As Alabama A&M University nears the celebration of 140 years of excellence in service and academics in 2015, the integral and significant role of research certainly highlights the institution’s rich and impressive history. Thus, continuous and quality research performance augments and facilitates the education of our students.

Indeed, the acquisition of new and leading edge technology, the burgeoning quest for useful information, and the inborn desire for self-enhancement come together to form the foundation upon which AAMU builds the case for its relevance in the decades ahead. An impactful research program has given rise to many advancements and developments in our society. Through stellar research efforts at AAMU, we have achieved considerable research prominence within Alabama, regionally, nationally, and globally.

The university is home to some of the most productive and prolific researchers in the country. The productivity of our researchers may be gleaned from the research dollars received and the number of grant proposals funded.

Thus far during the 2013-14 academic year, some 81 researchers submitted more than 110 proposals requesting nearly $50 million from federal and private funding sources. Professor Donnie Cook of the Department of Cooperative Extension is responsible for our largest research grant for the reporting period, with a $1,516,093.00 year award from USDA-NIFA.

Additionally, grants and contracts actually awarded to AAMU principal investigators have increased steadily by an average of 20 percent each year for the past five years. The 2013-14 awards continue this trend with a total of $31,252,971.35.

The research conducted is cutting edge and contributes to increased economic development and enhanced quality of life. Grants range from an interdisciplinary project aimed at improving physics instruction in high schools throughout the state, to cybersecurity, to alternative energy generation, to the discovery of the white nose bat. The university is also committed to international research efforts and mentoring the next generation of researchers as evident by student research exchange programs with universities in China and Brazil.

We are grateful for the energy and enthusiasm our Sponsored Programs team has provided for the university and day-to-day operations of our research component. We are confident that the unit will continue to improve and strengthen the grants and contracts process overall.

~ Andrew Hugine, Jr., Ph.D.
Remembering Dr. Dokhanian
A Research Legend in his Own Right
April 23, 1957 - January 25, 2014

Alabama A&M University’s Department of Physics, Chemistry & Mathematics’ Professor of Physics, Dr. Mostafa Dokhanian, was born in Semnan, Iran, April 23, 1957. His hard work led to funding from federal agency grants awarded to the university. Mostafa was the PI or Co-PI on grants from NASA, DOD, DOE, and USAF. He was the Principal Investigator for the AAMU-REU, (PS)2, HBCU-UP, and APEX ($8 million) grants. For 22 years, he taught many undergraduate and graduate students and worked on research projects in physics specializing in optics. Dr. Dokhanian was very active in enhancing the AAMU Physics undergraduate and graduate program. In 1993, he received an educational grant from NSF for a three-year project to develop the Microcomputer-based Physics Laboratory (MBL) at Alabama A&M University. The SPIN-UP committee members of AIP, who visited the department in October 2001, acknowledged the successful completion of that work. He was also involved in developing and continuously updating electronic course materials for the calculus based physics (CBP) and physical science courses. Dr. Dokhanian participated in several physics education related workshops such as Project Kaleidoscope. As an academic advisor, Dr. Dokhanian greatly influenced the education and lives of many undergraduate students, and also as an advisor or co-advisor to 12 M.S. and 5 Ph.D. students. He was a member of AAPT (American Association of Physics Teachers), OSA (Optical Society of America), and SPIE (International Society for Optical Engineering). Dr. Dokhanian’s dedication to Alabama A&M University, its Physics Department, the many students he taught or helped to fund, his friends, and family led to his being highly valued, respected, and revered by all who knew him.

Top Funded Principal Investigators for FY2013-14

During FY14 six researchers were funded research projects for over $400,000.00. One project director and one principal investigator were funded over one million dollars. Dr. V. Trent Montgomery was funded for $1,188,390.00. Dr. Donnie Cook was the top funded project director, she received $1,516,039.00 in funded award from USDA-NIFA. Other PIs are profiled as follows:

Dr. Donnie Cook
Total Funding for FY2013-14
$1,516,039.00

Dr. V. Trent Montgomery
Total Funding for FY2013-14
$1,188,390.00
Dr. Stephen Egarievwe

Total Funding for FY2013-14 $629,000.00

Dr. Stephen Egarievwe is an Associate Professor and former Chair of Engineering, Construction Management and Industrial Technology Department at Alabama A&M University (AAMU) from 2009 – 2013. Presently, he is the Founding Director of the Nuclear Engineering and Radiological Science (NERS) Center. Dr. Egarievwe is the national secretary of INCREASE (The Interdisciplinary Consortium for Research and Education Access in Science and Engineering), an organization that promote research in Historically Black Colleges and Universities (HBCUs) and other minority serving institutions (MSIs).

Dr. Egarievwe received his most recent funding for the NERS Center from a five-year $2 million joint grant from the U.S. Department of Homeland Security (DHS) and the National Science Foundation (NSF), a five-year $360,000 grant from the U.S. Nuclear Regulatory Commission (NRC), and an average of $100,000 yearly support in collaborative research with Dr. Ralph James’ advanced nuclear detectors research group in the Department of Nonproliferation and National Security at Brookhaven national Laboratory. Major supports for students and faculty members doing research at the NERS Center also come from the U.S Department of Energy (DOE) through the Visiting Faculty Program (VFP).

Dr. Egarievwe has his Ph.D. degree from Alabama A&M University in Applied Physics with specialization in quantum optics and lasers. The other graduate degrees that gave him both in-depth and broad multidisciplinary training across Science, Technology, Engineering and Mathematics (STEM) fields include: M.S. degree in Computer Sciences from Vanderbilt University School of Engineering, M.A. degree in Physics from Fisk University, and M.Sc. in Solar Energy from the University of Nigeria. His undergraduate education was at the University of Ife (now Obafemi Awolowo University), Ile-Ife, Nigeria, where he earned B.Sc. degree (with honors) in Engineering Physics with concentration in Nuclear Engineering. He is a member of the following professional organization: the Institute of Electrical and Electronics Engineers (IEEE), the Association of Teacher Educators (ATE), the American Society of Engineering Education (ASEE), the American Physical Society (APS), and the Association for Computing Machinery (ACM). Dr. Egarievwe was born at Orogun in the River Niger Delta region of Nigeria.

A major research project of Dr. Egarievwe at the NERS Center focuses on the development of semiconductor nuclear detectors that are capable of operating at room temperature without cryogenic cooling, and with applications in homeland security, medical physics and nuclear industries. In collaboration with Dr. Ralph James of Brookhaven National Laboratory and Dr. Jeffery Derby of the University of Minnesota, Minneapolis, Dr. Egarievwe and his AAMU team are developing large-volume high-efficiency cadmium zinc telluride (CZT) and cadmium manganese telluride (CMT) X-ray and gamma-ray detectors for applications in maritime and port security, border security, transportation security, nuclear nonproliferation and domestic nuclear security. Other research projects of Dr. Egarievwe at the NERS Center include: radiological assessment - analytics of radioactive materials released in the Fukushima Daiichi nuclear accident in Japan, in collaboration with Dr. Jamie Coble and Dr. Laurence Miller of the Nuclear Engineering Department at the University of Tennessee, Knoxville; communicating nuclear to the public and community relations with nuclear facilities, in collaboration with Dr. Jacob Oluwoye and Dr. Matthew Edwards of AAMU; cyber infrastructure security and power grid resilience, in collaboration with Mr. Julius Jow of AAMU and Dr. Yang Xiao of the Computer Science Department at the University of Alabama, Tuscaloosa; and improving the performance of CZT nuclear detectors using post-growth thermal annealing techniques, in collaboration with Dr. Aaron Adams of AAMU and Marcus Ashford of the Mechanical Engineering department at the University of Alabama, Tuscaloosa.

The key factors that have contributed to Dr. Egarievwe’s success in extramural funding and supporting junior faculty members in grant writing and professional development are his collaborations with federal funding agencies, experience in grant/project reviews, and reviewer to technical journals. His grants and projects reviews and collaborations with funding agencies include: the National Science Foundation (NSF) Graduate Research Fellowship, the U.S. Department of Homeland Security (DHS), the U.S. Department of Energy (DOE), the U.S. Nuclear Regulatory commission (NRC), the National Aeronautics and Space Administration (NASA), the Office of Naval Research (ONR), and the Office of Naval Research (ONR),
Dr. Egarievwe has developed a unique vertical approach to STEM education, the vertical education enhancement (VEE) model, that has achieved huge advances in training students and offering great opportunities to students at Alabama A&M University, including women and underrepresented minority groups. The VEE model progressively moves students through the various levels of education to the workforce by using a combination of theoretical education, practical training, hands-on experience, a tri-advising mentoring system (involving academic advisor, campus professional mentor and industry professional mentor), and research internships. A major outcome of the VEE model is project NERVE (nuclear education and research vertical enhancement) funded by the U.S. Nuclear Regulatory Commission, and with additional education and research supports from the U.S. Department of Homeland Security, the U.S. Department of Energy, and the National Science Foundation. The NERS Center and Brookhaven National Laboratory formed the underlying infrastructure for students training. In the last four years, working with Dr. Matthew Edwards and Dr. Jacob Oluwoye, project NERVE has produced two doctoral degree graduates, six master’s degree graduates, and eighteen bachelor’s degree graduates. Over ninety percent of our students present their research findings at conference from where about seventy percent has been published in technical journals and proceedings.

The VEE model developed by Dr. Egarievwe also has a component on continuous assessment and improvement of academic programs, which is used for the development of assessment-culture that is essential to higher education accreditation by organizations such as the Southern Association of Colleges and Schools (SACS) and academic program accreditation by professional bodies such as the Accreditation Board for Engineering and Technology (ABET). Within three years of becoming the Chair of Engineering, Construction Management and Industrial Technology Department, Dr. Egarievwe established and led assessment activities that got two engineering technology bachelor’s degree programs (BS in Electrical Engineering Technology and BS in Mechanical Engineering Technology) fully accredited by ABET. Dr. Egarievwe is a 2013 ABET IDEAL Scholar – Excellence in Assessment Leadership. In addition to STEM fields, the multidisciplinary research and education activities of Dr. Egarievwe also cuts across non-STEM fields such as social sciences, regional and urban planning, and teachers education. The NERS Center also engages students from education and other non-STEM programs in research and training.

Dr. Anup Sharma

Total Funding for FY2013-14 $494,602.00

Dr. Anup Sharma is a professor of physics. He has a Masters degree from the Indian Institute of Technology and a Ph.D. from Columbia University. The Ph.D. research involved first demonstration of a continuous-wave mirror-less laser in alkali vapor. Dr. Sharma continued his research in Optics and Spectroscopy at several places including the Max-Planck Institute, Germany, Texas A&M University and the Bhabha Atomic Research Center, India. He has been at Alabama A&M University since 1992. His research in lasers and optics encompasses several areas including fabrication of fiber-Bragg grating sensors for which he has a patent. He has also used UV lithography for fabricating micro/nano arrays on substrates which show promise for biosensing applications. In a recent contract from the Army, he has developed a technique for detecting explosives-related chemicals from distances of over 200 meters using an infrared laser and a telescope. This work also resulted in a grant from the Department of Homeland Security for detecting adulteration in food from a distance of several meters. Dr. Sharma has guided several Ph.D. students and developed graduate courses in Biophonotics and Nanophotonics as well as an undergraduate course in Nanotechnology. He is a recipient of a Career Award from the National Science Foundation.
Dr. William Stone

Total Funding for FY2013-14 $534,000.00

Dr. William Stone instructs courses in forestry and wildlife. He has developed a minor in Wildlife Biology at AAMU. He has also developed a fisheries minor with AAMU colleagues. He co-advises the student Chapter of the Society of American Foresters and advises the AAMU student chapter of The Wildlife Society. He is active in several wildlife, forestry and ecology professional societies including those above and the Southeastern Bat Diversity Network. Dr. Stone’s research involves determination of important habitat factors for a variety of wild animals in forest environments. Currently, his research focuses on mammals including bats, feral swine, and small mammal communities. He also studies neotropical migrant birds; impact of wildlife on forest regeneration and management; human-wildlife conflicts; and management/policy issues relating to wild species that are hunted, endangered, or cause economic damage to agricultural crops. Dr. Stone is a Certified Wildlife Biologist (The Wildlife Society).

2014 Summer Programs Impacted Students and the Community

During Summer 2014, the campus of Alabama A&M University was filled with excitement as many students, (elementary, middle, high school and undergraduates) engaged in exploratory, research, and enhancement activities, and learning experiences.

Most of these activities were funded by federal agencies. These included: The National Science Foundation, the U.S. Department of Agriculture, and the U.S. Department of Education. A brief description of each summer program is specified below.

Research Experience for Undergrads Site in China: Ecological and Environmental Research in Urbanized Landscape (NSF)

Dr. Yong Wang, Principal Investigator

The program will focus on ecological and environmental scientific research of the quickly urbanizing landscape of Nanjing Province in China. This research engaged students in a broad range of ecological and environmental scientific research with a focus on hypothesis-driven quantification, experimentation, the modeling of human-induced ecological, environmental changes, and particularly the ecosystem responses to urbanization. An international program, which provided an eight-week research experience to undergraduates. Students spent three days at AAMU followed by seven weeks at Nanjing Forestry University (NFU) in China and the remaining three days again at AAMU.

Building Global Engagements to Enhance Faculty and Students Professional Development and Career Opportunities in Agriculture’s Challenge Areas

Dr. Zachary Senwo, Principal Investigator

This summer component of Building Global Engagements to Enhance Faculty and Students Professional Development and Career Opportunities in Agriculture’s Challenge areas provided an opportunity to strengthen the global competence of students and faculty in food and agricultural sciences, while expanding their global awareness in a South American culture, along with introduction to new global vision through collaborative partnerships with institutions in Brazil.
TRIO - Upward Bound  
Ms. Pamela H. Thompson, Project Director

A federally funded program designed to assist eligible first-generation and/or low-income high school students, who have an academic need and a desire to go to college. This program is a year round program, which consist of both residential (summer) and academic (school year) components.

Physics Research Experience for Undergraduates (NSF)  
Dr. Padmaja Guggilla, Principal Investigator

30 participating students experienced the excitement of frontline research in Nanotechnology, Pyroelectricity, Triboluminescent Materials, Optical Hole Burning, Fiber Bragg Gratings Sensors, Electroporation, Surface Enhanced Raman Scattering, Chemical Sensors, Electric Redshift, Solar Cells, Corona Mass Ejections, and Coronal Loops and get acquainted with ethical issues in Physics for 10 weeks in the summer. The participants will gain experience in technical writing, presenting their research work to a variety of audiences, including dissemination of their results in local, regional, and national scientific conferences focused on undergraduate research.

NSF Louis Stokes Alliance for Minority Participation Summer Bridge Program (SBP)  
Dr. Jeanette Jones, Principal Investigator

A six week effort designed to facilitate the transition of Alabama minority students from high school to Alabama institutions where they have been accepted for the fall term. Students must be majoring in science, technology, engineering, or mathematics (STEM).

Strategic Plan to Enhance STEM Education and Research at AAMU  
(NSF HBCU-UP Summer Bridge Program SBP) (NSF)  
Dr. Marius Schamschula, Principal Investigator

The general purpose of this program is to broaden the minority’s participation in the national STEM workforce by recruiting, retaining, mentoring, and successfully graduating under-represented students. This program is innovative, comprehensive, transformative, and designed to strengthen STEM education at AAMU.

High School STEM Experience CETPS  
Mr. Gerald Vines, Project Director

This program is designed for the exploration of students from diverse fields of engineering through activities, competitions and field trips. Summer enrichment program for high school students with strong interest in mathematics and engineering.

Minority Serving Institutions Partnership Program (MSIPP) (DOE)  
Dr. V. Trent Montgomery, Principal Investigator

MSIPP is a consortium of MSI institutions dedicated to enhancing STEM education to produce more American scientists and engineers. The program takes some of the students who participates in the North Alabama Center for Education Excellence (NACEE) program and provides experiences in electrical engineering and computer science.
Intro to Food Nanotechnology Application in Food Engineering  
*Dr. Lamin Kassama, Principal Investigator*

Emphasis of this program is on Food Engineering; Increase the capacity to recruit and retain minority students into the Food Engineering concentration of food science profession to bridge the gap of underrepresentation in the food industry and governmental agencies.

Forestry Ecology and Wildlife Summer Apprenticeship Program  
*Dr. Kenneth Ward, Principal Investigator*

This program is designed to recruit quality students and foster their interest in forestry/fire careers and related disciplines. The target recruits are students from underrepresented and underserved communities interested in attending or already attending AAMU, and majoring in natural resources (Forestry and related; incoming freshmen-college sophomores). Participants were exposed to forest science and the tools (particularly fire) used in achieving forest health. Students were provided with a variety of quality work/educational experiences, hands-on experience and certification opportunities.

Pre-Freshman Bridge Program  
*Mr. Gerald Vines, Project Director*

A three-week residential program designed to introduce participants to mathematics skills and background information that will help them to advance in their college pursuits. This year’s theme: “Elevation”; we elevate in order to put ourselves and others in a better place. It also acts as a forum for the exchange of information and procedures to enhance each student.

Links Summer Art Camp  
*Dr. Cynthia Smith, Principal Investigator*

Designed to provide experiential learning in the arts to students from elementary through high school in the use of various art media (pastels, pencils, watercolors, acrylics, etc.) of use in the development of design compositions/expressions; and to introduce them to expressions through the performing arts the strategic goals of the Arts Committee is to expose and engage a selected group of students to the arts through Links programs and efforts.

REU Site: Fabrication and Characterization of the Nanoscale Devices (NSF)  
*Dr. Mohammad Alim, Principal Investigator*

The mentor-guided advanced research activities will *immerse future engineers and scientists* with skills and perspective necessary for professional development to address world’s nano-scale device applications.

Eight undergraduate students participate for *eight (8) weeks* during the summer studying the broad concepts of *Nanoscale Solid State Devices and Composites*. Each will receive hands-on exposure and training in the 2,500 sq. ft. class 1,000 clean-room facilities It is equipped with the fabrication/processing of the nano-scale materials and devices. Research topics include but are not limited to nano-wires, carbon nano-tubes, nano-layered thermoelectrics, large dielectric gate MOSFETs, etc. The evaluation and characterization facility is also equipped with Scanning Electron Microscopy (SEM), Seebeck Effect, van der Pauw - Hall Effect 4-probe conductivity measurements, impedance spectroscopy, structural analysis. These participants worked very closely with mentors as well as Graduate students.
The paradigm of pervasive computing is being transformed quickly from a vision to reality as powerful mobile and embedded devices make in-roads into many facets of our society and gradually become more and more ubiquitous in our daily life. Smartphones are undoubtedly everywhere with a growth rate 4 times faster than the mobile phone market. They are not just used as (traditional) mobile phones for phone calling and SMS messaging. Nowadays they are more used for many of the same purposes as desktop computers, such as web browsing, social networking, online shopping and banking.

**Intellectual Merit**

The goal of this project is to fill the gap between the ubiquity of pervasive and mobile computing technology and the lack of presence of pervasive and mobile computing security in the course curricula of universities across the nation. The necessity of this project is to educate students regarding a technology which has the potential of pervading through each and every aspect of daily life, the underlying security and privacy risks and possible countermeasures of the same. We address the current limitation on four fronts:

**Objective 1:** Enhancing security education through curriculum development. Based on the typical topics in pervasive and mobile computing, we will develop a course, Security and Privacy in Pervasive and Mobile Computing, that will cover the major security and privacy topics in several representative pervasive and mobile computing systems, including Wi-Fi, cellular networks, Bluetooth, RFID, mobile phone and wireless sensor networks. A prominent feature of this course is that the latest results from the research community are carefully integrated into the teaching materials. It will serve as a pilot for wider adoption of pervasive mobile computing security in course curricula across the nation. The proposed topics are presented in Section 3.1.

**Objective 2:** Engaging students through hands-on lab development. It is a well-known fact that hands-on experience in a security-related course is important. We will develop hands-on labs that is an essential component of the proposed course in Objective 1. These hands-on labs will contribute to the effective resources for security education and engage students in active learning. Our proposed work is presented in Section 3.2.

**Objective 3:** Improving undergraduate research capabilities through research project design. We will actively pursue involvement of undergraduate students, especially female and African American students, in research and motivate them in the conceptual learning through a list of hot-topic research projects. Our proposed work is presented in Section 3.3.

**Objective 4:** Building faculty capacity through hands-on workshops. We will hold two faculty development workshops to disseminate the teaching materials developed through this project and assist participating faculty members on how to use them. Our proposed work is presented in Section 3.4.

Besides the above activities, we will also evaluate the impacts of the proposed activities on student learning and faculty development through a set of evaluation tasks (Our evaluation plan is presented in Section 4). This project will finally result in an online repository of lecture slides, lecture videos, hand-on labs, undergraduate research project topics, review and evaluation material, and so on that can be easily transformed into transferable teaching objects for broader adaption. Besides the online dissemination approach, we will also actively pursue other ways for project dissemination such as dissemination via education and research conferences, via partner universities, and so on (Our dissemination plan is presented in Section 5).
Broader Impacts

The University of Michigan-Dearborn, is a participating institution. This project will impact both campuses directly. The course and labs developed in this project will help pave the path for students toward a career in information security. It will also impact Detroit’s automobile industry by producing a workforce who understand pervasive computing and the associated security and privacy issues. The joint effort in this collaborative project will improve the partnership between the two institutions to collaboratively improve IA education and will particularly increase the production of African American IA professionals. The topics in pervasive and mobile computing are very relevant to everybody’s daily life. Our hands-on labs are immersive through the use of mobile devices, emulator tools and virtualization techniques. Hands-on experiences from laboratory exercises will promote student curiosity, increase student interest and improve student learning outcomes. We expect more students will be motivated to study security, since the subject is so familiar to them. Therefore, the potential broad impact of this work is that it can help address the shortage of highly skilled quality information security professionals by producing a large and diverse IA workforce with strong information assurance skills and competency. The course materials are designed with online dissemination in mind and can be arranged in several transferable teaching objects (TTO) containing lecture slides, videos, animations, labs and quizzes. These transferable teaching objects can be adopted in many different settings such as: used in professional certificate programs and K-12 outreach, integration in the existing curricula of the adapting institution, or offered as a standalone course. Consequently they will be made available to a broader audience. Hence this project will impact our society through increasing security awareness and security professionals with the right skill set to cope with future challenges.

Finally, this project will also increase the number of teachers capable and qualified to teach others about mobile security through curriculum, academic sharing of materials, and collaborative research opportunities.

Center for Forest Ecosystem Assessment

Dr. Yong Wang

Alabama A&M University (AAMU) proposes to renew the support for the Center for Forest Ecosystem Assessment (CFEA) under NSF/CREST program. CFEA has been the key for the dynamic scientific, educational activities and institutional transformation at this African-American minority serving institution to: (1) strengthen integrative, multi-disciplinary research for improved understanding of natural resources and (2) increase the number of trained professionals, especially African-Americans, engaged in research, teaching, and management of renewable natural resources. CFEA has successfully accomplished or exceeded the goals established for the first funding period as evidenced by new research initiatives, strengthened multidisciplinary teams; expanded collaborations and synergies among thrust areas and with external partners; increasing the numbers of faculty and students participation in Center’s activities; and sustained products of research (233 presentations and 71 published manuscripts) and education (28 graduate students and 100+ undergraduates participated) since the inception of CFEA.

CFEA’s major goals for the next five years are (1) to continue being the leading research center in forest ecosystem ecology and assessment in the southern Cumberland region and (2) to educate future natural resource scientists, especially graduate students from groups currently underrepresented in science and technology fields. The Center will be re-organized into three focus areas:

1. Forest Community Responses and Dynamics (FCRD) group to focus on responses of microbial, plant, and animal communities to disturbance, causal mechanisms driving these responses, and the influences of meta-population dynamics and landscape and watershed-level patterns
2. Forest Ecosystem Functions and Processes (FEFP) to focus on energy fluxes and carbon and nutrients in response to disturbance by monitoring carbon sequestration, microbial communities, nutrient and trace element chemistry, organic matter, and mineralogy and morphology of the soil; and
3. Coupled Dynamics of Human and Landscape (CDHL) to focus on the changes in landscape dynamics and anthropogenic activities in response to forest disturbances at various spatial and temporal scales.
The Center will leverage inter- and trans-disciplinary synergies across the focus areas as well as collaborate with local, national and international scientific communities to meet regional research needs in training multi-disciplinary scientists. AAMU’s administration is committed to the continual support of CFEA. We will enhance our relationships with the USDA Forest Service, the Science and Education Alliance, the Center for Applied Tropical Ecology (CATEC) at the University of Puerto Rico at Rio Piedras, the USDA-Natural Resources Conservation Services, the US Environmental Protection Agency, and other partners in establishing a NSF’s “Super Center” and working on large scale NSF programs such as National Ecological Observatory Network (NEON) and Critical Zone Exploration Network (CZEN).

**Intellectual merit of the proposed activity:**

The research will undertake *systematic* and *synergistic* examination of the response of forest ecosystems to disturbances—prescribed burning and thinning—by monitoring ecosystem fluxes across molecules, meta-population dynamics, biodiversity, Carbon, and Nitrogen. We will perform multidisciplinary analyses of physical, chemical and biological components of forested landscapes. Data will be collected from existing randomized complete block design plots which have provided controls for confounding factors and allowed for hypotheses testing. In this large scale ecological experiment, time-series data collected at various landscape levels will be linked to plot level data to examine theories of intermediate disturbance ecology.

**Broader impacts of the proposed activity:**

The project will continue to integrate research with faculty development and graduate education in a university with 133 years of dedicated service to training students from groups still underrepresented in science and technology fields. Outreach to high school students and the public will target greater participation of underrepresented groups. CFEA will also build the institutional science, technology, database, and faculty infrastructure and enhance multi-disciplinary, multi-institutional, and international collaborations.

“Decreasing Dairy Cattle Methane Emission: An Improved Dried Distillers Grains with Solubles with the Potential of Enhancing Dairy Cows Performance”

*Dr. Gamal Eden Abdelrahim, Principal Investigator*

**Introduction**

Long-term goals: The long-term goal of the proposed project is to efficiently reduce methane production and to enhance cows' performance. Specific objectives of the proposed study are: (1) Feed lactating cows Dried Distillers Grains with Solubles (DDGS) supplemented with varying levels of peanut skins to reduce methane; 2) Feed lactating cows DDGS supplemented with peanut skins to improve digestibility, increase milk yield and improve milk composition.

Opportunities for nutritional and microbial manipulation to reduce enteric methane emissions from livestock have been extensively researched and reviewed by several groups (Ross et al., 2013; Hass et al., 2011). Literature (Abecia et al., 2012) shows that several technologies have been tested to reduce enteric methanogenesis, this include variation in the composition of microorganisms in the rumen (Ross et al., 2013) and use of feed additives such as condensed tannins (Waghorn et al., 2002; Woodward et al., 2004), fat (Eugène et al., 2008), and essential oils and their bioactive compounds (Khiaosa-ard and Q. Zebeli, 2013) to reduce enteric methane production by dairy cattle (Ross et al., 2013). And, several groups concluded that the dietary strategies can influence the amount of enteric methane produced by dairy cows (Beauchemin et al., 2008; Ellis et al., 2008). However, Abecia et al. (2012) indicated that the consequences of reduced rumen methane production on animal performance and milk quality are poorly understood and suggested that new technologies, especially in the form of feed additives, will have to be cost-effective and demonstrate that no residues are found in edible meat and milk.
Study Location
Plan of Operation and Methodology

The proposed study will be located at the Piedmont Research Station at the North Carolina State University (NCSU; Raleigh, NC.). The research station is located in Rowan County, nine miles west of Salisbury. Originally established as the Piedmont Test Farm in 1904 near Statesville, the station was moved in 1954 to its present site on 1,044 acres. Research at the station is divided into four research units: dairy, poultry, field crops and horticultural crops. The structures and facilities at the Piedmont Research Station are varied to support the diverse research program.

The dairy unit consists of a recently upgraded milking parlor with electronic equipment to track each cow as she enters the parlor to be milked. A station building was renovated into an on-site lab to aid researchers in collecting and analyzing data. And, to achieve the three objectives of proposed experiment, a three-year experiment will be conducted in collaboration with faculty from NCSU. Including, Dr. Shanoon Davidson, Dr. Kasim Ingawa, and Dr. Steve Washburn; and, all procedures involving animals will be approved by the Animal Care and Use Committee of NCSU.

Animals

All animal care and handling procedures will follow the farms written guidelines set forth by Federation of Animal Science Society (2010). Twenty-four multi- and primiparous Holstein cows will be used in the proposed experiment. Cows will be blocked by parity, production, and DIM, and assigned to treatment diets at random. Cows will be housed in a free-stall barn and fed total mixed ration for the duration of the study and group fed at 110% of expected feed intake once a day and have free access to water.

Diets

Three experimental diets will be formulated for the study with 65% concentrate and 35% forages (25:10 silage/hay ratio). Diets will be based on corn as the major concentrate component of the diets and corn silage as the major forage component. Accordingly, cows will be fed three dietary treatments containing 0 (control), 10, or 20% peanut skins (DM basis) as a replacement for corn and SBM. Control diet contained dry-rolled corn. The three diets will be formulated according to NRC (2001) to meet or exceed the nutritional requirements for early lactating cows (650kg of BW) producing 45.0kg of milk/d with 3.50% milk fat and 3.00% milk protein. The DM concentration of forages and concentrate mixes will be determined weekly and diet formulations will be adjusted to maintain the 65:35 concentrate/forage ratio.

Data Collection and Sample Analyses

Total dry matter intake (DMI) will be measured periodically. Total DMI will also be estimated on the three treatments, using chromic oxide (Cr2O3) as an indigestible fecal marker. The Cr2O3 will be administered twice daily (10 g/d) after each milking for 10 d every 60 days. Fecal grab samples will be collected and immediately frozen. On the same days that fecal samples will be collected, samples of concentrate and TMR will be collected. Samples will be dried and ground before analysis. The samples will be analyzed for DM, CP, ash, soluble CP (Krishnamoorthy et al., 1982), ADF and NDF (Ankom Daisy II, ANKOM Technology Corp., Fairport, NY), Non-structural Carbohydrate (NSC). Samples of silage and hay used in the TMR will also be taken during the intake periods and analyzed for DM, CP, ADF, NDF, nonfiber carbohydrates, ether extract, and minerals. The frozen fecal samples will be thawed, dried at 55°C in a forced air oven, and ground through a 1-mm screen. Fecal samples will be analyzed for CP, NDF, and Cr. The concentrate DMI on the three treatments will be measured daily in every group as the difference between offered and refused. Total DMI on the each treatment as TMR DMI. Apparent digestibilities of DM, NDF, and CP will be determined with the fecal output estimated using Cr2O3 as marker and DMI, and nutrient concentration in feces and feed.

Methane Measurement

Methane concentrations will be measured inside the barns and during milking the using the wired methane and ammonia SSSOT sensors*. The sensors will be hung from the ceiling of the barn such that continuous measurement of ammonia can take place.

The data will be collected in a USB drive from the control station and analyzed statistically by all available data such as temperature, humidity, feed type etc.
**Milk Sampling and Analysis**

Cows will be milked twice daily and milk yield will be recorded daily throughout the duration of the experiment. Milk samples will be collected weekly during the duration of the experiment and preserved. Milk fat and true protein will be analyzed on weekly basis by the DHIA milk testing laboratory. A subsample from each milking will be stored at 4°C until analyzed for milk components (fat, protein, and lactose. A second subsample of each milking will be stored at −20°C without preservative until analyzed for FA profile.

**Expected Outcomes**

The following major products, results, and measurable outcomes are expected to have occurred at the end of the project: The project will have developed an innovative diet manipulation strategy that reduces methane production in dairy cows. The project will have developed an innovative diet manipulation strategy that improves digestibility, increase milk yield and improve milk composition. The project will have generated data that will be used in writing more research proposals in the future.

The expected short-term outcome of this project's are 1) development of an innovative diet manipulation strategy to use in reducing methane emissions in dairy cows, 2) increase in the knowledge and skills of dairy producers in utilizing the strategy, and 3) publications and dissemination of the findings to a wider audience. Upon completion of the first year of the project, assessment of the progress toward reducing methane emissions will be completed. Also, at the end of the project duration a comprehensive report with the outcomes of the project will be prepared by the authors of this project and made available for the stakeholders to disseminate the results. This will include: The detail method feeding; and Feeding dairy cows DDGS supplemented with peanut skins to reduce methane and improve digestibility, increase milk yield and improve milk composition.

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**“Building Global Engagements to Enhance Faculty and Students’ Professional Development and Career Opportunities in Agriculture’s Challenge Areas”**

*Dr. Zachary Senwo, Principal Investigator*

This project's goal is to strengthen the global competence of students and faculty in food and agricultural sciences, expand their global awareness in a South American culture, and introduce them to new global vision through collaborative partnerships with institutions in Brazil. The specific objectives include: (1) educational building, research, and extension partnerships with Brazil's institutions in some of agriculture's challenge areas to enhance faculty and students' professional and career opportunities; (2) developing a summer enrichment international scholar exchange, experiential learning, education, research, and extension programs to promote awareness among faculty and students about the broad range of international opportunities in food, agriculture and related sciences; (3) using this and other overseas partnerships to build stronger pipelines for minority student recruitment into our programs.

The project supports our nation's efforts to build and strengthen human capacity and diversity through increased involvement of underrepresented minority students to be well prepared, culturally balanced and society ready in agriculture and related professions. The project is also meant to expand students and faculty global awareness in the understanding of NIFA's strategic goals which include: sustainable and renewable bio-energy, global food security and hunger, food safety, nutrition and health, sustainable rural economies and climate change in a global economy; natural resource management and conservation.

To date students and faculty have participated in these and other project activities, guided by Brazilian mentors: Learning firsthand some technologies developed by the Brazilian Agricultural Research Corporation [Embrapa] and adopted for Brazil's agricultural production and food security; energy production, (particularly bioenergy from sugar cane and soybean);
and quantifying nitrous oxide (N2O) emission from soils, practical aspects of biological nitrogen fixation in sugar cane and maize; (2) techniques and methods (soil preparation, soil fertilization using cover crops, composting, disease prevention and disease control, organic production of bovine milk, collection of soil fauna, restoration of degraded pasture (the corridor) used to enhance small scale organic farming productivity; (3) sustainable organic production and potential impact on families and communities; (4) understanding the source of the Amazon river and its ecological systems, fauna and flora, wildlife, and indigenous communities; (5) tropical agriculture; and (6) Brazilian culture and language training. The students in return submit activities reports, give seminars, and presentations to different classes across the campus. President Hugine, this summer signed a Memorandum of Understanding (MOU) with the Federal University of Roraima. This is probably the first with a Brazilian University.

Expected outcomes/results:

The project continues to significantly impact the quality of food and agricultural sciences education at both Alabama A&M University and Tuskegee University. The students enrolled in the program have become well prepared to address the critical national and international agricultural issues/USDA-NIFA’s strategic goals of global food security and hunger, food safety and quality, bioenergy/biofuel, global climate change education, natural resource management and conservation, and sustainable rural economies.

A project of this nature strengthens AAMU’s global stature to enable and establish a more globally aware student body. It provides students and faculty with a geographically diverse perspective for teaching and learning. Students benefit directly because activities can be integrated into courses being taught by faculty. Students and faculty have the opportunity to develop long-term scientific research, education partnerships, student and faculty exchanges, sabbaticals, and grantsmanships.

“Canola Research”

Dr. Rufina Ward, Principal Investigator

Domestic production of canola has not kept pace with the consumer demand for canola oil. Nearly 83% of canola oil consumed domestically in 2010 was imported mainly from Canada. In 2012, the total value of Canadian canola exports to the US was $3 billion. With the development of high yielding winter canola cultivars that are well adapted to the environmental conditions of the southeastern region, regional farmers stand to benefit from this trade deficits. The potency of canola to suppress pest microorganisms such as fungal diseases and nematodes is another incentive for farmers in the region to plant canola. With the potential adoption of early maturing lines developed at AAMU, Canola fits well in rotation with summer crops in a double cropping system. Our long term goals are to expand canola production and improve farm sustainability and profitability through crop diversification with increased adoption and cultivation of winter canola in the southeastern US. Our specific objectives are to 1) evaluate adaptability of early maturing winter canola (AAMU lines) in other states within the US southern/southeastern region; (2) determine dispersal behavior of tarnished plant bug movement from canola to summer row crops (e.g., cotton or soybean) critical in the development of pest management strategy against this pest; 3) determine efficacy of different canola cultivars in suppressing nematode population in the field; 4) evaluate harvest aids in minimizing seeds loss due to pod shattering, and 5) educate farmers and other stakeholders on canola technology through educational workshops and field days.

“Advancing Knowledge in Tropical Island Ecology, Biodiversity and Resource Conservation through Student Experiential Learning and Faculty Collaboration”

Drs. C. S. Christian, A. A. Rodriguez, R. Fraser, S. Hopkinson, and B. S. Herbert, Co-Principal Investigators

Current environment of international trade competitiveness dictates that university graduates are knowledgeable about other cultures, international conventions, and global resource issues. In addition, graduates must be equipped with the scientific and technical competencies necessary to operate effectively, nationally and internationally. This ‘mult-state’,
multi-disciplinary, and multi-institutional education project (EP), primarily targeted at minorities, is intended to assist a cohort of 28-30 undergraduates to develop required competencies, global perspectives, and knowledgebase for successful careers in agricultural-related disciplines and/or future graduate studies. Furthermore, through faculty collaboration, initiate a strategic partnership between Alabama A&M University and University of Puerto Rico. Project consists of an Orientation Seminar offered through on-campus lectures and online methods, Field Course conducted at Clemson University’s Caribbean field-station, and Faculty collaboration. Course modules are designed to increase students’ knowledge and understanding of island ecosystems, sustainable development, and related concepts, through critical thinking and experiential learning approaches delivered in a ‘tropical island outdoor laboratory setting’. Project, supportive of USDA’s strategic goal #6, bridges four disciplines—Environmental Science and Natural Resource Conservation (C1), Agricultural Science (G1), International Education (I1), and Biological Sciences (B1), under the umbrella of which ‘climate change’ and ‘food security’ challenge areas, and ‘bio-energy/biofuel’, ‘sustainable agriculture’, and ‘global climate change including environmental sciences’ priority areas are addressed. The project will broaden ‘students experiences’ and ‘treatment of agriculture in overall curriculum’, promote ‘stronger institutional connections’, and ‘foster partnerships’. Successful project implementation will result in measurable outputs and discernible outcomes and contribute towards the realization of the PD’s long-term career goal.

“Developing HS-STEM Workforce through Education & Research Emphasis on Explosives Detection Techniques”

Dr. Aschelew Kassu, Principal Investigator

This project envisions several activities including creating opportunities for involvement of Early Career Faculty in DHS-relevant research Projects and DHS-relevant undergraduate courses, establishing collaborative relationship with a DHS research center, improving curriculum by introducing material that will help students comprehend DHS-relevant technology and encouraging students to enroll in HS-STEM disciplines with work/study stipends. The project will establish strong collaborative relationship with the DHS Center-of-Excellence (ALERT) and a local federal laboratory AMRDEC (Aviation and Missile Research, Development, and Engineering Center) for faculty research and student traineeship, create an Undergraduate Seminar in which each student participant will present at least one seminar per year on a topic which is HS-relevant, and involve effective mentors who will provide guidance to students in selecting promising HS-relevant career opportunities and also encourage them to further expand their horizons by considering graduate studies. This will strengthen the current efforts in mentoring, educating, building a well-rounded research capability and providing scholarships for about ten women and underrepresented minority undergraduate students majoring in STEM discipline every year for up to four years for each student. The outcome of this objective includes recruitment and retention of students across STEM disciplines, mentoring students to pursue graduate studies and career opportunities HS-STEM related fields.

The research component of this project focuses on detection and identification of explosive materials using surface enhanced Raman spectroscopy, standoff Raman spectroscopy, and design of cost-effective sensitive SERS substrates. Both PI and Co-PI each have several years of experience using Raman Spectroscopy to detect explosives and produced more than 15 research articles. The underrepresented minority students co-mentored by the PI and Co-PI at AAMU and ALERT scientists will be able to conduct cutting-edge research at DHS-COE’s facility. This opportunity will further enhance the research capability of the early career faculty and the minority STEM students to produce high quality journal articles, conference publications and presentations. This will have a positive impact not only on the students and faculties involved in the project, but also to the HS-STEM scientific community.
Animal Scientists from Europe and Asia participated in two 2014 USDA Cochran Fellow Programs held at AAMU. For two consecutive years, the USDA selected AAMU as a host of Cochran Fellow Programs that focus on training animal scientists representing universities and private companies from Asia and Europe. This included two Feed Formulation and Dairy Nutrition and Genetics programs held on August 3-16, and August 17-30, 2014. The programs’ main goal was to train a total of thirteen (13) USDA Cochran Fellow from Indonesia and Macedonia. Similar to last year’s program, this year’s programs were directed by Dr. Gamal Eden Abdelrahim, Associate Professor in the Department of Food and Animal Sciences (FAS). Funded through $55,000.00 USDA grants, the programs objectives were to enhance visiting animal science professionals technical knowledge and skills in areas related to animal nutrition and genetics, dairy and beef cattle production, feed formulation and animal health. In addition to Dr. Abdelrahim, a team consisted of six professors and two staff from AAMU and North Carolina State University (NCSU) contributed to the programs.

The agenda of each program included an opening session in which the visitors were welcomed by invited AAMU administrators, including Dr. Lloyd Walker, Dean, College of Agricultural, Life and Natural Sciences; Dr. Martha Verghese, Chair of FAS; Ms. Marian Geter, Director of OSP; and Mr. Marcus Harper, OSP Grants Administrator. In a speech delivered on August 19th to the USDA Fellows from Macedonia, Ms. Geter welcomed the Fellows from Macedonia to AAMU and wished them success in the training. Also, Ms. Geter used her speech to provide the Fellows with in-depth information about AAMU in general and the OSP in particular, including the office’s role in promoting and facilitating externally-funded broad-concept research and associated strengthening, training and public service programs at AAMU. Then, Ms. Geter concluded her speech by taking questions from the Fellows and entertaining their comments and suggestions. This included comments by two visiting Animal Science professors in which they expressed to Ms. Geter their interest in collaboration in research with their counterparts at AAMU.

According to its website, the USDA indicated that the Cochran Fellowship Program provides short-term training opportunities to agricultural professionals from middle income countries and emerging markets. Its goals are: (1) To help eligible countries develop agricultural systems necessary to meet the food and fiber needs of their domestic populations; and (2) To strengthen and enhance trade linkages between eligible countries and agricultural interests in the United States. Since its beginning in 1984, the Cochran Program has provided training for more than 14,300 fellows from 123 countries.
Plan to Engage Faculty in Increased Grant Writing: To engage more faculty in grant writing and scholarly activities, and increase the number of proposals submitted to funding agencies, foundations and corporations.

Plan of Implementation: The Office of Sponsored Programs will develop and implement activities that will assist faculty to develop quality proposals. Each activity is briefly described below:

1. **Capabilities Assessment:** The Director and Grant Administrators (GA) will work with the Deans and Department Chairpersons to learn of the capabilities and interest of faculty in their colleges and departments. This will be achieved through:
   - A. One-on-one consultation
   - B. Meetings with Deans and Department Chairpersons

2. **Pre-Proposal Development:** Based on faculty expressed capabilities/interest(s), GAs will provide faculty with announcements that will fund research/projects of their interest.

3. **Assistance with Interpreting the Announcement:** GAs will assist faculty (new potential PI’s in particularly) with analyzing agencies/foundation’s announcements.

4. **Assistance with Budgeting:** GAs will assist PIs with budgeting during proposal development and prior to submission.

5. **On-Site Availability:** Each GA will be on site at their respectful college at least once per week. GA schedules will be posted in the Bottomline and sent to the deans and chairs.

6. **Follow-Up:** GAs will follow up with PIs who are writing and provide resources as needed, assist with making contact with funding agency.

7. **Establish a “Research Collaborations” Chat Room:**
   - A. Check with IT on an accessible portal (Blackboard, GoToMeeting) that will allow researchers to post research ideas, industry applications across disciplines, and merge ideas into collaborative proposals; Bring in University Administration, OSP staff, agency Program Officers into the Chat.

8. **Establish a Research Administration Training and Writing**
   - A. Equip with Laptops/Desktops, Agency Information
   - B. Begin New Researcher Training with Basic “How to Training” will be conducted (Finding Opportunities, Fastlane Registration, Electronic Package Completion and Submission)
   - C. Establish a Mentor—Protégé Program for each New Faculty Member
   - D. Review the opportunity for a Collaborative Research Hour: Poster Session for one hour each month (lunchtime) or from 5 to 6 to share research activities, and link activities for a proposal submission;
   - E. Bring in Professional Proposal Development organizations to provide training;
   - F. Utilize AAMU researchers to present a “How I Got Funded” session

9. **Review of Proposals:** Each GA will review proposals prior to submission.

10. **Submittal of Proposals:** All proposals will be submitted from OSP.

11. **Incentives:** OSP will provide incentives for grant writing.

12. **PI/PD Recognition:** Beginning March 2015, OSP will implement recognition incentives which include:
    - A. Principle Investigator (PI) of the Month: OSP recognizes each month the PI whose award brought in the largest amount of funds.
    - B. Research Writing Team of the Month: Along with the PI, OSP recognizes the writing team that assisted the PI with the writing of the proposal that was funded.
    - C. Project/Program Director of the Month: OSP recognizes the Project Director who submitted a successful competitive proposal and received the largest amount of funding that month.
    - D. Project/Program Writing Team of the Month: Members of the Project/Program Director’s writing team will also be recognized.
    - E. New PIs of the Month: Faculty, who have written for the first time will be recognized each month.
    - F. Research of the Year: The OSP is committed to recognizing researcher for outstanding efforts. A researcher will be recognized at the end of each academic year.
    - G. OSP End of the Year Recognition Affair: OSP will honor all PIs at an end of the year affair. The
College/School that received the most awards during the academic year will also be honored.

13. **Workshops**: OSP will bring to the campus representatives from various federal, state and local governments as well as foundations and corporations. In this context, OPS will sponsor Grant Writing Enhancement Workshops beginning during the week of April 7, 2015 and continuing through April 30, 2015.

### Funded Awards by College

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<tr>
<th>Funded Awards by College</th>
<th>No. Awards</th>
<th>Awarded</th>
<th>Indirect Cost</th>
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<tr>
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<tr>
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<td>2014 Total</td>
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### Sponsored Programs Funded Award Amounts FY2013-2014

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<th>FY2014</th>
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<tr>
<td>College of Agricultural, Life and Natural Sciences</td>
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<td>College of Business and Public Affairs</td>
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<td>Non-Academic/Administrative Units</td>
<td>1,360,131.00</td>
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**Legend:**
- Black Bar: FY2013
- Red Bar: FY2014
Sponsored Programs Submitted Proposal Amounts FY2013-2014

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<tr>
<th></th>
<th>FY2013</th>
<th>FY2014</th>
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<tr>
<td>College of Agricultural, Life and Natural Sciences</td>
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<td>28,575,599.04</td>
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