

**UGANDA CHRISTIAN UNIVERSITY
SUSTAINABLE DEVELOPMENT
CENTER**

**JULY 2022
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BACKGROUND

The grand development challenge in Uganda is to increase incomes among the 70% Ugandans who earn less than UGX4,000 per day [1]. Increase in income is recognized as the most holistically low-cost and high impact solution to complex global problems like energy insecurity, food insecurity, poor health, or poverty in general [2]. The inspiration for the STEM (science, technology, engineering, and mathematics)-centric Center comes from three directions. First, from the UCU vision of a research-led “center of excellence in the heart of Africa.” Second, from the 17 UN Sustainable Development Goals [3], which are a global development roadmap. Third, from work by research laboratories that is based on human-centered design and translational research to enable the translation of solutions to innovations (or from projects to businesses), in sub-Saharan African [2]. Here, we distinguish a solution from an innovation. A solution becomes an innovation when it is widely adopted, in multiple communities or regions, which is typically an indication of solution/innovation sustainability.

Area of inquiry that leverages current UCU strengths is the intersection of water, energy and food/feed. This intersection is of greatest interest because it is commonly featured when circular systems are considered in sustainability efforts. Circularity and sustainability are “two sides of the same development coin.” Although circularity is currently popular. It is not a new idea; it is based on nature. “Waste does not occur in nature. One organism’s waste is another organism’s food, and nutrients and energy flow in closed-loop cycles of growth, decay, and reuse” [4]. Figure 1 below illustrates the water-energy-food/feed nexus.

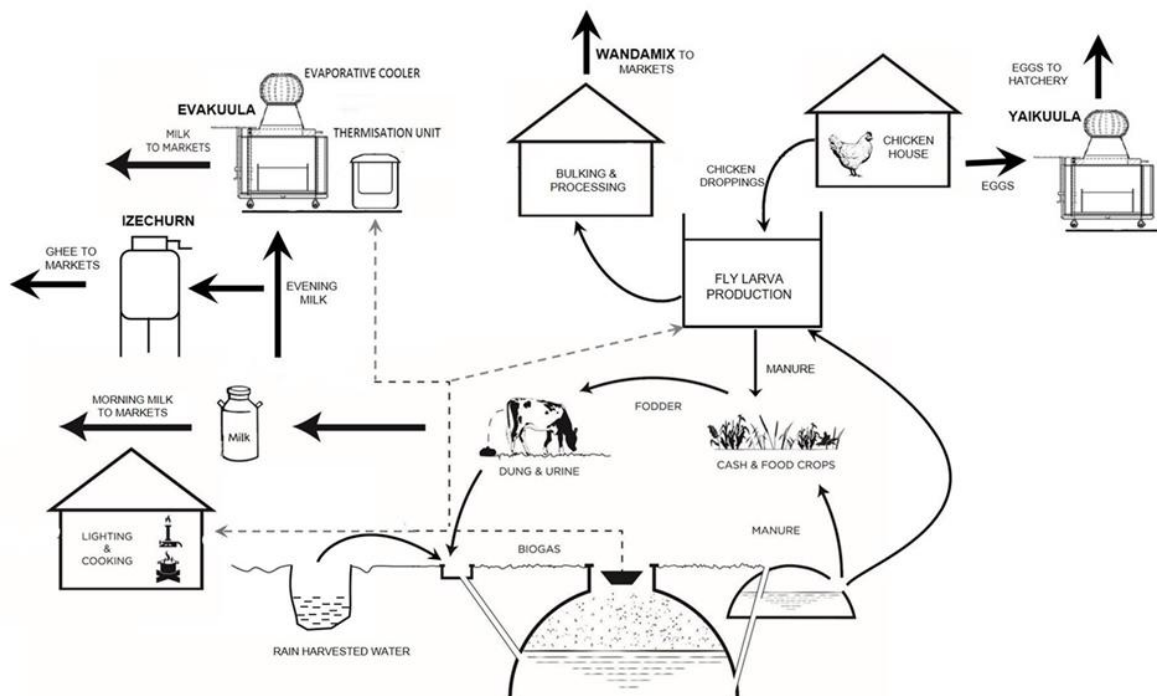


Figure 1. The graphic above illustrates how different technology-based solutions/designs solve smallholder farmer problems within the arching theme of sustainability at the intersection of water, energy, and food. WANDAMIX, the fly larvae protein concentrate is one of the products produced from a mix of biogas plant effluent and poultry wastes as substrate.

As shown in Figure 1, harvested rainwater is used by the household and by livestock (e.g., zero-grazed cows). The urine from the cows is used to dilute the dung to prepare the substrate that feeds the digester. The digester produces biogas. The slurry from the digester either goes directly to crops as liquid fertilizer or reaches the crops after larvae protein-based feed concentrate making. The cows eat the fertilized/watered fodder and produce milk and dung. The dung enters the cycle again.

The biogas (energy) from the digester is at the center of the ecosystem. Households cannot entirely rely on biogas for their energy source. Households that adopt biogas, mix biogas and firewood fuels. At a high biogas percentage of the mix, several benefits accrue. For example there are health benefits (less kitchen air pollution from firewood use), environmental benefits (less cutting down of trees), and time/labor saving (less time searching for firewood). As shown in Fig. 1, biogas is used as the energy source for two the solutions (EVAKUULA [5] and WANDAMIX).

The evening milk post-harvest loss among rural smallholder farmers is well known. Both IZECHURN [6] and EVAKUULA development were in responses to this problem. Making ghee from unsold milk is one way of reducing the loss. IZECHURN was conceptualized to reduce labor and/or increase productivity. EVAKUULA preserves the freshness of the evening milk so the milk enters the cold chain the next day.

Many smallholder poultry farmers are often forced to sell their flocks prematurely due to scarcity of feed ingredients, like silverfish and soya beans that are seasonal and are used as human food. An unpublished study has shown that use of WANDAMIX, a lower cost product, in comparison to an imported concentrate enables raising small flocks of meat birds profitable. Unlike other feed protein sources, WANDAMIX is non-seasonal.

VISION AND MISSION

Vision: Through the Center, UCU to be recognized as a leading change agent for transitioning technology-based interventions into innovations that increase incomes and/or well-being of those at the bottom of the economic ladder.

Mission: To provide support to UCU STEM graduate programs to train new “breeds” of graduate students comfortable with developing, piloting and evaluating technological interventions designed to improve human and economic development within complex low-resource settings.

The four center core values:

- 1) Achieving the main desired Center outcome of increasing incomes through technology-based interventions calls for a solution transitioning to an innovation. Multidisciplinary teams are in a better position to point the work toward the desired outcome. For example, it may be necessary to combine the technological-based and value chain-based approaches, which would require multiple disciplines to recognize hypotheses to test and methodologies to use to arrive at conclusions.
- 2) For the solution stuck or without any up-take, it may be necessary to involve a higher level of STEM (i.e., involve a highest level of STEM, such as at the PhD level to answer question that may unlock the solution from no up-take to innovation. A team composed of undergraduate and graduate students, is in a better position to traverse this continuum. This constitutes a model that seamlessly combines graduate and undergraduate educational.

3) As already mentioned, a solution becomes an innovation when it is widely diffused or adopted.

4) The center will host research, provide seed grants, courses (including seminars) that may contribute to academic degrees at all levels. As Uganda Christian University, we will seek to provide these things consistent with serving the church in its breadth and provide a depth of sustainable development understanding and practice for her leaders in a theologically relevant and biblically oriented manner.

ORGANIZATION PLAN

The Center will be administered through the Directorate of Research, Partnerships and Innovations (DRPI). The Center Chair, to be appointed by the DRPI, will be responsible for the day-to-day management of the Center. Given the interdisciplinary nature of the Center, it may be necessary to appoint a Co-Chair to assist the Chair in disciplinary matters that may be far removed from the Chair's space of expertise. The Chair will be assisted by an Advisory Committee of four, also appointed by DRPI. All appointments by DRPI will be for three-year renewable terms. Membership will be open to current faculty (internal or external) as affiliates. Affiliate members will maintain their primary home, where appointed. Affiliation will be achieved in several ways. For example, if a faculty member is mentoring a PhD student supported by the Center, the faculty may seek an affiliation with the Center. If a faculty member's teaching and/or research interests align with the mission of the Center, an affiliate membership for the faculty will be appropriate. As the Center grows, it may be necessary to appoint new faculty as core members, meaning their primary home will be the Center. A separate Cooperative membership will be structured for corporate organizations and/or individual donors.

KEY RESULTS WITHIN THE FIRST SIX YEARS

Secure local and overseas partnership. Local partnerships may include other research/academic institutions and well as industry. For industry, a fee structure may be established to contribute toward financial sustainability. Overseas partnership may include research/academic institutions that may support faculty and student exchanges.

Secure extramural (grant) funding for self-support. Examples of open calls include: 1) Funds for Innovation in Development (France). 2) International Research Experiences for Students (IRES) (US National Science Foundation). 3) Partnerships for Enhanced Engagement in Research (PEER) (funded by USAID and managed by the National Academies in partnership with several US Federal agencies). 4) Partnerships for International Research and Education (US National Science Foundation). A key three-year success measure is the Center becoming self-supporting by the end of Year three of the Center existence.

Establish multidisciplinary Certificates in Development. University of California Berkeley has implemented a MS and a designated emphasis programs, "to prepare students to develop, pilot, and evaluate technological interventions designed to improve human and economic development within complex, low-resource settings." The UCU Certificates will have a similar goal and will extend the graduate training for all disciplines involved (e.g., development studies, engineering, agriculture, and business).

Establish research/development needs (and/or knowledge gaps) through field interviews, conducted by multidisciplinary teams of students and faculty. Take advantage of existing outreach programs in business and the Social Sciences (Rotary Foundation-funded).

Establish undergraduate virtual capstone design/research teams that may be embedded with in Faculties/Schools made-up of students from overseas partner institutions and UCU seniors.

Establish a PhD program in engineering in close collaboration with the Faculty of Engineering in the following three emphasis areas: 1) Environmental Engineering, 2) Energy Engineering, and 3) Bioprocess Engineering. This is a starting point that does not “stretch the envelop.” For example, current strength in water/waste management can be extended to cover air quality. It should be pointed out that students in the Center pursuing PhDs in other disciplines will be supported, but will earn their degrees in their disciplines, such as Agriculture - a PhD program in Agriculture is in the final stages of the approval process.

Admit at least six (3) doctor students every year, translating into 18 students graduated and/or in the pipeline to graduate by the end of Year six of the Center existence – a key success indicator.

PROPOSED THREE-YEAR BUDGET

	Year 1	Year 2	Year 3
Revenues			
Intramural seed grant	20,000,000	0	0
Extramural grant overhead contribution	0	20,000,000	40,000,000
TOTAL Revenue	20,000,000	20,000,000	40,000,000
Expenses			
Office supplies	4,000,000	4,000,000	4,000,000
Communication and/or travel	4,000,000	4,000,000	6,000,000
Secretarial help	12,000,000	12,000,000	30,000,000
TOTAL Expenses	20,000,000	20,000,000	40,000,000
NET RESULT	0	0	0

PROGRAM TO KICK START THE SUSTAINABLE DEVELOPMENT CENTER

S/N	ISSUE	WHEN
1.	Establish the first Center-centric multidisciplinary research project (Green charcoal project).	JANURY 2023
2.	Identify and establish a focused, innovative and committed Advisory/Governing Committee.	SEPTEMBER 2023
3.	Establish a map of stakeholders (Ugandan, Global, and Regional) for the Center to build partnerships with.	NOVEMBER 2023
4.	Complete the first draft of the Certificate in development for external approval. Seek the UCU senate approval of the Center.	DECEMBER 2023
5.	LAUNCH UCU SUSTAINABLE DEVELOPMENT CENTER	JANUARY 2024

REFERENCES

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