

CENTER FOR SUSTAINABLE RURAL LIVELIHOODS

Spirit of Innovation

2021 DONOR IMPACT REPORT



IOWA STATE UNIVERSITY
College of Agriculture and Life Sciences



DIRECTOR'S MESSAGE

OVER the past year I have had the opportunity to travel to Uganda on four occasions to work with our team in Kamuli. Each time I meet with them I am more impressed with the passion with which they work. Their unstinting efforts are making a difference to the livelihoods of families throughout Kamuli District.

It goes without saying that 2020 and 2021 have been a difficult period across the world. Given the severity of the challenges imposed by the pandemic, we feel fortunate to have made modest progress. The teams in Ames and in Uganda have shown their agility as they adapted to new circumstances.

I have observed a tremendous spirit of innovation as each program responds to the lengthy pandemic. “Business as usual” is no longer an option. The teams in Ames and Kamuli had to innovate to deliver their programs as lockdowns changed the ways we were permitted to interact with the communities we serve. I observed innovation in labor-saving technologies. I saw innovation in delivery of fortified flour to improve infant nutrition. I saw innovation in ways to keep children learning while schools are closed. I saw innovation in income-generating activities. I saw innovation in crop and animal production in the face of climate change.

Let me share a specific example. Our team observed the high price of cooking oil, partly due to supply chain disruption. Tom Brumm at ISU and Thomas Buyinza in Kamuli came up with an idea to introduce a simple oil press. Knowing that expensive machines were very unlikely to be adopted at a household level, they purchased a muscle-powered oil press. We now have a simple process that any community member can use for free to extract cooking oil from seeds.

Our efforts in Uganda represent one small but important part of efforts across the world to improve conditions for people living in low-income countries. We are very much a part of that larger effort. In fact, when I examined the United Nations Sustainable Development Goals I saw that our efforts contribute directly to every one of the first six goals.

On behalf of our dedicated teams in Uganda and at ISU, thank you for the faith you place in us as we work with families in Uganda as they improve their communities.

David Acker, Director

Every dollar makes a difference

“Having been part of the ISU-Uganda Program, I know that everyone running it is doing their best; and having seen the products of their labor, I know how one dollar helps.”

LILLIAN NABWIIRE

— **INSPIRED** from a presentation by juniors and seniors at Makerere University, Lillian Nabwiire hoped to fulfill her internship requirement with the Iowa State University-Uganda Program (ISU-UP). The summer program was in need of a Food Science and Technology major, and after a vigorous selection process, Lillian was invited to be part of the 2013 service-learning team! That year, she worked with primary school children, on water and sanitation projects, and at one of three existing Nutrition Education Centers (NECs).

Lillian returned to ISU-UP in 2015 as a student leader. After a busy summer assisting with the program, Lillian was selected to go to Ames for a 7-week internship at ISU. She gained a lot of hands-on experience at the ISU Horticulture Farm, helping ISU grad students with data collection, and even giving her first poster presentation — to CSRL donors.

Her internship sparked Lillian’s interest in graduate school. She knew it would be challenging, so she studied diligently and saved everything she could, which included setting aside part of her internship meal allowance. She later used those funds toward her application fees and college entrance exams.

Back in Uganda, Lillian graduated from Makerere University in 2016 and returned to Kamuli as an ISU-UP volunteer. She put her Food Science education to work conducting quality control of food ingredients at the NECs, which had

grown to eight by 2017. She also helped to host a visiting group from the U.S. Virgin Islands (USVI) Giff Hill School. This pivotal connection resulted in an ISU donor-funded assistantship that allowed Lillian to return to Ames and obtain a double master’s degree in Horticulture and Food Science Technology.

Lillian is currently pursuing her Ph.D. at Iowa State. Her focus is food safety in the beef value chain, and her dissertation will include chapters about butcher shops in Kamuli and consumer behavior in the USVI.

From hands-on work in the field to CSRL FundISU campaign donations, Lillian has supported the work of ISU-UP in whatever way she can. When asked what advice she has for others who might be considering a donation, Lillian says “Bring it! No matter how small, it helps. I have benefited from the program, and I know that when I donate someone else will benefit.”



INSIDE	Donor support	2	Nutrition	6	Agronomy	10	WASH	14
	Education	4	YEP	8	Livestock	12	Food safety	16

Donor support, dedicated Uganda team help ISU-UP meet challenges during ongoing pandemic



— **THE COVID-19** pandemic entered its second year in 2021 with a glimmer of hope as newly authorized vaccines offered protection from serious illness and death, although it will be many months before most of the world can be vaccinated.

Uganda, a country of more than 45 million people, had recorded 126,644 cases of COVID-19, including 3,230 deaths, by early November, according to the Africa Centres for Disease Control and Prevention. The country had given 3.6 million shots, but a very small percentage of the population is fully vaccinated with two doses.

The Center for Sustainable Rural Livelihoods supports efforts to deliver COVID-19 vaccines to rural Ugandans, in part thanks to a \$33,000 gift from the Gerald A. and Karen A. Kolschowsky Foundation. The donation, from one of CSRL's original benefactors, is funding public education programs, transportation of staff and vaccines, data collection, and follow-up for vaccination programs in two districts.

“We are extremely grateful to the Kolschowsky Foundation for stepping up to support the delivery of life-saving vaccines,” said David Acker, associate dean for Global Engagement and CSRL director.

As the vaccine rollout progresses in Uganda, government measures to limit the spread of COVID-19 continued in 2021. Another lockdown occurred in June and July.

“The six-week lockdown meant tremendous economic hardship for many Ugandans. Fortunately, our team members are considered essential workers and were able to provide critical support to rural communities,” Acker said.

The ISU-UP staff in Uganda has responded tremendously to challenges presented by the pandemic across all areas of programming. ISU-UP staff in Uganda obtained some of the limited government-issued travel permits so they could, for example, visit smallholder farmers to administer treatments to sick animals, distribute seed, or deliver fortified porridge flour to mothers with infants.

“With schools closed and restrictions on group gatherings, it has been difficult to deliver our programs without major changes in operating procedures,” Acker said. “The ISU-UP team has responded by developing innovative support mechanisms.”

Restrictions during the pandemic have prevented ISU undergraduate students and most CSRL team members in Ames from traveling to Uganda.

Here are several examples of the pandemic’s ongoing impact on CSRL and the populations it serves:

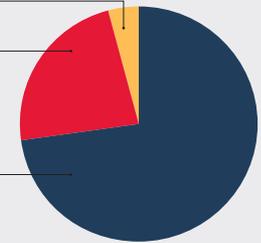
- **Livestock:** Supply chain disruptions caused some farmers to sell their livestock because they could not acquire feed or animal health care products. Other farmers harvested some of their animals to feed their families. Declining incomes caused by the pandemic hindered sales for farmers who were able to get their animal-source foods to a market. To help bridge the gap, ISU-UP assisted with the procurement, mixing, and distribution of 3,740 pounds of poultry feed and 1,188 pounds of pig feed to farmers in need. ISU-UP Community Based Animal Health Workers were also able to visit farms to provide timely poultry vaccinations to keep flocks healthy.

During lockdown, 18 agricultural club pupils from Nakanyonyi and Namasagali primary schools were provided indigenous chickens for rearing, which enabled the students to earn income and improve their protein intake. Indigenous chickens are easy to rear, inexpensive, and provide meat and eggs that are in high demand.

- **Youth Entrepreneurship Program:** Lockdowns restricted access to markets, forcing farmers to sell their conventional harvest at a significant discount or not at all. The ISU-UP team determined that chili pepper is a crop in demand in Europe, so several smallholder farmers began planting and marketing chili peppers for export, under the guidance of vegetable export companies in Kampala.
- **Community Income Generating Innovations:** When schools closed, two community tailoring centers opened in homes in Naluwoli and Kisaiky so pupils could continue to learn how to make re-usable sanitary towels, face masks, school uniforms, and minor repairs to their clothes and uniforms. To control the spread of COVID-19, groups in training were limited to eight to 10 pupils to ensure social distancing.
- **Water and Sanitation:** ISU-UP provided Namasagali Health Center III with three foot-operated handwashing facilities, 200 liters of liquid soap, 20 liters of hand sanitizer, and 500 face masks.

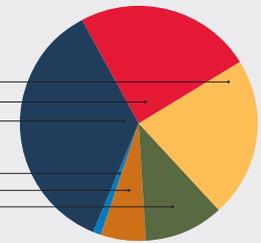
HOW OUR WORK IS FUNDED:

TOTAL: \$1,589,860



WHERE YOUR GIVING GOES:

TOTAL: \$453,508



UPGRADES TO SCHOOL FACILITIES

While Ugandan schools closed during the COVID-19 pandemic and students focused on home-based learning, several construction and renovation projects were completed at school facilities, built with donor support.

NAKANYONYI PRIMARY SCHOOL

Teachers' house kitchen. Teachers and their families now have accommodations in three duplex buildings: a house, kitchen, and latrine, thanks to Charles and Mary Sukup.

Four-room classroom block. One large room that had served as the preschool/ kindergarten room by day and sleeping quarters for boys at night has been rebuilt and expanded as four separate spaces:

- **Boys' boarding room** (a girl's boarding room already exists), for children who live far away or need extra time and teacher input to study for the national Primary Leaving Exam, which occurs toward the end of seventh grade and gives access to attend secondary school if family finances allow it.
- **Preschool/kindergarten room** for early childhood education.
- **Two primary school rooms** for grades 1-7. A divider can be removed to create one large classroom or space for large meetings of various school-affiliated groups and children's activities.

NAMASGALI PRIMARY SCHOOL

Boys' boarding room. Improvements were made to the unused classroom where boys sleep. A girls' boarding facility already exists, constructed in 2014 through the generosity of donors.

Boys' bathroom. An area for bathing was built separate from the boys' latrine. The girls already have access to a latrine and separate bathing rooms at their dormitory.



TEACHERS' HOUSE KITCHEN



PRESCHOOL/KINDERGARTEN

ISU grad students strive to make a d

— **FOUR** ISU graduate students from Uganda are continuing their journey of discovery made possible by ISU-UP and supportive donors. All four participated in the CSRL Service Learning School Garden Program as undergraduate students at Makerere University, learning alongside primary school children about caring for the gardens and poultry that provide ingredients for the school lunch program.

As graduate students, these four are engaged in studies that will prepare them for careers in food and agricultural and related sciences, ultimately benefiting Uganda through improved nutrition, a reduction in hunger, safer food handling practices, and better technical recommendations to help farmers sustainably manage their land.



Francis Akitwine is a soil science major in the master's program.

His support comes from Jim and Marcia Borel through the Borel Global Fellows Program. His research project focuses on soil testing and mapping.

Using novel laboratory methods to analyze soil samples, he is trying to identify specific properties of soils in the Kamuli area that limit plant growth and diminish potential agricultural uses of the land. A better understanding of soil properties and locations—based on creating a soil map of select locations in Kamuli—can inform decisions

from Uganda difference back home

about appropriate management strategies to improve crop production, soil, and water conservation strategies.



Shillah Kwikiiriza is a horticulture major in the master's program. Part of her support comes from Jim and Marcia Borel through the Borel Global Fellows Program. Through her research, she hopes to improve the production and marketing of squash by smallholder youth farmers in the Kamuli District.

Locally known as pumpkins, squashes could improve nutritional dietary intake and create farm income, but their availability is limited by low yields and a lack of good management practices. Her study will assess the feasibility of soil mulching and available traditional and improved cultivars, and market accessibility by the smallholder youth farmers of Kamuli.



Lillian Nabwiire is a food science major in the PhD program, with a double master's degree from ISU in horticulture and food science technology. Her master's research examined ways to improve food safety by fruit and vegetable growers and handlers in the U.S.

Virgin Islands. Her support comes from Dana and Martha Robes. Her PhD research is trying to identify opportunities to increase safe handling of food and ultimately improve public health. She is studying food handling practices used at butcher shops in Kamuli and by consumers in the U.S. Virgin Islands when shopping, storing, preparing, and cooking beef at home.



Becky Wokibula is a soil science major in the PhD program, with a master's degree from ISU in agronomy. Her support comes from the Michael Couch Soil Science International Graduate Student Scholarship. Her PhD studies involve developing better fertilization and cropping approaches for the various soils and

farmers in the Kamuli District, to increase conservation and sustainability of the soil. Part of this work includes identifying sources of ag lime—or ground up limestone, which is a soil amendment—and fertilizers in Uganda. She is also collaborating with fellow graduate student Francis Akitwine on soil mapping.

WHAT YOUR SUPPORT MADE POSSIBLE THIS YEAR:

- Distribution of home reading materials to 640 fifth- and sixth-graders during school closures
- Additional instructional materials for seventh-graders in five elementary schools, resulting in improved national test scores (75% pass rate)
- Expansion of school feeding and lunch program to include two additional schools, while increasing to five the number of days children receive lunch in the four primary schools served by ISU-UP

WHAT YOUR CONTINUED SUPPORT MAKES POSSIBLE GOING FORWARD:

- Continued distribution of additional instructional and scholastic materials to pupils and students to increase learning and improve basic academic and life skills
- Nutritious porridge as a meal for additional children in early childhood grades who attend half-day sessions
- Expansion of the youth institute to benefit more Kamuli District schools (educating students throughout the term about complex ag issues, including nutritional food security)
- Youth program for vulnerable school children to develop special skills and earn fees to stay in school



Support groups grow community

IMPROVE HOUSEHOLD HEALTH AND NUTRITION



— **WHEN** Dorothy Masinde suggested CSRL create support groups for mothers after they completed programs at the ISU-UP Nutrition Education Centers, her intent was to build networks of mothers that could encourage and help each other once they left the guidance of a NEC.

Each NEC works with pregnant women, breastfeeding mothers and their babies, and children at risk for malnutrition. Concentrating on the child's first 1,000 days, these programs ensure adequate nutrition by giving clients access to nutritious porridge made from locally available ingredients. Mothers are trained and given seeds to grow ingredients used for making composite flour so they can continue to provide porridge for their families after completing the program.

Initially, members of these new Food and Nutrition Security Support Groups focused on contributing one or two ingredients from their own gardens toward a batch of porridge shared by the group. It didn't take long, however, until the groups were ready to branch out. Several decided to raise money to invest in the needs of a member or the entire group.

"Before we knew it, each group had come up with their own ideas. To prepare the soil for planting, some groups went to each member's garden with hand hoes, so the digging went faster together. Or they put money together to rent a piece of land and grew a crop as a



collective," said Masinde, CSRL associate director for nutrition education programs.

Nineteen support groups have formed since spring of 2019, with memberships of eight to 21 per group for a total of 268 participants, primarily women of any age. They come together to learn about and discuss issues of food and nutrition security that impact household health and nutrition in Kamuli District. Each group sets its own rules and elects its leaders. They hold weekly meetings at the home of a member, which they have continued to do during the COVID-19 pandemic.

The Ndigakweya Bususwa support group, for example, consists of 16 women. Through their collective efforts and savings, they have:

- Purchased 16 cows, 16 chickens, 14 goats, and two pigs for the members
- Purchased utensils, mattresses, clothes, plates, cups, sauce pans, and mats shared by all members
- Gathered ingredients to make porridge for the group
- Rented land to grow soybeans, millet, and grain amaranth
- Planted 20 banana suckers for each member
- Made energy-saving stoves for each member's home
- Helped in each other's gardens, making mounds of sweet potatoes, for example

"When we talk about sustainability, this is one example. This shows that these women can be self-driven. To be able to put money together and buy even one cow for the whole group is something big, because women in Uganda don't normally own cows," Masinde said.

ISU-UP supports group training in agronomy, livestock, nutrition, sanitation and hygiene, and collective savings; technical support for their projects; access to seeds for porridge ingredients and seedlings for other crops.

WHAT YOUR SUPPORT MADE POSSIBLE THIS YEAR:

- Opened one new NEC in area of need
- Formed five new Food and Nutrition Security Support Groups for a total of 19 groups/268 members
- Purchased a new motorbike to enable trainers to travel to remote areas of need
- Additional support staff hired for Balawoli and Buyende, which met some of the increased need for programs

WHAT YOUR CONTINUED SUPPORT MAKES POSSIBLE GOING FORWARD:

- Construction of meeting areas in newly opened NECs
- Improved kitchens and latrines at new NECs to enhance sanitation and hygiene
- Additional support for handwashing supplies, masks, and sanitizers for COVID-19 prevention and management at NECs



Growing peppers for export helps stabilize markets



LOOKING to diversify the vegetables grown in the Kamuli District and expand their marketing opportunities, the Youth Entrepreneurship Program (YEP) added a chili pepper crop this year.

The new pepper grower and marketing group at Nakyaka consists of 19 farmers from five villages: Nakyaka, Tibasiima, Bugeywa, Bulongo, and Busuuyi. A dozen farmers are engaged in active production, owning a total of 4 acres. Seven farmers focus on marketing the crop, which includes harvesting, sorting, and delivering the green chili peppers to the exporter.

“For the first time since 2014, the YEP participants engaged in vegetable production for export to Europe and/or Kenya. This can help them address challenges due to unstable local markets for common vegetables such as tomatoes, green peppers, eggplants, and cabbage that these YEP farmers are already growing,” said Martin Lukwata, ISU-UP youth entrepreneurship specialist in Uganda.

The chili pepper project began with three pre-production trainings and three in-production trainings conducted by the exporter with support from YEP officers. Training sessions covered several topics, including nursery bed preparation; pest and disease identification, prevention, and control using natural pesticides and cultural control methods; best practices for harvesting; and postharvest sorting, storage, and transportation. The training sessions

also offered business management advice, such as guidance on budgeting. A total of 26 farmers were trained.

On Friday mornings before it gets too hot to work in their gardens, farmers harvest peppers by hand at the green immature stage and complete an initial sort. For farmers with larger fields, such as Namusoby Viola and Tibawala Rogers, the harvest begins Thursday evening. Harvested peppers are sorted a second time at the exporter-designated collecting center in Kamuli Town, where the peppers are graded and packed in plastic crates and labeled appropriately to ensure the farmer supplying the peppers will be paid correctly. The exporter provides a refrigerated vehicle to transport the produce to Kampala Friday evenings.

Export standards are monitored by field agents for the exporter, the ISU-UP youth facilitator Namwase Peninah, and YEP lead farmers Mulongo Frank and Nkwanga Zephania, who serve as peer mentors.

Farmers are paid each month, which enables them to plan better, build their savings, and improve their creditworthiness at the bank that holds their accounts.

The launch of this youth entrepreneurship project for export is another way ISU-UP collaborates with young adults in the Kamuli District to establish consistent markets for their agricultural products, and ultimately help them grow into productive, self-reliant community leaders.





MOBILE MARKETPLACE FOR UGANDAN CRAFTS

The Uganda Alliance is an ISU student organization that helps to market and sell Ugandan baskets and other crafts on campus and around the Ames area. Money from the sales goes to the women of the Tusbila Crafts Group that created the beautiful pieces, providing an income so they can help support their families.

Now, thanks to three recent ISU graduates, the Uganda Alliance has an attractive mobile marketplace for promoting both the crafts and the mission of ISU-UP.

Lars Ljungkull, Talia Drury, and Brett Garrett built a wheeled cart with cupboard space to carry the baskets and a countertop to display them. The three students, who graduated in May 2021, worked under the direction of Chris Martin, professor of art and visual culture in the College of Design.

When it's not parked at the CSRL office in Curtiss Hall, the cart may pop up at the Memorial Union, on Central Campus, or various other locations for special events.



WHAT YOUR SUPPORT MADE POSSIBLE THIS YEAR:

- Support for 74 youth-owned startups in agricultural crop enterprises, including chili peppers, green pepper, tomatoes, cabbage, watermelon, bananas, and passion fruits
- Establishment of community-based tree nurseries for fruit, fuel, wood, and animal fodder species, including 8,540 tree seedlings propagated, 974 planted so far
- 199 program participants learned new skills and earned supplemental income through Community Income Generation Innovation (CIGI) projects

WHAT YOUR CONTINUED SUPPORT MAKES POSSIBLE GOING FORWARD:

- Home-based garden enterprises for students to facilitate knowledge transfer to their communities, increase nutritional food security, and provide additional household income to keep children in school
- Collaborations with students in locally based higher institutions of learning, such as Busitema University, in youth entrepreneurship and student mentoring roles
- Expand CIGI program to three more communities in the district

Interest in trees taking root as perennial crop option

EVER since CSRL began its work in the Kamuli District, there has been interest in growing a diversity of perennial crops as part of the goal to develop climate-smart innovations that help Ugandans live sustainably. In recent years, the call has become louder for agroforestry—introducing timber and cash tree crops around or among the traditional crops or pastureland.

Landowners who plant trees suitable for firewood or charcoal could have a convenient fuel source for their kitchens, rather than having to venture miles away in search of firewood. Planting acacia and other leguminous trees would provide grazing for livestock and a source of nitrogen for the soil, which improves crop growth. With trees for coffee, cashew, cacao and even citrus, for example, these deep-rooted plants would tolerate drought years and provide reliable income for the smallholder farmers who sell their harvest.

“Over the last year and a half, as weather challenges got worse and worse in the tropics, we have seen that there would be crop failures for annual crops. That’s catastrophic for people right on the edge, so what do we do to increase stability if the annual crop doesn’t do well?” asked Lee Burras, CSRL associate director of agronomy and land use.

Burras, Morrill Professor in the Iowa State University Department of Agronomy, and other ISU experts, along with ISU-UP field specialists in Uganda, are trying to introduce a greater number of trees in the farming systems of Kamuli. ISU-UP started three community-based tree nurseries in the last year. Other nurseries are maintained by schools or landowners. Because farmers have limited land, they tend to include trees among the crops within

their gardens, says Moureen Mbeiza, ISU-UP agronomy and land use officer in Uganda.

With donor support, CSRL would like to expand the community-based tree nurseries to provide more quality seedlings for fruit trees and firewood and animal fodder species.

For instance, Burras sees great potential for growing trees that produce coffee beans in the Kamuli District, given the area’s elevation of 3,500 feet, which is ideal for Robusta coffee. With good management practices that include grafting an improved scion onto rootstock adapted to the local soils, as well as regular fertilizer and pest management, a landowner farmer could make money on the harvest within two to three years after planting.

“The nice thing about coffee is it does best as an understory plant. And then some crops work best for wood, or for nitrogen fixing. It wouldn’t be one thing or the other, but a combined system. We would need to put together an integrated system that optimizes these different niches,” Burras said.

Whether they provide income or food or improve the condition of the soil, tree crops are a healthy alternative for the Kamuli District.

“By increasing diversification in the farming system, the risk is spread over a greater number of crops. Then if the maize crop should fail due to a drought, farmers who also have a woodlot can sell the timber or firewood to help them maintain an income,” said David Acker, CSRL director.





BENEFITS OF SOIL TESTING, MAPPING

Testing and mapping the soil will ultimately help farmers in the Kamuli District sustainably manage their land. Two ISU graduate students from Uganda, Francis Akitwine and Rebecca Wokibula, are taking lead roles in this endeavor.

Testing the soil for pH and nutrient content helps to determine what to plant where and which soil treatments, if any, are needed for the best yield. However, the ISU-UP team doesn't have access to specialized equipment and chemical reagents for soil analysis. Instead, Akitwine is developing novel laboratory methods for use at Mpirigiti Rural Training Centre. Eventually, ISU-UP would like to build a community service laboratory at the training center for soil analysis and other monitoring needs of the ISU-UP outreach programs.

The two students also will develop soil maps using modern geospatial science techniques along with asking local villagers and farmers to describe the differences on their land. This indigenous soil mapping will help the ISU-UP team decipher the soil properties and classifications.

"Soil mapping and soil testing are two sides to the same coin. Neither is the endpoint. The endpoint is interpretations and recommendations—what will grow here and how do you make it grow better," said Lee Burras, CSRL associate director of agronomy and land use.



WHAT YOUR SUPPORT MADE POSSIBLE THIS YEAR:

- New or expanded gardens and field nurseries for more than 100 farmers
- Training on best agronomic practices for more than 700 women and more than 70 men who farm
- Distribution of improved seed and seedlings to client farms to grow soy, grain amaranth, collard, millet, egg plants, cowpeas, coffee, and cashews

WHAT YOUR CONTINUED SUPPORT MAKES POSSIBLE GOING FORWARD:

- Expansion of training program to include local agronomic professionals as well as more farmers
- Identification and distribution of better agronomic inputs such as fertilizers
- Collection of more yield data to improve best agronomic practices
- Land surveys of representative individual farms

BUILDING PARTNERSHIPS

The global genetics company URUS, which helped launch the bovine artificial insemination program, is just one of several organizations partnering with ISU-UP.

KUBUS, a private company in Spain, and ISU-UP are collaborating on a series of educational posters for farmers on topics pertaining to pig artificial insemination, as well as on developing and delivering educational webinars on swine production to students, staff, and faculty at Makerere University. Over the summer, KUBUS donated artificial insemination supplies to ISU-UP to help improve swine production in Kamuli.

ISU-UP has signed memoranda of cooperation and understanding (MOU) with both URUS and KUBUS. Curtis Youngs, CSRL associate director for livestock development, said the MOUs enable ISU-UP to obtain needed livestock supplies through donations or at considerable discounts, as well as build collaborative educational opportunities.

“These external partnerships help the program grow and extend its impact,” Youngs said.

In the future, URUS and ISU-UP will partner with the National Animal Genetic Resource Centre and Data Bank, a semi-autonomous division of the Uganda Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) which regulates the import of animal genetic resources, to conduct training programs for bovine artificial insemination technicians.

Other partnerships are under development with the National Agricultural Research Organization, an agency of the MAAIF; and the National Animal Genetic Resource Centre and Data Bank, to train veterinarians and other skilled professionals in bovine embryo transfer technologies.



For the smallholder farmers who own c
for their families, especially to combat

Bovine artificial insemination will boost milk production

— **IT MIGHT** sound far-fetched, but Iowa State University experts are helping Ugandan farmers get more milk from fewer cows than they could previously.

The formula begins with bovine artificial insemination. Local cows are impregnated with imported frozen dairy cattle semen so they produce calves with a higher genetic potential for milk production. Once the calves produced by artificial insemination reach sexual maturity, they will be mated. After the pregnant females give birth and then begin lactating, farmers will see the benefits of increased milk production. Just a couple of improved cows will generate more milk than could be produced by at least twice as many cows before.

For the smallholder farmers who own cattle, increased milk production means more milk for their families, especially to combat stunting, hunger, and malnutrition in their children. It also enables farmers to sell or barter extra milk to improve their family's standard of living, or even use the extra milk to make and sell value-added products like cheese.

cattle, increased milk production means more milk to combat stunting, hunger, and malnutrition in their children.

The artificial insemination project was launched by Curtis Youngs, professor of animal science and the M.E. Ensminger Endowed Chair of International Animal Agriculture at ISU, shortly after he became CSRL associate director for livestock development in April 2020. With expertise in the technologies of artificial insemination and embryo transfer, his goal is to bring enhanced production of animal-source foods to Uganda and other food-insecure areas around the world.

“The bovine artificial insemination project will yield a substantial long-term return on investment,” Youngs said. “We just need to be patient to see the results.”

The Iowa State University-Uganda Program gained access to superior cattle genetics through the global development branch of URUS, which supplied 1,320 doses of frozen dairy cattle semen from three breeds (Ayrshire, Jersey, and Holstein). In the future, URUS will partner with ISU-UP to organize and conduct educational sessions for Uganda smallholder farmers focused on bovine artificial insemination technology.

In addition to the benefit to individual farmers, there is an environmental advantage because the artificial insemination program breeds more efficient livestock that require fewer natural resources—land, feed, water—to produce a gallon of milk. The ISU-UP livestock program further reduces the carbon footprint of animal agriculture in the Kamuli District by returning animal waste to the land to enhance soil fertility.

WHAT YOUR SUPPORT MADE POSSIBLE THIS YEAR:

- 1,632 follow-up visits with 603 farmers and two primary school programs
- 4,100 vaccinations of poultry against either Newcastle or Gumboro disease
- Health treatment of 996 animals for diseases such as ringworm, mastitis, coccidiosis, and mange
- Breeding 85 female goats with Mubende breed male goats
- Cost-share on building 10 piggery units for 10 new pig farmers
- Cost-share on building rainwater catchment and storage systems for five farmers
- 272 farmer trainings on topics such as feeding programs and shed construction

WHAT YOUR CONTINUED SUPPORT MAKES POSSIBLE GOING FORWARD:

- Improved cattle milk production and enhanced meat production through artificial insemination project
- Expanded goat breeding program
- Installation of rainfall water capture systems for livestock farmers
- Liquid nitrogen generator for cattle artificial insemination



Remembering a s

AFTER floods swept through Buyende District in spring of 2020, ISU-UP supported displaced families and farmers with food, blankets, and seeds to replant crops that had washed away. The community also needed to replace public latrines to reduce health risks. CSRL had received special COVID relief and rehabilitation funding for the latrine project but still needed to identify an appropriate location on higher ground that would serve the community.

As fate would have it, the perfect location would be found for the project through a family with long ties to ISU-UP. Construction was completed and the public latrine facilities were dedicated in February 2021.

The land for the project was donated by Kapala Silve, a brother of Jackson Nteeba. Jackson was a onetime undergraduate student at Makerere University who was part of the CSRL Service Learning School Garden Program in 2008. He said the experience transformed his life.

WATER HARVESTING HOW-TO

By promoting convenient ways to access water, CSRL helps to encourage proper hygiene and sanitation practices that protect health. This year, gutters and rain barrels were added at two model homes that have been established as training centers for health and sanitation practices. The storage barrels collect rain water through piping from the gutters, demonstrating a low-maintenance way families could gather water at their own homes for use in hand washing, bathing, or latrines. Gutters and rain barrels installed at home could save families the time it takes to travel and carry water.

Shining star from Buyende District

“I am empowered in so many ways,” Jackson said in a story published in the 2008 CSRL Donor Impact Report. “This has strengthened my social responsibility as a citizen and exposed me to community needs. I feel like I can and should do something for my community.”

ISU faculty recognized Jackson’s academic ambitions and selected him as the first Makerere service learner to intern at Iowa State in 2009. He would thrive in Ames, graduating with a PhD in genetics in 2014. His dissertation, titled “Impact of metabolic perturbation on ovarian function,” examined the effect of conditions such as hyperinsulinemia induced during obesity and heat stress on impaired fertility in humans and production animals.

Jackson was working in Kansas City, Kansas, when he passed away Jan. 7, 2021, after being diagnosed with liver cancer. He was 35.

Colleagues remember him as a stellar student with an infectious smile. In a tribute published on the website of the Society for the Study of Reproduction, Aileen Keating,

his PhD adviser, wrote that Jackson “was truly a part of our family” in her ISU lab.

“He experienced the Iowa corn harvest in a huge combine harvester with Dr. Jill Madden’s family. When we went to conferences, Jackson used to amaze us by managing to pack the smallest travel bag imaginable, and yet every day he had a different outfit!”

He pursued postdoctoral work at the University of Iowa and the University of Kansas Medical Center, receiving a fellowship from the American Diabetes Association to support his work at KU Medical Center. He published 11 original research papers.

“Jackson’s legacy is his willingness to always help others, a principle of CSRL. He had a deep understanding of the children’s lives, which the ISU-UP activities aim to assist, and was a role model to all of the children,” said Gail Nonnecke, CSRL associate director for education programs.

He is buried at his parents’ home in Buyende District.

WHAT YOUR SUPPORT MADE POSSIBLE THIS YEAR:

- Two Water, Sanitation, and Hygiene (WASH) program model homes were equipped to demonstrate water catchment
- Two government health centers in the Kamuli District were provided with handwashing stations
- COVID related education and mobilization in partnership with Kamuli and Buyende district health centers, and organized by the Kingdom

WHAT YOUR CONTINUED SUPPORT MAKES POSSIBLE GOING FORWARD:

- Installation of new boreholes within communities of highest need as determined by ISU-UP in conjunction with local leaders
- Further expansion of WASH and postharvest training programs
- Expansion of COVID education and vaccinations in rural areas





Control of supply

TESTING FOR AFLATOXIN

INTRODUCING NEW EQUIPMENT

Time-saving postharvest tools that help families obtain nutritious and less-expensive ingredients were introduced this year.

Thomas Buyinza, ISU-UP postharvest field specialist, suggested using a stainless-steel press to extract oil from crops grown in the area. Edible oils can be expensive to purchase but are valued for the calories and essential nutrients they provide. The team in Uganda has been visiting farms to demonstrate the press using oyster nuts, locally known as “kulekula,” which are high in oil content and yield a flavorful and useful cooking oil. ISU-UP hopes the oil press becomes popular enough that farmers will share the device as well as profits from selling the oil.

George Kasangaki, a Makerere University and ISU-UP service learning student, built a prototype amaranth thresher that operates with a hand-powered crank. Harvesting the high-protein seeds of amaranth is a tedious task that has traditionally required laying the flower heads on a tarp and pounding them with sticks to separate the grain from the plant. Students are collaborating on revisions to the design with a company that built a pedal-operated maize cleaner designed by another Makerere student.



“There are so many places in Uganda and Africa that you can either eat grain that might have aflatoxin in it, or you can be hungry.”

TOM BRUMM, CSRL ASSOCIATE DIRECTOR

chain helps ensure food safety

REMAINS A CHALLENGE

— **AFLATOXIN** is a compound made by a fungus naturally occurring in agricultural fields, but good postharvest practices help keep aflatoxin well below acceptable levels so food products are safe to eat. In tropical regions like Africa, it's much harder to control the growth of the fungus that excretes aflatoxin, which proliferates when crops are not dried and stored properly.

Exposure to aflatoxins is associated with an increased risk of liver cancer in adults and stunted growth in children. Aflatoxins cannot be visually detected.

“Research across Africa, and in Uganda specifically, shows that 50% of maize in the marketplace has aflatoxin at various levels. There are so many places in Uganda and Africa that you can either eat grain that might have aflatoxin in it, or you can be hungry,” said Tom Brumm, CSRL associate director. He is the Mary and Charles Sukup Global Professor in Food Security in the College of Agriculture and Life Sciences, and a professor in the Department of Agricultural and Biosystems Engineering at Iowa State University.

Aflatoxin has been detected in the maize harvested in the Kamuli District. ISU-UP made changes at multiple points in the supply chain to ensure the safety of maize purchased for flour used in porridge, which is served to children at the Nutrition Education Centers and the schools. Brumm estimated the NECs use 4 to 5 tons of maize flour as an ingredient in the nutritious porridge prepared each month.

Maize is now purchased from farmers who can dry and store the grain safely, by using tarps to dry the harvest in the sun and avoid contamination from the ground, and by

storing grain in hermetically sealed silos to deter insects and rodents. The maize is then processed on a milling machine installed at the Mpirigiti Rural Training Center in Kamuli, instead of taking the maize to a public mill where contamination is possible.

Frequent testing for aflatoxin would be an ideal added step to further ensure grain quality. However, this is currently a challenge due to the limited availability of testing supplies and facilities in Uganda. ISU-UP plans to develop the capacity to conduct these tests in house. Our goal is to conduct these and other tests in a new multipurpose community service laboratory at the training center. When fully functional, the lab could provide timely and cost-effective testing for aflatoxin in grain, as well as monitoring of livestock feed, water, soil, agricultural inputs, and the health of plants.

“The lab would enable us to carry out high-quality monitoring required in all of our outreach programs, and to respond quickly to farmer and community needs for rapid testing. Using the lab, undergraduate and graduate students could tackle important research projects to benefit communities in Kamuli and throughout Eastern Uganda,” said David Acker, CSRL director, ISU associate dean for global engagement, and the Raymond and Mary Baker Chair in Global Agriculture.

The project is estimated to cost \$640,000, which would include designing, building, and equipping the lab. Multiple naming opportunities will be available for donors. Once funding is secured, it would take about two years for design and construction before the lab is operational.

WHAT YOUR SUPPORT MADE POSSIBLE THIS YEAR:

- 20 farmers increased their income through stored crops, after receiving silos and tarpaulins via the enterprise input support program in 2020
- Mechanization to improve food safety and reduce workloads: mechanical mixer for porridge flour, maize sheller, edible oil press, pedal-powered grain cleaner, and a second amaranth thresher

WHAT YOUR CONTINUED SUPPORT MAKES POSSIBLE GOING FORWARD:

- Additional storage silos and tarpaulins distributed to the community using enterprise input support program
- Community-based enterprises to share maize sheller and edible oil press among smallholder farmers
- Increase testing for aflatoxin to improve food safety



The Center for Sustainable Rural Livelihoods uses the power of education to develop responsible global citizens and thriving local communities that benefit from food and financial security, quality education and healthcare, civic participation, social inclusion, environmental stewardship, and overall sustainable livelihoods.

Thank you for helping this vision become reality.

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