West Virginia (West Virginia University) Annual Report - FY2021

Report Status: Approved as of 07/08/2022

Contributing Organizations

West Virginia University

Executive Summary

Overview

In 2021, WVU Extension delivered a mix of virtual and in-person education to address issues that were of importance to West Virginians. This annual report of accomplishments spotlights some of our impacts in supporting children and youth academic achievements, providing supplemental educational opportunities for those in need of continued professional development, improving health outcomes for individuals and families, and promoting the prosperity of West Virginians. In our core program areas (4-H youth development, family and community development, and agriculture and natural resources), the blend of reaching youth, families, volunteers, communities, and partners were seen in our most successful delivery methods of club programming, special interest groups, one-on-one farm consultations, e-dining with diabetes, community strategic planning, school-based enrichment, and afterschool experiences. While our reach with audiences was impacted by the pandemic, we identified innovative ways to expose our work to new and diverse audiences. We have been able to utilize technology to reach new audiences and to better inform and promote our programs. Our educational programs in this reporting cycle directly reached 219,301 adults and 71,074 youth.

In the last 8 months, WVU Extension has been working on a program transformation planning process. This process kicked off with the Dean of Extension, Jorge Atiles, meeting with several stakeholders within and outside of WVU to determine programmatic needs and areas of collaboration toward tackling public issues in the state. Such meetings have birthed increased collaboration, for example, between Extension and the College of Business and Economics at WVU. Extension faculty are increasingly partnering with faculty in other colleges by infusing educational and community outreach components into grant applications. As part of the transformation plan, WVU Extension recently conducted a survey on key decision-makers perceptions of public issues in WV (discussed in detail under the stakeholder input part of this report). The program transformation plan is expected to continue in FY2022 with emphasis on organizational structure and program development changes.

In 2021 the West Virginia Agricultural and Forestry Experiment Station has continued to conduct approved research activities across our Critical Issues, with participation in 38 approved capacity projects and participation in an additional 38 Multistate Hatch projects. In the last year the Experiment Station has focused on growing participation in the Experiment Station beyond the Davis College and currently has faculty from 7 other colleges (including Extension) as participants in the Experiment Station.

Critical Issue: Climate Change and Natural Resources Management

One of our notable efforts in addressing climate change and natural resources management in this reporting year includes the newly developed curriculum for educating livestock producers on research-based methods for implementing managed/regenerative grazing. Producers have indicated the adoption of grazing methods taught by our extension educators. The Grazing School program is one that will quickly expand across the state reaching more farmers with information that can increase their profitability without causing harm to the environment. Our pest diagnostics center is now being used at an increasing rate by growers to quickly identify pests and use appropriate pesticide alternatives prescribed by WVU Extension specialists. The pest diagnostic center boasts of farmers' cost production savings with a reduced chemical run-off into the Chesapeake Bay. We invest heavily in educating West Virginia youth on pollutants, the degradation timeframe for different types of waste, reduction of litter issues, and how to become active participants in conserving WV natural resources and protecting its environment.

Of the seven projects of the Experiment Station in the Critical Issue the underlying themes revolve around sustainable water use/mangement, assessment of factors impacting carbon dioxide reduction (particularly the role of soil microbes in sequestering carbon and adding value to low value woody material) and enhancing biomaterials and bioenergy utilization.

Critical Issue: Climate Change and Natural Resources Management (1890)

N/A

Critical Issue: Community Revitalization

WVU Extension's efforts toward revitalizing communities in WV focused on 10 communities in the last fiscal year. Some of our achievements in revitalizing communities involved facilitating strategic planning meetings among different stakeholders on development opportunities in participating communities. In some of the communities, strategic plans developed were used to provide direction for community action activities including economic profiling, workforce assessment, tourism and recreation innovations, and business retention plans. A noteworthy example of our efforts is the Mon Forest Towns Partnership Strategic Planning initiative. An assessment of partners and stakeholders revealed that they valued their role on the planning team and also felt that the initiative is beneficial to the communities, and has the potential to improve the economy of participating cities/towns. As an added value, stakeholders increased their knowledge of the economic and social impacts of outdoor recreation in West Virginia.

Of the eight projects of the Experiment Station focused on Community Revitalization, a theme of understanding factors that impact community resilience, understand the impacts of energy environments, small business and transdisciplinary approaches to greenspace/recreation/tourism. These projects have particular relevance to the state as West Virginia is made up entirely of small communities (no urban (poplation >50,000) cities) and is at the start of a monumental effort to reinvigorate communities and businesses in a time of transition from energy expraction to hopefully a more diverse and robust economy.

Critical Issue: Community Revitalization

N/A

Critical Issue: Food Access, Security and Safety / Sustainable Agriculture

For farmers, the sustainability of production is closely linked to product marketability and profitability. Market linkages from farm to end-users need to be strengthened to increase West Virginians' access to agricultural products. In this last fiscal year, agricultural and natural resources agents helped farmers to market their products through unconventional means such as online live sales. In Wardensville town, over 90% of bull sales were achieved through a piloted online farmers' market. We have also worked with individuals and families who harvest venison on the safe and proper harvest techniques, field dressing, and proper cooking and preservation methods. Individuals and families are increasingly learning how to grow their own foods through our gardening program.

Of the projects of the Experiment Station under this critical issue, we focused on the biological and genetic underpinnings of nutrient (including water) use efficiency and parasite ressitance, the use of underutilized protein sources for food, the genetics of trait morphology and the economics of small farm or minor species production. We have also done work in weed and insect pest management during the reporting yesr.

Critical Issue: Food Access, Security and Safety/Sustainable Agriculture

N/A

Critical Issue: Health Disparities

The global COVID-19 pandemic increased stress levels, particularly in children https://www.apa.org/monitor/2022/01/special-childrens-mental-health, and the demand for mental health services increased. West Virginia is among the states with the lowest rates of access to mental health care for youth and moderate access for adults https://www.mhanational.org/issues/ranking-states#one and this disparity was exacerbated by the pandemic. WVU Extension faculty addressed this disparity through programs for children and adults in stress management, mindfulness practices, and trauma-informed classrooms. Thirty-nine faculty members were certified to conduct Teacher Resources for Addiction Impact Now (TRAIN) to support public school teachers as the navigate the impacts of the opioid epidemic. Children and youth practiced stress management through mindfulness techniques and yoga.

The work of the Experiment Station towards the critical issue of health disparities has centered around identifying a lowering barriers to healthcare delivery to rural populations and increasing the health span of aging adults.

Critical Issue: Health Disparities (1890)

N/A

Critical Issue: Innovation and Entrepreneurship (1890)

N/A

Critical Issue: Nutrition and Obesity Prevention

WVU Extension provided obesity and chronic disease prevention programs through direct nutrition education for children, youth, and adults, and through support for policy, systems, and environmental changes at the community level. Through direct education, people learned to grow and preserve their own food during our yearly Grow This Challenge. Program participants adopted healthier behaviors such as drinking fewer sugar-sweetened beverages, moving more, and taking steps to manage their diabetes. Using a family-based approach, we implemented family cooking program and demonstrations to encourage the adoption of healthier cooking methods in the home. Overall, the WVU Extension nutrition program was implemented in more than 40 counties reaching over 2,750 youth and 597 adults.

Critical Issue: Strengthening Youth and Families

Given that WV is known for its high rate of grandchildren in kinship care in the nation, we worked with Grandparents to ensure that the grandchildren in their care have access to a supporting adult other than the grandparents themselves. We provided academic mentors to *grandfamilies* to close the generational gaps in the use of technology that may negatively impact the academic success of children in kinship care. As part of our commitment to strengthening youth and families in WV, we educated youth and adults on what they need to know about healthy relationships and the importance of evaluating their relationships. Our youth programs utilized the positive youth development framework to increase youth's agency in civic engagement and leadership opportunities. Youth were able to identify personality traits and list the character traits they see themselves improving on as a leader. We also provided workshops to public school employees to help them support students who come from families with substance misuse and abuse.

Of importance in the last fiscal year is our statewide effort on ensuring that the average West Virginian is financially literate. Under the huge umbrella of financial literacy, we have created microprograms such as *paying for post-secondary education (P4PE)* and *basic finance programs*. To increase our immediate college-going rate in WV, we piloted the P4PE program. We taught parents and high school students the importance of applying for FAFSA and other college-going scholarships. In this piloted effort, attendees (parents, high school students, guardians) were walked through the FAFSA application process and their burning questions were answered. A preliminary evaluation report of our *P4PE* program suggests that participating high school students showed positive attitudes toward attending college. WV Extension will continue to provide the resources necessary to overcome the financial barrier hampering WV youth's access to a college education.

The work of the Experiment Station focused on Strengthening Youth and Families focused on exposing young people to research as an approach to increase achievement and participation in STEM fields, particularly from historically coal extraction protions of the state. Other work focused on the value of greenspace and the natural environment to promote health and well being in communities.

Critical Issue: Strengthening Youth and Families (1890)

N/A

Merit and Scientific Peer Review Processes

Updates

None.

Stakeholder Input

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

In 2021, we set out to gauge stakeholders' opinions on priority issues in their communities that could be addressed by WVU Extension educational programs. While it was important to capture the opinions of all stakeholder groups in the state, we were more interested in understanding the issues that are of importance to state and local policy-makers. We tagged this effort, "Assessment of West Virginia Public Issues: Perceptions of Key Decision-Makers." This decision makers' needs assessment was executed in four phases. In phase one, we used secondary data to establish trends across the state starting with the three pillars of WVU: education, health, and prosperity as a guide. In phase two, we identified 58 community and individual-based issues using secondary and anecdotal data gathered through program evaluation efforts and agents' meetings with community members. We then grouped the issues under five pillars: education, prosperity, individual and family health, community health and civic engagement, and natural resource management.

The 58 issues were reviewed by a panel of experts including the Dean of WVU Extension, Associate Deans of WVU Extension, WVU Extension Program Unit Directors, a rural economist, and two evaluation specialists. In phase three, decision-makers across the state were asked to rate the 58 issues according to their levels of importance through an online or paper survey. The Dean of WVU Extension solicited stakeholders' participation through official letters, official visits, and collaborative meetings across the state. Extension agents also encouraged their stakeholders to participate in the survey.

Methods to identify individuals and groups and brief explanation

We used a purposeful sampling technique (Creswell, 2012) to narrow down stakeholder groups that are responsible for making key decisions across the state. Our final sample included 100 West Virginia delegates, 35 senators, 65 county superintendents, 167 county commissioners, and 400 individuals on Extension Service Committees for all West Virginia counties. Our survey targeted a total number of 767 key decision-makers. County agents also conducted key informant interviews and focus groups in their counties to further explore the issues that were prioritized at the county level.

Methods for collecting stakeholder input and brief explanation

Using a survey design, we assessed the level of importance of public issues from the lens of key decision-makers in West Virginia. Decision-makers rated the importance of 58 identified public issues under five pillars including education, prosperity, individual and family health, community health and civic engagement, and natural resource management. We obtained a list of email addresses as well as office and home addresses of identified key decision-makers. We then mailed paper surveys to them and gave them two weeks for completion. A follow-up postcard mail was sent to key decision-makers approximately two weeks after the initial mailing date.

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

We are committed to implementing stakeholders' comments on improving WVU Extension program visibility and public participation. Comments provided include increasing county agent hires, using technology to enhance visibility, and increasing Extension's volunteer base to aid effective programming. Based on stakeholder inputs, we have continued to initiate priority program teams that will address needs identified across different audiences. The results of the key decision-makers need assessment will be used to identify cross-cutting issue themes between the needs prioritized by decision-makers and our previously determined critical issues in the state. In the next year, we hope to implement statewide program transformation plans by creating program outcome teams around triangulated issue themes in the state. We will also continue to increase our volunteer base for wider program coverage.

Highlighted Results by Project or Program

Critical Issue

Climate Change and Natural Resources Management

Carbon Dynamics and Hydromorphology in Depressional Wetland Systems

Project Director

James Thompson

Organization

West Virginia University
Accession Number
7000515

Annual Report

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Vernal pools are one of the most ecologically valued types of inland wetlands as they provide habitat for numerous rare and endangered plants and animals and provide numerous ecosystem functions within upland landscapes. The objective of this multistate research project is to improve our understanding of the hydrological, biogeochemical and pedologcial properties and processes that affect organic matter decomposition, greenhouse gas fluxes, and carbon sequestration in depressional wetland ecosystems, as expressed across geographical and climatic gradients. These data can be used to set goals for the restoration of vernal pools and assess the effects of future climate change on these ecosystems.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Progress to date has focused on measurement and monitoring of a high-elevation vernal pool site that includes a natural wetland with clearly-identifiable hydrological zones (ponded, saturated, and unsaturated) located on the Monongahela National Forest near Holcomb, WV. The site has been instrumented with monitoring wells along three transects through all three hydrological zones. All observation wells were maintained throughout the year. Measurements on multiple components of the carbon cycle were initiated in FY2021. Assessment of carbon additions was initiated by deploying trap to collect litterfall and establishing plot to monitor deadfall. Assessment of decomposition was conducted by deploying sets of leaf-litter bags to measure litter decomposition rates and sets of wooden dowels to measure woody debris decomposition rates. The leaf-litter bags were deployed and retrieved during FY2021. The wooden dowels will be retrieved in FY 2022 as will the materials that collect in the litterfall traps and the deadfall plots.

Briefly describe how your target audience benefited from your project's activities.

The target audiences reached during this reporting period include (i) professional soil scientists working in West Virginia and surrounding states, (ii) colleagues at other land grant universities, and (iii) students (undergraduate and graduate) at West Virginia University. Descriptions of ongoing work and selected results have been presented at meetings and workshops at regional, national, and international levels. The specific meetings and professional conferences where the findings from this project have been disseminated during FY2021 included the 2020 National Cooperative Soil Survey Virtual Conference in June 2021. The results and implications of these research efforts were communicated directly to interested parties, such as soil scientists with the USDA-Natural Resources Conservation Service and USDA-Forest Service.

Briefly describe how the broader public benefited from your project's activities.

During FY2021, data collected in WV as part of this multistate research project contributed to an improved understanding of how Indicator of Reduction In Soils (IRIS) devices, which are tools used by practitioners of wetland science to identify the presence of wetland soils, respond to differences in soil temperature during their deployment in the field. While the more commonly-used Fe-coated IRIS devices are appropriate for periods when soil temperatures are warmer (>11 °C); however, Mn-coated devices more sensitive to the presence of wetland conditions when soil temperatures are cooler (5-11 °C). This information is expected to allow wetland practitioners to be more accurate in identifying the presence or absence of wetland conditions.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

One graduate student and one undergraduate student received training and mentorship through participation in the research efforts related to this project.

Effort will continue on all project objectives. Field work, laboratory analyses, and geospatial modeling will be employed.

Closing Out (end date 09/07/2023)

Biological Improvement of Chestnut through Technologies that Address Management of the Species and its Pathogens and Pests

Project Director
Matthew Kasson
Organization
West Virginia University
Accession Number
1020545

2021 Annual Report

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The goal of our work here at WVU supports 2 main NE-1833 objectives:1) evaluate biological approaches for controlling chestnut blight by utilizing knowledge of the fungal and hypovirus genomes to investigate the mechanisms that regulate virulence and hypovirulence; and 2) investigate chestnut reestablishment in orchard and forest settings with special consideration of the current and historical knowledge of the species and its interaction with other pests and pathogens.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Over the period from 2020 to 2021, our group continued to focus on use of Super Donor Formulation (SD328/82; Two *C. parasitica* strains engineered to remove virus transmission barriers) to help circumvent previous genetic restrictions to increase field efficacy this virus biocontrol. Our results show that the SD formulation can serve as an effective vector for introducing hypovirus into a natural, genetically diverse *C. parasitica* population and that specific virus used and application method impacts effiacy. The SD formulation may aid in controlling chestnut blight cankers in germplasm conservation orchards of American chestnut trees.

With the addition of a new graduate student beginning in Fall 2021, we are working to expand our understanding of some genetic barreiers that may have been discovered in my lab in select European *C. parasitica* strains EU65-EU74. We hope to shed additional light on these potential genetic barriers through pairing assays and DNA and RNA sequencing.

We have also shared SD strains with collaborators at TACF and SUNY ESF to allow for indepedent validation of efficacy in controlled lab and greenhouse settings.

Briefly describe how your target audience benefited from your project's activities.

Our research has provided guidance on field efficacy of SD strains to researchers at other instituions (both within the Regional Project and those Institutions where seminars were given including OSU and UKY) and The American Chestnut Foundation (national organization and state chapters). Ohter information on chestnut and chestnut restoration was provided to highschool aged students at First2 Network camp in Hillsboro, WV in summer 2021.

Briefly describe how the broader public benefited from your project's activities.

Our work is pioneering efforts to use engineered fungi to combat the chestnut blight pathogen, which continues to infect and kill American chestnut trees. By continuing to understand its impact in native forest settings, we can better understand its potential to help restore the American chestnut to our eastern forests.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

With pandemic-related shutdowns and reduced work effort, use of SD strains in orchards of American, European, Chinese and backcross chestnut trees has been delayed. Likewise, follow-up sampling in Western Maryland stands have also been delayed.

Rich-Regions Poor-People Dichotomy: A Wealth Approach to Building a Sustainable Future in Energy-Rich Regions of Appalachia

Project Director
Hodjat Ghadimi
Organization
West Virginia University
Accession Number
1016734

Rich-Regions Poor-People Dichotomy: A Wealth Approach to Building a Sustainable Future in Energy-Rich Regions of Appalachia

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

This study builds on our previous research that explored the extent to which the major components of regional wealth could be estimated using geospatial technologies and associated spatial databases. It will develop a comprehensive methodology and use advanced geospatial technologies to assess inclusive wealth in Energy-Rich Region such as West Virginia.

The wealth approach to development in ERRs can help integrate changes in natural, physical and human capital assets with regional economic development.The approach provides valuable insights about sustainable development in energy resource-rich regions in the state and in Appalachia and beyond.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The steps and tasks required for objectives of creating a Regional Wealth Knowledge Base (RW-KB) and developing a Regional Wealth Model (RWM) have largely been completed. Activities included i) collecting, organizing, and reviewing the existing literature on theoretical issues of development in Energy Rich Regions (ERRs) and approaches to regional wealth measurement; ii) creating a comprehensive metadata base on the existing data sources relevant to regional wealth measurement and ownership; and iii) reviewing regional wealth estimation and evaluation models and developing techniques to use geoscience technologies in wealth measurement.

The objective of Developing a Regional Wealth Index (RWI) is underway. The important and time- consuming objective of Pilot Study that requires extensive help of graduate assistants is the big next step followed by the final objective of Generalization and Dissemination of research results.

Briefly describe how your target audience benefited from your project's activities.

The study lays the foundation for developing planning and decision-making support systems that could help policy makers, decision makers, and practitioners at the county, state, and national levels. Given the negative situation created by the COVID 19 pandemic, research activities and preliminary findings were only presented internally in classes and in graduate seminars at the university. Plans to disseminate research findings through website, reports, technical notes, conference presentations, and other forms of publications will be pursued after completing the pilot study with actual regional data.

Briefly describe how the broader public benefited from your project's activities.

Nothing to report. Please see the response above.

Closing Out (end date 09/07/2023)

Renewable Energies: New Uses for Former Mine Lands in West Virginia. Design Principles and Recommendations for Minimizing Landscape Impacts

Project Director
Stefania Staniscia
Organization
West Virginia University
Accession Number
1015398

Renewable Energies: New Uses for Former Mine Lands in West Virginia. Design Principles and Recommendations for Minimizing Landscape Impacts

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The project aims to identify design solutions that allows for the placement and development of renewable energy (RE) facilities on former coal mine lands in southern West Virginia in a way that doesn't further disturb the landscape and is acceptable to communities living in the surrounding areas. As a matter of fact, a successful location and development of RE depends not only on the availability of natural resources – e.g. sun and wind – but also on public acceptance.

As already emerged from a small surveyed sample in an earlier phase of this research, most people would like to see former coal mine lands returned to a forested state, and only about 30% would like to see these areas turned into RE facilities. The project aims to provide design recommendations that will enable informed future planning, design and development decisions.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

As I already mentioned in my previous reports, I focused my research efforts on the Coal River Watershed (CRW). During this reporting period, with the help of two graduate students, I generated a database of information that will be relevant for the identification and description of the landscape characters. Using GIS, coal towns and other historic and cultural features were mapped. The data were mostly acquired from the West Virginia GIS Technical Center. In addition, features from USGS Topographic Maps at scale 1:24000 from the sixties and the nineties have been digitized. The CRW comprises 29 quadrangles and the features considered are related to coal mining and also include historic elements, such as churches and cemeteries.

Other data I am considering consists in the distribution of former surface mining areas before the SMCRA, in particular, strip mining and high-wall mining. These kind of surface mining operations are both present on the study area analyzed. They are also mapped in the historical USGS Topographic Maps. The mapping of their distribution is relevant to understand the actual conditions of the landscape, if any reclamation was applied in the recent past, or if they have been part of remining operations (MTM, MTR).

These data will be elaborated and used to inform landscape characterization practices. Indeed, the identification of specific landscape features represents the first step to address landscape characterization. Whether in the case where the mapping of the features and units of the landscape of interest is conducted through traditional manual and visual detection methods. Or in the case where the mapping is conducted by using classification algorithms based on supervised or unsupervised approaches.

Briefly describe how your target audience benefited from your project's activities.

For this reporting period, all activities were geared toward data collection and digitization and methodology development for landscape characterization. Therefore, the audience that benefited from the activities was two graduate students who worked with me.

Briefly describe how the broader public benefited from your project's activities.

The work has been disseminated through scholarly publications and participation in conferences as a presenter.

An abstract I submitted as second author for the March 2022 annual conference of the Council of Educators of Landscape Architecture was accepted in November 2021. It will be published in March 2022 and I will present at the conference.

In September 2021 I made a presentation at the the Conference Erasure and the Environment organized by Loughborough University in the UK.

Based on the qualitative content analysis of the novel Strange as This Weather Has Been, that I used to determine landscape characters of southern West Virginia coalfields, I submitted a manuscript to Landscape Journal.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

NA

Elucidating the Link Between the Soil Microbiome and the Fate of Soil Organic Matter

Project Director
Ember Morrissey
Organization
West Virginia University
Accession Number
1011670

Final Report for Elucidating the Link Between the Soil Microbiome and the Fate of Soil Organic Matter

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

It is clear that microbes are essential to the maintenance of life on Earth; however, we understand very little regarding how compositional differences among microbial communities (i.e., who's there) influence functional responses (i.e., what the microbes are doing). This knowledge gap, combined with increasing anthropogenic alterations of global biogeochemical cycles, makes it difficult to anticipate how processes controlling the flow of energy and cycling of elements may be altered in the Anthropocene. The aim of this project was to advance scientific understanding of microbially-mediated soil organic matter transformations, and help predict the fate of carbon and nitrogen in the future.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The goals of this project were to 1) Resolve understanding of chemical and physical factors that impact the composition of the saprotrophic soil microbiome within natural and managed soils and 2) Assess the impact of chemical and physical changes on microbially-mediated soil organic matter transformations.

Research under this project has addressed these goals and revealed new understandings of how microbial biodiversity is impacted by human activities and influences ecosystem health. Results include the publication of nine scientific manuscripts, three focusing on natural systems (forests) and six focusing on managed systems or highly disturbed ecosystems. The complete list of manuscript is provided in the comment section and three publications are highlighted below.

The Kane et al. 2020 manuscript reports on microbial community composition in reclaimed mine soils in West Virginia. Using a chronosequence of time since reclamation we investigated how microbial communities recover over time and what soil factors determine soil biodiversity. We found that both fungal and bacterial communities are strongly influenced by soil environmental conditions (i.e. soil organic matter, soil texture, pH). The influence of these factors suggests restoration efforts focused on restoring soil conditions may help the microbial communities recover as well.

The Walkup et al. (2020) manuscript reports result on microbial biodiversity and nitrogen cycling within the long-term Organic Crop Livestock Fields experiment at the WVU Organic Farm. In this manuscript we demonstrate that both fertilization with compost, and the integration of pasture into crop rotations, influence the composition of microbial communities. These changes in composition were found to be associated with altered function. Specifically, compost increased the proportion of

ammonium oxidizing organisms and soil nitrate levels, these effects were mitigated by having pasture in the crop rotation. Our results suggest that the integration of pasture into crop rotations in organic systems may reduce nitrogen leaching from compost.

Dang et al. (2021) found that changes in leaf little inputs in forest ecosystems had little impact on microbially mediated soil organic matter transformations. Specifically, the decomposition rates and assimilation of cellulose, glucose, lipids, and amino acids were unaffected by differences in leaf litter inputs in soil from a long-term experiment. These results suggest that microbial communities may be resistant to changes in leaf litter inputs associated with anthropogenic climate change.

Briefly describe how your target audience benefited from your project's activities.

The results of this work have been shared with the scientific community through peer reviewed publications and scientific presentations at regional and national meetings (listed in comments). Additionally, we have shared our findings with stakeholders including farmers and land managers. This was through presentations at meetings such as the American Society of Reclamation Sciences Annual Meeting and via outreach activities such as the WVU Organic Farm Field Day.

Briefly describe how the broader public benefited from your project's activities.

Findings from this project will improve mine land reclamation and agricultural sustainability enhancing the health of the environment for future generations. We also reached out to the public to share findings regarding soil health via press releases and social media.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Changes or Problems:
Dr. Freedman left WVU for a different institution and so this project changed leadership and has been managed by Dr. Morrissey since 2020.

Training and Professional Development:
This project helped train five graduate students and four undergraduates at West Virginia University and was acknowledged in two graduate theses (listed in the comments). The other graduate students are still in the process of completing their degrees. The graduate students were mentored on all aspects of scientific inquiry from experimental design, sample collection and analyses, data analysis and interpretation, as well as communicating the results. The undergraduates primarily focus on learning techniques associated with data generation but were also mentored on scientific communication, scientific thinking, and the scientific method. Undergraduate researchers gave three presentations and an undergraduate researcher coauthored one of the publications.

Scientific Publications (Hatch Support Acknowledged)
1) Zak, D. R., Argiroff, W. A., Freedman, Z. B., Upchurch, R. A., Entwistle, E. M., and Romanowicz, K. J. (2019) Anthropogenic N deposition, fungal gene expression, and an increasing soil carbon sink in the Northern Hemisphere. Ecology 100(10):e02804. 10.1002/ecy.2804
2) Kellner, E., J. Hubbart, K. Stephan, E. M. Morrissey, Z. B. Freedman, E. Kutta, and C. Kelly. (2018) Characterization ofsub-watershed-scale stream chemistry regimes in an Appalachian mixed-land-use watershed. Environmental Monitoringand Assessment. 190 (10), 586.
3) William J Landesman, Zachary B Freedman, David M Nelson, Seasonal, sub-seasonal and diurnal variation of soil bacterial community composition in a temperate deciduous forest, FEMS Microbiology Ecology, Volume 95, Issue 2,February 2019, fiz002, https://doi.org/10.1093/femsec/fiz002
4) Kane JL, Morrissey EM, Skousen JG, Freedman ZB (2020) Soil microbial succession following surface mining is governedprimarily by deterministic factors. FEMS Microbiology Ecology. 96, 11
5) Walkup J, Freedman Z, Kotcon J, Morrissey EM (2020) Pasture in crop rotations influences microbial biodiversity andfunction reducing the potential for nitrogen loss from compost. Agriculture, Ecosystems, and Environment. 304, 107122
6) Dang C, Kellner E, Martin G†, Freedman Z, Hubbart J, Stephan K, Kelly C, Morrissey EM (2021). Land use intensification

destabilizes stream microbial biodiversity and decreases metabolic efficiency. Science of the Total Environment, 767:145550

7) Martin, Gregory, Chansotheary Dang, Ember Morrissey, Jason Hubbart, Elliot Kellner, Charlene Kelly, Kirsten Stephan, and Zachary Freedman. "Stream sediment bacterial communities exhibit temporally-consistent and distinct thresholds to land use change in a mixed-use watershed." FEMS Microbiology Ecology 97, no. 2 (2021): fiaa256.

8) Michaels, R., Eliason, K., Kuzniar, T., Petty, J. T., Strager, M. P., Ziemkiewicz, P. F., & Morrissey, E. (2022). Microbial communities reveal impacts of unconventional oil and gas development on headwater streams. Water Research, 118073.

9) Dang, C., Walkup, J. G., Hungate, B. A., Franklin, R. B., Schwartz, E., & Morrissey, E. M. (2022). Phylogenetic organization in the assimilation of chemically distinct substrates by soil bacteria. Environmental microbiology, 24(1), 357-369.

Graduate Theses

1) Kane, Jennifer Lynne, "Soil microbial succession following surface mining is governed primarily by deterministic factors" (2019). Graduate Theses, Dissertations, and Problem Reports. 3922. https://researchrepository.wvu.edu/etd/3922. Dr. Zachary Freedman Chair.

2) Mayfield, Brianna L., "Mine reclamation using biofuel crops: Insights into the microbial ecology of the switchgrass (Panicum virgatum) microbiome" (2019). Graduate Theses, Dissertations, and Problem Reports. 3808. Dr. Zachary Freedman Chair. https://researchrepository.wvu.edu/etd/3808

Presentations

1) Kane JL, McDonald LM, Skousen JG, Morrissey EM, Freedman ZB (Oral-October 2020) Towards understanding the microbial mechanisms underlying the success of Miscanthus x giganteus on Appalachian marginal lands. American Society of Mining and Reclamation.

2) Martin G, Morrissey E, Carson W, Freedman Z (Poster – Nov 2021) Legacy effects of fire continue to shape the soil microbiome in an eastern deciduous forest. 2021 ASA, CSSA, SSSA International Annual Meeting, Salt Lake City, UT

3) Kuzniar T, Dang C, Morrissey E (Poster- Nov. 2021) Temperature, oxygen, and vegetation as drivers of microbial dynamics in warming boreal peatlands. 2021 ASA, CSSA, SSSA International Annual Meeting, Salt Lake City, UT

4) Dang C, Morrissey E (Oral- Nov 2021) Reduction in Microbial Diversity Decrease Carbon Use Efficiency in Soil. 2021 ASA, CSSA, SSSA International Annual Meeting, Salt Lake City, UT

5) Kane J, Freedman Z, McDonald L, Skousen J, Morrissey E. (Oral - August 2021). Integrating the ecology of the soil microbiome into our understanding of bioproduct agroecosystem productivity and sustainability. Ecological Society of America.

6) Kane J, Freedman Z, McDonald L, Skousen J, Morrissey E. (Oral – April 2021). Integrating the ecology of the soil microbiome into our understanding of bioproduct agroecosystem productivity and sustainability. Davis College Graduate Student Research and Creative Scholarship Day.

7) Liseski K, Morrissey E (Oral – August 2020). Effects of microbial inocula on soil nutrient cycling and the productivity of bioproduct crops in marginal soils. Ecological Society of America

8) Kuzniar T, Dang C, Morrissey E (Oral- July 2021) Temperature, oxygen, and vegetation as drivers of microbial dynamics in warming boreal peatlands. West Virginia University Undergraduate Summer Symposium

9) Reed K, Morrissey E (Poster - August 2021) Advancing field-based techniques to identify microbial allies in nitrogen retention in agricultural soils. Ecological Society of America

10) Kuzniar T, Michaels R, Eliason K, Petty T, Strager M, Ziemkiewicz P, Morrissey E (Poster- August 2021) Assessing the impacts of hydraulic fracturing on stream health using algal diversity in biofilms. Ecological Society of America

11) Martin G, Morrissey E, Carson W, Freedman Z (Oral – August 2021) Legacy effects of fire continue to shape the soil microbiome in an eastern deciduous forest. Ecological Society of America

12) Kuzniar T, Michaels R, Eliason K, Petty T, Strager M, Ziemkiewicz P, Morrissey E (Poster-December 2020) Assessing the Impacts of Hydraulic Fracturing on Stream Health using Biofilm Diversity. American Geophysical Union

13) Kane JL, McDonald LM, Skousen JG, Morrissey EM, Freedman ZB (Oral-October 2020) Towards understanding the microbial mechanisms underlying the success of Miscanthus x giganteus on Appalachian marginal lands. American Society of Mining and Reclamation.

14) Micheals R, Eliason K, Ziemkiewicz P, Strager M, Petty T, Morrissey EM (Oral – August 2020) Dynamic microbial responses to unconventional oil and gas development may alter ecosystem function in freshwater streams. Ecological Society of America

Climate Change and Natural Resources Management

Project Director

Adeola Ogunade

Organization

West Virginia University
Accession Number
7001907

WVU Extension Educates Livestock Producers on Research-based Grazing Production and Management

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Small and/or beginning farmers often find it difficult to achieve profitability in their operations. In many situations, only the top 25% of producers are substantially profitable while the other 50% are close to breakeven status. This is particularly true in West Virginia where the net farm income averages $5,675 and 47% of operations report zero profits or less than $2,500 profits. Considerations to maintain or improve profitability include attention to cost management strategies, value-added marketing, and utilizing resources to their highest value. One such resource is grasslands. It is estimated that 90% of grasslands are underutilized in a way that could benefit our farmers financially and mismanaged in a way that could negatively impact the environment. Improving grazing management is one way for livestock production to be sustainable and profitable for West Virginia producers.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

WVU Extension developed a livestock production curriculum that is adaptable to location-based specific needs of farmers. The curriculum was presented to producers as a 2-day program with a mixture of a traditional classroom setting and “hands-on” field activities. Specific topics of the classroom lectures included the importance/benefits of managed grazing, forage supply & demand, forage budgeting and forage mass estimation, selecting carrying capacities/stocking rates/and densities, and developing grazing and drought management plans. The field activities include a pasture walk, demonstration of temporary fencing supplies, assessing forage mass, creating paddocks to meet livestock’s daily feed requirements, and evaluating the effectiveness of these paddocks following grazing.

Briefly describe how your target audience benefited from your project's activities.

95% of participants reported that the information presented was valuable to help improve their farm management. Over 83% stated that they believed skills learned at the grazing school improved the annual profitability of their operation between $2,500 and $5,000. A pre- and post-evaluation of the grazing school program showed that knowledge on grazing and livestock management improved by 65.9% from the trainings.

Briefly describe how the broader public benefited from your project's activities.

The grazing school will continue to recruit producers to increase their knowledge and adoption of managed grazing. This program promotes carbon sequestration through managed/regenerative grazing, potentially limiting the emission of greenhouse gases into the atmosphere.

WVU Plant and Pest Diagnostic Clinic Reduces Farmers’ Production Costs

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

West Virginia has abundant unique forest, landscape ornamentals and other plant resources. Invasive pest species have been and continued to be a threat to these resources. In addition, many small growers of field crops, fruits and vegetables face endemic pests and diseases that reduce crop yield and quality. Growers in the state lose their landscape trees, ornamentals, and other plant resources worth millions of dollars if they are unable to identify pest/diseases and take quick remedial measures. Accurate and early diagnosis of pests and diseases play a critical role in taking remedial measures and maintaining plant health.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

WVU Plant and Pest Diagnostic Clinic provided proper diagnosis of the plant pest problem throughout the state and sent recommendations to clienteles for remedial measures. The clinic provided disease forecasting for fire blight incidence to apple growers and cucurbit downy mildew forecast to cucurbit growers. Our forecasting systems generated AgAlerts that was sent to the producers. AgAlerts helped farmers to take preventative measures to save crops from diseases. Disease diagnosis and recommendations for landscape trees and ornamentals helped in maintaining plant health and avoiding any epidemics.

Briefly describe how your target audience benefited from your project's activities.

This prediction system helped growers apply the right amount of bactericides and fungicides, respectively when there was a risk of disease incidence and spread. For example, the weather was relatively cool and dry during the 2020 apple bloom, and disease prediction indicated the need for only one antibiotic spray. In the absence of prediction capability, the calendar-based spray would require up to 4 weekly sprays thus, saving farmers 3 sprays. Similar saving was estimated for cucurbit and tomato growers due to the adoption of a prediction-based spray program. Overall, we saved farmers an additional 3 sprays. Cost savings for farmers were estimated at $900,000 for apple, cucurbit, and tomato growers due to the adoption of our prediction-based spray program.

Briefly describe how the broader public benefited from your project's activities.

This program reduces surface run-off of agricultural-based pollutants into the Chesapeake Bay.

Critical Issue

Community Revitalization

The Impacts of Power Plant Developments and Economic Revitalization Projects on Local Prices and Welfare in the United States

Project Director

Mark Sperow

Organization

West Virginia University

Accession Number

1025195

Power plants developments and their demographic and socioeconomic implications

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

While there have been power plant developments, either from nonrenewable or renewable energy sources, across the United States, there is limited evidence as to their impacts on demographic compositions and socioeconomic outcomes. This project addresses this gap by investigating power plants' short- and long-term impacts using spatially explicit power plant opening and location data and other socioeconomic and demographic surveys.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Major activities include a review of the energy development literature in the U.S. and in other countries to understand the theory and empirical analyses that have been conducted in the economics field. In addition, I cleaned the power plant opening and closing data and the American Community Survey at the Census Block Group level, and generated other biophysical variables that can affect power plant locations and socioeconomic outcome indicators. These activities enabled me to run various regression models to estimate the impacts of power plant operations on people's livelihoods, which achieves the first goal of the proposed project.

Briefly describe how your target audience benefited from your project's activities.

The results and implications generated from my project activities will benefit both policymakers at various levels and the local population in communities affected by any type of energy production. They will inform policy decisions going forward not only for general electricity generation but also with the energy transition to renewable energy sources.

Briefly describe how the broader public benefited from your project's activities.

The general public will benefit from any potential changes as a result of changes in policies due to the information provided by the project. For example, the analysis of differences in power plant operations' impacts by the source of energy, i.e., non-renewables vs. renewables, will show how their impacts vary and provide implications on what we might be able to do to mitigate negative impacts from switching to the use of renewable energy sources. In the end, the general public is the one that benefits from those changes in energy development policies motivated by the findings from the project.

Closing Out (end date 09/07/2023)

Sustainability initiatives and opportunities at American SME and microenterprises on the periphery of the fashion locus

Project Director

Kathryn Jones

Organization

West Virginia University

Accession Number

1016445

Gaining insights on sustainable footwear product design

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

By engaging with institutions and individuals actively working towards more sustainable textile and apparel business models in the state of West Virginia and the Appalachian region the goal is manifold: 1) delineate the manifestation of sustainable fashion entrepreneurship in West Virginia and the Appalachian region; 2) explore the affordances of and challenges to sustainable textile and apparel businesses in the state and region; and 3) explore the role West Virginia University (along with other stakeholders) may play in supporting sustainable textile and apparel business efforts as a point of competitive advantage for those firms.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Though the graduate thesis work completed in 2021 did not engage directly with WV SMEs, the mentored research did examine and propose new opportunities for sustainable fashion operations in the specific context of footwear product development. The project developed new relationships with professionals actively working in and contributing to more sustianble fashion operations at an SME.

Briefly describe how your target audience benefited from your project's activities.

New insights gained on the opporutnities and barriers in enacting of sustainable design processes. These insights were shared with academics that can use the information to help students prepare to enter design positions in which they will have to manage and enact sustianbility initiatives.

Briefly describe how the broader public benefited from your project's activities.

n/a

Closing Out (end date 09/07/2023)

Trans-disciplinary Approach to Community Planning and Development for Heritage and Recreation Tourism

Project Director

Peter Butler

Organization

West Virginia University

Accession Number

1015374

2021 Progress

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Develop capacities in organizations, communities, and regions through participatory design and planning engaging multiple disciplines from the academy to addressing multiple problems facing stakeholders.
Demonstrate and expand the evidence for the role of park and outdoor recreation services in promoting physical activity and associated preventative health benefits, particularly among youth.
Demonstrate and expand the evidence for the role of park and outdoor recreation services in promoting environmental literacy
among youth, and document the long-term influences of early lifespan connections with nature.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

We created transdisciplinary teams to address planning and design needs
We developed capacities in organizations, communities, and regions through participatory design and planning engaging multiple disciplines from the academy to addressing multiple problems facing stakeholders.
We demonstrated and expanded the evidence for the role of park and outdoor recreation services in promoting physical activity and associated preventative health benefits, particularly among youth.

Briefly describe how your target audience benefited from your project's activities.

We developed community and site design reports for Cowen, White Sulphur Springs, Franklin, Petersburg, Hinton, Clarksburg, Marlinton, Richwood, Clay, and Big Otter. These design reports were used to leverage and gain funding to support implementation of designs for community revitalization.

Briefly describe how the broader public benefited from your project's activities.

This benefits public heath increasing physical activity, building social capital, and oftentimes reusing damaged post-industrial landscapes revitalizing liabilities converting them to assets.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

We are building our students' and fellow faculty members' skills in community engaged scholarship through planning and design projects. The broader public benefits when designed and planned landscapes are built.

We will continue to engage with more communities and revisit past projects in order to build capacities for further development.

We have disseminated our projects and processes through publications and presentations:

Datta, U, Butler. P., Mandal, D. (2020) “Evaluating the Role of Integrated Landscape Planning in Transit-oriented Development Strategies for Reviving Dilapidated Urban Areas: A Case Study of Mullens, West Virginia, USA.” 100 YEARS OF DEEP TIME: CELA 2020. The Council of Educators in Landscape Architecture

Staniscia, S., Orr, L., Yuill, C., Butler, P. (2020) “Gary Hollow, West Virginia, U.S. The vanishing of a landscape of extraction.” Erasure and the Environment Conference, Loughborough University, London (UK), September 17-18, 2020. [Postponed to September 16-17 2021 due to Covid-19]

Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms

Project Director
Peter Butler
Organization
West Virginia University
Accession Number
1015215

2021 Results

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community

Benefits and Mechanisms: The role of the School of Design and Community Development's Community Engagement Lab at West Virginia University (WVU) in collaboration with WVU Extension Services Community and Resource Economic Development team (Doug Arbogast, Michael Dougherty, Daniel Eades) in contributing to the Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms project is to work with West Virginia communities and counties through participatory design and planning processes that will build capacity through recognizing assets and revealing new opportunities for development of those assets tied to outdoor recreation, parks and open spaces. The collaboration will strengthen the understanding of these types of environments and how they contribute to public health, community vibrancy and building relationships between citizens and their natural environment.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

We demonstrated and expanded the evidence for the role of park and outdoor recreation services in promoting physical activity and
associated preventative health benefits, particularly among youth.

We demonstrated and expanded the evidence for the role of park and outdoor recreation services in promoting environmental
literacy among youth, and document the long-term influences of early lifespan connections with nature.

We demonstrated and expand the evidence for the role of park and outdoor recreation services in promoting community vibrancy
and resilience.

Briefly describe how your target audience benefited from your project's activities.

We worked with rural WV communities including: Cowen, White Sulphur Springs, Franklin, Petersburg, Hinton, Clarksburg, Marlinton, Richwood, Clay, Big Otter.and others in providing design services and visualization documents towards project implementation. We created community and site designs for rural WV communities and urban neighborhoods that seek to create healthy living environments that raise the local quality of life and vitalize communities.

Briefly describe how the broader public benefited from your project's activities.

This book chapter will provide guidance to communities in pursuit of their Creative Placemaking efforts.

Butler, P. (2022) Creating Community in Rural West Virginia: the Power of Public Place Production. The Transformative Power of Parks. Sagamore Venture Publishing https://www4.iasnr.org/call-for-contributions-to-edited-book-thetransformative-
power-of-parks/ In Review

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

We will expand partnerships with WVU School of Public Health, WVU Extension Service, WVU CPASS to enhance our efforts, external proposals for funding and project outcomes.

Enhancing Rural Economic Opportunities, Community Resilience, and Entrepreneurship

Project Director
Heather Stephens
Organization
West Virginia University
Accession Number
1015216

Enhancing Rural Economic Opportunities, Community Resilience, and Entrepreneurship

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Increase the understanding of factors that increase rural opportunities and resilience. This includes entrepreneurship, energy, health care, and other factors.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

I have been working on collaborations with researchers from Wisconsin, Ohio, Texas Tech, and Pennsylvania. As of now, I have three working papers that have resulted from these collaborations, one related to the impacts of COVID on entrepreneurship, another more broadly on rural entrpreneurship, and a third on factors associated with labor force partcipation. I am also collaborating on two new projects to look at rural housing markets and minority and female entrepreneurship.

Briefly describe how your target audience benefited from your project's activities.

The working papers were presented at professional conferences for a total of 7 presentations and I hope they will be submitted for review at peer-reviewed journals soon.

Briefly describe how the broader public benefited from your project's activities.

As the research is completed, it will be of value to policymakers and others.

Rural America and the Economic Impacts of Energy, the Environment, Entrepreneurship, and Health Care

Project Director
Heather Stephens
Organization
West Virginia University
Accession Number
1012199

Rural America and the Economic Impacts of Energy, the Environment, Entrepreneurship, and Health Care

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

This project examines several potential drivers of growth or decline and their impact on rural communities, specifically energy development, drug abuse, and entrepreneurship and their relationship to U.S. rural community-level growth.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

A journal article related to opioids and rural development was published in a peer-reviewed journal.

Three other working papers related to entrepreneurship and opioids are underway and being prepared for submission to journals.

Briefly describe how your target audience benefited from your project's activities.

In addition to the journal article and working papers, the research was presented 4 times in 2021.

Briefly describe how the broader public benefited from your project's activities.

As the research is released, it will be of value and interest to the public and policymakers.

Community Revitalization

Project Director
Adeola Ogunade
Organization
West Virginia University
Accession Number
7001911

Calling Community Program Relieves Feelings of Social Isolation Among Seniors and Young Adults

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

COVID-19 pandemic has drastically changed lives across the globe. Social distancing measures adopted to curb the spread of the virus left many with emotional stress and sudden isolation. Older adults are more likely to experience adverse effects of the virus if contracted. Although older adults are more likely to feel isolated and disconnected, COVID-19 further elevated the extent to which they experience isolation and feelings of disconnection. Social isolation has been found to be associated with poor health outcomes including but not limited to dementia, depression, and heart disease among older adults and depressive symptoms among young adults.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The *Calling Community* program pairs college students with older adults to open communication line between the two parties involved via telephone. WVU Extension Service partnered with the WVU Center for Service Learning, the WVU School of Public Health, and the Foster Grandparenting Program of the Mid-Ohio Valley Regional Council. The Foster Grandparenting Program helped to recruit, register, and support senior volunteers to be paired with college student volunteers. Participating college students call their phone partner(s) twice a week for fun open-ended conversation for a full semester. Students complete online orientation, then check in weekly with the program coordinator for support and tips on engaging conversations.

Briefly describe how your target audience benefited from your project's activities.

Eighty-one senior citizens and 59 college students participated in the Calling Community program. Participation increased the social connection of both students and older adults. Approximately 68 older adults reported increased social connections with majority stating the program increased their connections “very much.” Participation in the program also helped to develop communication skills. Of the 59 college students who participated in the program, 54 reported an increase in comfort with communication via phone. Additionally,44students reported shifting perceptions of seniors, often citing a reduction in stereotypical views of older adults. Through a growing network of internal and external partners, the program will continue to address critical health needs in our state. The relationships forged between program participants exemplify the importance of positive connections necessary for a healthier society for all.

Briefly describe how the broader public benefited from your project's activities.

This program has the potential to improve the mental well-being of seniors and young adults in WV.

WVU Extension Rejuvenates Gateway Communities

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The state of West Virginia ranks among the worst deplorable infrastructure and poorest states in the nation. Public issues such as opioid and substance abuse, decreased population, and residual effects of the coal and mining industries led to many abandoned, dilapidated, and vacant buildings in the state. Many counties have been designated to be distressed and nonviable. WVU Extension developed programmatic efforts that will bring resources to communities that are impacted negatively to promote economic viability and community revitalization.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Through a transdisciplinary model, extension professionals worked with gateway communities to develop a formal partnership and a shared strategic vision to collaboratively grow a strong, sustainable recreation economy that enhances the quality of life for residents and visitors by providing the best outdoor experience. WVU Extension worked in partnership with the communities in developing plans that were used for community revitalization grant applications. Extension professionals also provided technical assistance to locally owned businesses and entrepreneurs to acquire business loans.

Briefly describe how your target audience benefited from your project's activities.

Our efforts to build partnerships across community development networks in WV yielded the following results:

- In Marlinton WV, a community space was designed and constructed to support local farmers market, a performance venue, and children’s play area.
- In Cowen WV, access to the B&O reservoir was improved to promote tourism activities
- In Tucker County, we created a model for community engagement that was administered in ten gateway communities.
- Collaborative and training efforts in our targeted communities yielded approximately $1.3 million private grant to support entrepreneurial development in our targeted gateway communities. These grants served 136 businesses, 102 jobs were created/retained, 50 businesses were supported through COVID-19, and $1.57 million in loans closed.

Briefly describe how the broader public benefited from your project's activities.

This program helps communities thrive by building human, community, and regional capacities to foster economic, social, and financial developments.

WVU Extension Rejuvenates Gateway Communities

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Briefly describe how the broader public benefited from your project's activities.

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Critical Issue

Food Access, Security and Safety / Sustainable Agriculture

Closing Out (end date 09/07/2023)

Evaluation of the Safety and Health Benefits of Apple Pomace and Development into Food Products for Human Consumption

Project Director

Janet Tou

Organization

West Virginia University

Accession Number

1017641

Evaluation of the Safety and Health Benefits of Apple Pomace and Development into Food Products for Human Consumption

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

our research is to investigate the feasibility of repurposing apple pomace for human consumption by determining its safety, nutritional value, health properties and consumer acceptance of products made with apple pomace. We hypothesize that apple pomace can be developed into safe, healthy, and tasty snack food for human consumption

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

We performed preclinical studies replacing calories in standard or Western diets with apple pomace to determine the effects on liver and brain health. Study 1 was completed in 2018 and the published paper showed that substitution of as Western diet with 10% kcal of apple pomace reduced non-alcoholic fatty liver disease (NAFLD), the leading cause of liver disease globally. This was attributed to the soluble fiber reducing absorption of lipids and reducing substrate available for hepatic triglyceride synthesis. However, the high fructose content of apple pomace may potentially increase risk of inflammation. Study 2 that substitution of as Western diet with 10% kcal of apple pomace resulted in down-regulation several hepatic inflammatory genes due to the antioxidant content of apple pomace. NAFLD has been suggested to be linked with brain structure and function. Study 3 completed in 2021 employed RNA-sequencing (RNASeq) technology to investigate diet-gene interactions in the hypothalamus of rats after feeding a Western diet calorically substituted with apple pomace. The results showed diet induced NAFLD decreases hepatic de novo synthesis of choline, a precursor to the neurotransmitter, acetylcholine. Based on preclinical evidence, apple pomace has the potential to be a sustainable functional food for maintaining brain function and for reducing the risk of neurodegeneration

Briefly describe how your target audience benefited from your project's activities.

The results have been presented at local research symposiums and will subsequently published in nutrition journals. Ayad Alawadi fully funded by the Kuwait Government successfully completed his MS thesis project entitled "Effect of Western Diet and Caloric Substitution with Apple Pomace on Fatty Acid Composition and Gene Expression in the Hypothalamus of Growing Female Sprague-Dawley Rats" was submitted for publication in 2021 and accepted pending revisions.

Briefly describe how the broader public benefited from your project's activities.

The clinical significance is that simple dietary modifications can contribute to brain health through prevention or reversal of NAFLD, the most prevalent chronic liver disease worldwide with associations to neurodegeneration. Thus, apple pomace merits further study as a sustainable functional food with the potential to benefit brain health as well as environmental health.

Critical Issue

Food Access, Security and Safety/Sustainable Agriculture

Integrated Approach to Enhance Efficiency of Feed Utilization in Beef Production Systems

Project Director

Matthew Wilson

Organization

West Virginia University

Accession Number

1025826

Integrated Approach to Enhance Efficiency of Feed Utilization in Beef Production Systems

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Today the state-of-the-art approach to measuring forage disappearance is limited to group assessment and tedious and time-consuming manual and laboratory efforts. Tools are needed to allow for individual intake estimation in group housed systems that better reflect grazing conditions. The field would also benefit from an approach that reduced the manual labor demand of traditional approaches. The project is addressing the need to develop advanced tools to indirectly measure pasture DMI by beef cattle using autonomous data collection (water intake, weight, weight gain, climate, etc.) and advanced analytical techniques, including machine learning. Additionally, as a co-product of this work we have collected data on water intake sufficient to model estimated water intake for contemporary groups and begin to assess relative water use efficiency within each group of animals tested.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

We have collected data on over 800 animals in confinement to calibrate models to reliably predict dry matter intake in a situation where we are able to easily measure it accurately. To date we have been able to reliably predict daily dry matter intake to within 1 kg/day and average dry matter intake throughout the test period to within 0.3 kg/day. We will continue to refine the modeling in the next fiscal year and expect the first papers to be published in the next fiscal year. We have also demonstrated that the residual water intake (RWI) for a given test group varies by as much as -6 to +10 liters below or above the predicted intake for groups of animals. In a 49 day test that equates to a 784 liter differences in water consumption between the least and most efficient animal. On an annualized basis that is a 5,844 liter (1,546 gallons) difference in water consumption between the least and most efficient animal.

Briefly describe how your target audience benefited from your project's activities.

An abstract of the data was presented at the American Society of Animal Science meeting in 2021. In addition, data was presented as part of the WVAFES station report during the W3010 meeting and an expanded version of that presented at a meeting organized in advance of the National Cattlemens Beef Association. Manuscripts are in preparation and should be submitted in fiscal year 2023.

Briefly describe how the broader public benefited from your project's activities.

To date the porject has not gotten to the point of producing information for consumption by the general public. In FY 23 we should begin sharing the data with producers and helping them understand what water use efficiency means and how it varies in their populations. In time, sufficient data should lead to selection capacities to improve water use efficiency.

Mycotoxins in a Changing World

Project Director
Daniel Panaccione
Organization
West Virginia University
Accession Number
1025230

Mycotoxins in a changing world

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Specialized metabolites, inlcuding ergot alkaloids, produced by fungi contaminate food and feed in agriculture, but also in some cases may be used for development of helpful pharmaceuticals. We studied the synthesis of ergot alkaloids in fungi from soil and from fungi associated with plants as mutualistic symbionts to understand their biosynthetic pathways and ecological signficance.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

We studied accumulation of ergot alkaloid from heritable symbiotic fungi (Periglandula species) in plants belonging to the Convolvulaceae (morning glory family). A broad survey conducted in collaboration with Dr Keith Clay of Tulane University showed that ergot alkaloids were found primarily in four groups of morning glories. We found ergot alkaloids in 36 species for the first time, and the data indicated that ergot alkaloid-producing, fungal symbionts had been acquired and lost by plants multiple times over evolutionary history. Ergot alkaloids were more likely to be found (and found in higher concentrations) in species that produced larger seeds. This observation is consistent with the defensive symbiosis hypothesis in which plants harboring defensive fungal symbionts have higher fitness than those that lack symbionts under conditions that promote predation (in this case, defending seeds in which significant resources have been invested). In a separate study, we found ergot alkaloids in three new species of the fungal geneus Aspergillus. The particular class of ergot alkaloids (lysergic acid amides) found in these species had not previously been detected in fungi outside the family fungal Clavicipitaceae (the ergot fungi). Analyses of sequence data indicated that the final few steps of the lysergic acid amide biosynthetic pathway evolved independently in the recently-found Aspergillus species compare to the ergot alkaloid producing fungi of the Clavicipitaceae.

Briefly describe how your target audience benefited from your project's activities.

Our data show that ergot alkaloids are found in more species of fungi, occupying different niches, than known previously. The data also suggest that ergot alkaloids provide protective functions to plants that harbor symbiotic fungi. Roles in protecting plants from pests have to be considered in managing systems to reduce ergot alkaloid accumulation.

Briefly describe how the broader public benefited from your project's activities.

New sources of ergot alkaloids and ergot alkaloid biosynthetic genes were discovered. Understanding how ergot alkaloids are made provides the opportunity to manage them to minimize negative impacts in agriculture or manipulate them for pharmaceutical production.

Modeling dry matter intake in grazing beef cattle.

Project Director
Matthew Wilson
Organization
West Virginia University
Accession Number
1024859

Modeling dry matter intake in grazing beef cattle.

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Today the state-of-the-art approach to measuring forage disappearance is limited to group assessment and tedious and time-consuming manual and laboratory efforts. Tools are needed to allow for individual intake estimation in group housed systems that better reflect grazing conditions. The field would also benefit from an approach that reduced the manual labor demand of traditional approaches. The project is addressing the need to develop advanced tools to indirectly measure pasture DMI by beef cattle using autonomous data collection (water intake, weight, weight gain, climate, etc.) and advanced analytical techniques, including machine learning. Additionally, as a co-product of this work we have collected data on water intake sufficient to model estimated water intake for contemporary groups and begin to assess relative water use efficiency within each group of animals tested.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

We have collected data on over 800 animals in confinement to calibrate models to reliably predict dry matter intake in a situation where we are able to easily measure it accurately. To date we have been able to reliably predict daily dry matter intake to within 1 kg/day and average dry matter intake throughout the test period to within 0.3 kg/day. We will continue to refine the modeling in the next fiscal year and expect the first papers to be published in the next fiscal year. We have also demonstrated that the residual water intake (RWI) for a given test group varies by as much as -6 to +10 liters below or above

the predicted intake for groups of animals. In a 49 day test that equates to a 784 liter differences in water consumption between the least and most efficient animal. On an annualized basis that is a 5,844 liter (1,546 gallons) difference in water consumption between the least and most efficient animal.

Briefly describe how your target audience benefited from your project's activities.

An abstract of the data was presented at the American Society of Animal Science meeting in 2021. In addition, data was presented as part of the WVAFES station report during the W3010 meeting and an expanded version of that presented at a meeting organized in advance of the National Cattlemens Beef Association. Manuscripts are in preparation and should be submitted in fiscal year 2023.

Briefly describe how the broader public benefited from your project's activities.

To date the project has not gotten to the point of producing information for consumption by the general public. In FY 23 we should begin sharing the data with producers and helping them understand what water use efficiency means and how it varies in their populations. In time, sufficienct data should lead to selection capacities to improve water use efficiency.

Inactivation of Foodborne Pathogens by Chemical and Physical Interventions in West Virginia Locally processed Chicken Products and Related Cost-effectiveness Analysis

Project Director
Cangliang Shen
Organization
West Virginia University
Accession Number
1023874

Inactivation of Foodborne Pathogens by Chemical and Physical Interventions in West Virginia Locally processed Chicken Products

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Evaluate the thermal inactivation activity of *Salmonella* and the surrogate *Enterococcus faecium* on moisture enhanced chicken products and chicken feeds.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Two PhD students Wentao Jiang and Tim Bolts, one MS student Alik Browning was invloved in this grant projects. Wentao Jiang sucessfully defended Summer 2021, Tim Bolts completed his PhD preliminary exam. We published two peer-review publications and three national and international food science/poultry science conferences.

Peer-review publications.

1. Timothy Boltz, Joseph Moritz, Victoria Ayres, Casey Showman, Jacek Jaczynski, and Cangliang Shen. 2021. Modeling thermal inactivation of *Salmonella* Typhimurium in poultry feed. ***Journal of Applied Poultry Research***, 20, Article 100208.

2. Wentao Jiang, Carly Waldman, KaWang Li, Jacek Jaczynski, and Cangliang Shen. 2021. Survival of *Salmonella* and the surrogate *Enterococcus faecium* in Cooking of Moisture Enhanced Reconstructed Comminuted Chicken Patties by Double Pan-broiling. ***Poultry Science***, 100, Article 101171.

Conference Abstracts

1. Tim Boltz, Victoria Ayres, Cangliang Shen, and Joe Moritz. Modeling the thermal inactivation of *Salmonella* reduction in poultry feed in a lab-based water bath. ***2021 Poultry Science Association Annual Meeting***, July 19-22nd (Virtual).

2. Wentao Jiang, Carly Waldman, and Cangliang Shen. Impact of Set-up Temperatures and Pump Rates for survivals of *Salmonella* and the surrogate *Enterococcus faecium* in Moisture Enhanced Reconstructed Chicken Patties after Double Pan-broiling. ***2021 Annual Meeting of the International Association of Food Protection.*** July 18-21, Phoenix, Arizona

We completed the following projects

Project 1. It aims to compare kinetic parameters of *Salmonella* and *Enterococcus faecium* in moisture enhanced and reconstructed comminuted chicken patties with different pump rates during double pan-broiling with various set-up temperatures. Fresh 1.5-kg chicken breast meat was course grounded, inoculated with *S.* Typhimurium and Tennessee, or *E. faecium*, followed by adding NaCl (2.0%) + Na-tripolyphosphate (0.5%) solutions to achieve pump rates of 1%, 5% or 11.1%. Meat samples were manually manufactured into patties with the thickness of 2.1 cm and diameter of 10.4 cm. Patties were packaged with polyvinyl chloride films in the foam-tray stored at 4°C for 42 h before double pan-broiling set at 200, 300, or 425oF for 0 to 420 s. Counts of pathogens were analyzed on XLT-4 and bile esculin agars with tryptic soy agar layers. Microbial data and kinetic parameters (n=9, USDA-Integrated-Predictive-Modeling-Program/USDA-Global-Fit software) were analyzed by the Mixed Model Procedure (SAS). Double pan-broiling reduced >5-log10CFU/g ($P < 0.05$) of *Salmonella* after 360 (200oF), 180-225 (300oF), and 150-165s (425oF), and of *E. faecium* after 270s (300oF), and 180s (425oF) across all samples. D-values (Mafart-Weibull model) of *Salmonella* and *E. faecium* in 1% moisture enhanced samples cooked at 200-425oF (102.7-248.2 and 115.5-271.0 s) were lower ($P < 0.05$) than 11.1% samples (119.8-263.7 and 122.5-298.3 s). *Salmonella* were more susceptible ($P < 0.05$) to heat than *E. faecium*. “Shoulder-time” (Buchanan-Two-Phase model) of *Salmonella* cooking at 200-425oF increased ($P < 0.05$) from 82.3-229.0 to 116.6-246.2 s as pump rate increased from 1 to 11.1%, whereas this phenomenon was not shown for *E. faecium*. Results indicate that *Salmonella* were resistant to heat in chicken patties with greater pump rate. *E. faecium* can be used as a surrogate for *Salmonella* in thermal inactivation validation studies of chicken products.

Project 2. We Modeled thermal inactivation of *Salmonella* Typhimurium in poultry feed. In study 1, 2- and 5-gram feed samples, contained in a sample bag, were inoculated with *S.* Typhimurium and submerged in a water bath heated to 90°C until internal temperatures of 75, 80, and 85°C were reached. In study 2, 2-gram samples were inoculated with *S.* Typhimurium and submerged into a water bath set at 75, 80, 85, 90, and 95°C heated for 0 to 180s. Feed sample and water bath temperature were monitored by thermocouples. Thermocouple data demonstrated 2- and 5-gram samples achieved a 5-log reduction of *S.* Typhimurium when internal temperature of feed reached 80°C and 85°C, respectively. D-values for linear and Weibull models were calculated for the 5 temperatures. D-values of the linear model were 6.70, 8.83, 12.05, 13.91, and 24.40s, and D-values for the Weibull model were 2.27, 3.67, 3.95, 4.68, and 7.63s when heated to 95, 90, 85, 80, and 75°C. Individual temperature datasets were further analyzed using GinaFit software. As heating temperature decreased, Double-Weibull and Biphasic models fit all the thermal data, indicating that *Salmonella* could have generated two subpopulations with different thermo-resistance. Similar to other thermal inactivation models, this study demonstrates that linear, Weibull, Double-Weibull, and Biphasic models could be used to predict thermal inactivation of *Salmonella* in poultry feed.

Project 3. We evaluated the thermal kinetic parameters of *Salmonella* in MH-reconstructed ground chicken patties as affected by temperatures and salt concentrations. Fresh 500 chicken breast was grounded, inoculated with Nalidixic-acid (NaL-200 ppm) resistant *Salmonella* Typhimurium followed by adding NaCl (1.0 and 3.0%) + Na-tripolyphosphate (0.5%) solutions to achieve pump rates of 8%. Samples were than weighted for 10-gram and added into filtered food sample bags vacuum packaged and followed by storing at 4°C for 42-h before heating in a circulated water bath set at 62, 66, 70, and 74oC for 0, 15, 25, 30, to 180-s, respectively. Counts of the pathogen cells were analyzed on tryptic soy agars plus NaL-200 ppm. Microbial survival populations and thermal inactivation kinetics (USDA-Global-Fit software) were analyzed by the Mixed Model Procedure (SAS, n=8, 2-repeats, P=0.05). Thermal dynamic data fit Weibull Model (RMSE=0.5163 to 0.7381 and AIC values=-44.026 to -8.868), but not the linear model (RMSE >1.000). Calculated D-values of chickens with 1.0% and 3% salt decreased (P<0.05) from 126.4±14.2, 44.6±6.9, 32.3±3.6, to 30.4±4.9 sec, and decreased (P<0.05) from 171.0±15.2, 56.4±5.7, 29.3±6.5, and to 24.8±4.9 sec, when heating temperatures increased from 62, 66, 70, to 74oC, respectively. D62 and D66 values of 3% salt samples were greater (P<0.05) than 1% salt samples, whereas their D70 and D74 values are similar (P>0.05).

Briefly describe how your target audience benefited from your project's activities.

Results of completed projects will be useful by the poultry meat and chicken feeds industry to develop proper thermal processes to eliminate Salmonella in moicture enhanced chicken products and feeds.

Briefly describe how the broader public benefited from your project's activities.

The quantitative data regarding home cooking practices to control *Salmonella* in chicken products fullfill the main date gap of safely cooking and handling poultry products as pointed out by WHO/FAO in 2009.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Covid-19 pandemic did have major impact of the project, but we tried our best to conduct the project as much as we can to follow the timeline. We inlcuded feeds project during FY2021 since it is the major issue from WV poultry industry.

Agricultural and Rural Finance Markets in Transition

Project Director
Ana Claudia Sant'Anna
Organization
West Virginia University
Accession Number
1021884

Agricultural and Rural Finance Markets in Transition

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Farmer's financial stress and strategies are impacted by events such as variations in commodity prices (e.g. price boom in 2007-2013) and government policy (e.g. tighter agricultural credit regulations). Increased credit regulations were put into place
after the 1980s. During the farm crisis, in the 1980s, farm asset prices and farm wealth declined forcing many farmers into bankruptcy and exit with negative consequences for rural economies. Current events (e.g. increased tariffs on agricultural commodities and considerable agricultural and macroeconomic policy uncertainty) have led many to question whether a similar
crisis could be in the near horizon.
Access to credit and greater credit availability can provide a means for new and beginning farmers to gain access to land and start a farming business. The availability and use of credit by farmers, rural businesses, and agribusinesses has a critical impact
on their long-term sustainability and competitiveness. Credit access can also have affect rural communities by impacting employment opportunities (i.e. agribusiness) and migration. Increased migration from rural communities could signify a reduced
number of younger generation farmers. Many young farmers will need access to credit to start or grow their operations. Work is,
also, needed to determine how to value and manage credit reserves in agriculture as well the implications of a new generation
of borrowers entering agriculture. Another aspect of credit use is its effects on other farm assets such as land values. Increased
credit availability may make it easier to purchase land, though it can also increase land values, via increased demand for land, increasing the difficulties in acquiring land. Work is needed to determine the relationship between credit, land values and farmers' decisions. The amount of credit available along with borrowing costs can have a direct effect on reducing the choices available to farmers and agribusinesses. Upon completion of the project, insights will be gained to provide insights to policy makers, producers and rural residents.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Major activities help me collect, analyze and contribute to the literature. Below I describe specific contributions.

A paper was published looking at the effect of Covid-19 disruptions to stock markets. Research was also published in relation to the effect of credit availability on land value as well as farmer contract choices. Government lending programs during Covid-19 findings were published. Below accomplishments during 2021:

Sant'Anna, A.C., Katchova, A. L., Cowley, C. "Exploring the relationship between land values and credit availability" Journal of Agricultural and Applied Economics, 2021:1-20

Nguemgaing, H.* and Sant'Anna, A.C. 2021 "The Impact of Supply Chain Disruptions on Stock MarketReturns during Covid-19" Agriculture Finance Review. 2021: Vol. ahead-of-print No. ahead-of-print.

Sant'Anna, A.C., Demko, I. Can FinTech and Non-Traditional lenders increase credit access in Agriculture? Evidence from the Paycheck Protection Program. Presentation at the 2021 AAEA Annual Meeting in Austin, TX

Demko, I; Sant'Anna, A. C., Liang, K. (2021) "An Overview of the Paycheck Protection Program (PPP) Loans and Implications to Agricultural Enterprise Recovery from COVID" Journal of Agriculture, Food Systems, and Community Development.

Sant'Anna, A.C., Bergtold, J.S., Shanoyan, A., Caldas, M.M., Granco, G. 2022 "Biofuel feedstockcontract attributes, substitutability and tradeoffs in sugarcane production for ethanol in the Brazilian Cerrado: A stated choice approach" Renewable Energy. pre-print available

Briefly describe how your target audience benefited from your project's activities.

Research has been published and presented in conferences. It has brought knowlegde and solutions to academics, farmers, bankers and policy makers.

Briefly describe how the broader public benefited from your project's activities.

Research published in non-peer reviewed journal as well as a working paper on the paycheck protection program was led to the invitation of the first author, Iryna Demko, to present findings in front of the U.S. House Committee on Small Business.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Work with graduate students has allowed them to become familiar with financial datasets, literature and software coding. Students have also been exposed to empirical methods used in agricultural finance. One student received a prize for their poster on stock markets and Covid-19.

Characterization and Modification of Volatile Organic Compound Traits in Horticultural Crops to Improve Biotic Interactions and Fruit Flavor

Project Director
Michael Gutensohn
Organization
West Virginia University
Accession Number
1021574

Characterization and Modification of Volatile Organic Compound Traits in Horticultural Crops to Improve Biotic Interactions and Fruit Flavor

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Volatile organic compounds (VOCs) are a class of compounds synthesized by plants that are readily emitted into the surrounding environment. In crop plants VOCs are important for aspects such as sustainable protection against pests, attraction of pollinators required for fruit set and quality, and the flavors of fruits and other produce. The overarching objective of this proposal is therefore to identify and characterize such VOC traits in different accessions of horticultural crops as well as closely related wild plant species, and subsequently re-introduce or modify these in crop plants by genetic crosses or by metabolic engineering.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Objective 1: We have used a collection of wild tomato accessions (i.e. *Solanum habrochaites*) that accumulate distinct terpenes and have identified two sesquiterpene traits that significantly affect the longevity, reproduction and feeding behavior of the potato aphid (*Macrosiphum euphorbiae*). Since one of these groups of sesquiterpenes is also found in cultivated tomato (*S. lycopersicum*), however at much lower amounts, we have used respective mutants defective in terpene accumulation to further verify the defensive activity of terpenes in tomato.

Objective 2: Next we have designed two expression constructs containing respective prenyl transferases and terpene synthases that will allow the formation of the identified active sesquiterpenes, as well as green fluorescent protein as visual expression marker. Both contructs were put uner the control of three different tissue specific promoters: the glandular trichome specific SlTPS9 promoter, the epidermis specific AtCER5 promoter, and the phloem companion cell specific AtSUC2 promoter. The function of both constructs was verified by transient expression under the AtCER5 promoter in tomato leavs.

Objective 7: We collected and analyzed VOCs from flowers of black cherry (*Prunus serotina*). A comparison of this floral VOC profile with those from flowers of other Rosaceae fruit crops demonstrated high conservation among this plant family. In parallel we characterized the assemblage of insects visiting the canopy of flowering black cherry trees to identify potential pollinators. In contrast to other Rosaceae fruit crops black cherry flowers attracted large numbers of flies as well as some butterflies, however, almost no bees.

Briefly describe how your target audience benefited from your project's activities.

Publications:

Wang F., Park Y.L., and Gutensohn M.‡ (2020). Glandular trichome-derived sesquiterpenes of wild tomato accessions (*Solanum habrochaites*) affect aphid performance and feeding behavior. Phytochemistry 180, 112532.

Wang F., Park Y.L., and Gutensohn M.‡ (2021). Glandular trichome-derived mono- and sesquiterpenes of tomato have contrasting roles in the interaction with the potato aphid *Macrosiphum euphorbiae*. Journal of Chemical Ecology 47, 204-214.

Larcenaire C., Wang F., Holásková I., Turcotte R., Gutensohn M., and Park Y.L.‡ (2021). Characterization of the insect assemblage and associated floral volatiles of black cherry (*Prunus serotina*). *submitted*

Wang F., Park Y.L., and Gutensohn M.‡ (2021). Epidermis-specific metabolic engineering of sesquiterpene formation in tomato affects the performance of potato aphid *Macrosiphum euphorbiae*. *submitted*

Presentation:

Entomology 2020, ESA Annual Meeting: The contrasting roles of trichome-derived monoterpenes and sesquiterpenes in the interaction of cultivated tomato and potato aphid (poster presentation).

Briefly describe how the broader public benefited from your project's activities.

The identification of the defensive sesquiterpene traits in wild tomato accessions now allows us to introduce these into cultivated tomato. This will ultimately lead to more sustainable ways of pest control.

The identification of pollinators and their attraction to black cherry is a first step towards solving the current problem in regeneration of this economically important timber tree species.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to

communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Progress on several of the projects (objectives 4, 5 and 6) during this reporting period was limited due to the ongoing Covid 19 crisis and respective restrictions.

Feed manufacture effects on pellet quality, hygienics, and nutrient availability

Project Director
Joseph Moritz
Organization
West Virginia University
Accession Number
1020437

Professor

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Meat-type poultry are fed pelleted diets; however, proper manufacture of pellets is critical to improve performance, maintain nutrient digestibility, and reduce pathogens that may be associated with feed ingredients. This project takes a comprehensive approach at recommending proper feed manufacture techniques that ultimately will feed meat-type poultry more efficiently and improve overall economics of production.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Publications and workshops have educated industry professionals and academics on improving feed manufacture techniques to more efficiently feed meat-type poultry and improve economics of production.

Briefly describe how your target audience benefited from your project's activities.

In 2021, a symposium audience well received this information. In addition, presentations provided to feed manufacture professionals was well received. These groups likely further recommended the techniques discussed and implented new practices in commercial pellet production.

Briefly describe how the broader public benefited from your project's activities.

The broad public benefits by maintaining access to affordable, abundant, and safe meat-type poultry products.

Spatiotemporal Interactions among Mile-A-Minute Weed, Its Natural Enemy, and Environment

Project Director
Yong-Lak Park
Organization
West Virginia University
Accession Number
1018878

Spatiotemporal Interactions among Mile-A-Minute Weed, Its Natural Enemy, and Environment

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

For the successful long-term management of invasive pests, it is necessary to predict the likelihood of establishing and spreading under different environmental and biological conditions at a landscape scale. This five-year research project was designed to identify the landscape-level environmental and biological drivers of mile-a-minute weed (MAM) invasion and how these drivers interact with an introduced natural enemy, the mile-a-minute weevil (MAM weevil).

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

To map the distribution of mite-a-minute weed (MAM) with UAS, we utilized two criteria to detect MAM patches from the aerial photos taken by UAS: 1) the equilateral triangular shape without lobes or indentations of MAM leaves on stem with nodes and 2) the distributional pattern of MAM forming a large monoculture. Before flying the drone at the site, a ground-truth was performed to mark the centroid of each plot. The aerial images were taken vertically from the centroid points at 15 different altitudes (from 5 m to 100 m). Each of 15 images was collected from 13 plots to determine the detectability of MAM by aerial imagery. The detectability was determined by a unique feature of the triangular leaves on each aerial image; when the margins of the triangular leaf were not straight or distorted, it was considered as nondetectable. In addition, the number of pixels per centimeter on images was counted using Photoshop to set the detection threshold. Aerial images were taken at 15 different altitudes to determine the detectability of MAM from other plants in the landscape. The size of each pixel on the image was ca. 0.13, 0.25, 0.35, 0.46, 0.60, 0.70, 0.84, 0.95, 1.07, 1.19, 1.39, 1.63, 1.83, 2.08, and 2.27 cm/pixel for 5, 10, 15, 20, 25, 30, 35, 40, 45, 50, 60, 70, 80, 90, and 100 m above the ground, respectively. At 5, 10, and 15 m above the ground, MAM was readily detectable from the images. Detection of MAM on images taken at 20 m above the ground was successful 46% of the time, and all of the images taken at higher altitudes were too blurred to detect MAM. These results suggest that MAM is detectable from aerial photos taken at ≤15 m above the ground or with a resolution of ≥0.35 cm/pixel.

Briefly describe how your target audience benefited from your project's activities.

Findings from the research were published in two journals: Journal of Economic Entomology and Northwestern Naturalist. In addition, the results of the research were presented at an entomology conference as well as at the Entomology Seminar Series at West Virginia University.

Briefly describe how the broader public benefited from your project's activities.

The project was presented to more than >100 people including K-12 students and a woodland owners association through the outreach program at the WVU Insect Zoo and Museum and WVU Entomology.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

One professional staff and two graduate students were trained for UAS technology that can be used for aerial survey of invasive plants.

Value-Added Ingredients from Repurposed Underutilized Resources

Project Director
Kristen Matak
Organization
West Virginia University
Accession Number
1018522

Value-Added Ingredients from Underutilized Resources

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Protein-energy malnutrition (PEM) is a condition where both protein and calorie needs are not being met and results in the reduction of key body functions. This condition in children is most often marked by stunted growth. A growing new source of protein whose potential has not yet been realized is that from insects. The most common delivery method of insect protein is by creating whole-insect powders (i.e., insect flours). These flours are typically rich in protein and fat and also some vitamins and minerals; however, they also contain chitosan/chitin which is a potential allergen.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Separation and concentration of proteins and lipids from the whole insect will be done using a pH shift process to separate protein and degumming by hydration or one-step organic solvents to separate lipids, respectively.

Briefly describe how your target audience benefited from your project's activities.

The target audience of this project continues to be graduate and undergraduate students. They benefit by gaining science-based knowledge through laboratory, practicum experiences, and formal classroom instruction.

Briefly describe how the broader public benefited from your project's activities.

The broader public benefited because the foundation of knowledge in this field has been expanded through publications of our work.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

The focus of this project has shifted slightly to include research on the insect-rearing stage. It is our hypothesis that food industry waste (like apple pomace) can be used as a supplement to normal insect feed and yield insects with similar proximate compositions as their traditionally fed counterparts.

Food Access, Security and Safety/Sustainable Agriculture

Project Director
Adeola Ogunade
Organization
West Virginia University
Accession Number
7001906

WV Women in Agriculture Increased their Farm Profitability

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

According to the 2017 Census of Agriculture, in West Virginia there are currently 13,498 female producers and of that number, 8,639 are principal producers of their operations. Some challenges women in agriculture encounter includes receiving lower profitability, limitations to partnership building opportunities, and balancing multiple responsibility roles. Agricultural educators may under-serve women in the industry through assumptions of what information will be useful to them especially when paired with gender and farming stereotypes. Addressing these challenges and the needs of women producers is why West Virginia University Extension Service developed the Women in Agriculture Annual Conference.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The Women-in-Agriculture Conference is a two-day conference that rotates around the state of West Virginia. On the first day, participants tour local farms for peer-to-peer networking on production practices. On the second day, participants attend educational sessions on risk management that focus on either horticulture, livestock, finance, or marketing topics.

Briefly describe how your target audience benefited from your project's activities.

A post-conference evaluation survey was sent out to women who participated in the conference. Of those who responded to the survey, 46 women reported at least a 20% increase in farm profitability. The increased profitability was attributed to keeping and using their farm records, selling to new markets, improving marketing strategies, and increasing production levels. Participation led to 85 women farmers diversifying their farming operation by expanding their horticulture operation, increasing value-added projects, adding a new livestock enterprise, or expanding their existing livestock enterprise. Forty-two participants implemented risk management strategies on their operations and reported associated benefits with this change. These benefits include reducing input costs, increasing farm income, and reducing liability. Also, 27 farmers implemented grazing management techniques, and 42 women made changes in horticultural productions practices such as planting cover crops and using IPM strategies. 71 respondents actively sought to improve their soil health, with almost half of these respondents reporting taking routine soil tests. In addition to learning new techniques and improving their operations, participants felt it was really good to come in contact with other women who enjoy farming operations citing WIA conference has a great network opportunity for women farmers in the state of West Virginia.

Briefly describe how the broader public benefited from your project's activities.

On average, 1 in 7 people and 1 in 5 children in WV are food insecure. Addressing the needs of women farmers in WV enhances food production efforts geared toward battling food insecurity in the state.

West Virginia Extension Educates High Tunnel Producers on Year-Long Food Production Practices

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

There are over 850 high tunnels in West Virginia. Utilizing a high tunnel allows farmers to extend their growing season and increase their profits. By incorporating a high tunnel, they are able to provide fresh produce year-round. High tunnels provide protection from extreme weather conditions like high winds, heavy rains, snow, drought, and hail. They also provide needed shade to protect crops from heat and sunscald. Adding a high tunnel to any operation can satisfy the need for food production sustainability.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

WVU Extension high tunnel lunch n' learn series was developed. Due to a global pandemic and the halt in face-to-face programming, this series was offered virtually over zoom. The series consisted of four educational sessions and one round table discussion. Sessions were taught by WVU Extension Specialists and agents covering setting up and operating. marketing, disease and pest management, and soil and nutrient management. Classes were roughly an hour-long during the lunch hour. If participants were not able to attend the live session, recordings were sent out after to be viewed at their leisure. 280 individuals registered for the program.

Briefly describe how your target audience benefited from your project's activities.

Farmers indicated that they increased their knowledge on production practices. At follow-up, farmers indicated that they planted cool and warm season crops, scouted for disease, took a soil test, and kept useful records. Assessment of the year 2020 growing seasons showed that farmers planted cool and warm season crops totaling 11,712lbs at an estimated value of $21,954.78. The high tunnel program series will continue to educate producers on production practices needed for a high yield.

Briefly describe how the broader public benefited from your project's activities.

This is an integrated effort targeting small and beginning high tunnel producers at the grassroots, and empowering them to combat food insecurity in rural West Virginia.

Critical Issue

Health Disparities

Improving the health span of aging adults through diet and physical activity.

Project Director

Melissa Ventura-Marra

Organization

West Virginia University

Accession Number

1021322

No. 2-"Improving the health span of aging adults through diet and physical activity."

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Aging adults face numerous barriers towards achieving optimal health and wellness including chronic disease. Middle aged adults today are more likely than the previous generation to enter old age with conditions associated with cardiovascular disease including obesity, diabetes, hypertension and hypercholesterolemia. Culturally targeted nutrition interventions to improve diet quality and reduce obesity among middle-aged adults are needed, especially in health disparate areas like WV.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Data analysis was performed to evaluate factors in a telenutrition weight loss intervention program associated with weight loss among participants of a 12 week telenutrition intervention for middle-aged and older men. The data will be used to inform future studies.

Briefly describe how your target audience benefited from your project's activities.

Professional development: increased undergraduate and graduate student knowledge and skills.

Briefly describe how the broader public benefited from your project's activities.

Not Provided

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Not Provided

Health Disparities

Project Director

Adeola Ogunade

Organization

West Virginia University

Accession Number

7001908

Don't Wait, Vaccinate!

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

West Virginia gained public attention for its initial success in administering Covid-19 vaccinations efficiently. However, West Virginia has now fallen behind the nation as state officials try to address vaccine hesitancy and barriers to access. According to the state Department of Health and Human Resources (DHHR) data, West Virginia's rate of seniors vaccinated now trails the rest of the nation.?A subset of seniors in West Virginia are grandparents taking care of their grandchildren. WV has the second-highest rate in the country for grandparents raising their grandchildren. Grandparents struggle with getting updated? knowledge and resources necessary to make informed decisions about raising their grandchildren. COVID-19 has added another layer of distress for these families. Targeting these families potentially draws us closer towards educating the whole family as COVID-19 vaccination efforts migrate to the younger population.???

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

West Virginia University and West Virginia State University partnered to improve vaccination rates and decrease vaccine hesitancy among Grandparents raising their grandchildren. We focused our efforts on grandparents raising their grandchildren belonging to at least one of the categories defined by our assessment variables (health outcome, poverty level, and demographics). This informed our choice of Clay, Kanawha, Mercer, and McDowell counties in WV. It also allowed us to indirectly reach grandchildren in the care of our targeted grandparents. We provided COVID-19 focused educational sessions with grandparents raising their grandchildren in Mercer, McDowell, Clay, and Kanawha County.

Briefly describe how your target audience benefited from your project's activities.

On average, grandparents improved their trust and confidence in vaccines. They also perceived vaccines to be highly beneficial. The post-evaluation survey of our educational event indicated that all participants increased their knowledge of COVID-19 vaccines. 76% of program participants reported that they were comfortable with getting their grandchildren vaccinated against COVID-19. This preliminary effort has indirectly reached 141 grandchildren in kinship care.

Briefly describe how the broader public benefited from your project's activities.

This program has the potential to decrease the COVID-19 infection and mortality rates among adults and youth, thereby saving lives and promoting the overall health of West Virginians.

FARMacy Provides Health and Nutrition Education in WV Communities

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Over 19% of West Virginians live in poverty which is about 5.7% higher than the national average. For many counties, grocery shopping entails visiting convenience and "dollar" stores offering minimal fresh produce. The high poverty rate and limited access to healthy food have rendered most of these communities vulnerable to poor health outcomes such as high rates of diabetes, obesity, and cardiovascular diseases. To decrease the rates of these silent killer diseases, WVU Extension developed an innovative program that will improve access to healthy foods and expose program participants to physical activities necessary to lead a healthy life.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

FARMacy, a 15-week program collaborates with community health centers to provide nutrition classes through food demonstrations and physical activities. Every program participant gets $30 worth of fresh produce from farmers partnering with the program. Educators use fresh produce from participating farmers for food demonstrations. At the beginning and end of each program cycle, participants undergo free testing of their A1C and cholesterol to determine changes in these metrics as a result of participation in the program.

Briefly describe how your target audience benefited from your project's activities.

FARMacy reached over 322 program participants in the last program cycle. Approximately, 20,738lbs of food produce were distributed to participating individuals and families. Preliminary data also shows an average 0.63 point decrease in the overall A1c of individuals who participated in the program. One program participant said, "we have learned so much. Her (referring to another participant) sugar levels have gone down and I've lost 36 pounds," A grandparent raising three grandkids also mentioned that, "I've never eaten an eggplant in my life before now and, you know, she's just teaching us all kinds of good recipes that are low calories and good."

Briefly describe how the broader public benefited from your project's activities.

FARMAcy provides access to healthy food in communities with high rate of poverty and chronic diseases. Access to healthier foods reduces vulnerabilities of these communities to chronic disease thus, leading to healthier and active communities.

Critical Issue

Nutrition and Obesity Prevention

Nutrition and Obesity Prevention

Project Director

Adeola Ogunade

Organization

West Virginia University

Accession Number

7001914

Kids Market Encourages Healthy Food Choices Among Youth

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Over 19% of children in West Virginians between the ages of 10 and 17 are obese. WV ranks 7th in the nation for a high rate of childhood obesity. Poverty and limited access to healthy food choices have rendered children from low-income families vulnerable to obesity. To decrease the rate of childhood obesity, WVU Extension developed a children-targeted program that will improve access to healthy food options.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The WVU Extension 6-week Kids Market program creates an avenue for children and youth to have a healthy food shopping experience. Boards of Education, farmers' markets, and local grocery stores partnered with Extension educators to provide children and youth with platforms necessary for them to apply their knowledge of healthy food options to make conscious decisions on what food to buy. Participating families received a mailed packet that includes a reusable shopping bag, shopping passport, and 5 farmers market tokens for each child enrolled.

Briefly describe how your target audience benefited from your project's activities.

A total of 29 market sites were held reaching 7,316 individuals. Over 7,450lbs of healthy food was donated to homes through this effort. On average, each participating farmer in market sites made $2,400 in sales. The farmers were pre-paid $100 a week for each of the market sites they service. Parents reported that their children enjoyed the shopping experience and felt great they had many food choices. One parent said, “liked the choices and that the kids could take as much as they wanted…”

Briefly describe how the broader public benefited from your project's activities.

The Kids Market program increases access of children and youth to healthy food options, potentially reducing rate of food insecurity and child obesity in West Virginia. The program’s partnership with local farmers potentially improves farm profitability in the state which is currently significantly lower than the national average.

West Virginians with Diabetes Improved Diabetes Self-Management Behaviors

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

Over the past several years, West Virginia has ranked extremely high for diabetes prevalence. The WV DHHR (Department of Health and Human Resources) website reports that 15% of adults in WV have been diagnosed with diabetes. West Virginia has the highest diabetes incidence and mortality rate in the country. The prevalence of COVID-19 brought a different concern as those with diabetes were also found to be at higher risk of complications if infected. Due to these potential complications, those with diabetes were less likely to participate in an in-person class for diabetes management education.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

West Virginia University Extension Agents worked to create a virtual format of *Dining with Diabetes* to allow those with diabetes to participate in educational opportunities in the comfort of their homes. We adapted the existing curriculum into an online platform and this allowed participants to be more engaged with one another and with program facilitators. We virtually taught 109 people across the state how to successfully manage their diabetes, eat healthy, and engage in physical activity using the Dining with Diabetes curriculum.

Briefly describe how your target audience benefited from your project's activities.

76% of those who participated felt confident in keeping their diabetes under control. 38% are fitting exercise into their daily routines, 42% are now eating in smaller portions, and 28% are cooking more at home. One participant noted, “The recipes provided during the class make me excited to cook at home and allow me to be healthier in my food choices. I am now exercising more than I did before the class...”

Briefly describe how the broader public benefited from your project's activities.

The population trend in West Virginia is declining at a steady rate. Diabetes was found to be one of the leading causes of death. This program potentially reduces health complications in West Virginians living with diabetes and participants' overall health care costs in managing Diabetes.

Describe and explain any major changes or problems encountered in approach. Additionally, note opportunities for training and professional development provided, how results have been disseminated to communities of interest, and any new details regarding what the project or program plans to do during the next reporting period to accomplish the goals.

Results of this programmatic effort have been disseminated through the National Extension Association of Family & Consumer Sciences 2022 call for an impact statement. The program is expanding to include other impact measures in its evaluation procedures. We are particularly interested in measuring how this program can lower anxiety and mental health stress often induced by diabetes self-management.

Critical Issue

Strengthening Youth and Families

Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms

Project Director

Shan Jiang

Organization

West Virginia University

Accession Number

1021528

Environmental Interventions to Promote Physical Activity and Healthy Lifestyles for West Virginian Communities

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

The study addresses critical issues about physical inactivity and preventive care among rural communities in West Virginia. The study aimed to transfer healthcare clinics sites into rural community wellness centers that promote healthy and active lifestyles through environmental design interventions.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

In the report cycle of Oct. 2020 through Sept. 2021, I have completed several activities under the umbrella of NE1962 Multi-state HATCH project. The primary study topic was *Environmental Interventions to Promote Physical Activity and Healthy Lifestyles for West Virginian Communities.* Although West Virginia has highly ranked forest coverage and abundant natural resources, citizens in rural communities—particularly seniors, the disabled, and the medically underserved—have limited daily access to public open spaces and physical activity opportunities Health care researchers and practitioners have jointly coined the community wellness center concept, which integrates walking trails, playgrounds, and therapeutic landscape features to support outdoor activities on the sites of community clinics or microhospitals. Community Care of West Virginia (CCWV) is a federally qualified health center that serves low-income and underinsured patients. The CCWV at Big Otter (Big Otter Clinic) in Clay County, West Virginia offers an array of medical services, including comprehensive primary care and chronic disease management for the entire family. The clinic is seeking to renovate the outdoor spaces by introducing therapeutic programs and landscape features, such as a walking trail loop, small healing gardens, and multifunctional spaces to increase access to physical activities and health events for residents in the county. Following an evidence-based research and design framework the site design is informed by survey results from patient and staff representatives regarding their site usage preferences, and a review of relevant research findings. The immediate goal of this project is to create a supportive walking trail through universal and inclusive design strategies as a safer alternative to vehicle roads in the community. The trail could also be used by patients for clinical physical activity prescriptions and referrals, or for walk-and-talk sessions with mental and behavioral health patients. The clinic staff members can also use the outdoor space for breaks during work, to reduce stress and burnout, and maintain quality care for the patients. The goal of the project is to transfer a traditional clinic site to a wellness center that connects to a more extensive trail system in Clay County. The wellness center model should connect health care, physical activity, and therapeutic landscapes and become a catalyst that promotes the overall well-being for rural communities, West Virginia.

*Animals are no longer used in this study.

Briefly describe how your target audience benefited from your project's activities.

Taking the Big Otter Clinic (Clay County) site for example, the trails and some garden features are being used by patients and staff members for walking and exercises, fundraising events, and other educational/medical purposes. The behavioral health team coordinated walking appointments for pediatric patients with ADHD conditions, and they observed that the patients can get 10-15 minutes of solid time in a much more relaxed atmosphere.

Briefly describe how the broader public benefited from your project's activities.

The wellness center model is expected to connect health care, physical activity, and therapeutic landscapes and become a catalyst that promotes the overall well-being of rural communities in West Virginia.

WVA0075NE1962 Outdoor Recreation, Parks and Other Green Environments: Understanding Human and Community Benefits and Mechanisms

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

My project addresses critical public health and physical activity issues in rural West Virginia communities through environmental design interventions. My project is tied to the objective of expanding the evidence for the role of park and outdoor recreation services in promoting physical activity and associated preventative health benefits.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

In the report cycle of Oct. 2020 through Sept. 2021, I have completed several activities under the umbrella of NE1962 Multi-state HATCH project. The primary study topic was *Environmental Interventions to Promote Physical Activity and Healthy Lifestyles for West Virginian Communities*. Although West Virginia has highly ranked forest coverage and abundant natural resources, citizens in rural communities—particularly seniors, the disabled, and the medically underserved—have limited daily access to public open spaces and physical activity opportunities Health care researchers and practitioners have jointly coined the community wellness center concept, which integrates walking trails, playgrounds, and therapeutic landscape features to support outdoor activities on the sites of community clinics or microhospitals. Community Care of West Virginia (CCWV) is a federally qualified health center that serves low-income and underinsured patients. The CCWV at Big Otter (Big Otter Clinic) in Clay County, West Virginia offers an array of medical services, including comprehensive primary care and chronic disease management for the entire family. The clinic is seeking to renovate the outdoor spaces by introducing therapeutic programs and landscape features, such as a walking trail loop, small healing gardens, and multifunctional spaces to increase access to physical activities and health events for residents in the county. Following an evidence-based research and design framework the site design is informed by survey results from the patient and staff representatives regarding their site usage preferences, and a review of relevant research findings. The immediate goal of this project is to create a supportive walking trail through universal and inclusive design strategies as a safer alternative to vehicle roads in the community. The trail could also be used by patients for clinical physical activity prescriptions and referrals, or for walk-and-talk sessions with mental and behavioral health patients. The clinic staff members can also use the outdoor space for breaks during work, to reduce stress and burnout, and maintain quality care for the patients. The goal of the project is to transfer a traditional clinic site to a wellness center that connects to a more extensive trail system in Clay County. The wellness center model should connect health care, physical activity, and therapeutic landscapes and become a catalyst that promotes the overall well-being for rural communities in West Virginia.

Briefly describe how your target audience benefited from your project's activities.

The Big Otter Clinic pilot site construction has made significant progress (financially supported by a series of funding agencies, including Mountains of Hope Mini-Grant, Active WV Mini-Grant Program, and Greater Kanawha Valley Foundation (GKVF). The trail has already been used by patients and medical staff members. The clinic's behavioral health team find the walking appointment options very useful for ADHD children -- they feel they can get 10-15 minutes of solid time with them in a much more relaxed atmosphere. A walking club with patients has also shown positive results from the reflection of the clinic physician.

Briefly describe how the broader public benefited from your project's activities.

The pilot site serves as a model for the region and the documented research results will contribute to the wider knowledge field about public health, physical activity, and therapeutic landscapes. Aside from the featured project in the report, I also wrote a book entitled *Nature through a Hospital Window: The Therapeutic Benefits of Landscape in Architectural Design* (Publisher: Routledge), a significant contribution to the knowledge field which benefits the broader public interest.

Strengthening Youth and Families

Project Director
Adeola Ogunade
Organization
West Virginia University
Accession Number
7001912

Children Improve Pro-Social Behaviors in Summer Literacy Program

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

When the coronavirus pandemic disrupted schools across the country, many children had reduced opportunities for academic, social, and emotional growth in a safe environment. Children and their parents or guardians had to quickly adapt to virtual classrooms and working from home. While some children thrived in a virtual setting, others were adversely impacted by the lack of academic, social, and emotional support they receive in a classroom. By the summer of 2021, conditions in West Virginia allowed for in-person summer enrichment programs, and schools were concerned about social and emotional learning for their students.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

Energy Express is a 6-week summer reading and nutrition program for children living in rural, low-income communities. In the summer of 2021, Energy Express hosted in-person programs in partnership with local schools, community centers, and faith-based organizations. Children who completed grades K through third participated in the program. Children were placed in groups of eight, led by a mentor. The mentors were AmeriCorps summer volunteers, and most were college students. The mentors were trained in creating a welcoming environment that promotes reading, writing, and art; providing activities that help kids to read and to understand what they read; and managing young children in a group setting. We created a parent survey to learn more about the kids' experiences in the program. We received data from 20 of 22 program sites. Respondents were parents (n=143), grandparents (n=22), guardians (n=11) or other (n=2). Ninety-five percent identified as White or Caucasian, 4% as Black or African American, and 2% preferred not to answer, consistent with the racial makeup of the state. Seventy-two percent reported that it was their child's first year in Energy Express.

Briefly describe how your target audience benefited from your project's activities.

The program was rated as excellent (83%) or good (16%) by 99% of those who responded to the survey. 92% felt that the program increased their child's literacy. Interest in reading, defined as a child reading independently or bringing a book to an adult to be read, increased from just under 3 days per week before Energy Express to just over 4 days per week at the end of the program. The respondents valued literacy assistance, STEM activities, and a positive relationship with a mentor as the most important benefits of Energy Express. Responses to open-ended questions on the survey indicated that children developed pro-social skills such as making new friends, increase in confidence, teamwork, and a positive relationship with the mentor. Parents and guardians highlighted some of the changes observed in their children: "Greater confidence and enthusiasm toward learning and relationships." "My child doesn't like to read but has showed interest in the books that were provided by Energy Express. He has also loved going to Energy Express every day. Per the teachers, he has learned valuable social skills which is very difficult for him. Thank you so much." "Yes, more confidence, loves to tell about her experiences daily. Has great interaction with and respect for her mentors. Has developed friendships with new children from different schools and has got to renew friendships with a child she was friends with in Head Start."

Briefly describe how the broader public benefited from your project's activities.

Vulnerable and low-income children in West Virginia who attend the WVU Extension Literacy program will have better academic outcomes potentially increasing their chances of completing a high school diploma.

Healthy Grandfamilies Program Improves Academic and Emotional Outcomes for Children in Kinship Care

In 2-3 sentences, briefly describe the issue or problem that your project addresses.

According to the US censors report in 2019, West Virginia ranks second in the nation for grandparents raising their grandchildren. Grandparents struggle with getting updated knowledge and resources necessary to make informed decisions about raising their grandchildren. This struggle was exacerbated by COVID-19 and grandparents assumed the dual role of being the caregiver and the teacher. The COVID-19 stay-home order also prevented vulnerable grandchildren from being able to cope with learning through technology due to limited access to the internet and less assistance from grandparents.

Briefly describe in non-technical terms how your major activities helped you achieve, or make significant progress toward, the goals and objectives described in your non-technical summary.

The Healthy Grandfamilies program was developed to provide academic support to vulnerable students who are in the care of their grandparents. Mentors that were assigned to each grandfamily virtually met with students once every week to provide academic assistance. The pilot program served 11 grandchildren who were under the care of their grandparents in the Spring

of 2021.

Briefly describe how your target audience benefited from your project's activities.

Qualitative evaluation of the program, through a focus group interview, showed that the Healthy Grand-families program benefited the two participant groups involved: grandparents and their grandchildren.

Grandparents reported that the program was beneficial to their grandchildren socially, emotionally, and academically. A grandparent mentioned that the assigned mentor “made bad days better for the kids.” Grandchildren were able to use technology and they improved their reading ability and math solving skills. A grandparent said that her grandchild “was a little bit hesitant at the beginning but the mentor made her fell in love with math.” Another grandchild who participated in the program learned to be more independent in doing things for himself and was more interested in reading books. A special needs child with mental learning deficit improved her reading skills.

Grandparents mentioned having difficulty using technology to help their grandchildren study. They attributed the difficulty to generational gap that exists between their own school experiences and their grandchildren’s school experiences. However, they described that the mentors helped closed this gap during the program. Grandparents also felt relieved from the stress of taking care of their grandchildren and attending to their academic needs during the stay-home mandate caused by COVID-19 pandemic. Other benefits grandparents cited include reduced feeling of isolation, learning new ways of helping their grandchildren academically, and having someone to talk to during the pandemic. One of the grandparents reported that the mentors assumed the role of being a “psychologist” by giving her a listening ear when she needed it.

Briefly describe how the broader public benefited from your project's activities.

Children raised by their grandparents have a higher risk for emotional, behavioral, and academic problems especially due to inter-generational gaps in kinship care. This pilot program provides the opportunity for children in kinship care to interact with a caring adult other than their grandparents. It has the potential to improve academic literacy levels among vulnerable school-age children in WV.

Type

Projects / Programs without a Critical Issue

Not Provided

Projects / Programs

0