Unique Milk Cooler to Boost Ugandan Dairy Farmers - PART 2 of 5By Darren Taylor Washington
13 January 2009

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The World Bank is to fund a project it thinks can significantly improve the lives of Uganda's many small-scale dairy farmers. Most of them don't have electricity, so they can't cool their milk. Much of it goes bad, resulting in huge losses for the farmers. But an engineer from the East African country, William Kisaalita, has developed a unique system, using renewable energy, that allows the farmers to keep their milk cold. Then they can transport it to sell it in distant markets – and boost their profits.

The Ugandan government estimates that there are 2.5 million smallholder dairy farms in the country, providing three-quarters of the local milk market. But small-scale dairy farmers in Uganda and other developing countries face major obstacles.

Prof. William Kisaalita, originator of a milk cooler to bolster African farmer's earnings

"These farmers can't refrigerate their milk because they don't have electricity, and they're too poor to afford kerosene fridges," says Kisaalita, who's a graduate of Uganda's Makerere University and currently a professor of biological and agricultural engineering at the University of Georgia in the United States.

He explains that the farmers milk their cows twice a day, in the morning and in the evening.

"The milk in the morning finds its way either through the informal or the formal markets. In the day, it's easy to transport. But the evening milk doesn't (get to the markets)," because it can't be cooled to enable it to be transported overnight to ready markets that are further away.

"(The milk is then) used in low-value products, like…cooking fat, which takes away a lot of the money from the pockets of the farmers. So there is a need to find a way that that milk can be cooled so that it can either enter the formal or the informal market, where it can fetch a real good value for the farmers," says Kisaalita, who adds, "When I saw that the farmers were losing up to half of their milk output, I started searching for a solution" in order to boost farmers' profits and increase food production in Uganda.

He says he found an answer in the form of a beer cooler originally developed in Germany.

From beer to milk using renewable energy

The professor reengineered the CoolSystem beer cooler, which was manufactured to meet the needs of affluent beer drinkers in Europe and Asia, and adapted it to the needs of smallholder dairy farmers in his home country.

Prof. Kisaalita's remodeled milk cooler

Kisaalita tells VOA his remodeled cooler uses a mineral called zeolite – a natural, volcanic, rock-like substance with a "micro-porous structure" that's mined in various parts of the world, including the United States. Zeolite has a remarkable capacity to absorb water.

Kisaalita explains, "The idea is that you…expose water adjacent to the container containing milk to (a) low vacuum, through a valve, and because of that, the water vaporizes. When the water vaporizes it (removes) the heat from the milk. Then you have the zeolite absorbing the water vapor, so that the vacuum and the vaporization continue. The principle is what is very well known as evaporative cooling. But this…has been configured so that we can achieve very high temperature drops, or temperature cooling."

He explains that the system has to be regenerated to enable it to cool the milk repeatedly.

"The way this product is configured is that if you go through a cooling cycle, you can't cool again, because the zeolite I talked about would be full of water," Kisaalita comments. "So the system has to be regenerated, and the way it's regenerated is by heating the zeolite, so that the zeolite can lose the water."

Kisaalita continues that this essential regeneration will happen by means of renewable energy.

"We're looking at…either using charcoal or biogas. We're leaning towards biogas, as the waste from cattle will be (readily) available to power the cooler."

Biogas is produced as a result of the biological breakdown of organic matter. It originates from biogenic material and is a type of biofuel. A type of biogas is produced by what Kisaalita calls "fermentation of biodegradable materials, such as manure." He says this type of biogas consists mostly of methane and carbon dioxide.

Kisaalita credits his students with helping him find what he hopes will be a solution to smallholder farmers' milk cooling predicament.

He says, "Since 2001 I've run two programs that link students in Uganda to students in Georgia and vice versa. These programs are actually the ones that delivered results in terms of the project. We address problems that smallholder farmers have that require engineering solutions. Every (US) summer, we go with these students and spend eight

weeks on the ground in Uganda – either researching the problem or implementing solutions."

Farmers all over the world could benefit

courtesy of Musaka Kisaalita

One of the Ugandan dairy farmers hoping to benefit from the unique milk cooler project

Now that Kisaalita's secured some funding for his project, he says his next step will be to identify an initial 50 farmers in a rural area of southwestern Uganda, about 20 miles from the city of Mbarara, as the first beneficiaries of his milk cooling system.

"There are a lot of cows in the area and the people seem to be open-minded as to adapting to new technology. Most of them are smallholder farmers, and we are interested in this type of farmers," he says. "We are not so interested in the bigger farmers, because most of them have electricity, (although) in the long run we think they may also benefit from this because one can foresee a business model where these larger farmers actually increase their productivity by buying (milk) from the smaller farmers who'll be using the product."

Kisaalita says the first 50 farmers will each own about six cows.

"This is the best capacity for the product. We will provide each of them with a cooler. As they produce, as they cool milk and add to their overall productivity – initially we will take a fraction of that milk, so that will serve as payback. They'll be paying back the unit as we go along," he states.

Kisaalita anticipates that the farmers will have paid off the cost of the units after about six to nine months of operation, after which they'll own the coolers.

He estimates that the price of each cooler will be "anywhere between $600 and $800. This may sound a lot for smallholder farmers, but our economic calculations suggest that if a large fraction of the extra milk produced is used as pay back, these farmers can pay for the unit in approximately nine months."

Kisaalita says that if the first batch of farmers in southwestern Uganda "totally embrace" the new milk coolers, as expected, the new technology will be distributed among dairy farmers throughout the country, and then possibly to "nine other countries that we've identified that have similar milk market conditions" – including regional neighbors Kenya and Tanzania, but also as far away as Mozambique and Madagascar.

He maintains that interest in his cooler is "building" in other parts of the world.

"There are a number of other countries outside sub-Saharan Africa that have similar (milk cooling) problems. So there is this sense that if we succeed in sub-Saharan Africa, there will be others – like Vietnam or Colombia – that would be interested in the product."

The engineer says the cooler is appreciated for its potential to allow smallholder dairy farmers to provide produce to export markets.

Kisaalita explains, "For milk to meet international standards, it has to be cooled to four degrees Celsius, within four hours of milking. If you're going to export any milk product, this is the standard that's required. Having very little milk that meets this requirement means that the chances for export are limited. The country cannot earn foreign exchange from the milk."

He hopes his cooler will ease this crisis.

Life-enhancing benefits

Kisaalita says another advantage of his system is its "versatility" and the fact that in remote areas without power it can be used to keep a variety of products at a very low temperature, including fruit juices, and in so doing promote small business development."It's easy for us to foresee a vendor, a businessman, who wants to sell cold juice, either at a stall or on the road, (cooling) the juices in this product and (selling) it as people go by."

According to Kisaalita, his cooler could also potentially keep people alive in areas where there's no electricity or where power has failed.

"At clinics or hospitals, the device could be used as a back-up system to keep medicine and vaccines cold (which is essential to preserving them). When there are blackouts, the cooler could be used to cool the medicine until the electricity comes back on," he says.

Kisaalita emphasizes that profit isn't his primary motivation in developing and promoting his cooler.

"I'm personally excited about doing something for people whose earnings are low. They are like my mother, my aunt, my uncle…. I'm more excited about doing something for what I call 'my people.'"