



FEED THE FUTURE

The U.S. Government's Global Hunger & Food Security Initiative



A GLOBAL HUB FOR SORGHUM AND MILLET

SMIL conducts extensive research and develops new technologies to improve the resiliency of vulnerable communities producing sorghum and pearl millet in semi-arid regions. SMIL does this by creating and supporting food systems and entrepreneurial opportunities to reduce poverty and hunger in West and East Africa and Haiti. SMIL focus countries are Ethiopia, Haiti, Niger and Senegal, with regional benefits to Burkina Faso, Togo and spillover value to the United States. Through a focus on inclusive development and human capacity and institutional capacity development, SMIL invests in the next generation of private and public leaders in sorghum and millet food systems.



Ethiopia



Haiti



Niger



Senegal



**Collaborative Research
on Sorghum and Millet**

A NOTE FROM THE SMIL DIRECTOR

The Feed the Future Innovation Lab for Collaborative Research on Sorghum and Millet (SMIL) is a global hub of cutting-edge research focused on increasing the resiliency of small-scale sorghum and pearl millet producers while leveraging global benefits to the sorghum industry in the U.S. and worldwide, supported by USAID. SMIL focuses on building an interconnected global research network that provides innovative technology solutions in response to emerging national agricultural research for development needs. Embedded within the program's portfolio are numerous activities to build human and institutional capacity that will contribute to research and long-term development in Ethiopia, Haiti, Niger, and Senegal.



"It's not only an opportunity, but is also my hard work to bring me here. When I go back and join an institute, other people will understand that women can do things by themselves and they are the same as our men. Women may also feel that they can do anything they want because they have strengths. It's not always that people push you to a position — you need to push yourself, too. So I'll show that by being a woman of good opportunity and a lot of hard work."

Etaferahu Kassa Ejegu

*SMIL graduate student in agricultural economics,
Kansas State University*

To date, the SMIL network has been responsible for:

- Numerous releases of improved sorghum and pearl millet hybrids
- The establishment of proof-of-concept agronomic interventions to improve yield and reduce loss due to pests and poor seedling vigor of pearl millet
- The development of value-added food products with highly nutritious properties
- Consumer acceptance studies on new food products
- The creation of the first sensory laboratory for food product evaluation in West Africa
- The publication of gender-differentiated technology priorities in Ethiopia

In Ethiopia, strategic and applied advances have been made with the discovery of genes conferring anthracnose resistance to sorghum and the official release of a farm-adapted variety, Merera, with up to 43% yield gain, along with the release of a hybrid sorghum variety and hedonic testing of new sorghum hybrids with superior functionality and nutritional properties for food products, particularly injera.

In West Africa, multi-country genomics-assisted breeding platforms advanced new sorghum varieties with drought, heat, and striga resistance leading to national seed registration. Additionally, new materials with superior food and forage quality properties and lines with resistance to sorghum midge and storage pests have been identified and incorporated into the national breeding programs. Applied research has enabled the delivery of a millet head miner control technology through integrated pest management strategies. Smallholder farmers, particularly women, are benefitting from the regional scaling of a pearl millet seed ball fabrication and planting technique that provides 25% yield gains. Women entrepreneurs in partnership with national food science teams have developed and marketed value-added food products from composite flours for porridges fortified with locally available sources of micronutrients. In urban settings, couscous with lower production costs and the completion of consumer acceptance and market penetration studies of new food products are guiding youth and women toward new entrepreneurial opportunities.

More than 90 students have benefited from post-graduate degree training, including many early-career leaders in their respective NARS receiving ongoing mentoring as they contribute to food products of the future.

Regards,

Tim Dalton

**Director of the Feed the Future
Innovation Lab for Collaborative
Research on Sorghum and Millet**

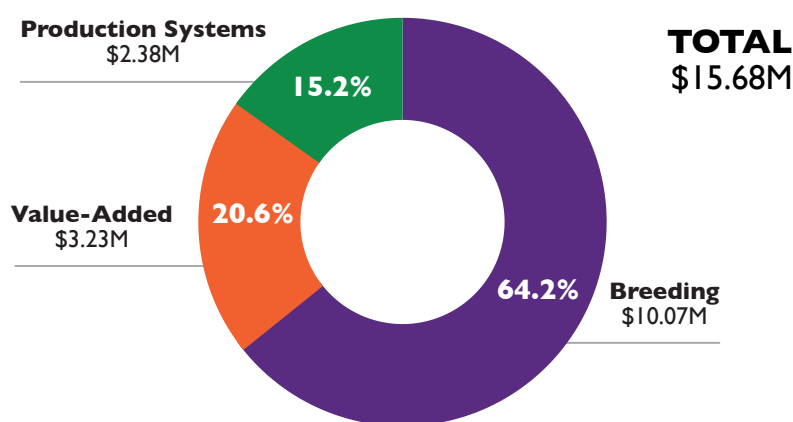




RESEARCH

The SMIL research network is a consortium of in-country teams networked with U.S. universities, USAID partners, USDA and other higher education institutions around the world to leverage the expertise of the private and public sector. The SMIL portfolio of research projects and technology delivery is based on engaging actors at the inception. This “first mile and last mile” approach supports a co-creation process of research and technologies that lead to higher adoption rates.

RESEARCH BUDGET - AREA OF INQUIRY



PROJECT TITLE

	PHASE 1	PHASE 2
Advancing Improved Functionality and Protein Quality Sorghum Hybrids for Food Applications in Ethiopia	\$807,896	\$1,049,668
Genetic Enhancement of Sorghum to Promote Commercial Seed Supply and Grain Market Development	\$912,356	\$775,000
Genetic Improvement of Sorghum for Resistance to Fungal Pathogens	\$1,110,810	\$1,056,897
Improving Sorghum Adaptation in West Africa with a Genomics-Enabled Breeding Network (SAWAGEN)	\$1,142,836	\$1,446,854
Genetic Enhancement of Pearl Millet for Yield, Biotic and Abiotic Stress Tolerance in West Africa (GENMIL)		\$1,228,053
Sorghum Trait Deployment Pipeline for Improved Food and Feed Value	\$1,089,095	\$423,000
Enabling Marker-Assisted Selection for Sorghum Disease Resistance in Senegal and Niger		\$899,853
Seedballs - Enhancing the Yield Effect in Pearl Millet and Sorghum and Disseminating the Technology in West Africa	\$191,540	\$523,314
Expanding Markets for Sorghum and Millet Farmers in West Africa Through Strengthening of Women and Youth Processors and Nutrition-based Promotion of Products	\$733,378	\$799,613
Durable Adaptation to Aphid and Drought for Smallholder Sorghum in the Americas - Haiti		\$595,930
SMIL Agricultural Economics Research		\$286,333
Biological Control of the Millet Stem Borer and the Millet Head Miner in Niger and Senegal	\$637,788	
Development of Biotic Stress-Resistant Sorghum Cultivars for Niger and Senegal	\$818,736	
Development of Dual-Purpose Pearl Millet Varieties for the Benefit of Farmers and Agro-pastoralists in the Sahelian and Sudanian Zones of West Africa	\$465,709	
Improved Crop Genetics and Processing Methods for Increased Productivity and Nutrition for the Smallholder Sorghum Producers in Ethiopia	\$737,527	
Pearl Millet Improvement for Productivity, Climate Resilience and Nutritional Quality	\$29,904	
Implement a Genomics-Assisted Breeding Program in a Small Breeding Program in a Developing Country	\$1,081,985	

TECHNOLOGIES READY TO SCALE

Technology development and deployment is facilitated in close partnership with end users and stakeholders in the food system to meet identified demands and foster a continual feedback and improvement process. SMIL research is invested in

short-, mid- and long-term innovation. The following are examples of solutions in progress with the SMIL research teams.

A list of technologies ready to scale with further information and videos is available at <https://smil.k-state.edu/smiltechnologies>

PRODUCT LIFE CYCLE FRAMEWORK

PHASE 1

Under Research

27 Technologies

Example: Development of locally improved sorghum using genomic-assisted breeding platform

PHASE 2

Under Field Testing

20 Technologies

Example: Improved forage sorghum with bmr traits in Niger

PHASE 3

Made Available for Uptake

8 Technologies

Example: Registered disease-resistant sorghum in Ethiopia with 40% yield gain

PHASE 4

Demonstrated Uptake

6 Technologies

Example: Registered germplasm with sugarcane aphid resistance for global use



LATEST TECHNOLOGY UPDATE: New technology helps Ethiopian farmers increase sorghum yields

Merera is a new release variety in Ethiopia that has shown up to a 43% increase in yield. This variety has natural, built-in pest resistance to anthracnose disease and birds. This increase in yield provides more sorghum and increased income for small-holder farmers. "The variety was made available by the research center," says a local farmer. "When they told us of its demonstration, we accepted and started producing it in our fields. We have found this sorghum is better than others. It resists drought, increases productivity and gives better yield within a short time. The leaf is also used for cattle, so it has multiple uses."



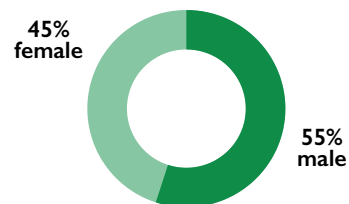
HUMAN AND INSTITUTIONAL CAPACITY

Growing the Next Generation of Researchers

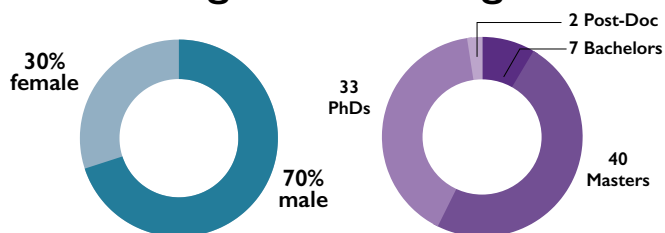
Through research initiatives, SMIL focuses on training the next generation of scientists and researchers within the National Agricultural Research Systems (NARS). With a strong partner network of universities and NARS, SMIL supports students so they can pursue graduate studies in various disciplines, from plant breeding and genomics to agriculture economics, food processing and other fields. More than 90 students have received their academic training through SMIL since its inception in 2013, and that number continues to grow.



11,900+
completed
short-term
training

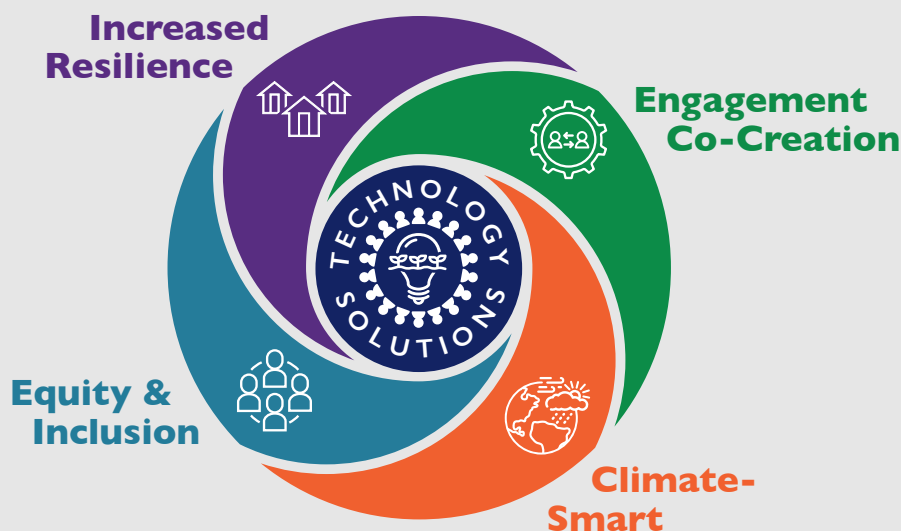


90 students supported through
long-term training



Local Women Leaders Are Key to Research Adoption

It's vital to have buy-in and engagement from the local community to support successful adoption of the new technologies. SMIL has created local feedback loops to engage stakeholders including local cooperatives, farmer associations and community leaders throughout the process. One great success is under the leadership of Dr. Hannatou Moussa Oumarou, who has led the efforts for localized training of the seed ball technology that enables women to dry seed their pearl millet fields weeks before the rainy season. Under Dr. Moussa Oumarou's leadership, SMIL has created a trainer of trainers (ToT) and farmer-to-farmer initiatives to support skills transfer between women and their farmer associations.



Sorghum and millet are resilient crops vital to vulnerable communities across the Sahel region and throughout Africa.

Our network of plant breeding and productions systems management projects

SMIL plant breeding and production systems management projects focus on supporting smallholder farmers and farmer cooperatives to produce climate-smart sorghum and pearl millet crops adapted to ever-changing production environments, working closely in communities across the focus countries to address farmers' needs. With the food processing and value addition projects, SMIL is strengthening demand and markets while sharing the processes and findings from city to city and village to village. In addition, women entrepreneurs are being trained to produce and market nutrient-rich food products for children and improve food staples for the broader local communities based around sorghum and millet as key ingredients.



STAY IN THE KNOW WITH SMIL

Website: <https://smil.k-state.edu>



Kansas State University
College of Agriculture
148 Waters Hall
Manhattan, KS 66506
Office: +1 785-532-6309
Email: smilnews@k-state.edu

70%

of caloric intake among vulnerable populations in The Sahel is from sorghum and millet

500,000,000

people globally depend on sorghum and millet as an essential part of their diet



USAID
FROM THE AMERICAN PEOPLE

