International Collaboration in Plant Breeding Education

by Tracy Hmielowski

• With funding from the Gates Foundation, faculty at Iowa State University (ISU) have been able to collaborate with universities in Africa to develop a curriculum in plant breeding.

• A key to the success of this program was the involvement of faculty from Africa, who helped to shape the curriculum and how it could be used.

• In addition to providing materials, ISU provides ongoing support through a learning community.
Conversations and research are ongoing on the topic of the projected increase in human global population and the need for increased food production to match. As the population and demand increase, we will likely also see changes in climate across the globe that will impact agriculture. Plant breeders play an important role in all of this since they are responsible for developing varieties that not only have higher yields, but are also well suited for more extreme climate conditions. Some regions have well-established plant breeding programs, but developing nations are likely to find a greater need for both plant breeders and new cultivars to ensure food security of growing populations.

One effort to address this need is the Plant Breeding Education in Africa (PBEA) program. This program is a collaboration among Iowa State University (ISU), the Alliance for a Green Revolution in Africa (AGRA), the Bill and Melinda Gates Foundation, and three universities in Africa. One of the objectives of PBEA is to increase access to high quality open educational resources in plant breeding and genetics. This has been achieved by a collaborative international network of plant breeders and university faculty in the U.S. and Africa who modified coursework from the ISU online plant breeding program.

In 2011, Walter Suza joined the ISU faculty to develop the online courses for a master’s program in plant breeding. The curriculum filled a need for distance plant breeding coursework for students seeking additional education who may be unable to relocate for a traditional master’s program. The online graduate program also caught the attention of the Gates Foundation, which saw the potential for these online courses to be used more broadly. A representative of the Gates Foundation met with CSSA and ASA Fellow Kendall Lamkey, head of the ISU Department of Agronomy in 2012, to discuss how the ISU online courses could be adapted for use by African universities.

Adapting the Courses to Meet Africa’s Needs

“Plant breeding has a tremendous impact in improving livelihoods, and it’s especially critical for Africa where yields are so low and food insecurity is common,” says Suza, who is now serving as director of PBEA. “Right now, we’re seeing a lack of trained plant breeders and crop scientists to bring about the changes we’d like to see in crops of importance to Africa.” While ISU and the Gates Foundation agreed the ISU curriculum could aid in training plant breeders in Africa, they also recognized the need to adapt the coursework for international use.

To ensure that the curriculum would be useful, representatives from partner universities in Africa were involved. This collaborative effort began with the initial PBEA meeting in December 2013 when faculty from Makerere University in Uganda, the University of KwaZulu-Natal in South Africa, and Kwame Nkrumah University of Science and Technology in Ghana visited Ames, IA. Adapting the curriculum had to take into account Africa’s plant breeding context and technology infrastructure, including intermittent internet access. Teams of faculty and staff from all institutions were formed to oversee the development of the PBEA coursework. Additionally, examples that were relevant to crops grown in Africa give local context to the science of plant breeding.

The goal for students who participate in the PBEA program in Africa is to obtain the necessary skills to run cultivar development programs. The coursework developed covers six topic areas that fall under categories such as crop genetics, molecular plant breeding, and cultivar development. Within each topic area, there is background information, discussion topics, activities, and assignments for students to work through. Suza says the topics and modules are structured so that African instructors have the flexibility to adapt and deliver the courses and modules to best suit their teaching needs.

Online Community to Support Instructors

To support instructors in Africa, PBEA has established a professional learning community. The community helps onboard new faculty, provide updates to those using the curriculum, and enable faculty to share feedback on the modules. Additionally, faculty can share their experiences using the curriculum and strategies for working with students.

Mike Retallick, Professor and Chair of the Agricultural Education and Studies Department at ISU, oversees the learning community and says it helps faculty rethink their role. “The term we have been using is plant breeding educators,” he says. “We are challenging faculty to transition from being a plant breeder to a plant breeder educator.” This includes getting faculty to rethink education as being more than memorization and helping them to foster skills and problem-solving abilities in their students. Having this support system for those using the PBEA materials not only makes it easier for faculty in Africa to use the program, but also shows the commitment of ISU to maintaining this collaboration. Through the learning community, there are monthly communications and face-to-face meetings are scheduled approximately three times per year. Modules are updated as needed to incorporate suggestions from faculty as well as new science.

The successful collaboration among PBEA partners has resulted in 49 students in Africa graduating from the program. Suza shares that to date, 91 students have participated in the PBEA program through the partner universities in Africa representing 11 sub-Saharan countries, including Ghana, Uganda, and South Africa. The first cohort graduated from the program in 2016, and by 2018, 64 students had graduated. With continued commitment from ISU and partner universities in Africa, PBEA hopes to continue educating plant breeders in Africa who will be instrumental in adapting future crops to meet the needs of their communities.

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