Engineering Innovation to

Improve Food Security for Smallholder Farmers

Announcing an open competition for engineering students at

Kwame Nkrumah University of Science and Technology • Mississippi State University
University of Ghana • University of Illinois at Urbana-Champaign
University of Development Studies • University of Missouri

1st Place $750  2nd Place $500  3rd Place $250

Many crops in sub-Saharan Africa are hand cut and threshed by beating with sticks. This is very hard labor and limits the amount that can be planted and harvested, creating food insecurity for many subsistence farmers. The Soybean Innovation Lab is sponsoring a contest between three universities to design a small thresher for use by smallholder farmers in sub-Saharan Africa. The winning design, if functional, will be built by the USAID Soybean Innovation Lab (SIL) and distributed to three districts in the Northern Region of Ghana. Local blacksmiths will be invited to attend training on construction of the thresher. The thresher design should take the following factors into account:

1. The thresher will ultimately be produced by local blacksmiths with very rudimentary tools so the design and construction requirements should be as simple as possible.
2. Two versions should be designed- one that can run on a small gasoline engine and another that can run off bicycle power.
3. The thresher should have two wheels so that it is transportable. It should have a tow bar that would allow it to be pulled using a bicycle or small motorcycle and it should have handles like a wheelbarrow so it can be hand pushed.
4. It should be designed to thresh a small armload of whole soybean plants per load.
5. It should be designed so that farmers can easily capture seeds in a 50-100 kilo bag and post-harvest loss should be minimized.
6. The design should be understandable by people who have limited reading skills (fabrication and operating instructions should be communicable with graphic instructions).
7. Your university’s Agronomy Research Center may have small threshers that you can look at to get design ideas. Your design can be based on existing technology but should be made as simple and replicable as possible and cannot violate existing patents.
8. A “Vogel” thresher design was produced in the 1950s for harvesting small grains and may be a good starting point because its construction was intended to be easily replicable.
Letter of Intent Due: **February 29, 2016** (email a note to Kerry Clark, clarkk@missouri.edu)

Final Submittal Due: **May 1, 2016** (email to Kerry Clark, clarkk@missouri.edu)

**Contest Rules**

1. Students from any discipline may compete as individuals or in teams.
2. Measurements should be in metric units.
3. Winning designs that are feasible, effective, and that do not infringe on existing patents will become available for public use through SIL.
4. Designs will be judged by an equipment manufacturing firm specializing in small agricultural research equipment.
5. Designs should be computer drawn and submitted as pdf files. If students do not have access to design software, clear, neat hand-done drawings may be submitted by scanning and emailing.
6. Material costs should be estimated.
7. Materials to build the thresher should target total costs less than $1,000 USD. Low cost as well as functionality will be a factor in the winning design.
8. Your design should be simple and clear enough that a blacksmith without any engineering training can easily follow it to produce a working thresher.
9. A narrative explaining the logic behind your design should be included. Explain why you chose the specifications in your design and why they are optimal for soybean threshing.
10. First prize is $750, second prize is $500, and third prize is $250.
11. Deadline for design submission is May 1, 2016. A letter (e-mail) of intent to compete should be sent by February 22, 2016. Winning teams will be identified by June 2016.
12. Send letters of intent and design submissions to Kerry Clark at clarkk@missouri.edu. (you may also address any questions on the contest or your designs to this address or to your local contact).
13. Total prize amount is in US dollars but equivalent will be paid to winners in local currency.

**About the Soybean Innovation Lab**

The mission of the Soybean Innovation Lab (SIL) is to provide researchers, extensionists, the private sector, NGOs, and funders operating across the entire value chain the critical information needed for successful soybean development. SIL is part of the US Agency for International Development Feed the Future Program.

SIL focuses its efforts on four key research pillars that comprise the essential components of sustained production, improved livestock and household nutrition and sustainable market linkages for soybean development:

To accomplish our mission SIL brings together leading U.S. and African soybean researchers, both natural and social scientists, to provide a sound research foundation to achieve the development to commercialization process of soybean in sub-Saharan Africa (SSA).

**University Contacts**

Kwame Nkrumah University – Dr. Emmanuel Bobobee ([Emmanuel.bobobee@gmail.com](mailto:Emmanuel.bobobee@gmail.com))
University of Development Studies - Dr. Felix Abagale ([fabagale@yahoo.com](mailto:fabagale@yahoo.com))
University of Missouri - Kerry Clark ([clarkk@missouri.edu](mailto:clarkk@missouri.edu))
University of Illinois at Urbana-Champaign – Dr. Jeremy Guest ([jsguest@illinois.edu](mailto:jsguest@illinois.edu))
Mississippi State University- Dr. Dan Reynolds ([dreynolds@pss.msstate.edu](mailto:dreynolds@pss.msstate.edu))
University of Ghana –
**Thresher Photos**

The thresher shown below was built by a village blacksmith in Ghana. He probably used small threshers imported from India or China as his model. Although this can be pushed like a wheelbarrow, it is tippy due to having only one wheel. The motor is also slightly underpowered. The size and price were favorable to smallholder farmers.