PART I:

QUESTIONAIRE FOR APPLICANTS TO THE SHIREE INNOVATION FUND

On behalf of the Department for International Development (DFID)

PROJECT CONCEPT NOTE (PCN1 Stage)

PROJECT TITLE	A low cost 'Pot-in-Pot' vegetable cooler for poor farmers
DATE OF SUBMISSION	3rd March 2009
AVERAGE LENGTH OF TIME EXPECTED FOR PARTICIPANTS/ BENEFICIARIES TO GRADUATE FROM POVERTY	A vegetable cooler will help poor farmers to keep their vegetables and eggs fresh for about two weeks. They will be able to sell on demand, fetching higher prices, rather than 'rush sell' because of spoilage. Community income levels should rise noticeably. As project gestation time is low, a poor farmer's family can graduate from poverty in less than eighteen months.
EXPECTED TOTAL NO OF PARTICIPANTS/ BENEFICIARIES TO BE LIFTED FROM EXTREME POVERTY	2,000 households; based on production of 10,000 'vegetable coolers', and considering use of five devices per family on an average,
OVERALL BUDGET (in Taka)	BDT 5.000.000
AVERAGE COST PER PARTICIPANT/BENEFICIARY	BDT 2,000; considering price per device to be BDT 400 each with five devices per family, on average.
APPLICANT NGO & CONTACT DETAILS for both head office as well as field office, please include name, institution, address, email, telephone and facs	**Society for Development Initiatives (SDI)**
	Contact Person: Mr. Shamsul Haque *Designation*: Executive Director *Address*: House # 54/1,Road No.4, Block-C, Shahjahan Road, Mohammadpur, Dhaka-1207, Bangladesh. *Telephone*: 9122210, 9138686, 8115368 *Mobile*: 01711815053 *E mail*: [sdi@bdcom.com] ; [mshamsulh@gmail.com] *Website*: [www.sdi.org.bd]
PARTNER DETAILS	**A. SANKALPA TRUST** *Contact Person*: Dr. Subhrankar Mukherjee, *PhD,MBA* *Designation*: Managing Trustee *Regd. Address*: P6: Cluster 2, Purbachal, Salt Lake, Calcutta 700097, India. *Telefax*: + 91 94330 19821 ; Mobile: +91 9433019821 *eMail*: <subra@engr.colostate.edu> *Website*: [www.sankalpacmfs.org] **B. VILLAGE EARTH** Colorado State University, Fort Collins, CO 80523, U.S.A. *Note*: Professor Emeritus Maurice Albertson, the Founding President of Village Earth has recently passed away on 31st December 2008. Accordingly, Dr. Subhrankar Mukherjee—who is an Affiliate Faculty of Civil Engineering Department, Colorado State University, Fort Collins—will also function as the contact person for Village Earth, in this proposal.

DEFINING THE INNOVATION:

The innovative cooling system in the original ‘Pot-in-Pot’ cooler that was proposed by Mohd. Abba of Nigeria consists of two earthenware pots of different diameters, one placed inside the other. The space between the two pots is filled with wet sand or any other medium that can be kept constantly moist, thereby keeping both pots damp. Fruit, vegetables and other items such as drinking water are put in the smaller inner pot, which is covered with an appropriate cover that keeps the ‘*coolth*’ in, whilst permitting the watering process without removal of the top cover. It should be placed in a dry and well-ventilated place for optimum results.

The phenomenon that occurs is based on a simple principle of physics: The water contained in the sand between the two pots evaporates towards the outer surface of the larger pot where the drier outside air is circulating. By virtue of the laws of thermodynamics, the evaporation process automatically causes a drop in temperature of several degrees, cooling the inner container, destroying harmful microorganisms and preserving the perishable foods inside.

Figure 1: Pot-in-Pot device with a stainless steel internal pot, developed at Sankalpa Research Center, Nadia.

Abba's trials have shown that eggplants, for example, stayed fresh for 27 days in-stead of three, and tomatoes and peppers lasted for three weeks or more. Spinach, which usually spoils after a day, remained edible after 12 days in the Pot-in-Pot storage.

We have validated these results in our preliminary experiments at our Sustainable Development Center at Santiniketan, and later at the Sankalpa Research Center at Nadia, where we have constructed a novel prototype, by replacing the inner earthen pot with a stainless steel container, as shown in the figure above.

INTENDED PARTICIPANTS/BENEFICIARIES:

The impact of the ‘Pot-in-Pot’ vegetable cooler is perhaps greatest for women and girls, since they can sell vegetable produce and food from their homes and overcome their age-old dependency on their husbands as the sole providers. The device will liberate girls from having to sell food on a ‘distress selling’ basis, or to make repeated visits to the markets for their daily purchases. Instead, they will be free to attend schools or pursue any activity of their choice.

Poor farmers will be able to sell on demand rather than 'rush sell' because of spoilage, and community income levels should rise noticeably. This will help to stem disease and in part contribute to slow the pace of the rural exodus to cities, in general.

LOCATION OF PROJECT:

Coastal upazilas of Chiitagong (Sandwip) and Cox's Bazaar District.

ARE THE OUTPUTS OF THE INNOVATION LIKELY TO BE APPLICABLE TO THOSE IN MORE THAN ONE DISTRICT?

The ‘Pot-in-Pot’ vegetable cooler can be used throughout Bangladesh. The device is based on clay pottery, which is prevalent in all village-based communities.

TOTAL COST OF INNOVATION/PROJECT:

The cost of manufacturing the ‘Pot-in-Pot’ vegetable cooler is about BDT 400 each.

DURATION OF PROJECT:

One year

How long will project beneficiaries/participants remain out of poverty?

In perpetuity, once the proposed system has been fully implemented

WORK PROGRAMME & DELIVERY PLAN:

The proposed work activities in this project are described in Part II, Section C., and will not be repeated here, for brevity. The projected 'Time Schedule' for the execution of the tasks in the 'Pot-in-Pot' project in the First Year is shown below:

Table 1: Time schedule for the execution of tasks in the 'Pot-in-Pot' project in Year 1

#	Activity Description	Time Taken (in Months)											
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th
1	**Value Proposition I (Phase 1)**	WORKPLAN											
1.1	Implementation study reports								**Legend**				
1.2	Identification of Target Work Areas									Activity			
1.2.1	- Need/demand based requirements									Preparation			
1.2.2	- Technical conduciveness studies									Report/Documentation			
1.3	Impetus/barrier assessment studies												
1.4	Mitigation Plan												
1.4.1	- Initiate 'Public-Pvt. Partnerships'												
1.4.2	- Community development model												
1.5	Develop 'participatory' Workplan												
2	**Value Proposition II (Phase 2)**							TECHNOLOGY PACKAGE					
2.1	Generate Conceptual Design Report												
2.2	Training of local human resources												
2.3	Monitoring procedures and plans												
2.4	Assessment of outcomes/outputs												
2.5	Develop 'Public-Pvt. Partnerships'												
2.6	First Interim Report							DISSEMINATION					
3	**Value Proposition III (Phase 3)**												
3.1	Manufacture of 'Pot-in-Pot' devices												
3.2	Distribution of PiPs												
3.3	Website, database creation												
3.4	Seminars and Workshops												
4	**Value Proposition IV (Phase 4)**						INSTITUTIONZATION						
4.1	Technology/product demonstrations												
4.2	Institutionalization of project												
4.3	Estimate of benefits												
4.4	Final Report & Project Closure										Final Report		

How can the NGO ensure that specific activities will result in specific impacts?

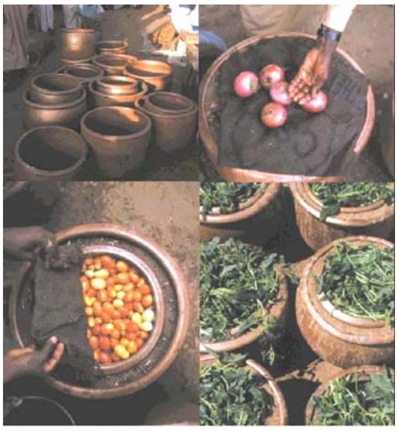
We can ensure that these specific activities will result in specific impacts if there are:

- Adequate funds and human resources for implementing the four 'Value Propositions' detailed in Part II, Section C and graphically depicted in the above timeline;
- Activities are implemented in the proper sequence and sufficient time is given for achieving the objectives of each 'Value Proposition', as defined.

PART II:
NARRATIVE OF THE INNOVATION PROPOSED BY THE NGO
PROJECT CONCEPT NOTE (PCN1 Stage)

A. BACKGROUND OF INNOVATION:

The basic motivation for the 'Pot-in-Pot' (PiP) Absroption-type Refrigeration System is the lack of electricity in rural communities, for there can be no refrigeration presently without electricity. The idea was popularized by the 2002 Rolex Award winner, Mohd. Abbas of Nigeria, who successfully made and distributed the device shown on the right, in the villages of Nigeria. However, research in South India reveals that the concept has been used there for several centuries, to specifically cool drinking water. Therefore, it can be concluded that the idea is viable, well tested and replicable. Prototypes have been built and tested by Sankalpa Trust in Shantiniketan and Nadia in West Bengal, India, as well as by SDI in Bangladesh, with very positive results.



The impact of the 'Pot-in-Pot' vegetable cooler is perhaps greatest for women and girls, since they can sell vegetable produce and food from their homes and overcome their age-old dependency on their husbands as the sole providers. The device will liberate girls from having to sell food on a 'distress selling' basis, or to make repeated visits to the markets for their daily purchases. Instead, they will be free to attend schools or pursue any activity of their choice.

Poor farmers will be able to sell on demand rather than 'rush sell' because of spoilage, and community income levels should rise noticeably. This will help to stem disease and in part contribute to slow the pace of the rural exodus to cities, in general.

B. PROJECT PURPOSE OR OBJECTIVE:

SDI works in locations such as Urirchar in Sandwip, where there is no electricity and no possibility of electricity generation in future, either. Hence, there is no scope for setting up electrically powered conventional cold storages. The local farming community produces large quantities of perishable food products, such as vegetables, eggs and milk. However, the lack of refrigeration facilities precludes the possibility of attending the next weekly market day for selling these perishable goods in the Mainland Market. Currently 'middlemen' traders from Chittagong collect the vegetables and eggs at low, 'distress' selling price levels, but are able to sell them in the mainland market at almost three times the price that they pay to the farming community. Therefore, if these poor farmers have access to appropriate technology—such as the 'Pot-in-Pot' vegetable cooler, which can help them to preserve their perishable food products for at least one week—then these poor farmers will have enough bargaining capacity with the middlemen for getting a fair price. Currently, selling farm produce is subsistence income. However, if these poor farmers can get better prices for their farm produce, the surplus revenues will enable them to accumulate enough capital to establish more profitable ventures. This process will have a cumulative effect, and will eventually result in enhanced livelihood security and income generation.

C. PROJECT ACTIVITIES & OUTPUTS:

The project is sub-divided into the following four value propositions (or phases)—in line with the 'Plan-Do-Check-Act' (PDCA) cycle for scientific planning and control:

Value Proposition I: *Study cost-effective models for production and distribution*

WORK PRODUCT: 'Study Report' for optimal production and dissemination strategy

- Identify target work areas where the technology can be replicated;
- Impetus/barrier assessment studies for each of the identified 'work area';
- Develop appropriate mitigation plans;
- Develop appropriate monitoring procedures and evaluation plans;
- Assessment of outcomes.

Value Proposition 2: *Develop and implement the 'Technology Package'*

WORK PRODUCT: Implementation of the PiP manufacturing operations

- Build socio-technical infrastructure—considering 'hard' and 'soft' technology;
- Develop a participatory 'Workplan'.

Value Proposition 3: *Commercial production, distribution and dissemination*

WORK PRODUCT: 'Market creation approach' and partnerships

- Commercial mode of village level operations;
- Payment mechanisms for distribution of services and equity management;
- Focus on the socio-economic factors and physical performance data.

Value Proposition 4: *Institutionalization of the 'PiP' dissemination model*

WORK PRODUCT: Holding onto gains; final report and project closure

- Generation of feasibility studies and technology/product demonstrations;
- Identify collaborative projects to attract investment and promote 'Public Private Partnerships';

Outputs: In addition to progress/ final reports, the expected "outputs" from the project from the socio-technical activity, effort and associated work products are:

- Technology transfer, training, and deployment of PiPs for absorption cooling;
- Results of monitoring and evaluation of performance data;
- Training and capacity building of both—project personnel as well as participating community members, as this is a participatory driven project;
- On-site visits, workshops and seminars to popularize the outcomes;
- Development of country-wide PiP manufacturing and distribution programs;
- Project website that acts as 'Information clearing house', which will facilitate project implementation and also provide access to information, globally.

Prototype development and test results: The Sankalpa Research Center at Village Baidyapur in District Nadia, West Bengal, India has conducted several trials with PiP systems. Sample test results of one such test, obtained over a period of two months, are shown below in Table 2:

Table 2: Test results for Pot-in-Pot Absorption cooler at SRC-Nadia.

Date	Humidty				Cooler Temperature (ºC)		
	Dry (ºC)	Wet (ºC)	dt (ºC)	Hmdty (%)	Ambient	Cooler	Difference
9th April 08	30	28	2	86	32	26	6
10th April 08	30	28	2	86	31	25	6
13th April 08	29	27	2	86	31	27	4
3rd May 08	30	29	1	93	32	25	7
4th May 08	30	28	2	86	31	26	5
24th May 08	30	27	3	79	32	26	6
						Mean	5.7

We conclude that the mean cooling effect obtained at a relative humidity of about 85% is a drop in the ambient temperature of about 6^{o}C, in the inner, cooled chamber.

It should be observed that the results obtained at Nadia—with the inner stainless steel inner container—are even better than the double earthen pot prototypes that were made in Santiniketan. Since the climatic conditions prevalent at Nadia are similar to Bangladesh, we expect similar cooling effects from PiP devices in Bangladesh, as well.

D. RISKS AND ASSUMPTIONS:

There is no inherent risk in the absorption refrigeration technology, as pottery devices are used widely in villages of Bangladesh, and the pottery making technology is well understood. There are no known environmental hazards in the largescale use of PiP devices.

However, a socio-technical risk in the project is to overcome the mental and attitudinal resistance to change for selling the idea of a passive, absorption refrigeration PiP vegetable cooler to people who have already been introduced to forced cooling regimes from electricity-driven, compressor-based refrigeration systems. To mitigate this risk, considerable 'soft technology'[1] investments will have to be made, for project success.

[1] "Hard technology" describes an operable and mechanistic system that is derived from knowledge of natural sciences. It relates to the skills, tools and rules that are employed by people to alter, accommodate and manage nature for human survival and development. On the other hand, "soft technology" is derived from knowledge of the social sciences and non-natural science. It is based on the common laws or experiences in economic, social and humanistic activities, and organically generates its own rules, mechanisms, means, institutions, methods and procedures that contribute to the improvement and control of its environment and surrounding community.

Hard technology does not stand-alone. "Appropriate hard technology relates to engineering techniques, physical structures and machinery that meet a need defined by the village, and use materials at hand or readily available." Hard technology must be surrounded by appropriate soft technology, such as social and organizational structures, human interactive processes, motivational techniques and a wide variety of education and training programs. Soft technologies are now considered to be vital for the success of hard technologies.