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FEED THE FUTURE INNOVATION LAB FOR LEGUME SYSTEMS RESEARCH

November 2023



The Feed the Future Innovation Lab for Legume Systems Research fosters dynamic, profitable, and environmentally sustainable approaches that contribute to resilience, productivity, and better nutrition and economic opportunities. The lab is managed by Michigan State University.

From the Management Office

Legume lab grant writing workshop and competition comes full circle with first published paper

A capacity building activity of the Feed the Future Innovation Lab for Legume Systems Research has culminated in the publication of an article on the characteristics of pigeon flour as a food ingredient for one researcher. The Grant Writers Workshop and Seed Grant Competition provided researchers from target African countries the opportunity to attend a two-week workshop to improve their grant writing skills and submit a proposal for research supported by the Legume Systems Innovation Lab.

Richard Atinpoore Atuna, a lecturer in the department of food, science, and technology at the University for Development Studies in Tamale, Ghana was one of 40 legume researchers selected for the workshop and subsequent winner of one of five grants awarded. His research findings on the project titled, *Improving the Nutritional Qualities and Utilization of Cowpea and Pigeon Pea Using Household-level Processing Methods* were recently published in *Nature's Scientific Reports*.

The workshop was led by science communication expert, Mark Bayer of Bayer Strategic Concepts. Bayer, developer the RISE system (Raising the Influence of Scientists and Engineers), uses a unique blend of proven rhetorical tools, persuasion principles, and communications techniques to help scientists boil down their work into jargon-free, and engaging narratives to secure funding and advance their careers.

The workshop participants, who were chosen through a competitive concept note submission process, worked collectively and one-on-one with Mark to hone their writing and speaking skills. They then submitted proposals based on their winning concept notes to the Legume Systems Innovation Lab. Recipients of five grants then went to work on their one-year projects.

The workshop was open for research in any aspect of the legume value chain specific to the Legume Systems Innovation Lab's target crops of cowpea, pigeon pea, or common bean for work in any of the program's target countries of Benin, Burkina Faso, Ghana, Malawi, Mali, Mozambique, Niger, Nigeria, Senegal, and Zambia. Over 70 concept notes were submitted to the popular workshop.



Richard Atinpoore Atuna from the University for Development Studies in Ghana presents during the Legume Systems Innovation Lab 2023 Global Convening in Livingstone, Zambia.

The grant recipients also showcased their enhanced presentation skills to over 100 global legume researchers when they presented their research as invited guests at the Legume Systems Innovation Lab 2023 Global Convening held in

Livingstone, Zambia. The event also provided the researchers a great networking opportunity.

Atuna's article, "[*Physico-functional and nutritional characteristics of germinated pigeon pea \(*Cajanus cajan*\) flour as a functional food ingredient*](#)" explores the effect of germination on pigeon pea flour's pH, color, water and oil absorption, swelling and foaming capacities and bulk densities and food components such as moisture, ash, fats and oils, protein and carbohydrates. The findings indicate that germinated pigeon flour will perform better than non-germinated flour.

"We are thrilled with the results of this capacity building activity," shares John Medendorp, Legume Systems Innovation Lab Deputy Director. "Richard's publication is the first from this activity, but I have no doubt that it will be followed by others. The level of research output from this small but motivated group has been inspiring."

In the Field

Project Final Reports

The Legume Systems Innovation Lab awarded competitive and commissioned project grants to support research activity during the first five years of the lab. These projects, now concluded, have submitted final technical reports which we will feature in our monthly newsletter. This month we feature a project that worked on cowpea breeding in Burkina Faso, Ghana, and Senegal.



Development of Market-Driven Improved Cowpea Varieties for West Africa using Mature Markers

Led by Dr. Philip Roberts, University of California - Riverside

Cowpea, a highly nutritious legume crop vitally important to food security in the Sudano-Sahel, West Africa, especially for women and children, complements dietary cereals. However, typical smallholder farmer yields are 10-20% of yield potential, mainly due to insect pests, pathogens, parasites and drought.

The project focused on Ghana, Senegal and Burkina Faso, three countries in the West Africa cowpea production region, chosen on the basis of: 1) alignment with USAID country foci, with Ghana and Senegal being Feed the Future target countries and Burkina Faso a Feed the Future aligned country, with Zones of Influence impacted by cowpea production dynamics, either directly through local cowpea production increases (northern Ghana, central and northern Burkina Faso) or secondarily via country-wide cowpea systems enhancements (Senegal); 2) representation of the primary cowpea production agro-ecologies within each of the countries, and providing a broader regional representation of West Africa cowpea production systems; and 3) mature host country-UCR collaborative research and breeding partnerships that provided a robust project efficiency, productivity and management framework.

Cowpea downstream breeding utilized previously discovered single nucleotide polymorphism (SNP) marker haplotypes linked to target traits. A suite of marker-trait pairs was used in improvement of elite varieties and lines through indirect selection for enhanced variety releases. Tolerance/resistance to aphids, thrips, *Macrophomina*, and *Striga*, together with drought tolerance and preferred grain quality (large seed, rough seed-coat for quicker cooking time, plus seed color specific to host country target region market preference for white, or light cream with brown-eye or black-eye, or brown) were phenotypes chosen to improve six current popular varieties, and in selecting breeding population lines for market-driven preferred grain types.

Improvement of elite varieties and lines was conducted using three sets of cowpea breeding stocks. These included three breeder-selected current elite varieties in each host country; elite 8-parent multi-parent advanced generation intercross (MAGIC) lines and a set of new super-MAGIC (spMAGIC) lines developed by intercrossing selected MAGIC population lines carrying high positive allele content of target traits; and elite marker-assisted recurrent selection (MARS) lines developed in Burkina Faso and Nigeria. Field and greenhouse phenotyping in Ghana, Senegal and Burkina Faso was matched with SNP marker high-throughput genotyping to select for both the target traits (foreground selection) and for recurrent background recovery (background selection) in backcrossing cycles. Near-release lines were tested regionally to broaden release potential. Formal release applications were prepared and submitted by the host country co-PI in each country.

In California, cowpea dry grain novel market classes of breeding lines were advanced, utilizing marker resources and breeding lines for overlapping trait targets with the West Africa targets. This project leveraged funding from the California Dry Bean Advisory Board to produce one improved blackeye dry-grain cowpea variety ('California Blackeye 77' or 'CB77') and advanced

breeding lines for fresh market and canning, in support of the US dry bean industry.

Primary capacity building in each of the host countries was achieved by graduate degree training in cowpea breeding and genetics, coupled with continuous short-term training of host country scientists in molecular breeding. The outputs and associated capacity building contributed to Feed the Future priorities to increase pulse productivity via yield gain, thereby promoting dietary nutritional value and the livelihoods of women and youth, and resilience by increased household incomes.

[Read the full report](#)

In the News

Seeking nominations

The Feed the Future Innovation Lab for Sustainable Intensification in collaboration with the African Women in Agricultural Research for Development (AWARD) is seeking nominations for a leadership academy course titled, "*Gender, Leadership, and Personal Branding (GLEAN)*." For more information please contact Jan Midendorf, jmiddend@ksu.edu.

Featured Legume of the Month

RED KIDNEY BEANS



Red kidney beans are an excellent source of protein and potassium.

According to the [USDA](#) one cup of red kidney beans provides a whopping 43 grams of protein and provides 73% of your daily recommended value of potassium.

Kidney beans have a robust flavor with a soft texture making them a good addition to soups and stews.

Cooking with Red Kidney Beans...

Red Kidney Bean Turkey Chili

This healthy chili recipe calls for ground turkey and uses can red kidney beans for convenience. Other ingredients include onion and tomato puree with spices cumin, chili powder, cardamon, and salt.

In just 30 minutes you will have a warm and satisfying main dish. Add toppings like yogurt, cheese, onions or avocado and serve alongside a salad for an easy weeknight family meal. Be sure to make extra chili as it is a great leftover for lunch or an after school snack.



[Get recipe here](#)

For More Information on the Feed the Future Innovation Lab for Legume Systems Research

[Visit our website](#)



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