Strengthening the Global Competence in Forestry and Agriculture through Collaborative Programs With China (ISE Project)

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Project Summary

We have designed this project with the support and collaboration of five institutions: Chinese Academy of Science (CAS) Institute of Applied Ecology, CAS Northeast Institute of Geography and Agroecology, Beijing Forestry University, Guizhou University, and Louisiana State University. The goal is to strengthen the global competence of minority students and faculty in forestry, agriculture, natural resources, and climate change. We will: 1. Enhance SU student global awareness, perspectives and competitiveness through the establishment and implementation of a study in China program; 2. Provide experiential learning opportunities for students through multidisciplinary and multi-institutional partnership with China; 3. Enhance SU faculty capabilities to conduct collaborative research through a one-month research engagement in China; 4. Enhance the international content of existing courses at SU and create a new course entitled Global Perspectives of Forestry and Agriculture; and 5. Enhance SU faculty and students' capabilities in disseminating their international findings. The project will enable faculty and students to gain knowledge and learn strategies to address the complexities of global agriculture, forestry, natural resources, and climate change. The project will raise general awareness at SU about related issues and the need and advantages of studying the topics in a multidisciplinary and internationally collaborative environment. Increased awareness will translate into better benefits of bringing Chinese technologies to the U.S. agricultural and forestry industries and to related businesses for increasing their competitiveness in the global market. This project addresses USDA NIFA strategic goals on agriculture, forestry, natural resources, and climate change; and the ISE priority area on Strengthening the Global Competence of Students, Faculty, and Staff in Agriculture and Related Areas.

ACE Implementation: The New Energy Workforce: Sustainable Materials, Energy & Technology

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Project Summary

Interdisciplinary Focus: Highlighted by developing concentrations within the Colleges of Agricultural Sciences, Engineering, and Sciences, the ACE Implementation Project at Southern University will create an interdisciplinary international degree program that integrates research, academics and experiential learning toward resolving sustainability issues faced by Louisiana, this nation and the global community.

Activities: Expose undergraduate students to sustainable materials, energy, and technologies through an interdisciplinary dual-degree curriculum that integrates academics, research and global engagement with international universities; Assemble interdisciplinary teams of international scientists and engineers to identify solutions to sustainability challenges affecting the global community; Engage in interdisciplinary sustainable materials, energy and technologies research activities with special emphasis on clean and renewable resources suitable for commercialization and replication.

Primary Audience: Students, faculty and potential entrants to the STEM Enterprise at Southern and identified partnering universities in China (Guizhou University and Shenzhen University); Louisiana's science, technology, economic and business sectors; Louisiana citizens; HBCUs and representative national organizations; residential communities surrounding collaborating universities.

Intellectual Merit: Southern is centering itself at the forefront of the sustainability frontier by engaging in the development of the next generation of sustainable materials, energy and technologies. Basic sciences that will lay the foundation for development of this initiative within the SU STEM enterprise are Agricultural Sciences, Engineering, and Physical Sciences, which will combine to support three primary research thrusts – Materials Science & Energy Technologies; Biomass Conversion, Biofuels & Bioenergy; and Climate Change & Environmental Impact. Computational Science & Information Technology will serve as an undergirding connection throughout. As a result of partnering with members of the international STEM Enterprise, we will expand the knowledge base of our students and faculties with respect to sustainable development, developing solutions to real-world problems from a global perspective. Two objectives with associated activities will serve the goal while attempting to answer the question of how to combat declining interest and enrollment in STEM and how to positively affect research capacity and production at HBCUs. According to the National Academy of Sciences (NAS), "Increasingly, the most significant new scientific and engineering advances…cut across several disciplines." NAS also reports that, undergraduates are strongly attracted to interdisciplinary courses, especially those of societal relevance. One NAS report cites the example of Stanford University which increased student interest and improved STEM graduation rates with implementation of an interdisciplinary program in Earth Science. The benefits of interdisciplinary education have been reported to include enhancing students' knowledge, attitudes, skills and beliefs, in particular on understanding of professional roles, flexibility, problem-solving, and inquiry. NAS also reports that lessons learned from industry and National Laboratories provide strong evidence that interdisciplinary partnerships benefit research effectiveness and promote diversity.

Broader Impacts: The broader impacts resulting from the proposed project include integration of research and education in advancing the discovery, understanding and application of sustainable materials, energy and technologies necessary to engender a world-class 21st century STEM workforce. Aligning academic instruction with relevant sustainable development research thrusts will broaden the participation of underrepresented ethnic groups in transformative sustainability innovation. Forging

collaborative partnerships that emphasize student and faculty exchange, joint research foci, joint course offerings and joint academic degree programs will promote scientific and technological understanding within the global STEM Enterprise. Further promotion of contributions to sustainable development on a global-scale will occur through scientific research; advisory studies; dissemination and education; participation in symposia, scholarly workshops, presentations, and seminars.

Strengthening Teaching and Learning In Urban Forestry Through Climate Change Education

USDA CBGP. PIs: Drs. Zhu H. Ning, Kamran Abdollahi, and Andra Johnson, Professors

Project Summary

To address the USDA/NIFA/CBGP strategic goals and priority areas on global climate change, water quality, and sustainable agriculture, this joint project has assembled unique and collaborative multi-state and multi-region entities with complimentary goals to ensure the effective, transformative, and innovative approaches to integrate climate change education into its curricula both at graduate and undergraduate levels at Southern University and A&M College (SU). The partners include Louisiana State University, USDA Forest Service (FS) Southern Global Change Program, FS Southern Research Station and Northeast Research Station, FS Center for Urban Forestry Research, East Carolina University, American Forests, and Davey Tree Company. The objectives are to 1. Enhance the curricula by developing a new course on how climate change impacts forest, natural resources, and ecosystems in urban environment and urban –rural interface, and how to mitigate the impacts, 2. Enhance student competence and workforce preparedness through research training, 3. Strengthen experiential learning by creating a summer program of field study trips to our partners' research sites, 4. Enhance scientific exchange and learning environment by implementing an annual symposium, 5. Foster critical thinking by establishing an Ecology Forum, 6. Enhance student professional development through attending conferences, and 7. Utilize the enhanced program to recruit from underrepresented groups. The project will enable faculty and students to gain knowledge and learn strategies to address the complexities of climate change, forestry, natural resources, and ecosystems, which will translate into better benefits of applying learned knowledge and technologies to the agricultural and forestry industries and to related businesses for increasing their competitiveness in the global market. The project will strengthen the education capabilities at SU; will enhance students' marketability and workforce preparedness; and will develop sustainable partnerships that will enable SU students to interact and succeed in the global workforce.

Quantifying the Responses of Urban Tree Species to Elevated CO_2 and Flooding

USDA CBGP. PIs: Drs. Zhu H. Ning, Kamran Abdollahi, and Andra Johnson, Professors

Project Summary

This project is designed in collaboration with the USDA Forest Service (FS) Southern Global Change Program to address the USDA/NIFA/CBGP strategic goals and priority areas on global climate change and sustainable agriculture. The project goal is to quantify the responses of urban tree species to elevated CO_2 and flooding in partnership with the FS Center for Bottomland Hardwoods Research, FS Southern Research Station and Northeast Research Station, Louisiana State University, East Carolina University, Society of American Foresters, and Davey Tree Company. Experiments using live oaks and nuttall oaks will be conducted with elevated CO_2 and periodic flooding as treatments. The objectives are to 1. Characterize the growth responses; 2. Quantify net photosynthesis both at leaf and whole-plant levels; 3. Analyze the tolerance at biochemical level by determining carbohydrate content, and soluble protein and Rubisco analysis; and 4. Examine adaptation at anatomical level by investigating leaf, shoot and root structure, and by root subrization analysis. The results will enhance our understanding of how urban trees respond to elevated CO_2 and flooding in light of climate change. The project will generate fundamental knowledge that can be transferred to the stakeholders in hope of economic gains. The results will contribute to regional recovery, and post hurricane and storm urban forest restoration and afforestation. The information can be used in urban/rural forest management and establishment of a sustainable healthy community forests. This project will enhance the quality of SU research programs; enhance faculty and student competitiveness in research; strengthen our partnerships and collaborations with 1890 and 1862 institutions, USDA FS, NGOs, and private industry; and enhance the quality and preparedness of our graduates for the global workforce.