$3.3 million in grants aims to improve farming in Africa

Cornell University

Two Cornell-based research projects -- one that boosts the soil-building effects of biochar for plants and another that harnesses genomics technology to accelerate maize and sorghum breeding in Africa by three-to-four times -- have each been given more than $1.6 million in grants.

The research is funded by Basic Research to Enable Agricultural Development (BREAD), which is supported by the National Science Foundation (NSF) and the Bill and Melinda Gates Foundation. BREAD seeks to partner advanced research expertise with the developing world. NSF supports research components in the United States while the Gates foundation supports affiliated partners overseas.

The first project aims to develop microorganisms (inoculants) to add to biochars, produced when organic waste is burned at low temperatures without oxygen, to improve soil health in small farms in Kenya, where soil degradation is directly linked to food insecurity, hunger and poverty.

"Biochars act like a sponge or microbial reef where microorganisms like to live, proliferate and hide from predators," said Johannes Lehmann, associate professor of soil biogeochemistry, who leads the project. The inoculants would infect plant roots and support mycorrhizae fungi and other bacteria to provide plants with such essential nutrients as nitrogen and promote growth.

Lehmann's group also seeks to develop stoves that would be made locally in Africa. The stoves would produce biochar while they were used for cooking and would eliminate indoor smoke, a serious health consequence of wood stoves in Africa. Also, farmers would be able to use such on-farm waste as shrubs, grasses and crop residues -- rather than harder-to-find wood -- to fire up the stoves.

The $1.6 million project also includes outreach to spread information and protocols about biochar, inoculants and cook stoves through workshops, presentations, CDs and publications.

The group includes researchers from Cornell's Departments of Crop and Soil Sciences, Mechanical and Aerospace Engineering and Applied Economics and Management; the University of California--Irvine; World Agroforestry Center of Kenya; and the University of New South Wales, Australia.

To more than triple breeding cycle rates to develop new maize and sorghum varieties in sub-Saharan Africa, researchers received $1.7 million to apply new molecular breeding technology to sequence trillions of base pairs from 12,000 breeding lines of maize and then sorghum. They hope to winnow the lines down by

90 percent, retaining only those that hold the most promise for drought tolerance and nitrogen efficiency.

This method would allows breeders to inexpensively select the most promising varieties based on their genotypes before doing crosses in the field, rather than undergoing the painstaking practice of crossing and breeding all the lines in drought and nitrogen deficient conditions.

"This is a really exciting opportunity to partner internationally," said Ed Buckler, a U.S. Department of Agriculture-Agricultural Research Service research geneticist with Cornell's Institute for Genomic Diversity, who leads the project. He added that breeding gains in Africa are well below those in the United States due to scarcity of fertilizers, small-scale breeding efforts and variable annual weather conditions. With the new technology, Buckler hopes to improve the rate of breeding in sub-Saharan Africa to equal the U.S. rate.

The group -- which includes researchers from Cornell; University of South Carolina; International Crops Research Institute for the Semi-Arid-Tropics-Patancheru, Hyberabad, India; and International Maize and Wheat Improvement Center in Kenya -- also will develop publicly available protocols and software to duplicate the methods for other species and will train researchers at Cornell and in Kenya and India in the methods.

SOURCE [1]

Links:
[1] http://www.news.cornell.edu/stories/Sept10/BREADaward.html