organic amendment types and rates. We also assessed the climate change-induced variations in blue and green water usage in U.S. urban agriculture, and the spatio-temporal impact of climate change on precipitation and evapotranspiration and consequently on crop IRRs. Our CARC researchers discovered a cause of pregnancy failure in goats which we expect to resolve by adjusting the timing of a prostaglandin injection during the synchronization of estrus program. Additional research revealed that treated soil organic amendments alter produce phyllosphere microbiome but do not increase the risk of contamination with foodborne pathogens.

#### **Critical Issue: Environmental Management (1890)**

Patterns of Nutrient Dynamics within and below the Rootzone of Collard Greens Grown under Different Organic Amendment Types and Rates

The knowledge about nutrient dynamics in the soil is pivotal for sustainable agriculture. A comprehensive research trial can retort unanswered questions. Dynamics of nutrients sourced from organic amendment types (chicken manure, dairy manure, and Milorganite™) applied at different rates (0, 168, 336, 672 kg total N/ha) were monitored within and below the rootzone of collard greens cultivated on a sandy loam soil in Prairie View, TX, USA. Macro- and micronutrients (e.g., TN: total nitrogen, P: phosphorous, K: potassium, Na: sodium, Ca: calcium, Mg: magnesium, B: boron, Cu: copper, Fe: iron, and Zn: zinc) were analyzed from soil solution samples collected during six sampling periods from within and below the rootzone. As hypothesized, the organic amendment types and rates significantly ( $p < 0.05$  and/or  $0.01$ ) affected nutrient dynamics within and below the crop rootzone. Chicken manure released significantly more TN, P, K, Na, Ca, Mg, B, Cu, and Fe than the other two amendments. The application of chicken manure and Milorganite™ resulted in higher below-the-rootzone leachate concentration of TN, Na, Mg, and Ca than in the leachates of dairy manure. Dairy manure treatments had the lowest concentrations of TN, Ca, and Mg; whereas, Milorganite™ had the lowest concentrations of P, K, Na, B, and Cu in the collected leachates. The higher level of P (i.e., 4% in Milorganite™ as compared to 2 and 0.5% in chicken and dairy manures, respectively, might have reduced the formation of Vesicular-Arbuscular (VA) mycorrhizae—a fungus with the ability to dissolve the soil P, resulting in slow release of P from Milorganite™ treatment than from the other two treatments. Patterns of nutrient dynamics varied with rain and irrigation events under the effects of the soil water and time lapse of the amendment applications' rates and types. All the macronutrients were present within the rootzone and leached below the rootzone, except Na. The dynamic of nutrients was elementspecific and was influenced by the amendments' type and application rate.

Climate change-induced variations in blue and green water usage in U.S. urban agriculture

Urban agriculture could assist in meeting the growing global demand for food without overburdening agricultural areas. To fully realize the potential of urban agriculture, it was necessary to better understand the implications of urban agriculture and climate

change on the food-energy-water nexus. Another study was conducted to investigate the influence of local climate change on irrigation requirements, and green and blue water usages for turf grass and three common urban agriculture crops (carrots, spinach, and sweet corn) in eight midsized U.S. cities. Baseline (1980–2010) and Future (2040–2050) daily climate data were combined with site-specific crop water uptake data to calculate irrigation requirements using the Irrigation Management System Model, IManSys, a numerical simulation model that uses a water balance approach. The irrigation requirements (IRRs) were further used to calculate the energy requirements and associated greenhouse gas emissions for the four crops in each location. Results showed the spatio-temporal impact of climate change on precipitation and evapotranspiration and consequently on crop IRRs. On the east coast, increases in summer precipitation during the crop growing seasons resulted in relatively small increases in blue water contributions (<222%) to crop water demands. On the west coast, though, decreases in precipitation lead to more drastic increases in blue water contributions (>222%) for these same crops. The energy requirements and greenhouse gas footprints of urban agriculture were weakly correlated to the blue water portion of the IRRs in individual cities but were largely impacted by the source of the water used. Overall, the results highlighted the importance of appropriate and thoughtful crop selection for urban agriculture paired with environmentally sustainable water sourcing to maintain, or even reduce, future water and energy footprints of urban agriculture.

### Crop Growth, Air and Water Quality, Yield, and Economic Benefits of Sweet Corn in Response to Organic Amendment Types and Rates

Organic production practices for southeast Texas were necessary to help producers and protect the environment. This project aimed to formulate environmentally acceptable and economically viable organic crop production practices that ensure soil fertility, environmental sustainability, and optimal economic return in southeast Texas. A field experiment was conducted to:

1. evaluate and quantify the effect of organic amendments types and rates on crop yield components and nutrient and water use efficiency;
2. quantify the effects of these treatments on soil organic carbon (SOC), CO<sub>2</sub> emission, soil moisture, and nitrogen dynamics within and below the root zone;
3. define, compare, and correlate critical factors that contribute to crop yield, nutrient- and water-use efficiencies, SOC sequestration, soil CO<sub>2</sub> emissions, and NO<sub>3</sub>- leaching;
4. determine the financial profitability of adopting organic management practices described above;
5. formulate environmentally sound and economically viable organic production (OP) practices; and
6. conduct an outreach program to demonstrate organic cultural practices to different stakeholders.

In the end, we collected, analyzed the preliminary data, and presented the results at different conferences. Different research activities were demonstrated to the Reuse Water Quality REEU program participants and the NSF INFEWS Scholar program.

We addressed the challenges of natural resources and environmental management with an intensive integrated multidisciplinary approach. Field and laboratory experiments, modeling, and monitoring of environmental parameters were needed to address these critical issues, such as climate mitigation and adaptation, water conservation and protection, water quantity and quality, and soil health. We developed advanced research testbeds on the Prairie View A&M University (PVAMU) research farm to monitor soil health and water quality parameters, greenhouse gas (GHG) emissions, and others under different management practices while growing one majorly crop of Texas. We used ground sensing, remote sensing, and modeling approaches to monitor and quantify the impact of types and rates of fertilizer and irrigation applications on soil and water quality and GHG emission from field scale to global scales. While we realize more investigations were needed before recommending the best management practices to our limited resources farmers and growers, climatesmart agricultural practices were the best management strategies for environmental management under changing climate.

#### **Critical Issue: Adult and Community Leadership (1862)**

This is an 1862 Institutional report. However, we are an 1890 Institution therefore this section is not relevant for us.

#### **Critical Issue: Agriculture Production (1862)**

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### **Critical Issue: Community and Economic Development (1862)**

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### **Critical Issue: Community and Economic Development (1890)**

The Community and Economic Development (CED) Unit staff diligently engaged in activities to increase community and economic opportunities through group training, and individual consulting. Specifically, our staff have been with individuals, communities, and groups to inform and educate them numerous diverse issues. The majority of our programming were related to small businesses, youth entrepreneurship, workforce development, homeownership, disaster preparation/response, asset and wealth building, saving and investing, credit building, debt management, and budgeting. We continue to pay special attention to programs for limited resource individuals. We saw remarkable increases in community development and community services through non-profit capacity building. In addition to the programming, we implemented training that focused on addressing rural prosperity in economic development, technical innovation, improved quality of life, support of a rural workforce, and e-connectivity for rural America as identified by the Task Force on Agriculture and Rural Prosperity. During the previous year, our Texas Data Reporting system recorded the CED unit of having made 6,405 total contacts. The Educational Events had 3,535 and there were 2,870 contacts from other categories.

Rural and low-income communities have been especially affected by the global pandemic and its effect on the US economy. Unit staff sought to increase community and economic opportunities through group training and individual consulting. CED staff worked with individuals, communities, and groups to inform and educate them on issues related to small business, youth entrepreneurship, workforce development, homeownership, disaster preparation/response, programs for limited resource individuals, asset and wealth building, saving and investing, credit building, debt management, and budgeting. As a result, we increased community development and community services through non-profit capacity building. Specific training addressed rural prosperity in economic development, technical innovation, improved quality of life, support of a rural workforce, and e-connectivity for rural America as identified by the Task Force on Agriculture and Rural Prosperity.

Additionally, the CED Unit partnered with the Economic Development Administration to conduct thousands of hours and 100's of days to provide multiple certificate training and job placement in Welding, Construction, Nursing, and Electrical through The Rural Workforce Academy (TRWA).

Overall, agents throughout the counties of Texas also came together to conduct 9 virtual sessions through our Businesses In Development (BID) program that provided training and instruction to new and existing businesses. The instructions included directions on how to do business with the State of Texas through state contract opportunities.

We achieved some remarkable outcomes that included:

#### **THE RURAL WORKFORCE ACADEMY**

- The CED Unit conducted Thousands of hours of skills training through The Rural Workforce Academy (TRWA) in Welding, Construction, Nursing, and Electrical. Nearly half were employed.
- U.S. Department of labor approved Registration of Apprenticeship Program
- Certification gives us ability to partner with employers who can receive salary reimbursements for hiring apprentices.
- Recognized as the only HBCU to become a Registered Apprenticeship serving the community at large.
- Department of Labor agree to Partner with PVAMU CED Unit to provide paid apprenticeships over the next 4-years valued at more than \$5,000,000 in paid apprenticeship dollars.
- 303 rural and underserved community members trained in Welding, Core Construction, Certified Nursing Assistant, or Electrical Technician.
- 145 rural and underserved community members EMPLOYED and/or registered as an apprentice with one of our jobsite partners.
- The most participants trained in the State during the Pandemic.
- Training partners contribute over \$50,000 to 2020-21 TRWA program in in-kind services, supplies, and sponsorship.
- Expanded training to include cyber security, System administration, cloud engineer, python, coding, drone pilot operator, organic gardening, and Emergency Medical Technician.

#### **BUSINESS IN DEVELOPMENT (BID) PROGRAM**

- In 2021, El Paso, Willacy, Jefferson, Harris, Liberty, and Hidalgo Counties, along with Specialists from Headquarters teamed up and collaborated to facilitate 9 virtual sessions.

As a result of the program:

- 72 hours in 1 on 1 counseling hours

Seventy-eight (78) proposals were submitted totaling \$4,304,500 with funded bids in the amount of \$ 474,950 in contracts awarded (municipal, state, tribal and federal).

#### **Critical Issue: Connecting Agriculture and Health (1862)**

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#### **Critical Issue: Crop Production and Utilization (1890)**

As part of the outreach programming, the Agronomic and Specialty Crop Urban Agriculture Small Farm Outreach Programs (ASUS) were presented to educate socially disadvantaged producers about crop production and utilization practices to address crops' production for food and fiber. Crop productivity is being enhanced through new plant sciences as a new discipline to address the food scarcity problem and socio-economic regress with social disadvantage farmers and ranchers crop return.

We presented this program because, among other things, it conducted educational workshops and implement demonstration field days to educate and train agricultural producers on crop production systems. The culmination of this program, helped producers maximize production levels and increase farm profitability. We conducted several other education programs on urban agriculture, backyard garden, agriculture enterprise, and pollinator garden. The targeted audience benefited significantly. For example, the Agricultural Entrepreneurship Series was held hybrid-style with in-person attendees participating. Three workshops were held from 9-11 am on August 5th, 12th, and 19th. Overall 86% indicated that as a result of their participation in this series, they will increase their participation in: local, state, and federal programs, including USDA programs. 100% of the participants indicated that they expect to benefit economically from this series.

Texas, particularly the Greater Houston area, has a diverse ethnic representation and has a rich food culture involving many crop plants and edible plant species with high nutritional and medicinal properties. The great demand for these crops and plant species coupled with the suitable climatic conditions in the state provide an opportunity for their local production as niche crops to improve small farm diversification and sustainability. Successful production of these crops will improve small-scale farm incomes, strengthen the local food systems, enhance value addition in terms of new product development, and ultimately diversify the American food culture.

There is ongoing germplasm development of selected medicinal plant species and crop plants including industrial hemp, purple sweet potato and under-utilized crop plants grown as specialty crops. In addition to genetic characterization, this effort included agronomic studies to identify adaptable varieties and sustainable production methods. Biochemical evaluations were also being done on some of the medicinal plant species and to identify important bioactive compounds relevant to human health and well-being. Educational workshops were conducted in collaboration with our Extension colleagues to share the science-based information generated from the research activities thereby enhancing public awareness and societal impacts. Our students were engaged in these research activities to gain hands-on research experience as a high impact practice. We found a total of 33 cultivars of industrial hemp were evaluated for potential bioactive compounds. Two promising breeds of purple sweet potato were identified for expanded field trials in the state, ongoing evaluation of sustainable production methods including the use of plasticulture and high tunnels were evaluated for identified suitable cultivars of specialty leafy vegetables including vegetable amaranth, Malabar and Egyptian spinach. Studies were also conducted to evaluate the impacts of planting date on the growth and yield of four popular adapted strawberry varieties. The preliminary results indicated a loss of revenue for delayed planting of these varieties. Critical to our progress, was the development of 10 partnerships with private companies to support our research activities. Deliverables associated with these research activities included five virtual workshops and three conference presentations as well as ten published fact sheets on specialty crops. A total of 26 students were provided valuable experiential research training

#### **Critical Issue: Disaster Management & Outreach (1890)**

Our efforts aim to build capacity in disaster management programming by conducting relevant research. The projects addressed the following issues: disaster preparedness mitigation, response & recovery. The projects encompassed training of 1890 network personnel through a close relationship with the Extension Disaster Education Network (EDEN). In one Texas project, researchers were aiming to understand the response to USDA Food Aid among minority residents and farmers in COVID-19. This was a collaboration between PVAMU and TAMU College Station. A major component had been the project of

training student researchers in field research strategies and methodologies. Furthermore, residents, personnel from not-for-profit organizations, foodbanks, food pantries, community leaders, Mayors and other stakeholders were also active participants. Over 50 persons have participated in telephone interviews (conducted by student researchers) and completed surveys. Stakeholders from Bexar County, Harris County, Cass County, Walker County, Washington County, Waller County, Jasper County and Leon County participated in the project. The project had a multiple case study design and participants were recruited through snowball sampling. Over 6 student researchers from the two institutions had been trained in this project (4 English speaking and 2 bilingual).

Our preliminary results were as follows: 1. Regarding success of the program in Texas, respondents indicated that the program was seamless, large number of people received food assistance and quality products were included in the food boxes. 2. In response to what attracted them to the program, food quality, the variety of available foods, and a ready-made means of increasing food distribution were the most prevalent reasons organizations were attracted to the program. 3. Regarding how the pandemic impacted operations, the major reasons were as follows: having to discontinue operations due to lack of funding, a decrease in the number of volunteers to the pandemic (personal sickness and family) and safety concerns. 4. Challenges included inadequate storage for perishable food items, unknown arrival times for food trucks and lack of volunteers. One of the PVAMU student researchers won the 1st place in social systems at the 2022 MANRRS conference.

A successful part of this critical issue is that undergraduate students gained valuable research experience, the project contributed to significant community outreach, thereby increasing the footprint of the Texas AgriLife, and increased understanding of the value of food aid in times of disaster. The research team agreed that the outcomes of this project were beneficial in numerous ways. They included strengthening disaster programming for extension and positively impacting food aid policy in the USA.

### **Critical Issue: Food Safety and Education (1890)**

The American food supply is considered to be the safest in the world. The Centers for Disease Control (CDC) estimates that foodborne illnesses affect millions of Americans each year:

- 48 million people get sick each year from a foodborne illness,
- 128,000 people are hospitalized
- 3,000 deaths occur because of foodborne illnesses

There are four groups considered to be at higher risk of foodborne illnesses. These groups make up 20% of the population and include young children, senior adults, pregnant women, and those with weakened immune systems due to illness or other medical conditions. Adults 65 and older are at higher risk for hospitalization and death from foodborne illness; therefore, food safety is particularly important for this target group. The senior population becomes vulnerable because organs and body systems go through changes as you get older.

The Cooperative Extension Program (CEP) county agents targeted limited resource adults and youth and provided presentations on food safety. Limited resource clientele learned proper food handling procedures, personal hygiene while preparing produce and meat products to prevent cross contamination, how to prepare and store food properly. Agents and specialist within the Cooperative Extension Program were ServSafe trained and received certification. Educational trainings were conducted with restaurants, schools, and churches teaching staff members how to properly handle food. Educational methods used to conduct trainings included one-on-one consultations, on-site food demonstrations, train-the-trainer, educational programs and classes, taught a series of food safety classes to special interest groups, and educational displays at various sites.

The Cooperative Agricultural Research Center (CARC) provided information to the Cooperative Extension Program regarding Conducting research-based food quality and food products. CARC provided information to agents on how to protect vegetables and fruits from being contaminated in home gardens as well as during preparation. CARC worked with CEP Family and Community Health (FCH) Specialist to develop, FACT Sheets, social media, and other resources pertaining to food safety.

Coping with the pandemic, face to face classes were not conducted. How to Your Food Safe series were posted weekly to the social media platform, Facebook. A food safety overview, plus lessons addressing food safety basics: clean, separate, cook, and chill were the lessons shared with online participants. A total of 38 sessions were posted to Facebook reaching 450 online contacts. The lessons captured an overview of the food safety basics: clean, separate, cook, and chill. Clean is step 1 of the 4 simple steps to keeping individuals safe from foodborne illness or food poisoning at home. Clean focuses on the importance of handwashing which is one of the most important steps to prevent food poisoning. Separate is important to prevent cross

contamination. This lesson discusses how to handle raw meat, poultry, seafood, and their juices to ensure they do not touch ready-to-eat foods and produce. Cook focuses on keeping hot foods hot by cooking to proper internal temperature and chill focuses on keeping cold food cold. The series addresses the importance of practicing safety in the home to prevent foodborne illness and food poisoning.

Treated soil organic amendments alter produce phyllosphere microbiome but do not increase the risk of contamination with foodborne pathogens. Organic soil amendments were applied to soils to improve plant growth and maintain soil quality and health. However, the improper handling and application of organic soil amendments, especially in their raw or undertreated form or applying manure at the wrong time, may result in contamination of fresh produce with foodborne pathogens (FBP). Responding to this critical issue, this study was to assess the response of phyllosphere microbiome of collard greens to organic soil amendments. Randomized field trials were set up, with a plot size of 3 × 3 m<sup>2</sup>. Soil was amended with composted poultry manure, composted dairy manure or treated sewage sludge (milogranite) at four levels (control: 0 kg/ha, low: 168 kg/ha, med: 336 kg/ha, high: 672 kg/ha) right before planting. Collard greens were grown in the plots. Each treatment was replicated three times resulting in a total of 36 plots. Six leaf samples were collected from each plot at the time of harvest. DNA was extracted from leaf washes, and V4 region of bacterial 16S rRNA gene was sequenced and analyzed.

Since we have the International Goat Research Center at Prairie View A&M University, our main focus in the area of Food Technology is to utilize goat milk and meat, developing products that are nutrition healthful and readily available to residence of Texas and other states. Currently, we are developing goat milk, yogurt and other dairy products containing fucoxanthin, a carotenoid with bioactivity. Research has shown that fucoxanthin is an effective bioactive compound in controlling obesity in humans. The goat milk products that are developed will be tested on volunteer human subjects, under controlled conditions, to ascertain their anti-obesity effects. Obesity is a prevalent problem in our society and overall, the US population suffers from this unhealthy life-style more than other western societies. Since obesity contributes to a number of health related problems such as diabetes, cardiovascular problems, and certain types of cancers, developing products that can contribute to the control of obesity will result in savings of billions of dollars annually in medical costs.

#### **Critical Issue: Food Security in Texas Communities (1890)**

Nutraceuticals became a household word. In addition, the nutraceuticals and functional foods industry were experiencing unprecedented growth as more and more consumers learned about the health benefits of these emerging products. An example of a functional food is milk fermented with lactobacilli (e.g., Bifidobacterium, Lactobacillus). Potential health benefits that had been linked to these microorganisms included: improved lactose digestion; control of intestinal pathogens; reduction of serum cholesterol; tumorinhibiting effects; immune system stimulation; prevention of constipation; generation of group B vitamins; production of bacteriocins; and, inactivation of some toxic compounds. Kefir and yogurt are milk fermented products.

Since goat milk has been the most consumed milk in the World, our research at CARC was focused on increasing the world market of goat milk products by enriching goat milk with bioactive compounds (e.g., omega-3 fatty acids, carotenoids, polyphenols). In this regard, we planned to advance the science of goat milk fermentation through the enrichment of goat milk for yogurt-making with polyphenols such as green tea catechins and pomegranate anthocyanins to improve the health of the people in Texas, the Nation and developing countries abroad. A low dose of epigallocatechin gallate (EGCG) from green tea had been found to increase fat oxidation by thirty-three percent (33%). A clinical study provided evidence that a single tea catechin, EGCG, can increase fat oxidation in obese men, at least within 2 h a er meal intake. With the World Health Organization (WHO) estimating that by 2025, global obesity prevalence is predicted to reach 18% in men and surpass 21% in women, the opportunities for a scientifically-substantiated weight management food product (e.g., goat milk yogurt enriched with EGCG) was impressive. Green tea had been studied extensively for its potential in the weight management category, with the compound EGCG highlighted as a key component. Three mechanisms had been proposed: EGCG could increase energy metabolism and fatty acid oxidation; inhibit fat cell development (apodogenesis); and/or reduce lipid absorption and increase fat excretion.

The major grain crops such as wheat, maize, rice and sorghum that are grown in large acreages in Texas provided most of caloric needs and fruits and vegetables are consumed for good health. However, the cost of crop production had been increasing, whereas farm profitability had been declining. As a result, the cost of staple food has been increasing and food has become less affordable for many Texans. Therefore, we were investigating ways to increase yield of crops grown in Texas. An increase in yield would ensure profitable and sustainable crop production systems and alleviate food insecurity. Responding to this critical issue, research project that would help to increase the yield of grain and fruit crops through modulating shoot branching has been initiated. Shoot branching was a major yield component determined by dormancy and growth of axillary buds. Most crops developed unproductive branches that competed for light and nutrients with the productive branches and

reduced crop yields. Farmers manually removed (prune) branches to improve the yield and quality of fruits. However, pruning fruit crops substantially increased the cost of production, and pruning branches in grain crops growing in the field at high density was not feasible. The objective of the project was to advance knowledge of the physiological and genetic basis of shoot branching in plants using maize and sorghum as models and translate the knowledge into developing strategies to modulate shoot branching through agronomic and breeding approaches.

Near-isogenic lines of sorghum, maize, and wheat vary in shoot branching, thus being useful for dissecting the physiological and genetic basis of shoot branching regulation, were obtained from various institutions including, Cornell University, Donald Danforth Plant Science Center, and the Commonwealth Scientific and Industrial Organization (CSIRO, national lab equivalent to USDA) in Australia. A state-of-the-art plant growth chamber equipped with light emitting diodes of various wavelengths that was enabled to simulate the light quality and intensity (photosynthetic photon flux density) under various planting density (a major factor that regulates shoot branching in the crops) was purchased and installed. Plants were grown in the plant growth chamber under various light quality and photosynthetic leaf area and the growth of branches had been studied.

Our results suggested that light quality and photosynthetic leaf area, controlled shoot branching through distinct molecular pathways. The guiding hypothesis of the project was multiple distinct physiological and molecular pathways which regulated shoot branching in diverse plant species activated a suite of regulatory genes that promoted or inhibited shoot branching. The long-term goal of this project was to identify a suite of agriculturally important shoot branching genes, and to modulate their functions to optimize shoot branching as desired and increase yield.

### **Critical Issue: Fostering Strong Families (1890)**

Financial literacy classes were conducted virtually due to the pandemic. A primary tool used for financial literacy is Healthy Cents. This curriculum teaches strategies for saving money when buying and preparing food. A goal is to help participants stretch their food dollars as far as possible so family members can eat healthy foods prepared at home. Healthy Cents also considers ways to avoid wasting food to make the most of food purchases. Virtual lessons include 44 posts on Facebook: meal planning to make life simpler, food shopping strategies to save money, and smart shopping for fruits and vegetables. There were 355 reached. As community agencies listed restrictions due to the pandemic, community partner Frost Bank conducted financial literacy classes at two senior centers: Gus Garcia and Turner Roberts. Topics include identity theft, mobile banking, and credit card use. These topics are pertinent to older adults because they are targets for scams and identity theft.

The results from the 38 participants are:

- 38 of 38 (100%) understand the importance of keeping track of spending
- 37 of 38 (97%) recognize a budget can help achieve financial goals
- 37 of 38 (97%) knowledge of money management increased
- 37 of 38 (97%) intend to use one or more of the money management skills in the money management program

Parenting is without question a critical influence on a child's mental health, development, and positive family environment, yet less than 1% of parents have evidence to parent education programs. Evidence-based parenting programs have numerous benefits including decreases in parental depression; increase parental confidence; and decrease in social, emotional, and behavioral problems in children. Parent education classes benefit parents by teaching child development and child management skills. They learn to create environments that can lead to the development of more positive behaviors in their children. Parenting education teaches parents how to be a positive role model who develops strong values and beliefs in their children.

The Robert D. and Billie Ray Center at Drake University reported that teaching the 6 Pillars of character; Trustworthiness, Respect, Responsibility, Fairness, Caring and Citizenship builds on the character of youth to increase the civility and develop ethical leaders throughout the world. The Harris County Program Area Committee identified Character Counts as an educational approach to address the Fatherlessness in Harris County. Character Counts curriculum was used in elementary school and middle school students. Workshops were conducted at Scarborough Elementary, Forest Brook Middle school and Roberson Middle School.

A retrospective post was utilized to measure knowledge gained and adoptions of best practices. A total of 86 of 99 (86.87%) participants completed the retrospective post survey instrument.

The students reflected on their experience in the program and were able to increase their knowledge in the following areas:

- 86 of 99 (46.5%) plan to use Effective Communication.

- 86 of 99 (59.3%) plan to use Cooperative and Respect. 86 of 99 (64%) plan to use Team building in Action.
- 86 of 99 (45.3%) plan to use Presentation Skills.

### **Critical Issue: Health and Wellness (1862)**

This is an 1862 Institutional report. However, we are an 1890 Institution therefore this section is not relevant for us.

### **Critical Issue: Healthy Lifestyles (1890)**

Relevance: Approximately 37.3 million people in the United States have been diagnosed with Diabetes. However, 96 million American adults have prediabetes. For adults with diagnosed diabetes:

- 69% had high blood pressure, and 44% had high cholesterol.
- 39% had chronic kidney disease, and 12% reported having vision impairment or blindness.
- Diabetes was highest among Black and Hispanic/Latino adults, in both men and women.

African Americans are almost twice as likely to be diagnosed with diabetes as non-Hispanic whites. In addition, they are more likely to suffer complications from diabetes, such as end-stage renal disease and lower extremity amputations. Although African Americans have the same or lower rate of high cholesterol as their non-Hispanic white counterparts, they are more likely to have high blood pressure. African American adults are 80 % more likely than non-Hispanic white adults to have been diagnosed with diabetes by a physician. About 208,000 American youth under age 20 are estimated to have diagnosed diabetes.

Chronic diseases are responsible for 7 of 10 deaths each year, and treating people with chronic diseases accounts for 86% of our nation's health care costs. Areas of focus for the Cooperative Extension Program includes diabetes and hypertension. Diabetes can cause serious health complications including heart disease, blindness, kidney failure, and lower-extremity amputations. Diabetes is the seventh leading cause of death in the United States. High blood pressure is a common and dangerous condition. About 1 of 3 U.S. adults—or about 70 million people—have high blood pressure. Only about half (52%) of these people have their high blood pressure under control. This common condition increases the risk for heart disease.

Results: The Prairie View A&M University/Cooperative Extension Program, and the advisory committee, recognized “A Taste of African Heritage” (ATOAH) and A Taste of Latin Heritage (ATOLH) nutrition education/healthy lifestyle programs as vital to address obesity in limited resource families. Both programs were presented as educational methods on line and face to face. ATOAH and ATOLH was implemented by online classes and face to face.

There were 78 participants who attended the classes virtually and they showed improvement within the following areas: 91% showed improvement in one or more diet quality indicators (i.e. eating fruits, vegetables, red and orange vegetables, dark green vegetables and drinking less sugar sweetened beverages, 79% showed improvement in one or more physical activity behaviors (i.e. exercising for at least 30 minutes, doing workouts to build and strengthen muscles, 43% participants did not eat less that they wanted so that there was more food for the family,

Nutrition programs were delivered throughout the year in diverse locations of Maverick County. Choose Health: Food, Fun, and Fitness (CHFFF). This is a comprehensive nutrition and fitness curriculum composed of six hands-on lessons for 8-12-year-olds (3rd-6th graders). Developed by Cornell University's Division of Nutritional Sciences in collaboration with Cornell Cooperative Extension's 4-H Youth Development Program, CHFFF uses experiential learning to teach healthy eating and active play, targeting behaviors research shows to be most important for preventing childhood obesity and chronic disease. Topics include replacing sweetened drinks with low-fat milk and water, eating more vegetables, fruits, and whole grains, eating fewer high-fat and high-sugar foods, and playing actively 60 minutes a day.

Results: A total of 45 sessions were conducted with 998 limited resource youth attended the workshops face-to-face. 906 of the participants showed improvement one or more food safety practices such as: by eating more fruits and vegetables, 708 of the participants engaged in 30 minutes of exercising, and 838 of participants showed improvement in food safety practices by washing hands before preparing food, washing all items and surfaces after cutting raw meat or seafood, not thawing frozen food at room temperature or using a meat thermometer.

### **Critical Issue: Natural Resources and the Environment (1862)**

This is an 1862 Institutional report. However, we are an 1890 Institution therefore this section is not relevant for us.

### **Critical Issue: Preparing Youth for Life and Work (1890)**

Within this critical issue, two national issues continue to plague Texans: the broken worker pipeline and obesity. With Science, Technology, Engineering, Agriculture, and Mathematics (STEAM) careers increasing every day in the nation, minorities were largely underrepresented in this occupation area. Across the nation, data showed that obesity rates were significantly higher for: Hispanic (20.7%), non-Hispanic Black (22.9%), non-Hispanic American Indian/Alaska Native (28.5%), and non-Hispanic Native Hawaiian/Other Pacific Islander (39.8%), and children according to the 2018-19 National Survey of Children's Health (NSCH). There were also disparities by income level: 21.5% of youth in households making less than the federal poverty level had obesity, which was more than double the 8.8% of youth in households making at least 400 percent of the federal poverty level. In Texas, 17.3% of youth ages 10 to 17 were obese; giving Texas a ranking of 12 among the 50 states and the District of Columbia, according to The State of Obesity.

The Cooperative Extension Program prepared youth for life and work. There were 80,891 contacts, with 30,000 of those being direct. Participants gained leadership skills and explored careers through programming in STEM education, healthy living and civic engagement.

Prairie View A&M served as the lead institution (El Paso and Cass Counties) in a partnership with Langston, the University of Arkansas at Pine Bluff, Central State, West Virginia State, and North Carolina State University to reach over 1,000 youth with the 2021 4-H Ag Innovators Experience. The 2021 challenge was "Curbing Our Carbon Appetite," which taught elementary aged kids the importance of taking actions that can reduce atmospheric carbon. They actively learned how individual, family, and community food choices affect carbon in the atmosphere.

The "4-H At-Home Garden Series" used the Junior Master Gardener curriculum to create a six lesson video series on YouTube. Youth participants received free gardening supply kits. With the recruitment of 8 adult volunteers, a total of 265 youth (ages 8-18) in underserved communities across Texas were reached.

To address childhood obesity in Texas among those youth populations with the disproportionately higher rates, CEP extension agents from 13 Texas counties collaborated with 44 faith-based and community partners to implement Heroes 4-Health. Of the 1395 youth reached with this healthy living program, all of them participated in at least six hours of nutrition education and 50 served as health ambassadors. There were also family engagement in health outreach activities that reached an additional 300 participants.

Our evaluation results showed there were tremendous knowledge, skills, and interest gained by the participants. Youth participating in the 4-H At-Home Garden Series and Ag Innovators Experience were more likely to be aware of agricultural and STEM careers. Eighty percent (80%) of the youth evaluated (n=583) believed that after completing the Carbon Our Carbon Appetite challenge, they had a better understanding of how they can contribute to continuing a healthy food supply; and, Fifty-two percent (52%) stated that they were now more interested in science and agriculture. Sixty-seven percent (67%) of the Ag Innovator teen ambassadors (n=23) agreed or strongly agreed that they would like a job that involved science. At least 86% (n=157) of At-Home Garden Series respondents wanted to have a career in horticulture or another STEM-related career. One of our main weapons in this critical issue was Heroes 4-Health which had a great impact on teen leaders as evidenced by the success stories below:

- "As teen ambassador with the Heroes 4-Health - JMG program I have gone to places where I never knew and do things I had never done before... having the confidence of speaking to an international audience (Jamaicans), raising food for our community, and even achieving the 4-H Unsung Heroes Award. All that exposure and more has given me a sense of direction of what I want to become in life, which is a Restaurateur." – Cass County teen ambassador
- "I got to go to different schools and actually teach the lessons by myself. I have been doing 4-H health projects for 8 years now, and I really liked sharing what I have learned." – Bexar county teen ambassador

### **Critical Issue: Sustainable Livestock Management (1890)**

The Agriculture And Natural Resource (AgNR) unit of Prairie View A&M University (PVAMU), Cooperative Extension Program (CEP) acknowledged the fact that limited-resource agriculture producers have suffered from financial situations due several extenuating circumstances. They include: low market prices; seasonable droughts; and, depleting government assistance programs for many years.

In addition, some lack the critical agricultural resources.

To address some of these issues, livestock management educational programs were conducted through the CEP Agriculture and Natural Resources (AgNR) unit. The AgNR unit conducted more than 20 education programs on: Beef Cattle Production and Management; Increasing Small Ruminant Production; Nutrition Management; Pasture & Hayland Management; and, External and Internal Parasite Control through our Livestock Management Program. Most importantly, we have built new, and hopefully sustainable, partnerships with several major and influential stakeholders. They included: National Goat Consortium; East Texas Goat Raisers Association (ETGRA); PVAMU County Agent Small Ruminant and Livestock Committees; Central Texas Dairy Goat Association; American Goat Federation (AGF); and, Texas Sheep and Goat Raisers Association.

Keeping in mind the overall NIFA critical issue, we hosted the 2021 Nation Goat Conference for National Goat Council and reached over 200 participants. In addition, we also opened up opportunities for landowners to become involved with funding opportunities through USDA. The education programs increased the participants' knowledge about practices, changed techniques perceptions to improve livestock production, and had the potential to effectively improve savings.

Through the use of an electronic retrospective post-evaluation education program survey evaluation by the CEP AgNR unit, some data collected show that an average of 83% of respondents indicated that they expected to benefit financially after attending the program. Nearly 94% of respondents indicated that because of their participation in one or more of these programs, their participation in local, state, and federal programs would definitely increase.

Improved efficiency of artificial reproductive technologies (ART), in the goat, is impeded by early embryonic loss due to the effects of abnormal regressing corpora lutea (CL) on the uterine environment. Furthermore, the effects of temporal changes in microbiome community relationships during the estrous cycle and early pregnancy have not been characterized in the goat. Residual feed intake (RFI, feed efficiency of growing goats) and its relationship to feeding behavior, growth and reproduction performance, and milk and meat production has not been determined in the goat. These were critical knowledge gaps that once filled would advance the science of goat production and improve the livelihoods of the people of Texas, the Gulf Coast region, and developing countries to attain food security globally.

Work was conducted with high resolution Doppler-ultrasound scans of the ovaries and their structures pre- and post-synchronization of the estrous (reproductive) cycle, collection and analysis of temporal changes in the microbiome of the reproductive tract during the reproductive cycle, and development of the GrowSafe system to determine feed efficiency and behavior in the goat. In evaluating the vasculature of the ovarian structures (follicles and corpora lutea (CL)) with color-Doppler ultrasound, it was determined that the temporal vasculature changes on follicles could not be imaged, but these changes could be imaged on the CL. The progesterone assays used to monitor the estrous cycle pre- and post-synchronization, in conjunction with high resolution color-Doppler ultrasound imaging, established two distinctly different types of synchronization/luteal failure. The second type of failure had not been previously reported in the goat. Samples had been collected and underwent processing and analysis to determine the temporal changes in the microbiome during the goat estrous cycle. The GrowSafe system was successfully adapted for use with goats for determining residual feed intake (RFI, feed efficiency). The system was made adjustable to adapt to the rapid growth of weanling goats and their ability to feed singly in the GrowSafe feed bunks.

Conducting the activities presented in this program afforded undergraduate students from Prairie View A&M University and 4th year veterinary students from Texas A&M University the opportunity to participate in all phases of the hypothesis driven research. In the synchronization/luteal failure studies, the participants learned the importance of conducting hypothesis-based research. The study demonstrated that one of the proposed hypotheses failed, however, the data from the study helped us to determine two distinct forms of failure. The second type of failure, previously undocumented, had been potentially able to be resolved by adjusting the timing of a prostaglandin injection during the synchronization of estrus program. That failure type decreased the pregnancy rate by 20% and its elimination would be a significant improvement in the success of the synchronization of estrus/ovulation in goats. This provided our stakeholders with an improved synchronization process in their genetic improvement through artificial reproductive technologies. The development of a successful program for determining residual feed intake (RFI, feed efficiency) in goats, provided the basics for beginning to understand the relationship in feed efficiency and traits like reproduction and meat and milk production. Our students had been learning these relationships as corollary processes related to their course work. This allowed us to understand the importance of these relationships to different goat breeds and provided recommendations for our stakeholders. Research manuscripts were developed to disseminate the knowledge to the scientific community to further the broader impacts of the research.

## Merit and Scientific Peer Review Processes

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### Updates

None

## Stakeholder Input

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### Actions to seek stakeholder input that encouraged their participation with a brief explanation

None

### Methods to identify individuals and groups and brief explanation

We employed a couple of snowballing statistical sampling techniques to identify individuals and groups that may provide pertinent and anecdotal information relevant to our critical issues. We encouraged our staff, stakeholders, and volunteers to identify other persons or groups that have knowledge about our issues. We further ask those persons and groups if they are also familiar with additional persons and groups that can do the same. We continued the process of identifying more individual until our contact information were exhausted

### Methods for collecting stakeholder input and brief explanation

None

### A statement of how the input will be considered and brief explanation of what you learned from your stakeholders

Having identified our stakeholders through LABs and snowball sampling, we considered the merits, impact, and consequences of their input to shape policy and programming. A major take-away is to have a diverse group of stakeholders with immense background, experiences, and skills. Consequently, we have learned, from our stakeholders, what motivates our clientele, issues and actions to keep them engaged, and incentives to sustain positive behavior change

## Highlighted Results by Project or Program

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Type	Projects / Programs
<b>Projects / Programs without a Critical Issue Not Provided</b>	<b>0</b>