Letter of Interest Form
All applicants MUST use this form to apply

Development Innovation Ventures (DIV) aims to find and support breakthrough solutions to the world's most important development challenges. DIV seeks applications that have ideas for addressing development challenges more effectively and more cheaply. If you have a great idea, please submit a Letter of Interest (LOI) to DIV using this form. **Citations should be provided whenever possible, and assumptions used to generate estimates should be clearly explained.** Please submit the final LOI to DIVApplications@usaid.gov. Once you submit a LOI, it will undergo a competitive review and if successful, we will ask you to submit a full application.

For additional information about DIV, examples of great projects that we support, and our application process and timeline, please visit DIV's website at http://www.usaid.gov/div/. **Please carefully review our Annual Program Statement available on our website before submitting your LOI.**

I. Eligibility Checklist

DIV welcomes applications from many types of organizations including foundations, U.S. and non-U.S. non-governmental organizations (NGOs), faith-based organizations, U.S. and non-U.S. private businesses, business and trade associations, international organizations, U.S. and non-U.S. colleges and universities (public and private), civic groups, regional organizations, etc.

Applicants must meet the following minimum requirements (check all that apply):

☒ Applicant is a legally recognized organizational entity under applicable law.

☒ Applicant's activities take place in the countries for which USAID provides assistance. If the project covers other countries, the DIV grant can only be used for activities in USAID presence countries.

☒ Applicant is not an organization from a country that is ineligible for assistance under the Foreign Assistance Act, as amended, or related appropriations acts.

II. Organization Information

A. Organization legal name:

B. Organization type (please select from dropdown menu): For-profit company

If 'Other', please specify: Also private-public partnership with universities

C. Organization address:

Street Address
City: Kampala
State/Region:
Zip/Postal Code:
Country: Uganda

D. Contact information:

Primary point of contact		Secondary point of contact	
Name:		Name:	
Title:	CEO	Title:	CTO
Telephone:		Telephone:	
E-mail:		E-mail:	

III. Overview Information

A. Project title: Sustainable Alchemy: Transforming Africa's Waste Problem into Energy and Fertilizer Opportunities

B. DIV stage (please select from dropdown menu): 1

C. Which of the following best describes the sector your innovation addresses? (please select from dropdown menu) Water, Sanitation, and Hygiene

If 'Other', please specify: Also Health, Energy, & Agriculture

D. Partner organizations: Makerere Univ. Ctr for Research in Energy & Energy Conservation. UW-Madison Global Health Institute

E. Total funding requested (USD): 100000

F. Proposed cost share (USD): 300000

G. Country/countries where the project will take place: Uganda

H. Expected duration of project activities (months): 18

I. Has the applicant ever received USAID funding in the past? No

J. Has the applicant received USG funding for this or a similar project? No

IV. Project Information

A. Development Challenge and Your Solution

What development challenge are you addressing? What solution are you proposing? What is the magnitude of this challenge in the proposed country of implementation, as well as globally (include relevant statistics)? What about this particular solution gives it the potential to significantly impact the development challenge in a way that has not been feasible before? If applicable, describe previous experiences implementing or testing the solution and any evidence of successful development impact. Please provide relevant data and citations in support of your statements. (1/2 page limit)

THE CHALLENGES

In Uganda, a rapidly urbanizing and expanding population urgently requires innovative responses to these seemingly intractable development challenges:

(1) Chronic power outages retard economic development, with peak demand reaching 445MW and available capacity rarely exceeding 300MW (2011 Energy Regulatory Authority, Uganda).

(2) Over 1,800 tons of uncollected municipal solid waste (MSW) enter public waterways each day (Takahirwa 2012), causing floods that spread waterborne illness, damage property, and may be responsible for up to 75% of pollution in Lake Victoria (Odada 2004).

(3) Agricultural expansion is the leading cause of deforestation in this critical biodiversity hotspot, which is home to some of the last wild gorillas and chimpanzees (Rademaekers 2010).

(4) Farmers struggle to feed the world's third-fastest growing nation. Uganda has one of the highest rates of soil depletion on the planet, but one of the lowest rates of fertilizer application (Namaazi 2008).

THE SOLUTION

A proven technology called anaerobic digestion could transform these development hurdles into investment opportunities. We propose to divert organic MSW from landfills, convert this waste into biogas (mostly methane), and combust the gas to produce renewable electricity. The digested wastes are then used as a nutrient-rich fertilizer. If every ounce of Kampala's organic waste were productively utilized (about 70% of 3,000 tons of MSW generated each day), 3 million urban residents would enjoy cleaner streets and safer water, 200,000 homes would enjoy renewable electricity, and 120,000 small farms would enjoy better crop yields. The revenues generated from energy, carbon credits, and fertilizer sales could support the costs of Kampala's waste collection services indefinitely.

WHY NOW? WHY UGANDA?

With the World Bank (2012) predicting global MSW production to double to 2.2 billion tons/year by 2025, urban areas worldwide will have a pressing need for financially sustainable models for MSW management. Uganda is the ideal testing ground for designing a large-scale urban biogas system in a resource limited setting. The Ugandan government recently announced favorable 20 year rate guarantees of US$ 0.115/kWh for biogas electricity. With more than 200 micro-scale biogas digesters deployed across the country, Ugandans are familiar with the basic principles of the technology. Now is the time to scale-up by training a cadre of Ugandan biogas experts and leaders.

B. Objectives and Anticipated Results

What are your objectives and the anticipated results for the proposed level of DIV funding support? How would DIV support help you meet your goals for the innovative solution? (1/2 page limit)

OBJECTIVES & RESULTS

Although a city-wide system of productive municipal solid waste use is technologically feasible, can such a model can be successfully implemented? We seek DIV Stage 1 funding to construct a proof-of-concept system in Kampala that would process 1 ton of waste each day and generate about 5kW of electricity and modest volumes of fertilizer. This system would reveal some of the practical challenges of orchestrating an integrated waste management system. Through a system of rapid, iterative business development, we will answer the following questions:

1) How can we engage local communities to collect and sort their waste? Source-sorting is the most cost-effective approach to separating organic wastes, but behavior change is complex. If we pay local women leaders to educate their peers and supervise waste bins, will communities comply?

2) What will it cost to transport waste to our site? How do we create value for existing formal and informal sector waste collectors while complying with existing regulations?

3) What is the appropriate technology? Biogas expert Vianney Tumwesige will construct our proof-of-concept system using local materials. Based on the costs of construction and operations, would Kampala be better served by multiple smaller systems like our proof-of-concept or a large system?

4) Who will use our fertilizer? We will partner with the Makerere University Department of Agricultural Extension & Innovation, UW-Madison College of Agriculture, and small farmers from the National Organic Agricultural Movement of Uganda to assess the nutrient values and performance of the fertilizer produced from the digested wastes. Which end-users will be most interested in our product? How can we customize our fertilizer to meet their nutrient needs?

THE ROLE OF DIV STAGE 1 FUNDING

$100,000 of Stage 1 DIV Funding, when combined with our $160,000 of existing financing and $140,000 of in-kind donations, will enable our team to construct and operate the proposed proof-of-concept system for 1-1.5 years. This timeframe will enable us to test our assumptions about our innovative business model, helping to generate robust and scalable estimates of inputs, outputs, labor requirements, and potential revenues that can be used to design a self-sustaining model of waste management for cities like Kampala. Armed with rigorous evidence that is based on proof-of-concept system operations, we plan to secure private investment and loans to scale-up.

C. Potential Impact & Scale

What is the possible magnitude of impact your proposed solution could have on the stated development challenge, both in the country described above and globally (include relevant statistics)? Who and how many will the solution directly impact? Who and how many will the solution indirectly impact? Provide a definition of direct and indirect "beneficiary" as it relates to your project's potential impact, and explain your methodology for calculating the anticipated number of beneficiaries. What is the maximum level of scale your innovation could reach in the long-term, both in the country described above and globally? What are possible avenues for scale up over the next 3 – 10 years? (1/2 page limit)

PUBLIC HYGIENE BENEFICIARIES
Direct: 2,000 (proof-of concept), 200,000 (per full-scale)
On average, urban residents in the region generate about 0.5 kg of waste per day. Our proof-of-concept system will accept 1 ton of waste per day (e.g. waste from 2,000 people). A scaled system could accept waste from 200,000 residents.

Indirect: 3,000,000 Kampala residents +2,000,000 fishermen
All citizens benefit from cleaner streets and trash-free waterways. Keeping waste out of public sewers prevents trash from clogging waterways and causing massive flooding. Keeping urban run-off out of the Lake Victoria watershed protects the drinking water of urban residents and the livelihoods of fishermen from deleterious effects of pollution. Our proof-of-concept system will need to be scaled before these benefits are realized.

ENERGY SECURITY BENEFICIARIES
Direct: 100 (proof-of-concept), 10,000 (per full-scale)
100 kg of organic waste roughly translates into 1kW of electricity. On average, Ugandan electricity customers consume electricity at a rate of about 0.1kW. Therefore, for every 10kg of waste processed, we generate enough electricity for one person. Our proof-of-concept project will process about 1,000 kg of waste per day, generating enough electricity for 100 people. A full-scale system could provide power for 100,000 people.

Indirect: 34 million (the population of Uganda)
Widespread power outages retard national economic development. With Uganda's fast-growing and rapidly urbanizing population, electricity demand will only continue to rise. We applaud the Ugandan government's commitment to hydropower, but a sustainable energy future in an era of climate change requires a diversified energy portfolio. Unlike solar, wind, or hydropower, which are impacted by severe weather events, electricity generated from biogas can be used to meet demand in any weather since people continuously produce waste.

FOOD SECURITY BENEFICIARIES
Direct: 300 (proof-of-concept), 30,000 (per full-scale)
Each 1,000 kgs of waste we process will produce 900 kgs of high quality fertilizer. We estimate an effective application rate of 1,000 kg/acre. The average subsistence farm in Uganda is about 5 acres. Our proof-of-concept system will produce about 300 tons of fertilizer in the first year. That's enough for about 60 family-farms to increase yields. Assuming an average family size of 5, we help feed 300 people each year. At scale, each system could produce fertilizer to help feed 30,000.

Provide the most appropriate estimate of who the solution will directly and indirectly affect.

	Direct	Indirect
Now?	2400	0
In 3 years?	240000	34000000
In 5 years?	1200000	80000000
In 10 years?	2400000	150000000

D. Competitive Landscape

What are existing common practices or competing solutions that seek to address the same development challenge as your innovative solution? What makes your solution more appealing to public and/or private sector stakeholders in comparison with these alternatives? Describe the cost-effectiveness of your innovation including the difference in estimated cost/per development outcome for your innovative solution and that of competing solutions or existing practices. If your solution is a completely new idea or does not have market competition, explain why you believe it is likely to generate or maintain interest from the public and/or private sector, including cost considerations. (1/2 page limit)

SIMILAR PROJECTS

Heifer International has installed over 350 fixed-dome biogas systems in Uganda, predominantly at small-scale zero-grazing dairy operations. Members of our project team have also constructed small-scale systems at orphanages and schools across the region. However, biogas projects of this scale cannot confront Kampala's urban waste problem. At Kampala's Kitezi landfill, an appropriately-scaled methane recapture project will mitigate greenhouse gas emissions and generate electricity, but unlike our project, it will not divert newly generated MSW from the landfill. An innovative start-up in Kenya called Sanergy plans to transform waste into energy and fertilizer. However, Sanergy focuses on latrine waste, whereas our business focuses on MSW.

WHY HASN'T THIS BEEN DONE ALREADY?

During our intensive market research, we learned that several companies had attempted projects similar to ours but failed because of (1) lack of engagement with local communities and (2) exclusive consideration of capital-intensive, complex system designs ($15 million+). Our team has been engaging directly with women vendors and market committees in Kampala to develop this project. We want to begin with a locally-constructed, rather than a capital-intensive, project.

COST-EFFECTIVENESS

We tranform a public-sector financial burden into a private-sector revenue stream. Our business model incentivizes participation at every step in the value chain. Local market women are paid to encourage the public to sort their waste into bins for organic and inorganic trash. Formal and informal sector waste collectors are paid to bring organic waste to our site, creating extra income. Waste is diverted from the already over-full Kitezi landfill, extending the life of this public resource and saving the Kampala City Council the financial burden of constructing a new landfill. The electricity we produce will receive favorable rates from the Uganda Electrical Transmission Company Ltd. that exceed kWh rates for thermal, hydro, or solar power. Fertilizer from biogas digesters has been shown to increase crop yields by 60-172% on Ethiopian smallholder farms (Edwards et al. 2012). We expect our fertilizer to perform at least as well, and it will be competitively priced. Better cost estimates will be generated through the proof-of-concept system, which will allow us to conduct nutrient and other analyses of the fertilizer as well as evaluation of production costs and the market.

E. Measuring Success

Briefly, how do you propose to evaluate the development impact of your solutions and how will you generate relevant implementation lessons? Approaches to evaluation will vary by solution, but evaluation plans for both public and private sector solutions should include steps to measure the social impacts in some way and to evaluate the potential impact and scale and cost-effectiveness

assumptions provided above. How is your evaluation structured to inform future scale up? (1/2 page limit)

We plan to partner with the University of Wisconsin-Madison's Global Health Institute (USA) and the Center for Research on Energy and Energy Conservation (CREEC) at Makerere University (Uganda) to measure our successes and challenges. At the proof-of-concept stage, researchers and students at these universities will work in tandem with us to evaluate and assess social and environmental benefits and options for future scale-up. Below, we describe our measurement approaches by sector.

Safer water and better public hygiene: Better public hygiene can be quantified by measuring how much trash is removed from the Byogwera market where we will work. Every day, when waste arrives at our site, we will weigh it to determine how much was removed from the market (we anticipate about 1 ton daily). Shortly before we begin collecting waste, we will conduct interviews with a random sample of market residents to assess how they perceive waste to affect their health (e.g., disease incidence, anxiety), hygiene, and drinking water safety. Because contamination of water is a complex problem, we will not be able to rely on quantitative measurements to assess the impact of our Stage 1 project, but will look to interview data for qualitative measures. We will also repeat these interviews with market residents during and after Stage 1 operations.

Improved energy security: Using electric and/or gas meters, we will evaluate how much energy we produce daily on our site (as electricity or as biogas for direct heating/cooling).

Improved food security: At initial stages, a few specially selected smallholder and commercial farmers with small plots of unused land will be provided with free or heavily subsidized fertilizer for beta testing on their land (representing different agroecological zones, soil qualities, and soil types). During a normal growing season, we will test our fertilizer against 1) no inputs, 2) traditional compost, 3) raw manure 4) chemical fertilizers typically used in the developed world, like N-P-K formulations and 5) chemical fertilizers typically used in the developing world, like urea. We will evaluate these side-by-side to determine differences in a) yields, b) soil nutrient levels, c) residual nutrient support, d) nutrient loss to ground and surface waters and d) changes in maize and wheat grain protein contents.

F. People

Describe the composition of the project team, including partner organizations (if any), that will be responsible for implementing the proposed project. Explain how the project team possesses the skills and experience necessary to achieve the proposed objectives. (1/2 page limit)

CORE TEAM

Our four founding members represent a new generation of social entrepreneurs that believe in international collaboration. ---------- is a PhD student at Makerere University who studies conservation and agriculture, holds an Msc in Primate Conservation from Oxford-Brookes (UK) and has managed a small tree-planting company that employed over 100 people. ----- has extensive experience engaging local communities. ---------- is an MSc student studying the impacts of small-scale biogas systems, and founder and owner of Green Heat (U) Ltd., a highly successful company that has installed 26 small-scale anaerobic digesters

all around Uganda. ----- is considered Uganda's premier small-scale biogas expert. ---------- and ---------- are both PhD students at one of the top agricultural and energy research universities in the United States, the University of Wisconsin, Madison. ----- is a microbial ecologist and former Peace Corps Volunteer (Ghana 03-05) who first visited Uganda in 2001 and has been returning ever since. ----- is a sociologist with a molecular biology Bsc degree who worked in Egypt for 2.5 years and now researches agriculture and economic development in Ethiopia. ----- and ----- have worked with the Wisconsin Bioenergy Institute since 2010 to assess Wisconsin's biogas opportunity. The women have also won three prestigious National Science Foundation grants. This team has been working together for more than 2 years and has secured over $160,000 in support for this project.

OUR PARTNERS

The team has spent significant time developing strong relationships with key stakeholders including government officials (Presidential Advisors, KCCA, ERA, UMEME, REA), private sector (slaughterhouses, Uganda Carbon Bureau), and civil society (market committees). This project enjoys strong institutional support from the University of Wisconsin-Madison and Makerere University Center for Research in Energy and Energy Conservation. The UW-Madison campus is home to the renowned African Studies Program, the Energy Institute, the Global Health Initiative, and the Nelson Institute for Environmental Studies. The project team has also established strong relationships with the private sector including DVO Anaerobic Digesters (the largest on-farm anaerobic digester installation company in North America), BioFerm Anaerobic Digesters, and others. This project connects the amazing academic and industrial talent present in Wisconsin to Uganda.

V. Submission

Please email your completed LOI in MS Word or compatible format to DIVApplications@usaid.gov. Please do not send any additional attachments or information. Once you've submitted your LOI, you will receive a confirmation that we have received it. Your LOI will undergo a competitive review and if successful, we will ask you to submit a full application. Please carefully review our Annual Program Statement available at http://www.usaid.gov/div/ before submitting your LOI.

By submitting this LOI, your organization is certifying that the answers to the questions are accurate to the full extent of your organization's knowledge.

Name of authorized representative _____ Date _____

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