

Embracing Sustainable Development as a Profession

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Recent years have witnessed wide publicity of a variety of global sustainability issues reaching across political and natural borders. While some of these challenges have been around for decades, recent renewed interest has brought them to the forefront of societal importance. For example, this past year's increases in food prices and food shortages have highlighted the pervasive issue of global poverty, and recent flooding and droughts in the United States and tsunamis in Asia have led to renewed emphases in ecosystem services and water supply issues. Dismal statistics about our current global situation and ominous forecasts about our future can be heard or read on a daily basis in nearly all media news outlets. The good news? The time has never been more appropriate for agricultural and biological engineers to play a leading role in problem-solving on the global stage.

Engineers are trained to use the principles of science and engineering to improve individual and societal existence. Over the last century, agricultural and biological engineers have played a critical role in advancing human civilization through large-



Students from KSU's chapter of EWB help Grassroots, an Indian NGO, develop a system to move goods from villages to roadways in the Himalayan foothills.

scale mechanization and industrialization. Some have argued that the rapid enhancement in industrial productivity may have contributed to new societal challenges, such as climate change and an imbalanced global distribution of wealth and well-being. As 21st century engineers,

we have an opportunity and a professional responsibility to contribute in a *pro bono* manner to the solution of these problems.

Agricultural and biological engineers are uniquely positioned to contribute their perspective and more than 100 years of experience

as a profession. Because most global sustainability issues involve many facets (such as economics, society, and environment), amelioration of these concerns unquestionably requires multi-disciplinary approaches. Indeed, the profession of agricultural and biological engineering is inherently multi-disciplinary. From water supply, to soil quality, to waste management, to mechanization, to bioprocessing and renewable energy, the expertise within our field can address many of the critical issues facing the globe. As professionals, ASABE members can offer a wide array of practical skills that allow contributions for not only one or two of these dire global needs, but nearly all.

Highlighting our discipline's role in improving peoples' lives and preserving the environment should attract students who want to help enhance the quality of life in the world's impoverished and developing communities. Such students include women and minorities whose recruitment and retention in engineering programs remain a major challenge. These populations usually cite their intentions to help people as a reason for choosing professions such as medicine or law over engineering. As modern agricultural and biological engineers, we should loudly communicate the unique opportunities that our discipline offers to students and professionals who want to make a difference in the daily lives of the world's most disadvantaged people by helping them secure safe drinking water, adequate sanitation, affordable housing, renewable energy, and sustainable agriculture.

In recent years, engineers have been given an outlet for international



ISU-ESW students plan for biogas digester installation in Uganda

service work to address global issues. Specifically, organizations like Engineers Without Borders (EWB-USA) and Engineers for a Sustainable World (ESW) offer opportunities for students and professionals alike to become involved in international and local service projects with a special focus on increased sustainability. Founded in 2000, EWB-USA has quickly grown to include chapters in every state in the United States, with more than 200 chapters (student and professional) working on projects in 41 countries (www.ewb-usa.org). ESW, founded in 2002, focuses on infusing sustainability into engineering education and practice through domestic and international service projects. ESW has chapters on about 20 campuses across America (www.esustainable-world.org).

Example projects

India. Four members of Kansas State University's (KSU) student chapter of EWB recently spent their spring break in India to learn firsthand how non-governmental organizations (NGOs) work with villagers in the lower Himalayas to promote rainwater harvesting, sustainable agriculture, micro-enterprise development, and renewable energy. Architectural, agricultural, civil, electrical, and mechanical engineering students have joined forces to help design a rope-way conveyance system that will enable rural women to transport goods from downhill village workshops to uphill roadways.

Uganda. Iowa State University's (ISU) ESW chapter has been collaborating with ISU's Center for Sustainable Rural Livelihood on technology development projects in Uganda. Several



...and then work with Ugandans to dig a pit for the digester.

student teams have traveled to Uganda to work on location with an NGO. Students designed and built a biogas digester and subsequently provided advice and education on its maintenance and utilization. In addition, a rooftop water harvesting system was designed and built to catch and store water during the rainy season for household use.

Brazil. Students from ISU and the Federal University of Vicosa, Minas Gerais, Brazil, have worked together on two U.S. EPA People, Planet, and Prosperity (P3) projects. The focus of these projects was on small-scale renewable energy in Brazil and Iowa. Systems models were developed to estimate sustainability metrics as well as economic feasibility. Opportunities and barriers to adoption were analyzed. Two ISU student teams traveled to Brazil

to learn about Brazilian bioenergy systems and work with the UFV team on project tasks.

In the past five years, several courses and a few degree programs focusing on engineering and technology development for the developing world have emerged in U.S. engineering colleges. For example, Virginia Tech teaches a course titled Water Supply and Sanitation in Developing Countries, the Colorado School of Mines offers a minor in Humanitarian Engineering, and Iowa State University engineering faculty members teach a multidisciplinary course titled Sustainable Engineering and International Development. In the ISU course, students work in multidisciplinary teams and on term projects set in the developing world. The majority of the projects address sustainability in agri-food systems including such

topics as water quality, biorenewable energy, food processing, and rural electrification. Clearly, the experiences that engineering students have in working on these kinds of projects are important in their development as professionals. Students have indicated that the projects are helpful for them in understanding the practice of engineering and development. Projects set in the context of developing world problems have helped students to see how engineering concepts can be applied to real-life situations.

Agricultural and biological engineers are uniquely placed to engage local and international communities in sustainable development work. Our skills and experience can help improve the quality of life in the world's impoverished and developing regions. Integrating international projects into engineering education programs can help recruit and retain students while immersing them in culturally enriched and socially contextualized technical experiences. These projects can also challenge working professionals to practice their skills in uniquely resource- and technology-constrained environments. Our profession's unique connections with technology, food production, and natural resources give us a preferred edge and an obligation to promote sustainable engineering and development, and mentor the engineers of the future who are involved in groups such as EWB and ESW.

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