

Ohio (Central State University)

Plan of Work for 2023-2027

Status: Final (Approved 9/29/2022)

Executive Summary Overview

Executive Summary:

Central State University (CSU), the only state assisted Historically Black College and University (HBCU) in Ohio, is a residential, co-educational institution located in Wilberforce, 20 miles east of Dayton, Ohio. Central State was designated as an 1890 Land-Grant Institution on February 7, 2014. Over the past years, CSU has aligned its mission with the mission of the Land-Grant legislation and has transformed the previous College of Science and Engineering into the John W. Garland College of Engineering, Science, Technology and Agriculture (JWG-CESTA). The University provides educational opportunities to the general population, and enhances its teaching, research, and extension activities to solidify its Land-Grant status. Dr. Jack Thomas, CSU's President, is committed to the Land-Grant mission and vision, and is guiding the institutional efforts statewide and beyond to serve the stakeholders in the areas of extension, research, and instruction. The State of Ohio supports CSU's Land-Grant mission by providing a one for one match for the Evans-Allen Research, Cooperative Extension, and the McIntire- Stennis programs. Dr. Morakinyo Kuti serves as the Interim Dean of CESTA and the Director of CSU's 1890 Land-Grant Programs. Dr. Kuti has the oversight of all Land-Grant Programs and the related linkages with The Ohio State University, the other Land-Grant Institution in the State of Ohio. Central State's Land-Grant Program is guided by the CSU Land-Grant Advisory Council (LGAC). The LGAC consists of 12 regular members and 2 Ex-Officio members representing a cross-section of stakeholders from Ohio. Members include representatives from the Ohio Farm Bureau, Ohio Farmers Union, Ohio Agribusiness Association, Natural Resources Conservation Service of USDA, commodity groups, a technology company, farmers, and an agricultural vocational institution from the area. The composition of the LGAC is dynamic to meet CSU's evolving 1890 Land-Grant Mission.

Central State's Land-Grant Programs are managed through Research and Extension directorates. The Agricultural Research Development Program (ARDP), the equivalent of an experimental station at Central State University, is led by Dr. Subramania I. Sritharan, the Associate Director of Research and Dr. Siddhartha Dasgupta, the Associate Extension Administrator leads the Cooperative Extension Program (CSUE). Central State University (CSU) is currently engaged in the search for a Dean and Director of 1890 Land Grant Programs. Dr. Claudine Gee serves as the Director of Operations and Fiscal Matters, providing fiscal management of all the Land Grant Funds (Evans Allen, Extension, McIntire Stennis, EFNEP, ARREA and the CBG).

CSU is receiving higher levels of federal support for its Evans-Allen and Cooperative Extension Programs from 2018 Farm Bill compared to the level between 2014 through 2018. The higher funding level has enabled CSU to engage in expanded research and extension activities. CSU intends to increase engagement in farm research and expand extension farming initiatives. CSU is utilizing a systems

approach to serve Ohio and the Nation. The systems approach places emphasis on small and under-represented farmers, as well as other stake holders in Ohio.

The research and extension plans focus on five critical issues related to (i)Plant Systems, (ii)Animal Systems, (iii)Food Nutrition and Health Systems (FNH); (iv)Natural Resources and Environmental Systems and (v)Advanced Technologies And Commercialization Systems.

Issues to be addressed under Plant Systems (I) include introducing alternate crops, enhance development of natural products, improvement of crop quality and investigation of alternative production systems. Growers in Ohio and across the country face low crop prices and struggle to keep their farms solvent. The overproduction of major grain crops (corn, soybeans, and wheat) by US farmers suppresses commodity prices. Alternative crops are needed to provide growers new revenue streams. Our focus related to Animal Systems (II) will be on Avian and Small Animal/Fish farms. Ohio is one of the largest egg farming states in the Nation.

The Evans Allen Research Program and CSU Cooperative Extension Program are collaboratively working on issues affecting the poultry farmers in the State of Ohio. In FNH (III), behavioral, economic, environmental, cultural, educational, and genetic factors will be integrated in research & extension. Diet and nutrition are important to overall health. Diseases related to obesity, sedentary lifestyles, nutrient deficiencies, and food insecurity, are major dietary health concerns in the U.S. Studies on factors related to the health of African American population are needed to find pathways to improve wellness of the affected communities. Preventative mechanisms for reducing angina will also be studied. Determining the effects gasotransmitters on diabetes and cardiovascular disease models including tissue culture, will guide in the possible intervention mechanisms using nutritional approaches.

Under Natural Resources and Environmental Systems (IV), CSU scientists will address issues related to pollinators; water resources and agricultural water quality; soil health; and problems affecting municipal stakeholders in managing the water and wastewater systems under chemical and other climate change. CSU will introduce agricultural best management practices in reducing nutrient loads in the watersheds that drain into the Ohio River and subsequently into the Mississippi river and Gulf of Mexico. Key steps include, utilizing advance geospatial technologies, modeling and other innovative lab and field techniques coupled with on farm research. Precision Agriculture (PA) focus in the Advanced Technologies And commercialization systems program (V) will be designed to assist small and medium scale farmers. Central State will also develop appropriate services for commercializing the newer technologies so that farming costs are lowered, and economic development is enhanced. PA technologies, as they are adopted to larger farms, have not always been an economically viable option for small scale farms. PA technologies will be adapted to make farming more profitable and sustainable. CSU will develop robotic and UAV solutions equipped with advanced sensors and Artificial Intelligence (AI) solutions that are suitable for urban, beginning, and small to medium sized farms.

The knowledge gained by CSU will be shared domestically and globally. CSUE will continue to assist farmers by providing guidance on alternate crops, specialty crops, hydroponics, aquaponics, bee keeping, integrated pest management, small animals, soil health, advanced technology applications in organic and conventional farming, sustainable agriculture, and agricultural eco systems. CSU CSUE is delivering programs and technical assistance in 60 Ohio counties that exhibit higher-than-average poverty. The 60 counties are divided to five sections namely, the Southwest, Southern, Northwest, Northeast, and Southeast regions. CSUE hired four Regional Extension Associates, with an open position

for the fifth Regional Extension Associate. Their roles are to oversee all Extension programming in these regions, conduct needs assessments, and program impact assessments.

Merit and Scientific Peer Review Processes

The Merit Review Processes that will be followed are listed as follows:

Internal University Panel External University Panel

Combined External and Internal University Panel Expert Peer Review

A combined internal, external, and non-university merit review process will be used during this planning period. The Cooperative Extension Program (CSUE) and Agricultural Research Development Program (ARDP) will utilize a combined internal and external university and external non-university panel to gather important feedback to better address stakeholder demand. Members will be selected every two years to provide a review process of the Joint Extension/Research Plan of Work (POW) to establish the merit of the planned programs. Administrative unit members, specialists, and researchers from both the internal and external land-grant universities will provide input into the plan of work. Additionally, non-university panel members will consist of various partnering agencies with similar types of research and extension priorities in the state will be used to establish the merit of the plan or work. The merit review process will focus on the four planned programs. A comprehensive and detailed program review will be conducted by the panel of the planned programs in the plan of work (POW) at least every other year.

Projects that are initiated under the POW are externally reviewed for the relevance in meeting the need of the communities served, scientific approach proposed, and overall effectiveness. Both CSUE and ARDP will utilize advisory committees to initiate program reviews of all planned programs during the next five years. The reviews will be conducted by panels selected specifically for the purpose of the review. These reviews may consist of peer review of grant applications (small and large) by internal faculty panel, administration, and stakeholders with expertise. External experts from outside of CSUE and ARDP will be used when needed. Local joint county program reviews conducted by advisory groups at the county level will be used to guide the program and research direction of the planned programs of the POW. Local program reviews will be conducted only where CSUE and ARDP offices establish advisory councils and program committees for merit review and comments on the effectiveness of program impact.

Peer review processes will consist of assessments by internal and external extension and research professionals from both land-grant universities of the state. The research program will be reviewed annually by scientific peers. Stakeholder groups will evaluate the relevance of research priorities, the thoroughness of research procedures in individual projects, project outcomes, publications, and direct and indirect impact of the project. Internal evaluators will consist of administrators and scientists not directly associated with the planned programs. Expert reviewers and peer review participants will be selected from governmental agencies (state and federal), other universities, and local officials directly related to the commodities or other outputs of the research. Publications by CSUE and ARDP are peer reviewed before publications in print or electronic media.

Stakeholder input: Action Taken to Seek Stakeholder Input

Stakeholder Input

Stakeholder groups will evaluate the relevance of research priorities, the thoroughness of research procedures in individual projects, project outcomes, publications, and direct and indirect impact of the project on the stakeholders. Internal evaluators will consist of administrators and scientists not directly associated with the planned programs. Expert reviewers and peer review participants will be selected from governmental agencies (state and federal), other universities, and local officials directly related to the commodities or other outputs of the research. Publications by CSUE and ARDP are peer reviewed before publications in print or electronic media.

To Seek Stakeholder Input:

Use of media to announce public meetings and listening sessions

Targeted invitation to traditional stakeholder groups. Targeted invitation to non-traditional stakeholder groups. Targeted invitation to traditional stakeholder individuals. Targeted invitation to non-traditional stakeholder individuals

Targeted invitation to selected individuals from public. Survey of traditional stakeholder groups

Survey of traditional stakeholder individuals. Survey of the public.

Survey specifically with non-traditional groups Survey specifically with non-traditional individuals Survey of selected individuals from the public.

Other (focus groups, public information booths at local gatherings)

To encourage stakeholder input, CSUE and ARDP will use local, regional, and statewide media outlets to solicit involvement and participation. The Extension offices, in cooperation with OSU Extension, will have committees to provide input for program planning, implementation, and evaluation. Local planning committees will be formed in each county office. CSUE and ARDP recruit, plan, and implement public interaction, e.g., town hall meetings, and focus groups sessions. A one-on-one target outreach method will be conducted to gather information and include stakeholders' input. Town Hall meetings and focus group sessions will be held to increase awareness of our mission.

Stakeholder input: Methods to Identify Individuals and Groups

Methods Used to Identify Groups and Individuals to Collect Input:

Use of Advisory Committees Use of Internal Focus Groups Use of External Focus Groups Open Listening Sessions Needs Assessments

Use of Surveys

Other (1-on-1's with existing and stakeholder)

Multiple approaches will be used for the next planning period to seek stakeholder input. The approaches include formal surveys, focus groups, key informant approaches, advisory councils

(collaborating groups, agencies, and organizations) and combinations of the preceding methods. Efforts will be made to ensure that the stakeholders involved will include representatives of the limited resources households in terms of geographic location, family status, income level, age, gender, disability status, and users or non-users of existing educational programs. Guideline manuals will be designed for collecting data from stakeholders and ensuring accomplishment of program priority goals.

Advisory Councils will assist Agents/Educators with identifying and engaging local advisory councils to gather information about the needs and issues in local counties. The Extension Advisory Council will provide recommendations and identify issues for educational programming. The Research Advisory committee will include researchers from USDA and State agencies, business representation and commodity groups. The Town Hall meetings will be implemented to identify issues or needs of citizens in cities targeting the public. Open listening sessions and needs assessments will be conducted jointly between Research and Extension personnel. A series of focus group sessions will be implemented to further prioritize issues identified in public hearings (e.g., town hall meetings).

Stakeholder input: Methods for Collecting Stakeholder Input

Methods Used to Identify Groups and Individuals to Collect Input:

Use of Advisory Committees. Use of Internal Focus Groups. Use of External Focus Groups. Open Listening Sessions. Needs Assessments. Use of Surveys

Other (1-on-1's with existing and stakeholder)

CSU will utilize multiple approaches for the next planning period to seek stakeholder input. The approaches will include formal surveys, focus groups, key informant approaches, advisory councils (collaborating groups, agencies, and organizations) and combinations of the preceding methods. Staff will ensure that the stakeholders include representatives of the limited resources households in terms of geographic location, family status, income level, age, gender, disability status, and users or non-users of existing educational programs. Guideline manuals will be designed for collecting data from stakeholders and ensuring accomplishment of program priority goals.

Advisory Councils will assist Agents/Educators s to gather information about the needs and issues in local counties. The Extension Advisory Council will provide recommendations and identify issues for educational programming. The Research Advisory committee will include researchers from USDA and State agencies, business representation and commodity groups. CSU staff will conduct town hall meetings to identify issues or needs of citizens in cities. Research and Extension personnel will jointly conduct listening sessions and needs assessments. Staff will conduct a series of focus group sessions to prioritize issues identified in public hearings (e.g., town hall meetings).

Stakeholder input: A Statement of How the Input Will Be Considered

How Collected Input Considered

In the Budget Process

To Identify Emerging Issues Redirect Extension Programs Redirect Research Programs

In the Staff Hiring Process In the Action Plans

To Set Priorities

Stakeholders' input is crucial in building relevant research and extension programs. The stakeholder input process is essential to refocusing and reaffirming priorities on an on-going basis. The stakeholders' input will help CSU's research and extension activities remain current to society's needs. The process is also critical in identifying emerging issues. The stakeholder input will inform and guide research and extension operations. Consequently, resources will be allocated according to the population's greatest need.

Critical Issues

CSU - Advanced Technologies and Commercialization Systems.

Initiated on: Jun 01, 2020

State: Ohio

Term Length: Long-term (>5 years)

CRITICAL ISSUES ON ADVANCED TECHNOLOGIES AND COMMERCIALIZATION SYSTEMS.

Description:

The infusion of advanced technologies in agriculture is exploding. Applications of mechatronics that integrates expertise in mechanical engineering, electrical engineering, computer control, machine vision and information technology in a seamless manner in precision agriculture are expanding. Research in mechanical design of new or modifying and adapting agriculture machinery for precision delivery of novel integrated pest management strategies for pest control, coordinated machine control in response to sensory feedback, sensor technology and high-level programming will be needed in improving efficiency of farming systems. Integration of technologies related to sensors and actuators, robotics, micro-computers, system simulation and system analysis will be needed in the future.

Central State intends to develop a nationally recognized research program in precision agriculture (PA) in collaboration with the faculty researchers and local companies engaged in technologies suitable for small and medium scale farmers. It is seen as a critical need to expand the ongoing research on non-chemical, high energy based pest control conducted by researchers in ARDP, in Agriculture and Natural Sciences and Manufacturing Engineering bringing additional capabilities in mechatronics engineering to develop devices that enhance agricultural efficiency, reduce costs and improve sustainability. We also will develop appropriate services for commercializing the newer technologies so that farming costs are lowered, and economic development is enhanced through newer higher paying jobs in related advanced technology companies. The critical issues related to supporting small and medium sized farms are also related to the efforts under Advanced Technologies. Precision Agriculture (PA) technologies have made farming more profitable and sustainable.

However, PA has not always been economically viable option for small scale farms. CSU is proposing to develop robotic and UAV solutions equipped with advanced sensors and Artificial Intelligence (AI) solutions that are suitable for urban, beginning, and small to medium sized farms. These studies are related to critical issues impacting natural resources and environmental systems as well. The climate change predictions in humid subtropical regions show possible negative effects on crop yields. Hence,

better preparation and adaption strategies are needed to mitigate climate change impacts on agricultural systems. CSU plans to study historical spatio-temporal climate and yield patterns and monitor evapotranspiration (ET) and greenhouse gas emissions from agricultural fields using flux tower and soil gas flux systems with a particular reference to small and medium scale farms.

Agriculture has become highly mechanized in the last few decades. This substantial transformation was led by advancements in precision agriculture (PA) technologies like GNSS, auto-steering, crop and soil sensors, rate control technologies of crop inputs, and yield mapping. PA technologies have proven their worth in many ways by (a) making farm operations more efficient and sustainable, (b) enhancing agriculture profitability and productivity, and (c) by providing environmental benefits with reduced use of chemicals and natural resources. However, PA has not always been economically viable option for small or medium farm operations. Small-scale and specialty crop growers may not benefit very much from this wave of technological advancements as large-scale production growers. Very little work has been done to uplift small-scale farming to make PA a profitable and desirable choice for beginner farmers. This issue needs to be addressed for the betterment of the small scale, beginning, socially disadvantaged, and specialty crop growers. Small-scale farmers who farm less than 5 acres are very important for world food security as they are responsible to produce 35% of the world's food. Therefore, the development of effective precision agriculture solutions for small-scale farming is imperative for sustainable agriculture and world food security. Agriculture 4.0, another wave of technological advancements in agriculture, is bringing robotics, artificial intelligence (AI), drones, and Internet of Things (IoT) to mainstream. There is need to develop solutions specifically focused on small scale farming based on these Agriculture 4.0 technologies. Under this project, Central State University is proposing to develop precision agriculture and robotic technologies that are affordable and suitable to be used by small scale growers in Ohio and beyond with the following specific goals to be accomplished in next five years.

Science Emphasis Area

Bioeconomy, Bioenergy, and Bioproducts, Environmental Systems, Food Safety, Sustainable Agricultural Production Systems

CSU - Animal Systems

Initiated on: Nov 26, 2019

State: Ohio

Term Length: Long-term (>5 years)

Avian Systems: Ohio is one of the largest egg farming states in the Nation. The poultry industry in Ohio identifies 4 major areas as critical -Animal Care and Bio Security; Food Safety; Environment and Sustainability and Innovation and Technology. The Agricultural Research Development Program (ARDP) and CSU Extension (CSUE) are planning to collaboratively work on issues affecting the poultry farmers in the State of Ohio. The State of Ohio produces 10 billion eggs and 526 million pounds of chicken annually and is the second most leading State in the US for egg production. A critical need is for an avian veterinarian who can serve the poultry producers through performing appropriate examinations, interpreting health history and conducting laboratory tests. The veterinarian is expected to visit farms, hatcheries, processing plants and other avian enterprises to diagnose, report and formulate prevention and control plans for spontaneously occurring diseases of poultry and a variety of other avian species.

Small Animal/Fish Systems Research Program: One of the CSU's long-term goals is to establish an animal science program. CSU has already invested in aquaponics research and extension programs that involves training and technical assistance of limited-resource and small farms in rural and urban areas. Additionally, CSUE is seeking farmer-partners and partners from other 1890 and 1862 Land Grants to develop an Extension-based comprehensive educational program for forage-based ruminant production systems (e.g., grass-fed beef/goat production). CSUE will start an apiculture (beekeeping) apprenticeship program. Of particular focus will be clients who are military veterans because beekeeping has shown to have salubrious effects on those that have suffered various form of trauma. CSUE educators are being trained by CSU apiculture scientist Dr. Hongmei Li-Byarlay, on various aspects of managing beehives. This apprenticeship will include hands-on trainings, workshops, as well as technical assistance to beekeepers. To support this mission, CSUE will be purchasing hive management and honey harvesting tools that will be kept in trailers for our clients to borrow. The beekeeping apprenticeship program should increase bee populations across the state, causing an increase in its associated benefits, and diversify farm income for beekeepers. The descriptions of CSU Bee research programs are given under the Critical Issue Section on Natural Resources and Environmental Systems. The food safety aspects are covered under the Critical Issue Section on Food, Nutrition and Health.

Science Emphasis Area

Bioeconomy, Bioenergy, and Bioproducts, Food Safety, Sustainable Agricultural Production Systems

CSU - Building new farmers, supporting limited-resource and urban farms

Initiated on: May 21, 2020

State: Ohio

Term Length: Long-term (>5 years)

Central State University is dedicated to educating and assisting limited-resource farms and urban farms and increasing the number of successful socially disadvantaged and military veteran owned farms. Part of this effort will include the training of prospective/beginning farmers recruited among traditionally underserved communities, including urban communities. To support this effort, CSU intends to hire research and extension staff in soil less production systems as well as specialists in specialty crop market assessments and experts in ruminant grazing.

CSU will continue to develop research objectives related to beekeeping, hydroponics, aquaponics, and specialty crop production that are congruous with the limitations of land, capital, and labor that typify these farms. Their findings will guide extension demonstrations and farmer training. Extension programs in Community and Economic Development will provide training in entrepreneurship and business development, while Family and Consumer Sciences will educate farm families about the judicious selection of food for good nutrition, improving relations within a farm family and stress management, and on personal family finances.

CSU Extension will continue to provide limited-resource farms and urban farms with interactive classes that include in-depth training along with hands-on experience through the on-site demonstration farm. The classes focus on organic and conventional, intensive vegetable production and beginning farmers will learn about crop management, pest management, post-harvest handling and food safety, use of

farming equipment/farm safety, business planning and development, marketing, land access and engagement with USDA programs. The limited-resource farms and urban farms programs will target socially disadvantaged populations and military veterans. CSU Extension will develop farm demonstration and training sites in collaboration with governmental and nongovernmental and community organizations.

Impacts:

- Increase number of new farmers in region
- Create mentor relationship for new farmers
- Improve access to resources to help farmers establish crops
- Develop marketing opportunities

Term: Long

Science Emphasis Areas

Bioeconomy, Bioenergy, and Bioproducts

Sustainable Agricultural Production Systems

Science Emphasis Area

Bioeconomy, Bioenergy, and Bioproducts, Sustainable Agricultural Production Systems

CSU - Engaging Communities and Transforming Lives

Initiated on: Nov 26, 2019

State: Ohio

Term Length: Long-term (>5 years)

Critical Issue - Engaging Communities and Transforming Lives

Description:

Central State aims to improve the overall conditions facing individuals and families in Ohio's communities, as well as addressing agricultural issues in rural, urban, and Appalachia locations. Building Families and Communities-Family Consumer Sciences: Issues include childhood obesity, family resilience, financial readiness, health, hunger, and environmental degradation. Addressing these through research and programming focused on human nutrition, food and non- food products, food safety, hospitality/recreation, health, and financial education are planned. Creating Youth Pathways to Success: The 4-H and Youth Development program currently addresses societal needs by providing strong and resilient individuals, families, and communities in Ohio.

Developing Better Socio-Economic and Sustainable Communities: CSUE's Community and Economic Development (CED) programs seek to empower communities to achieve their goals through education and technical assistance. This will be achieved through offering high school equivalency education, criminal record expungement program, and local and micro entrepreneurship and jobs programs. Small/micro entrepreneurship development by CED programs will also include assisting beginning farmers of Ohio to develop and manage their farm business. A CED program called Farm Business

Bootcamp will accomplish this by teaching farmers about business structures, business planning, record keeping, financial management, and farm taxes.

CED programs will include workshops and technical assistance related to governmental disaster relief programs and assisting with completing applications to obtain disaster relief. In conjunction, CED will feature a program focusing on preparing individuals and families for managing life risks, unemployment, under employment, homelessness, etc., called “Just A Paycheck Away.”

Community improvement is one of CED’s focus areas. A CED program called Resilient Communities will be developed to help organize and manage the challenges and opportunities faced by socially disadvantaged communities. CED workshops will train community members in team building, discovering community assets/opportunities/challenges, develop a vision for strengthening communities, and implementing plans to achieve community goals, including creating of community development proposals and applying for community development grants.

Workforce development is a CED topic for community development and transformation of lives. Unemployment and underemployment are rampant, particularly in communities of poverty. CSUE’s CED program will continue to implement the “A Step Up: Customized Workforce Development Training” program, and engage people to receive job skills by partnering with organizations and programs outside of the university.

Improving Agriculture, Sustainability and Economics - Agriculture and Natural Resources (ANR): This links our Land-Grant research and extension efforts by providing education to Ohioans through conferences, seminars, workshops, field demonstrations, and farm tours. The CSUE ANR program will be involved in farmer training, dissemination of research results from CSU’s ARDP program, providing technical support for agricultural and forestry operations.

Gardening has been shown to contribute towards building resilient individuals, families, and communities. CSU Extension will provide educational programming at the CSU Botanical Garden to help participants develop gardening skills. Anticipated audience will be school groups, community groups, CSU students, staff and faculty. Programming will focus on gardening, landscaping, nature, resource management, woodlot management and more. These topics will be also presented in other areas of Ohio using videos and/or podcasts and discussions.

A community garden area will be available and educational programs will focus on helping participants develop gardening skills. CSU Extension is also responsible for the care, maintenance, and planting at the CSU Botanical Garden. Programming at the CSU Botanical Garden will target socially disadvantaged populations.

Impacts:

- Develop botanical garden programming
- Develop community gardens
- Maintain botanical garden for educational outreach

Term: Long

Science Emphasis Areas

Education and Multicultural Alliances

Family & Consumer Sciences

Human Nutrition

Science Emphasis Area

Education and Multicultural Alliances, Family & Consumer Sciences, Human Nutrition, Sustainable Agricultural Production Systems, Youth Development

CSU - Food Nutrition and Health Systems

Initiated on: Nov 26, 2019

State: Ohio

Term Length: Long-term (>5 years)

Food Nutrition and Health Systems: Health of individuals and overall populations encompass many factors: behavioral, economic, environmental, cultural, educational, and genetic. Diet and nutrition are important to overall health. Diseases related to obesity, sedentary lifestyles, nutrient deficiencies and food insecurity, are major dietary health concerns in the U.S. CSU seeks to expand knowledge of the factors affecting health-particularly those that can be addressed through nutrition and exercise intervention – through genetic testing, nutrition/exercise education and programming, and the creation or enhancement of food production and delivery systems to underserved populations. Methods are needed to positively impact community health, by working with individuals and systems to determine the best practices in health promotion. The University also aims to understand the mechanisms of action of nutrients in disease development and progression, with the goal of recommending nutrients as potential preventative or adjuvant treatment modalities.

Appropriate data will be collected, analyzed and published in peer reviewed literature, extension bulletins and curriculum, and incorporated into undergraduate course work ensuring that all stakeholders benefit from our research results. For example, because underserved populations often lack access to nutrient-dense foods, CSU aims to develop novel or enhance existing methods of food production to ensure a sustainable and accessible supply of affordable, safe food and have direct impacts on sustainability efforts, agricultural economy, and human health. Studies on factors related to heart health of African American population are essentially needed to find pathways to improve wellness of the affected communities. Preventative mechanisms for reducing angina will have to be researched. Determining the effects gasotransmitters such as nitric oxide (NO) and hydrogen sulfide (H₂S) in diabetes and cardiovascular disease models including tissue culture, will guide in the possible intervention mechanisms using nutritional approaches. These Studies in these disease models will provide valuable information for improving human health and associated science.

Fresh produce consumption has increased in the US because of increasing health consciousness of consumers, improved year-round availability, creative marketing, and improved varieties. Fresh produce consumption increase however, has coincided with several foodborne pathogenic cases outbreaks and diseases linked to produce which are major threats to food industry. For the past few years, most foodborne contamination and outbreaks are associated with fresh produce (fruit and vegetables).

Human pathogenic bacteria, *Salmonella*, *Listeria*, and *Escherichia coli* O157:H7, *Staphylococcus aureus*, and *Shigella*, and Norovirus, Hepatitis A virus, and Protozoa are the leading contaminants in produce industry. Currently, there is limited literature in understanding the human pathogen sources, survival behavior in produce and environment, and mode of transmission and contamination during production. Effects of climate change and changes in global trade and consumption patterns are expected to influence the quality of fresh produce and impacts food safety. Climate change effects including extreme weather events and natural disasters, such as floods and drought have increased the frequency of heavy rains, frequent and longer drought periods, acidification of water, CO₂ enriched atmosphere, and extreme precipitations with altered patterns and potential rising in sea levels. All these effects of climate change are expected to impact the agricultural production methods and potentially support the growth, survival, antibiotic resistance, and emergent of new strains of pathogenic microorganisms associate with food and water sources. Also, the insect pests, microbial vectors, population is expected to grow due to altered weather patterns. Increment in temperatures is expected to increase the rise of sea level that may influence human pathogens survival and proliferation in agricultural production systems.

Central State will focus on prevention and/or reduction of chronic diseases invulnerable and underserved populations. Extension programs in Family and Consumer Sciences will cover human nutrition, disease abatement through nutrition and exercise, cooking methods, and individual/family mental health. CSUE's Family and Consumer Science (FCS/EFNEP) program will continue to partner with CSU's Food and Nutrition and Health Systems researchers to provide up to date research-based information to our stakeholders. CSU will continue to provide Diabetes Empowerment Education Program to our minority, socially disadvantaged, and economically depressed stakeholders, hold demonstrations in incorporating more vegetables and fruits in their diets, and provide exercise options that can be done at home with no specialized equipment. A mobile kitchen will be used for cooking demonstrations and education. It will also be useful in 4-H programs where school kitchens cannot be used to provide education on human nutrition and learn cooking skills.

Additional health education will include programs to improve immune health including discussions about diets and lifestyles that boost immunity, how to maintain optimum health and develop a more intentional plan of action towards lifestyle modification for increasing health and immunity to fight back viral infections. These trainings will present the inclusion of more herbs and spices in diets, as well as innovative plant-based holistic therapeutic approaches to mitigate diseases. Since mental wellbeing is also related to the physical condition, programs will be developed to reduce overall stress and promote healthy living.

A Health Education Mobile Unit (HEMU) will be used for educators to offer health education to low income and rural communities as these populations have many barriers to access to quality clinical care for variety of reasons like lack of insurance or the geological locations. The use of the HEMU will be coordinated with county health departments so that their medical staff could accompany CSUE staff in order to perform health checks and other medical procedures. In response to the COVID-19 pandemic in low-income communities in Ohio, CSU will continue to provide education related to hygiene practices that mitigate the spread of pandemic, food safety plans for farmers, and provide vaccination education in our communities of service. The HEMU will allow county health department professionals who could bring additional vaccination resources to communities of poverty.

Nicotine/tobacco use, and secondhand smoke exposure contribute to many health issues affecting Ohio families and communities (SHIP 2020-2022). The health challenges related to Nicotine/tobacco use include increased risks for cancers, infant mortality, heart disease and asthma. 21.15% of adults ages 18 and older are current smokers in Ohio (BRFSS). E-cigarettes and other vaping product use among youth has been surging in Ohio, which is a concern for future addiction to tobacco/nicotine and other drugs. There is a 135% increase in vaping related products use among Ohio's youth between 2017 and 2019. CSUE staff will use evidence-based youth and adult smoking cessation curricula to promote smoking cessation and addiction prevention.

Other health and nutrition programs will include the CSUE 4-H programs which will partner to train children, youth, and families at risk about healthy eating on a budget, inexpensive production of produce for at-home consumption, and provide opportunities.

Science Emphasis Area

Bioeconomy, Bioenergy, and Bioproducts, Family & Consumer Sciences, Food Safety, Human Nutrition, Youth Development

CSU - Natural Resources and Environmental Systems

Initiated on: Nov 26, 2019

State: Ohio

Term Length: Long-term (>5 years)

Description:

Pollinator Issues: Honeybees are the most important managed pollinators contributing \$15 billion for the U.S. economy, but the honeybee colonies are in a 40-50% decline in the country. Managed bee colonies are in a 60% annual decline in Ohio. Promoting mite resistant bees is one of the most effective ways to mitigate the bee decline. It is imperative that we develop new methods for increasing genetic diversity and to improve queen bee quality. The limiting factors affecting local honeybee resources include fewer queens and the nuclei available to fulfill the demand of beekeepers in the region.

Water Resources and Water Quality: Water issues in the US are related to 1) variability in availability of the resource for agriculture, domestic industrial and commercial uses, firefighting, and recreation; 2) floods and droughts; 3) water quality in agricultural and urban areas; 4) economics of water resources and 5) ways for energy generation. The major phenomenon of change in climate impacts all aspects of water, which requires planning structural and non-structural measures. A major water issue in Ohio is related to water quality. Nitrogen and Phosphorus in agricultural runoff and leaching continues to be a non-point source pollution affecting water quality in Ohio watersheds by causing harmful algal blooms. **Soil Health:** An assessment of soil information and health at local, regional, and global scales will provide a holistic system-based approach to address the issues at the nexus of plant, animal, natural resources, and environmental systems. **Agricultural Ecology:** Biodiversity and saving endangered species are important for improving the ecosystems in farming areas. Organic farming has numerous benefits in improving the ecosystems.

Agricultural Water Quality: Nitrogen and Phosphorus in agricultural runoff and leaching continues to be a non-point source pollution affecting water quality in Ohio watersheds by causing harmful algal blooms. So far, little research has been done in cropped acres of southwestern Ohio to quantify the impact of

nutrient pollution on water quality. We intend to assess the effectiveness of several agricultural best management practices in reducing nutrient loads in the Great and Little Miami watersheds that drain into the Ohio River and subsequently into the Mississippi river and Gulf of Mexico. Central State expects to achieve this by utilizing advance geospatial technologies, modeling and other innovative lab and field techniques coupled with on farm research.

Soil Information and Health: A critical component of plant productivity and environmental quality in agricultural systems is the concept of "soil security." To effectively manage natural resources, informed management of soil resources is imperative. An assessment of soil information and health at local, regional, and global scales will provide a holistic system-based approach to address the issues at the nexus of plant, animal, natural resources, and environmental systems. This approach will include the use of advanced techniques and instrumentation that harnesses the recent developments in agricultural sciences such as isotope geochemistry, proximal sensing, satellite sensing, drone-based sensing, soil microbiology, and pesticide chemistry to solve broad societal needs such as climate change mitigation, carbon markets, renewable energy systems, non-point source pollution abatement, enhanced crop productivity, diversified cropping systems and pollinator behavior and health. We expect to utilize advanced machine learning and geospatial techniques to carry out this assessment at varying spatial scales.

Municipal Stake Holder Water Quality Issues:

A water quality issue affecting municipal stakeholders is managing the water and wastewater systems under their respective jurisdictions. The wastewaters from these systems, though treated and released still carry considerable loads of Nitrogen and Phosphorus. Major work elements involve developing guidelines for watershed level decision making on water quality restoration and improvements by the municipalities and counties; enhance environmental sustainability Expansion of modeling as a decision-making tool to include socioeconomic factors; Enhancing the smart models to include other and emerging "contaminants of concern" and Augmenting wastewater smart sensors with biosensors to detect viruses leading to county-wide public health crisis

Climate Change Issues:

CSU Extension is involved with the Interagency Forestry Team comprised of representatives from USDA Agencies: Forest Service and NRCS; Ohio Department of Natural Resources Divisions: Forestry and Wildlife; and Extension: Ohio State and Central State. These programs are ongoing and focus on a 17-Appalachian county area in Southeast Ohio. The Forest Outreach Coordinator is co-located with the U.S. Forest Service to help with the efforts for oak regeneration and stewardship while enhancing economic viability in this region with the highest poverty rate in Ohio. CSU Extension will be focusing on legacy planning for woodland owners with an emphasis on heirs' property, minority landowners and underserved audiences.

Agroforestry is an emerging sustainable model for small-scale farms. CSU Extension will be engaged in programs, workshops, and resources for farmers interested in agroforestry and seeking information for their farm operation. Agroforestry outreach will include rural and urban opportunities and engage with practices such as permaculture, mushroom production, riparian buffers, and silvopasturing.

Impacts:

- Engage with woodland owners in Appalachian Ohio to encourage oak regeneration and stewardship
- Provide workshops on legacy planning and heirs' property issues
- Develop programs and workshops on agroforestry to increase awareness and adoption for rural and urban farms

Science Emphasis Area

Agroclimate Science, Bioeconomy, Bioenergy, and Bioproducts, Environmental Systems, Sustainable Agricultural Production Systems

CSU - Plant Systems

Initiated on: Nov 26, 2019

State: Ohio

Term Length: Long-term (>5 years)

Issues to be addressed under plant systems include advancement of alternate crops, increase development of natural products, improvement of crop quality and investigation of alternative production systems. Growers in Ohio and across the country face low crop prices and struggle to keep their farms solvent. The overproduction of major grain crops (corn, soybeans, and wheat) by US farmers suppresses commodity prices. Alternative crops are needed to provide growers new revenue streams. Moreover, large-scale adoption of alternative crops can reduce overproduction of major crops, thereby increasing commodity prices. It is relevant to explore and develop crop plants to provide knowledge and help establish valuable niche markets for alternative and specialty crops.

Interesting candidates for Ohio include hemp, high-amylose corn, perennial crops, medicinal plants, biomass crops. Hemp can be utilized as a food, fiber, feed, bioenergy, and medicine. Given the desire for increasing Ohio hemp production will diversity the state agriculture, give growers alternative revenue streams, reduce dependence on two crop systems (corn-soybeans), and provide ecological sustainable benefits and can result in products in enhancing human health. Hemp, *Cannabis sativa* with a Δ^9 -tetrahydrocannabinol (THC) content less than 0.3%, can be utilized as a food, fiber, feed, bioenergy, and medicine. New hemp varieties bred and adapted to Ohio will provide growers across the region superior genetics to maximize crop yields and reduce chances of crop failure. These traits will enhance the success of hemp crops within the region and maximize farmer returns. Developing techniques to make use of hemp fiber for composite materials and medicinal products appear a valuable effort.

Recent surveys have revealed a more than 20% drop in public plant breeding programs with activities in designing, planning, managing, and conducting plant breeding activities. Many of these projects have historically been located at land-grant institutions but, overtime have been dropped with changes in policy and funding eliminations citing rapid advancement in the private sector. Despite years of concern and growing public distrust of domination multinational companies, the trend continues. A program for the improvement of specialty corn that works with Ohio producers toward identifying new market opportunities by the development and commercialization of hybrid varieties with useful novel starches as determined by the needs of the end-users appears necessary. In this regard high-amylose corn is of interest, which has elevated levels of amylose content in the starch. Recent developments indicate potentials for use of it in bioplastics and by food companies for a starch type that resists digestion. Diversification of cropping systems including perennials, agroforestry and soilless cultivation for

alterative and sustainable agricultural systems will allow producers more opportunities to for risk-aversion and access to niche markets. Besides conventional farming, research emphasis appears critically needed on organic management strategies. The development of novel natural products from horticultural production that have potential to provide enhanced economic value to agricultural systems is likewise foreseen to bring potential economic benefits to Ohio producers. In addition, plant the promotion of soilless cropping systems like hydroponics, organic production, and strategies for extending the production season merit attention for additional solutions. The potential for natural products to remediate some of the most current public concerns such as human health and nutrition, pests and pathogens, as well as other societal problems merits exploration. Developing natural products from plants to establish valuable niche markets for alternative and specialty crops. Investigations of plant species will study naturally producing compounds that have the potential for applications in food, medicine and industry appear as a critical need.

Science Emphasis Area

Bioeconomy, Bioenergy, and Bioproducts, Sustainable Agricultural Production Systems

CSU - Preparing our youth for the future

Initiated on: May 21, 2020

State: Ohio

Term Length: Long-term (>5 years)

Preparing youth, for STEM careers, leadership, resiliency and finances

Description:

Creating Youth Pathways to Success: CSU's 4-H Youth Development program currently addresses societal needs by providing strong and resilient individuals, families, and communities in Ohio. Specifically, youth are receiving hands-on education on STEM topics, natural resource management, and on agriculture. Youth will learn water science-based careers through collaborations with International Center for Water Resources Management. This programming will continue in future, with emphasis on schools with a significant population of at-risk youth.? In addition to STEM topics, youth will learn leadership, business skills, environmental knowledge, agriculture, human nutrition, and exercise science. Developing Better Socio-Economic and Sustainable Communities. CSU is focused on providing a holistic approach to improve the overall conditions facing individuals and families in Ohio's communities, as well as addressing agricultural issues in rural, urban, and Appalachia locations. Building Families and Communities: CSU's Family Consumer Sciences program will provide training to families and communities on specific issues like childhood obesity, family resilience, risk management, financial readiness, health, hunger, and environmental degradation. Addressing these issues through scientific research and programming focused on human nutrition, food and non- food products, food safety, hospitality/recreation, health, and financial education are essential plans of action: CSUE's Community and Economic Development program seeks to empower communities to achieve their goals through education and technical assistance. The aims of this program are community development and revitalization, leadership development, local economic development, entrepreneurship and small business development, and government programs and disaster preparedness and assistance.

Term: Long

Science Emphasis Areas

Education and Multicultural Alliance

Sustainable Agricultural Production Systems

Youth Development

Science Emphasis Area

Education and Multicultural Alliances, Sustainable Agricultural Production Systems, Youth Development

CSU - Promoting food nutrition and health for socially-disadvantaged communities

Initiated on: May 21, 2020

State: Ohio

Term Length: Long-term (>5 years)

Critical Issue – Promoting food nutrition and health for socially disadvantaged communities

Description: The welfare of socially disadvantaged communities is a critical priority for 1890 Land-Grant programs, including CSU. Socially disadvantaged people are at a greater risk of poor nutrition and illness, including diabetes, than more affluent populations. The United States spends \$200 billion in healthcare related to obesity, and more than 81 million Americans are completely inactive and lack physical activity. Ohio has the 11th highest adult obesity rate in the nation, and the sixth highest obesity rate for youth ages 10 to 17.

CSU will engage in research and extension activities related to human nutrition and exercise education, as well as food delivery systems to underserved populations to target treatments are necessary. Research results will help determine the best practices in health promotion. These endeavors will be based on nutrigenomics knowledge, which could lead to personalized nutrition plans. Research into relaxation techniques using Yoga and integrate the nutrigenomics with the use of herbs can also benefit our target audience. Obesity in children is a growing epidemic in the United States, and the minority populations are especially at risk for obesity. As part of the research program, physiologic parameters including resting heart rate, blood pressure and body composition will need to be assessed before and after the intervention.

CSUE will play a critical role in the dissemination of research results pertaining to human nutrition and health. CSU has acquired a Health Education Mobile Unit (HEMU) to assist Family and Consumer Science staff bring programs over all 60 service counties. The HEMU will also accommodate county health department medical staff who will augment CSUE health programs with additional education, health screenings, and other medical services.

Term: Long

Science Emphasis Areas

Bioeconomy, Bioenergy, and Bioproducts

Family & Consumer Sciences

Food Safety

Human Nutrition

Youth Development

Science Emphasis Area

Bioeconomy, Bioenergy, and Bioproducts, Family & Consumer Sciences, Food Safety, Human Nutrition, Youth Development

CSU - Supporting small and medium-sized farms

Initiated on: May 21, 2020

State: Ohio

Term Length: Long-term (>5 years)

Critical Issues: CSU - Supporting small and medium-sized farms

Ohio small and medium-sized farms are afflicted with production risk, fluctuating prices, and shrinking access to labor. These include limited resource farms that are often owned by farmers of color. These farms face challenges, not only of production, but also of marketing, management, and overall viability. To facilitate their survival, CSUE will create a Small Farm Program that will conduct research and extension activities suitable for limited resource and small farms. These activities will involve production research and outreach, and incorporate land access trainings, specialty crops market assessments, production technology economic assessments, postharvest food handling/food safety, value added product development and regulations, farm business management, use of farming equipment/farm safety, USDA programs for limited resource and small farms, and trainings in farmer organizations including farmer cooperatives. Farming demonstrations will be conducted on CSU's main campus and at collaboration sites with external partners. These demonstrations will host field days and workshops. CSUE will invite successful minority and military veteran farmers and other agents (e.g., crop buyers, agribusinesses, input suppliers, USDA staff, etc.) to share information and inspiration to trainee farmers. ARDP's will contribute to the Small Farm Program by sharing information about alternative crops including hemp, Cannabis sativa with a THC content less than 0.3%. ?amaranth, sweet potato, high-amylose corn, tree fruit and nut crops, medicinal plants, and hops. High -amylose corn is of interest to consumers who want to lower the starch-based calories in their diet due to its lower glycemic index than other starches. Emphasis will also be placed on small and medium-scale hydroponic/soilless culture systems and other fertigated fruit and vegetable production systems using soils that can grow plants intensively, requiring no tillage and harvesting equipment, and needing reduced labor applications.?

CSU Extension will provide sustainable resources for small-scale and organic farmers that focus on three elements of sustainability: profitability, stewardship, and quality of life. The resources will provide local workshops, trainings, and farm demonstrations for improving soil health, composting, integrated pest management (IPM), small-scale livestock, regenerative practices, land access, land transfer, local and direct food marketing. Programming will target socially disadvantaged populations.

ANR Educators currently engage with small-scale farmers through a state-wide “Growing Small Farms Webinar Series”. The webinars are held monthly on third Thursdays during the summer and weekly on Thursdays during the winter. Topics include organic production, beekeeping, specialty crops, integrated pest management, small-scale poultry and livestock, pasture management, soil health, and agroforestry. The webinars are recorded and available on YouTube for farmers who missed the session. A podcast will also be developed from the recordings to increase access by busy farmers.

CSU Extension will provide focused programming, workshops, and resources on hydroponics and aquaponics for beginning and small-scale farmers. Programming will focus on managing these systems and low-cost, low-input systems to reduce the need for large amount of capital to begin a system. Demonstration sites for aquaponics has been implemented on CSU campus and sites will be developed in other areas of the state or provided through mobile, educational options.

The environmental impact of pollinators is key for agricultural production. CSU ANR educators will be providing beginning beekeeping programs to help increase the number of successful apiaries in Ohio. Videos will also be developed to help beginners become successful in the beekeeping experience.

Protecting agricultural environment

Pollinator Issues: Promoting mite resistant bees is one of the most effective ways to mitigate the bee decline. It is imperative that we develop new methods for increasing genetic diversity and to improve queen bee quality. The limiting factors affecting local honeybee resources include fewer queens and the nuclei available to fulfill the demand of beekeepers in the region. Climate Change: Small and medium size farmers are critically impacted by global climate change variations. Assisting farmers to meet conditions due to weather and climate changes is seen as a priority issue. Climate change in Ohio is resulting in incidences of drought and higher levels of spring precipitation. The difficulties for farmers and other stake holders arise due to 10% increase in spring precipitation and increase in drought in Ohio. ?Adding drainage systems to reduce the impacts is increasing the cost of inputs for farming. Research is needed to t design and implement structural and non-structural measures to meet climate challenge issues in Ohio. Water Resources and Water Quality: Water issues in the US are related to floods and droughts, water quality; hydro energy. The major phenomenon of change in climate impacts all aspects of water, which requires planning structural and non-structural measures. Soil Health: An assessment of soil information and health at local, regional and global scales will provide a holistic system-based approach to address the issues at the nexus of plant, animal, natural resources and environmental systems. ?Agricultural Ecology: Biodiversity and saving endangered species are important for improving the ecosystems in farming areas. CSU’s forestry program in southeastern Ohio will educate stakeholders in forest management and conservation of oaks and other valuable forest-based natural resources.? CSU’s ANR program will invest in educating farmers about organic production systems for horticulture and row crops.

Climate smart farms are key to helping farmers manage climate change. Programming will be offered by ANR educators to help farmers with climate-smart practices to encourage carbon sequestration and lower energy inputs. Programming will also focus on managing climate change through technology tools to manage changing weather and provide crop protection. Soil health is also an integral part of climate smart farms and resources will be developed to address cover crops, increasing soil biology, and no-till options for small-scale and specialty crop farmers. Programs for climate smart farms will target socially disadvantaged populations.

CSU ANR Extension will provide focused programming, workshops, and resources on new and emerging technologies used by beginning and small-scale farmers. These technologies include smart irrigation and hydroponics. Programming will focus on managing these systems and low-cost, low-input systems to reduce the carbon footprint. Demonstration sites for smart irrigation has been implemented on CSU campus and sites will be developed in other areas of the state.

These items of critical issues to assist small and medium farmers include developing demonstration sites for smart irrigation, hydroponics, and aquaponics; Create programs to highlight low-cost, low-input systems for new technologies; Create resources to encourage climate-smart farms; and Identify soil health practices for small-scale and specialty crop farmers.

Organic Farming: Organic farming is a pathway to improved health and nutrition while enhancing? sustainable agriculture. ARDP and CEP will work together in developing methods to enhance organic farming in Ohio with a focus on small and medium farmers. We propose to use advance technology tools to enhance the production of organic produce in Ohio and improve the levels of farm income for farmers. A major impact is also improved health and nutrition of Ohioans.

Term: Long

Science Emphasis Areas

Agroclimate Science

Bioeconomy, Bioenergy, and Bioproducts

Environmental Systems

Sustainable Agricultural Production Systems

Science Emphasis Area

Bioeconomy, Bioenergy, and Bioproducts, Sustainable Agricultural Production Systems