Ben-Gurion University of the Negev
Blaustein Institutes for Desert Research
Zuckerberg Institute for Water Research
Dept. of Environmental Hydrology & Microbiology
Adam Abramson, PhD Candidate

Adam Abramson, PhD Candidate
Tom Groenveld, PhD Candidate
Prof. Eilon Adar
Prof. Alon Tal
Dr. Naftali Lazarovitch
Zuckerberg Institute for Water Research
Albert Katz International School for Desert Studies
Ben Gurion University of the Negev
Midreshet Ben Gurion, 84990, Israel

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Dear Sir or Madam:

On behalf of the Ben Gurion University of the Negev, Israel, we would like to present a brief outline of an ambitious research project that began in October, 2008. We believe strongly in the potential for this project to have a positive impact in fighting food insecurity, poverty and sub-standard water supplies in rural areas of sub-Saharan Africa. A cornerstone of this project is humanitarian assistance that is informed by rigorous academic research. In short, we propose to demonstrate a rural water development model that is sustainable on several fronts.

Rural Sub-Saharan Africa suffers from the lowest rate of access to improved water resources in the world (less than 47%). Coincidentally, poverty rates are among the highest in the world, with the vast majority of the population earning an income from small-scale agriculture. Through engaging the vast health improvements of improved water sources with the income-generating potential of increased access to water, these two challenges can be met simultaneously through strategic water resources development and improvement initiatives throughout the region.

The purpose of this study is to demonstrate and assess a water development model for rural, at-risk communities that is hydrologically, environmentally and economically sustainable. By combining efforts to bring clean water with small-scale irrigation development, farmers are equipped to pay for investments *themselves* by selling produce from their gardens. This hybrid approach to rural water development—digging wells with a capacity to provide water for both drinking and micro-irrigation—creates an economically sustainable system by which full costs of intervention are recovered, allowing the replication of more interventions (Polak, 2002).

The Model

The main idea is to combine water development for both drinking and micro-irrigation. This model is illustrated conceptually below:

84990 שדה בוקר, תייקר טל": *08-6563509* פקס: 08-6596909		*Sede Boqer Campus, 84990* *Tel: 972-8-6563509 Fax: 972-8-6596909*
	E-mail: adamab@bgu.ac.il	

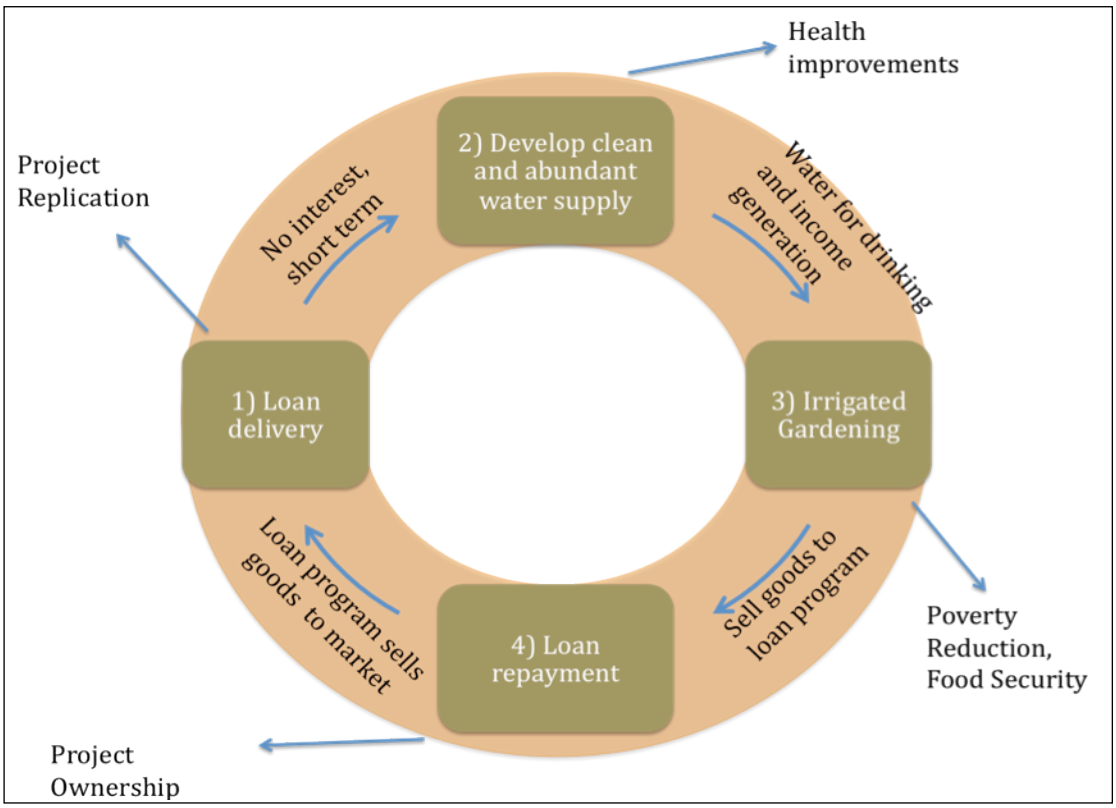

Figure 1: Outline of proposed loan-water-irrigation-repayment program.

1) The first component of this initiative is to develop a structured microfinance framework that allows household groups or entire communities to borrow a soft loan for their own water resources development. The loan itself should be offered on a voluntary basis to those who are willing to meet its requirements: full repayment in 2 years.

2) The second component of this initiative is to promote specific low-cost water development approaches. These technologies include:

A) **Low-cost drilling**

The "Baptist" drilling approach developed by Terry Waller of Water for All, International (www.waterforallinternational.org), is a very practical, low-cost approach for drilling wells that can be profitably made for less than $1,000.

Photo: The "Baptist" drilling method developed by Water for All, International. Here it is being used by a team of local drillers in Samfya, Zambia.

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Hand-augering approaches also allow low-cost development of wells at a fraction of the cost of conventional drilling rigs,

Photo: Hand-augering technique- in coordination with IDE-Zambia outside of the capital, Lusaka.

B) **Low-cost pumping**

The rope and washer pump, developed by, among others, International Development Enterprises (IDE) Zambia, is a low-cost, simple pump that operates with a wheel that guides a rope fitted with knots or "washers" that ascend through a column and carry water up as the wheel turns.

Photo: Rope and Washer pump developed by IDE and in use in Zambia.

The Access2 pump, developed by Water4 Foundation (www.water4.org) is a simple PVC-based pump designed to be a low cost, effective alternative to standard hand-pumping approaches. It is sold for $18 and pumps roughly 10 Liters / minute from depths of 20 meters or more.

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Photo: The Access2 pump working after installation on a 24-meter borehole in Samfya, Zambia

The Treadle Pump operates on both suction and pressure and is able to lift water from a depth of up to 7 meters and push it another 7-10 meters high. It is operated by moving one's legs up and down in a treadling motion, which causes less exhaustion than hand-pumps. It is also able to pump larger volumes and is applicable especially for small-scale irrigation. They are also manufactured in coordination with IDE-Zambia and are locally available.

Photo: The Treadle Pump, in a workshop in Lusaka where it was being modified for use in Zambia.

C) **Low-cost treatment**

BioSand Filtration is a simple, low-cost approach to household water treatment especially relevant for rural, resource poor areas. It consists of a simple concrete housing into which is placed varying grades of sand. This column of sand creates a natural filtering system that is able to reduce levels of fecal contamination to potable levels. Since the materials are locally available, this is a very feasible technology for rural SSA.

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Photo: This housing for a BioSand Filter was poured near Ndola, Zambia by a local non-profit organization, SHIP. It can be made locally or bought for $65.

Such appropriate, low-cost technologies will be offered as part of the loan program to determine the feasibility of such approaches.

3) The third component of this initiative is the promotion of additonal income from the newly developed water supply. Especially among small-scale farmers, the marginal returns on water supply for activities such as irrigation of cash crops or other small-scale enterprises are tremendous. Previous studies have demonstrated that farmers can pay for drip irrigation kits, for example, in several growing seasons with the additional benefit of creating a supplemental income source.

Photo: Dr. Elijah Phiri, head of the Soil Science Department of the University of Zambia in Lusaka, demonstrates low cost drip irrigation's potential for income generation for small-scale farmers.

4) The fourth component of this initiative is actually a combination of the first three. By offering a micro-loan to households or communities interested in improving their water supply, income-generating activities together with low-cost water resources development or improvement can provide a model for full cost recovery of investments (and thus economic sustainability). This "package" approach would address several key challenges to rural SSA's economic development.

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Implementation

To actually implement this plan requires a pilot study to determine the economic feasibility of certain keystone technologies for both water development and income generation as well as the performance of full cost recovery. Once these are tested in several rural contexts with various water development characteristics, larger policy implications could be determined and adjusted for large-scale implementation. This would require a government-backed micro-loan program with the resources and cooperation of ministries of agriculture and water resources. As the model would be financially robust, income generated from ongoing projects would be recovered and used toward furthering water development goals.

The pilot study will be conducted in a rural setting 57 km north of Livingstone, Zambia in a village named Simango. This setting has been identified as a fitting location for this project due to the fact that it shares many characteristics with rural Sub-Saharan Africa at large. Recent surveys conducted in December, 2009 indicate that roughly one third of the population suffers from recurring health problems due to contaminated water sources, and over 98% would participate in such a proposed loan program at some level. The vast majority earn income from farming activities from the main staple crop in the region, maize meal or "Nshima," leaving many of them with many hours of free time in the long dry season to participate in off-season gardening, if water and other inputs were available.

In many ways, Simango is a perfect place for this effort. While Zambia benefits from vast water resources (over 40% of the surface water of Southern Africa lies within its borders), only about 30% of the nation's economically irrigable land is under irrigation. Frequent droughts cause much of the population to be at risk of famine, and in the past few years alone, over 1.7 million people have faced food shortages (Daka, 2006). Many of the country's 600,000 agricultural settlements or villages suffer from food insecurity, especially those that are far from Zambia's vast surface water resources. In addition, drinking of contaminated water further aggravates health risks and strengthens cyclical forces of poverty. Only 40% of Zambia's rural population has access to an improved water source, and it is estimated that in order to meet even 75% of this population's water needs, over 22,000 boreholes need to be drilled, mostly in rural areas (Study, 1995).

Hydrological Assessment

Before extensive water development takes place, a hydrological assessment with the systematic monitoring of local groundwater and surface water resources will be performed. Chemical parameters will be assessed to ascertain the hydrological dynamics of the field site. A pre-assessment was conducted in October, 2008. However, further sampling is needed to ensure an accurate hydrological understanding to inform the water development decision-making process.

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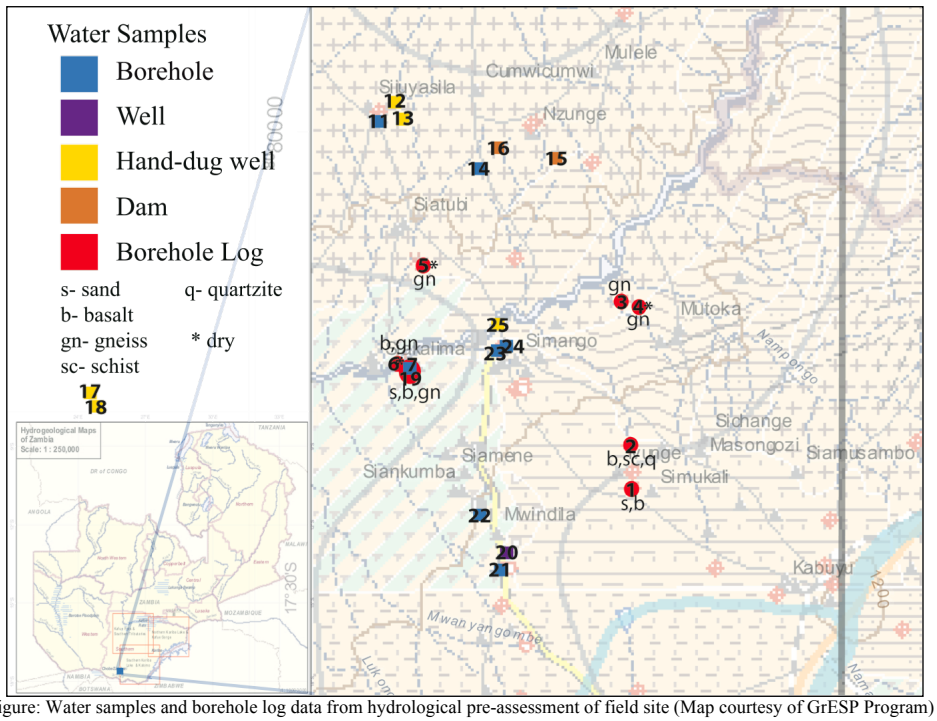

Figure: Water samples and borehole log data from hydrological pre-assessment of field site (Map courtesy of GrESP Program)

Fieldwork will begin in **January, 2011** in partnership with a doctoral research program at the Albert Katz International School for Desert Studies of the Ben Gurion University of the Negev, Israel. Limited funding has already been secured (Grace and Hope Charitable Trust, USA) and additional funding will be used toward diversifying the range and number of replications of technological approaches through the Micro Loan Program, the purchase of necessary field equipment, and in performing a comprehensive hydrological assessment of the field site.

Budget Item	Amount	Timetable
Micro Loan Program	$70,000	2011-2012
Field Site / Equipment	$40,000	2010-2012
Hydrological Assessment	$10,000	2011
Total Budget Need	**$120,000**	**2010-2012**
Current Funding	$70,000	2010-2012
Requested Funding	**$50,000**	**2010-2012**

Table: Budget for 2010-2012

The implications of such a study in a world where 85% of all farms are 5 hectares or less are enormous. As Solomon describes in the Proverbs, “abundance of food is in the fallow ground of the poor.” We hope that you will join us in bringing forth an abundant harvest.

Sincerely,
Adam Abramson
Tom Groenveld

Prof. Eilon Adar Prof. Alon Tal Dr. Naftali Lazarovitch

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