Designing Devices For Africa's Rural Poor

University of Georgia
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In industrialized countries, a milk cooler is where shoppers grab a gallon of milk at the grocery store. A nutcracker is something people use to pry open a pecan.

But in developing countries, those two devices can look quite different. In some countries, a milk cooler is something a dairy farmer uses to keep his cows' milk from spoiling. A nutcracker is a person with a rock.

Thanks to William Kisaalita, Ph.D., a professor and tissue engineer at the University of Georgia (UGA) in Athens, storing and harvesting food has become much easier for farmers in Uganda and Morocco. The milk cooler and nutcracker he developed give an economic boost to those who struggle to make a living.

The Uganda-born Kisaalita worked with UGA engineering students to develop these two devices. And though the innovations may be made of metal, a lot of heart goes into the invention process.

The professor, who grew up just outside Kampala, Uganda, is now a U.S. citizen. He and his wife, an accountant, have four children who are healthy and successful. His current surroundings are a stark contrast to the place where he grew

up: a house made of reeds and mud, lit by kerosene and heated with wood.

Kisaalita left Uganda, earned his doctoral degree in Canada, and joined UGA's College of Agricultural and Environmental Sciences in 1991. After asking himself what he could do to help people like those he had grown up with, he set up a program in which engineering students can go overseas and design products to help the poor.

The first product they came up with was a milk cooler about the size of a dishwasher. Farmers along Uganda's "cattle corridor," a 50,000-square-mile dry-land area stretching north to south, are now using that cooler.

That region is home to more than 2.5 million dairy farms. Most farmers have between two and five cows. Farmers milk the cows, which produce an average of 50 liters of milk a day, in the morning and evening.

> *In the past, lack of refrigeration forced farmers to pour about 40 percent of their income potential down the drain each night.*

During the day, farmers sell the milk to local vendors who transport the milk to cooling stations. But those markets are closed in the evening. So, in the past, farmers had no way to cool the milk produced in the evening. The

So Kisaalita and 15 of his undergraduate students came up with a power-independent cooler for short-term milk storage. The cooler uses a vacuum system and a mineral called zeolite to help keep the milk cold.

Research funding came from a number of sources: the University of Georgia Research Foundation Inc., the World Bank, U.S. National Science Foundation, U.S. Department of Agriculture and U.S. Environmental Protection Agency.

After the first prototype of the cooler didn't work well enough to market, Kisaalita found an unlikely partner: a German company called Cool-System KEG GmbH, which had designed a selfcooling keg for beer drinkers. After some redesign, Cool-System produced a cooler called CoolChurn. The keglike cooler chills15 liters of milk within three or four hours, and keeps it cold for a full day.

But instead of resting on his laurels, Kisaalita has continued to engineer practical, simple solutions for Africa's rural poor. So when a colleague approached him in 2005 on behalf of people in rural Morocco, Kisaalita took up the challenge.

The professor and his students were determined to crack the mystery of how to help the Moroccans. Women and children in Morocco used rocks to manually open argan nuts, which contain oil-rich seeds. When cracked open, those seeds yield argan oil, which gourmands around the world use as a cooking ingredient. The oil also serves as a rich source of vitamin E for cosmetics.

Cracking those nuts using rocks was not only labor-intensive, it was unsafe. Workers engaged in this work sometimes broke fingers. Sustaining such an injury meant women and children faced periods of inactivity and lost income from one of the few economic activities available to them. Given the lack of proper medical care, those broken fingers often resulted in poorly healed bones. That could lead to hand or finger deformity — even permanent injury.

So Kisaalita and students Max Neu, Meghan Samberg, Jonathan Dunn and Phillip Jones designed a simple metal-and-wood structure that cracks one nut at a time and is three times faster than cracking with rocks. The device is much sturdier than a nutcracker a consumer in the United States might use for something like an almond because argan nuts are incredibly hard to crack. Kisaalita's nutcracker maximizes safety, thereby eliminating injuries while greatly increasing productivity and income.

The University of Georgia Research Foundation Inc. and the University of Georgia Office of the Vice President for Public

Service and Outreach both funded the technology, which is now in use in Morocco.

Someone who lives in an industrialized country may not always think about where the food comes from before it arrives on a dinner plate. But for William Kisaalita and his students, the question of how farmers will get food on the table is one they won't be forgetting anytime soon.

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