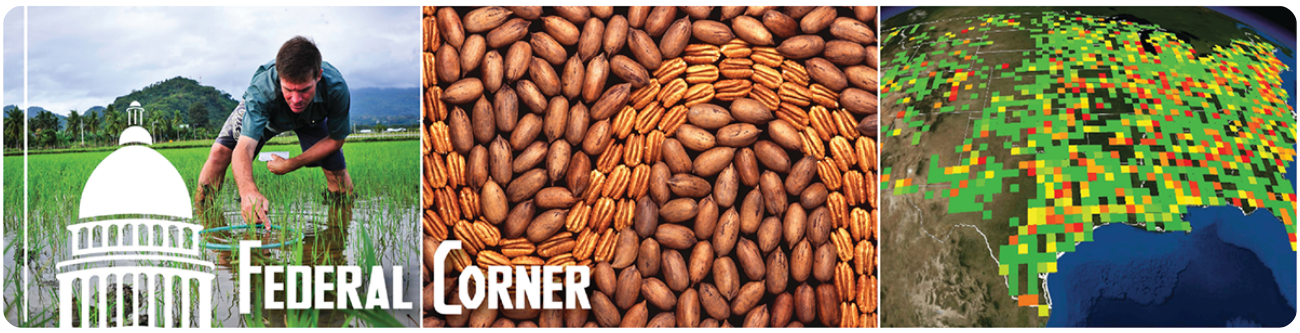
Science Societies

Crop improvement ≠Plant breeding

How the Feed the Future Innovation Lab for Crop Improvement Is Expanding Critical Engagement

By Kelly Merchán, Comunications specialist at Cornell University

April 22, 2021



The Federal Corner is a bi-monthly column featuring writers from a diversity of federal agencies. Its purpose is to give funding agencies a chance to reach out directly to members.

That's right, we said it—crop improvement and plant breeding are not the same thing. We may be breeding plants, but crop improvement represents a much broader continuum of activities at the intersection of agricultural, life, and social sciences. Like plant breeding, crop improvement has the ultimate goal of generating useful germplasm, but it's germplasm that increases equitable benefits to those who are most marginalized. It is this qualifier that is often overlooked, and it is why at the Feed the Future Innovation Lab for Crop Improvement (**https://ilci.cornell.edu**), we decided to do things differently.

Dr. Benard Yada studies the quality traits and weevil resistance of sweet potato varieties as part of the "quick win" sweet potato project Uganda at the National Crops Resources Research Institute (NaCRRI/NARO).

Photo provided by Dr. Bernard Yada.

Feed the Future Innovation Labs are dynamic hubs led by U.S. universities that work to reduce global hunger, poverty, and malnutrition. There are more than 20 such labs across the country focused on specific needs. When the U.S. Agency for International Development put out a call in 2019 for a new Innovation Lab to improve varieties of crops as drivers of productivity, growth, resilience, and nutrition, we knew this was our chance to make a holistic impact. Our team of experts led by Cornell put together a proposal to create an Innovation Lab for Crop Improvement with the mission to equip National Agricultural Research Institutes (NARIs) with the power to define their unique goals and drive advancement in crop improvement to reduce malnutrition and hunger and provide equitable benefits to women and youth.

When we were selected as the newest Innovation Lab, we set out to create an organization that put NARIs first. We started by creating a unique request for proposal (RFP) process that nurtured a co-equal relationship with the scientists seeking funding for their concepts. Our Centers of Innovation RFP garnered interest from 104 applicants at NARIs in 26 countries. Finalists went through a co-creation stage, engaging directly with our Innovation Lab team at Cornell University, Clemson University, Kansas State University, Colorado State University, Makerere University, Cultural Practice LLC, and RTI International to further develop ideas, find and fill gaps, and ensure that social issues were prioritized alongside scientific innovation.

The co-creation process—which we believe should be the standard, not the exception—established durable partnerships founded on principles of shared dialogue and idea formation. Together in 2020, we formed new regional hubs for crop improvement with four Centers of Innovation in **Costa Rica/Haiti**, **Malawi**, **Senegal**,

and **Uganda**.

In launching these centers, we recognize that food insecurity is deeply entangled with issues of poverty, malnutrition, and gender inequity, particularly in vulnerable, resource-poor communities. These issues are at the center of why crops are bred in the first place, so why are social impact so often detached from breeding programs? We're trying to change that.

A Multidisciplinary, Systems Approach

At the Innovation Lab for Crop Improvement, we envision "crop improvement" as the holistic approach with plant breeding at the nexus but where additional systems-oriented multidisciplinary expertise drives a model specific for NARI programs and priorities. Our team unites NARI scientists with experts in priority setting, trait discovery, genomics, phenomics, and breeding informatics. Right alongside those integrated teams are economists, social scientists, and specialists in institutional capacity development, gender, youth, nutrition, and inclusion.

Dr. Stanley Nkalubo researches fast-cooking and high-seed-iron traits for new common bean at the National Crops Resources Research Institute (NaCRRI) as part of the "quick win" common bean project in Uganda. Photo provided

by Stanley Nkalubo.

Our roots are in the advancement of crop improvement sciences wherein we co-develop cutting-edge tools, technologies, and methods (TTMs) that are adapted for NARIs with NARIs that improve and accelerate plant breeding. But our work doesn't stop there: our branches are engaged with in-country plant breeders, social scientists, and local communities.

We are focused on technical TTMs, such as open-source databases that enhance the accessibility of tools for the analysis of spectral data or applications that manage genomics trial data and can connect to phenotypic information; however, we never lose sight of the long-term sustainability of NARIs and their key stakeholders—smallholder farms and local consumers that are the center of food systems and value chains.

"Growing our Innovation Lab has been an interesting and complicated puzzle," says **Stephen Kresovich**, program director of the Innovation Lab. "As someone with a background in plant genetics and genetic resources management, I'm learning from disciplines that I've never had the opportunity to connect with before."

The scientific approaches we take with our focus crops—sorghum, millets, legumes, roots, tubers, and banana—are embedded in cultural contexts. Food is much more than what someone consumes: it also has unique and intangible qualities from how it is grown by farmers, processed by communities, prepared by households, and eaten in various forms. The individuals growing and eating these crops know best—from the potential of cowpea to boost nutrition of children in Malawi to preferences for sorghum by smallholder farmers in Uganda.

Our Innovation Lab's priority-setting team encourages breeders to take a step back before diving into plant breeding and consider the long-term impact and societal outcomes of their breeding efforts. How are current priorities set? Whose voice is heard when setting those priorities? Who will make decisions around the varieties that breeders develop? Who prepares, processes, and markets the food products? What positive or negative impacts on gender equality, nutrition, youth, and climate resilience could varieties have?

"You can't breed for everything at once, so it is our job to look at the big picture," says **Hale Ann Tufan**, associate director of the Innovation Lab and co-lead of the priority setting team. "We are interested in creating a framework that helps programs focus and prioritize to understand where their investments are most likely to have the greatest impact for food security, nutrition, gender equality, and other social impacts for their target stakeholders."

Tissue being collected in Haiti as part of the "quick win" sorghum project. Photo provided by Gael Pressoir.

Locally Grown Solutions

As noted previously, our crop improvement model is embedded in meaningful relationships and engagement with national breeding programs. Too often other models enforce a top-down approach. At our Innovation Lab, in-country scientists are in the driver's seat.

While NARIs have always played the most critical role in establishing national food security goals and strategies, they too often lack the necessary space, support, and agency needed to design and implement their home-grown research visions and solutions. We believe that more progress will be made when NARIs can design and implement innovations that prioritize and target their unique needs, and that these solutions will be more sustainable in the long-term.

“Sometimes donors assume that just because another problem existed somewhere else, it also exists here, which is usually not the case,” says **Scovia Adikini**, principal investigator of the East African Center of Innovation for Finger Millet and Sorghum in Uganda. “Leading this Center of Innovation is so powerful because it allows us to prioritize our own research agenda and interact with our own communities who are deeply involved in our work and who ultimately are the ones who will sustain our impact in the food system.”

Trevor Rife (Kansas State University) facilitates a training on phenoapps for digital data acquisition in March 2020 with National Agricultural Research Organization (NARO) in Nepal. Photo provided by Trevor Rife.

If local stakeholders cannot sustain programs in the long-term, then even well-bred crop varieties serve little purpose. “Resilience” is a buzzword with a two-fold meaning: while we are breeding for resilient crops that can stand up to pests and diseases, we are also promoting resiliency in organizations and communities. After all, if plants and people can stand up to economic and environmental crises, then we have a better chance at breaking the cycle of poverty.

“In order to be sustainable, resilient breeding programs must possess the institutional capacity—the necessary resources, human capital, and technical expertise—to respond to changing food security needs that are in line with emerging environmental, economic, and social challenges specific to particular regions,” says **Mathew Abraham** , assistant director of the Tata-Cornell Institute for Agriculture and Nutrition and co-lead of the Innovation Lab’s institutional capacity team.

Looking Forward: Building a Global Network

A critical examination of crop improvement systems is needed to build more inclusive breeding programs and communities that can and must sustain food systems. We see much room for growth in our own practices, most notably the disruptive development of TTMs co-designed with and for NARIs.

The arc of crop improvement continues with other domains such as agribusiness and seed systems, and we recognize the critical role of partnerships with minority-serving institutions and between the public and private sectors. Just as plant breeding cannot be disengaged from human life, we cannot separate crop improvement from the larger food system. Ultimately, the outcome of our efforts must connect with the global network that is operating and transforming food security for a better and more just world.

To hear about the Innovation Lab for Crop Improvement’s latest opportunities and activities, sign up for our newsletter (**https://bit.ly/3d4yr5h**) or contact us at Send Message. This study is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the Feed the Future Initiative. The views and opinions expressed in

this article are those of the author and not necessarily the views and opinions of USAID.

More news & perspectives

Back to issue

Back to home