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**Building Human Resources in Bioenergy:
An International Training Program at Michigan State University**

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Introduction: The Importance of Bioenergy and the Need for Trained Human Resources

Biofuels and bioenergy has become a global issue due to the widespread interest in finding and developing alternatives to fossil fuels, including biofuels, while ensuring food security and environmental quality. Many developing countries have ample and unique bio-resources to utilize for generating bioenergy and have an opportunity to harness their rich biological resources. Education, capacity building, information, dialogue and networking are critical to better formulate appropriate policies, research, development, and outreach programs to address energy issues for sustainable development. Currently there is a lack of training programs, courses and curriculum devoted to biofuels/bioenergy.

Design and Offering of the Bioenergy Training Program

This paper describes a unique international short course on biofuels and bioenergy that has been designed and offered at Michigan State University since 2009. To the authors' knowledge, it is the first and only international short-term training program offered in the United States that focuses on bioenergy issues related to developing countries.

Goal of this Training Program

The goal of this training program is to build human resources capacity in the area of biofuels and bioenergy, especially in developing countries. It aims to do this by: (a) exposing biofuels and bioenergy specialists first-hand to cutting edge research in the field; (b) allowing these professionals to network with some of the top scientists in the field, private sector and with each other; (c) equipping these professionals to make decisions on policy and investments for their countries,

institutions and/or businesses; and (d) allowing the opportunity for joint research projects and/or investments.

Program Components

This comprehensive short course provides education and information on various issues related to biofuels and bioenergy, including research, policy, technology transfer, commercialization and socioeconomic issues. It is divided into three main platforms: (a) technical, (b) social systems, and (c) agricultural. The technical platform deals with scientific research on conversion technologies (biochemical, biological, and thermochemical). The social systems platform covers ethics, economics, supply chains and life cycle assessments. The agricultural platform includes sessions on feedstock development and environmental and sustainability research. A final session on Biofuels and Developing Countries highlights the issues relevant to bioenergy, food security and rural development.

The course is offered by MSU in collaboration with research stations, farming communities, and the local private sector in the state of Michigan working on bioenergy issues. The international participants also share knowledge and experiences drawn from their current work and programs and policies on bioenergy in their home countries. Course topics have evolved each year based on feedback and suggestions received from the participants. In addition, a special private online group has been created for alumni of the course so that they can interact, network, and share information with each other.

Results: Impacts of the Short Course Program

Diverse Pool of Professionals Trained

The offering of this course has resulted in the training of 27 professionals from five continents and 13 countries over the past three years. Around 10 international participants are expected to attend this training course in 2012. Participants come from various sectors (government, public sector, private industry) and represent a variety of professional roles (scientists, engineers, researchers, policy makers, university/academia, administrators). Through this course, a global network of bioenergy specialists is being formed for continued networking and sharing of information, expertise and experiences.

Spin-off activities. Several spin-off activities have directly emerged as a result of this short course.

1. Michigan State University was invited to participate in an Expert Consultation on Developing a Sustainable Bioenergy Programme in Africa, Dakar, Senegal, April 12–14, 2010.
2. Several scientists have been hosted at Michigan State University for additional training in bioenergy areas.
3. MSU has been asked by two institutions in India to partner to develop bioenergy educational programs: TERI (The Energy and Resources Institute) University, New Delhi, and MET (Mumbai Education Trust) in Mumbai.

Curriculum Development. Efforts are under way to offer and institutionalize

similar courses at universities in developing countries. As mentioned above, TERI (The Energy and Resources Institute) University, New Delhi, India, has requested assistance in developing and offering a joint course in biofuels and bioenergy, as they begin to develop their own bioenergy curriculum. A proposal has been submitted for this education partnership.

Bioenergy Network Development. The short course is serving as an excellent platform for developing a global network of biofuels/bioenergy professionals and specialists.

Conclusion, Recommendations, and Implications: A Way Forward

Michigan State University will continue to enhance and offer this short course in the coming years. Building on this course, MSU plans to offer longer-term research internships. Plans are also underway to institutionalize these types of courses at local universities in developing countries. As mentioned earlier, a joint bioenergy education program is in development between MSU and TERI University in India. In addition, advanced courses and online courses are planned that will focus on specific aspects of bioenergy and will serve as a cost-effective way of sharing knowledge and information in bioenergy.

Through the network developed through this training program, collaborative research between scientists at MSU and at institutions around the world in the bioenergy field has begun. In the near future, MSU plans to organize a global forum on bioenergy to bring together worldwide expertise and experiences on bioenergy. This forum will encompass education, research, outreach, human resource development, information sharing, networking, curriculum development, online

resources, and establishing regional and global platforms for continuing cooperation on bioenergy.

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