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*Electricity where the sun shines*

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## **Solar pumps for commercial production** **in remote Lao villages**

Proposal for a Public Private Partnership for exploring and developing a commercially viable rental service for solar pumps and related equipment.

### **1. Summary**

Sunlabob is a Lao company operating in the solar markets. It has established rental services for solar home systems in Lao PDR. These rental mechanisms have been awarded the DM-prize of the World Bank. Sunlabob now intends to develop rental services for productive use of solar energy, beginning with solar pumping for producing cash-crops.

Initial tests with pumps, solar arrays and drip-irrigation equipment have shown to be promising, with high interest from villagers and from local authorities. First calculations show that solar pumps may become competitive with fuel operated pumps, if indeed they can be rented. Sunlabob now intends to apply the successful procedures with developing the solar home rental systems to developing solar rented pumping systems. For this purpose a PPP is proposed to DEG.

The main activities over a 30 month period are projected to be trainings and demonstration/test-installations in 14 pilot villages spread throughout Lao PDR, and promotional efforts. Thereby the technical aspects shall be fully explored, the servicing network shall be trained, the monitoring shall assess the commercial success of farmers, of the village-based service providers, of the agronomic services provided to client villages, and of Sunlabob's rental operations. This shall lead to viable business plans based on tested data for farmers, service providers, and Sunlabob. These shall be attractive for local and international investors. Thereby it is expected that considerable impact will be achieved in job-creation and income generation in remote rural areas off the grid in Lao PDR. The promotional efforts shall ensure that local authorities, the donor community and potential investors know about the potentials.

Sunlabob has good contacts to suppliers of irrigation equipment from outside Laos, and to the expertise for using it.

However, the agronomy of irrigated crops and their marketing is outside the sphere of immediate competence of Sunlabob. It is for this purpose that Sunlabob wants to enter into a business partnership with another Lao company that can provide the agronomic and marketing services to farmers. At present

such companies hardly exist in Lao PDR. Therefore Sunlabob expects to be coaching a group of people competent in irrigation-agronomy and interested to establish a commercial venture, to develop their own company. Sunlabob will thereby act as a business support service to this company in all business matters except the technical issues of agronomy of micro irrigation and cash-crop marketing. There is a risk implied in this, as it is not sure that after 30 months such a company actually will be standing on its own commercial feet. However Sunlabob is prepared to cover any shortcomings and to continue to coach for the business aspects until independent commercial operations are possible.

Competition neutrality of this PPP will be ensured by making public the technical specifications of the installed systems, the sources of material and expertise, the procedures in the villages, and the developed curricula. Any villagers and service providers can thereby access the relevant information if they want to launch themselves in a similar business.

## **2. Background information**

Sunlabob is a Lao company providing energy services in remote rural areas where the electric grid does not reach. It was founded in 2000 and is operated and owned by two Lao professionals and one German manager. The main output so far has been in solar systems ranging from small solar home systems to large systems for operating communication antennas. Sunlabob is well known in Laos for its efforts to provide commercially viable energy services in remote areas. Sunlabob is recognized by government agencies as being a part of the countries efforts to develop a market economy.

Over the last three years Sunlabob has explored and developed rental services for solar energy. The reason is the low purchase capacity of Lao village households. The challenge was to set up a fast-reaction network of service agents, and to organize the collection of rents in a way that enhances discipline in payments. This has been achieved through a set of pilot efforts organized with PPPs. At present a functioning and tested system is in place. This allows a much larger percentage of rural households to afford themselves solar lighting at commercially viable conditions. In this rental service independent Sunlabob-trained small entrepreneurs who have a franchise agreement with Sunlabob take care of the installation and servicing of solar home systems. The systems are rented out by Sunlabob to a Village Energy Committee designated by the village authorities and specifically trained by Sunlabob to then sub rent the systems further to the individual households. Sunlabob has been awarded the prize of the Development Marketplace of the World Bank for this successful introduction of commercially viable solar rental services for individual households.

Productive use of solar energy (i.e. beyond lighting) is the next step that needs to be accomplished. In the Lao setting, with its still largely rural economy, solar pumping into micro irrigation equipment for producing marketable cash-crops is expected to have by far the biggest potential impact in terms of income in poor villages and in terms of the benefiting number of villages.

Initial calculations by Sunlabob suggested, that solar pumping combined with cheap drip systems may be cheaper per irrigated plant than with conventional fuel-operated pumps. But this would only work if the equipment can be rented. Because Sunlabob has functioning logistics in place for rental services, Sunlabob decided to explore this. A successful rental service for pumps will mean that villagers no longer pay for hardware that they have trouble to understand and keep in good working order. They pay for the service itself, which has a direct impact on their income and livelihood. Furthermore renting the equipment allows them to be much more flexible, something that is highly appreciated by villagers.

An initial first test was conducted in Ban Sorg village in order to assess some possible equipment. This test has revealed that equipment suitable for Lao conditions is available and that there is a high interest among villagers and local government officials in the possibility of renting solar pumps. However, it also became clear that the agronomy of micro-irrigation needs to be better understood, and the marketing of the produced crops needs to be looked into. Various technical challenges became clear as well such as the need for cheaper water storage devices and the need to better assess the various technical options Solar pumps for commercial production in remote Lao villages, Proposal for a PPP between DEG and Sunlabob

for water-distribution. Furthermore it became clear that villagers were interested in a wide range of water-use other than irrigating high-intensive gardens, ie. for watering livestock, for washing, and even for drinking water. Overall, the practical experiences so far with this test suggest that the original assumption is correct, ie. there is a high probability that solar pumps will have a big impact on the economy of many villages that are away from the electric grid. Furthermore the contacts of Sunlabob with local government authorities at district and provincial levels and with the ministries are very supportive of further pushing in this direction.

Based on these results Sunlabob decided to further explore the requirements for a successful rental service for solar pumps. For this purpose Sunlabob is searching for interested public and private partners who will enter into a public-private-partnership with Sunlabob for further exploring and developing solar services for pumping, ie. public development agencies, financial sector operators, representatives from the solar and irrigation industries, human resource developers, etc.... The aim is to arrive at tested operational and financial procedures, based on which an investment program can be formulated. The generated data shall allow to build viable business plans for investments by investors.

This paper is a first proposal to DEG for a Public-Private-Partnership with Sunlabob on this pre-investment effort.

### **3. Domain for this PPP**

The PPP shall be restricted to:

- the exploration and identification of the operational requirements and the technology for viable rental services for solar pumps, and the required related services (production advice, marketing advice, etc).
- the collection of the data required to build fundable business plans for solar pumping for the producing farmers, for the provision of the related services, and for the rental service itself.
- 14 pilot villages in 7 provinces in which this PPP shall be active. This shall allow assessing the procedures across the wide range of conditions prevailing in Lao PDR.
- The setting up of the commercial operations of a Lao company, independent from Sunlabob, which will earn money from providing micro-irrigation technology and related advice to villages.

### **4. Joint objectives of this PPP**

This PPP shall provide:

- Tested operational procedures for commercially viable renting of solar pumps.
- tested agronomy for producing high-value off-season crops with the installed equipment
- a useful partnership between Sunlabob and an agronomic company (working name "Xao Ban"). The agronomic company will take care of exploring the most efficient use of the micro-irrigation equipment (i.e. drip lines, etc) and train clients accordingly. It will also train clients on marketing their crops.
- Suitable procedures for marketing the produced cash crops, and indications on the level of returns that can be used by farmers to pay for the equipment and services.
- Cheap and tested means for storing and/or distributing the pumped water.
- Effective criteria for monitoring the economic success of the client farmers and the status of the rented equipment.
- The data and any other information required to build business plans for farmers, service providers, and for the rental service. The business plans of farmers and service providers shall be attractive to local financial institutions. The business plans of the rental service shall be attractive to investors (loans or equity).

## 5. Private reasons for reaching the joint objectives

- Farmers: Increased income through cash-crop production that would otherwise be either impossible or too expensive.
- Households: Clear drinking water in case of pumping from bore wells.
- Sunlabob: Rental business
- Xao Ban (an agronomic service company with which Sunlabob will enter into a partnership): Business from selling agronomic advice and trainings to local service providers and farmers, plus selling the drip-equipment. Sunlabob and “Xao Ban” will share the distribution network of trained small entrepreneurs.
- Solar Service Agents: Business from servicing the installed equipment.
- Other local service agents (village extensionists, village technicians, etc): Business from providing trainings, information, advice, etc....

## 6. Public reasons for reaching the joint objectives

- DEG:
  - Income generation for disadvantaged remote villages away from the electric grid
  - job creation in rural areas within the service network
  - With “Xao Ban” the emergence of a commercial provider of advice on production and marketing to remote farmers producing for quality markets.
  - environmental concerns with fuel-driven pumps
  - effects on “local good governance” through the village energy committees
  - Possibilities for follow-up projects for sustainable use of natural resources, value chains, micro credits, commercial service delivery in rural areas.
  - The possibility of drinking water when pumping from clean bore wells. Here the general health aspects come to play, along with improved nutritional status of families due to kitchen gardening.
- Village, District, Provincial authorities:
  - Economic development in the village, health (drinking water when pumping from bore wells, and nutrition when kitchen gardening is made possible).
- Government of Laos
  - The establishment of market oriented services in rural areas

## 7. Envisaged actors and their roles/functions

### THE ENVISIONED SITUATION TO BE REACHED:

In each pilot village a producer group operates a rented solar pump. The pump, the solar array, the initial distribution tank and two primary lines are owned by Sunlabob and rented out to the Village Energy Committee (VEC). The secondary lines from the two primary lines up to the plants or other uses of water is owned by individual farmers, including their individual water storage and distribution systems. The VEC operates the rented equipment and sells water to the individual users. The VEC then pays the rent of the equipment to Sunlabob.

### FIRST LEVEL SUPPORT FUNCTIONS

Village Extension Workers (VEW, officially designated in the Village Extension System of the Ministry of Agriculture) provide contacts, agronomic advice, and marketing advice to producing farmers. Usually this will be embedded services, i.e. the advice comes along with the irrigation equipment. Producing farmers pay them for both the equipment and the advice.

Village Technicians (VT) trained by Sunlabob take care of primary technical servicing of the solar pump and the distribution system. They are paid by the Village Energy Committee for the rented parts, and by Solar pumps for commercial production in remote Lao villages, Proposal for a PPP between DEG and Sunlabob

the individual farmers for the individually owned parts. (The functions of Village Technician and Village Extension Worker may be combined in the same person).

#### SECOND LEVEL SUPPORT FUNCTIONS

The Sunlabob Service Agent (SA) franchised by Sunlabob takes care of second level servicing of the rented equipment, i.e. the pumps and the solar array and the primary distribution system. This service is paid for by Sunlabob through the rental returns. The earnings of these Service Agents are tied to the amount of rents coming in from their area. Such SAs already exist in areas where Sunlabob operates rental services for solar home systems. They are therefore available for the whole range of solar applications, not just for solar pumping.

“Xao Ban” provides irrigation equipment, agronomic and marketing advice and coaching to the Village Extension Workers. The Village Extension Workers pay for the irrigation equipment and sell it to farmers. The equipment always comes with the embedded advice and coaching services.

Sunlabob will act as a business development service to this new company called “Xao Ban”. The result will be another Lao company that provides services in poor rural areas in Lao PDR on a commercial basis. The business of this company will be independent of Sunlabob, but the businesses of the two companies have strong synergies, and a partnership is therefore aimed for.

#### THIRD LEVEL SUPPORT FUNCTIONS

Sunlabob provides training and coaching to the franchised Service Agents to be capable of good servicing of the rented equipment and thereby make a business.

Enterprise Development Company (EDC) is contracted by Sunlabob to provide business training and know-how to Xao Ban, to the Service Agents, the Village Extension Workers, and Village Technicians.

Several of the functions at village level may be taken up by the same person, i.e. VT and VEW

## 8. Main activities during the PPP

The time-frame for the PPP is expected to be 30 months. During this time the following activities are envisaged:

#### Identification of suitable actors, i.e. “Xao Ban” and villages.

Some contacts have already been established with people who are interested to operate a “Xao Ban”. Identify their specific shortcomings and training needs to take up the challenge.

The pilot villages will be preferably selected from among villages already involved in rental services for solar home systems, and who have the water required water resources.

#### Initial feasibility surveys in each potential pilot village

#### Negotiations with local authorities, villages, etc

Experience shows that rental services will be secured only when local authorities understand and support the procedures.

#### Workshops

1. With Sunlabob Master Trainers for the technical aspects (facilitated by hired consultants). With Xao Ban on the marketing aspects (facilitated by EDC) and use of drip-irrigation (facilitated by hired consultants). With Master Trainers of both Sunlabob and Xao Ban together on the whole system and its operations. Curriculum development for the trainings that Sunlabob MTs and Xao Ban will provide to local service agents (i.e. SAs, VEWs, VTs, VECs)
2. With Sunlabob Service Agents on the basics of solar pumping, the technical specifications, and the installation of drip-systems. Curriculum development for what they will train.
3. With Village Energy Committees and Village Technicians on the various types of systems and their operations. Detailed planning together with all on what will happen in which village.

### Detailed planning (based on workshops)

Based on the negotiations, detailed plans will be set up for each pilot-location. The idea is to test various approaches in various areas and villages to understand the range of useful setups for the whole system (water sources, pumping heads, volumes of water, water storage options, cash crops, ethnic groups)

### Installation of the equipment in the villages

#### On-the-job trainings

During installation and later during initial production....

- Sunlabob trains the Sunlabob Service Agents how to correctly install and service the systems.
- Sunlabob trains the Village Technicians how to correctly do the first level maintenance and control of the systems.
- Sunlabob trains the Village Energy Committees to manage the operation of the rented equipment and selling of water.
- Xao Ban trains the Village Extension Workers on installing and using the drip systems, on efficient use of water, and on production and marketing of crops.
- Village Extension Workers and Village Technicians train farmers on operating their individual systems and on production and marketing of crops irrigated with the systems.

#### Monitoring

Useful criteria for the economic success of farmers and of the systems will be explored together with the villagers and the service agents. Effective indicators for these criteria will be tested. Data-management software will be installed and tested at Sunlabob. This data is crucial for evaluating the economic viability in order to then formulate sound investment proposals to investors (the main objective). For this reason a monitoring expert will be hired for this PPP.

#### Promotion

- Stakeholder workshop at the beginning, with all types of potentially interested and involved actors, to explain to all what the effort will be, and get some feedback and commitment.
- Exposure visits to the pilot sites for decision makers contemplating the use of solar pumps: Neighboring villages, authorities from neighboring districts and provinces, representatives of various government agencies, representatives of various donor agencies and projects/programs, potential future investors.
- Promotion campaign at trade fairs, i.e. That Luang at national level, and provincial events.
- Media features (TV, radio, press....)
- Presentations at national and international meetings / conferences

#### Evaluation

Stakeholder workshop towards the end of the effort, with all types of involved or interested actors. The questions to be answered in the evaluation workshop will be:

- With the developed rental procedures, is solar pumping commercially viable in typical locations? Which rental procedures fit which type of location?
- Are the operational partnerships viable, i.e. between Sunlabob and "Xao Ban", between "Xao Ban" and VEW/VTs, between SAs and VTs. What needs to be improved, and how?
- Can business plans be constructed based on tested data, i.e. for irrigating farmers, for the VTs/VEWs, for "Xao Ban", for the rental fund of Sunlabob? What needs to be done to make these business plans attractive for local financial institutions and/or for investors from outside Laos (social investment funds, investments by donor agencies, etc.).

Evaluation Report

#### Admin and management

Overall management will be done by Sunlabob. Sunlabob will also make its commercial experience available to “Xao Ban” and train and coach this partner-company to be successful in its commercial operations.

## 9. Competition neutrality

The following results of the effort will be made publicly available in order to ensure that competition with Sunlabob by any other agency is possible:

- Technical descriptions of the installed systems, with sources of materials and expertise
- The curricula for farmers, Village Extension Workers, Village Technicians, Village Energy Committees
- A description of procedures from initial contact in a village to fully operating successful rental system in that village.

## 10. Risks

Sunlabob at present has international contacts to proven providers of tested drip-irrigation equipment for conditions prevalent in Laos. First tests with such equipment promise high usefulness for poor remote farmers. Technically this is not a problem. Sunlabob can also easily import and distribute the equipment through its own network. However, the agronomy of producing drip-irrigated crops (and/or alternative uses of pumped water) and the marketing of such crops is outside the sphere of competence of Sunlabob. It is for this purpose that Sunlabob is scouting for a partner for this venture. The working title for this partner at present is “Xao Ban”.

“Xao Ban” is yet to be identified definitely. The idea that agricultural services can be provided commercially is fairly new in the Lao context. But with an innovation such as cheap drip-irrigation and solar pumping, and potential other uses of newly available water at the household level, it looks promising that the idea of commercial services can be introduced. “Xao Ban” is therefore expected to be group of professionals who want to operate a commercial enterprise with drip-irrigation and the associated services in agronomy and marketing.

The people in “Xao Ban” will need to:

- be competent in the agronomy of irrigated cash-crops
- have a business outlook, i.e. want to operate this venture as an own commercial enterprise
- have their own network of contacts in villages
- already have experience in marketing cash-crops or interested in acquiring the competence to market themselves or coach villagers to market.

Sunlabob will be training and coaching “Xao Ban” on the entrepreneurial aspects of operating their business. The risk is that due to possible setbacks with personnel, by the end of the PPP “Xao Ban” is not yet an existing commercial entity with which Sunlabob can enter into a business partnership. In this case Sunlabob will have to temporarily safeguard the agronomic side of the venture with hired people. However, care will be taken right from the beginning to launch “Xao Ban” on a commercial footing, and aim all support from Sunlabob towards reaching at a commercially independent entity “Xao Ban” with which Sunlabob can join in a business partnership. Training and coaching for this process will be ensured through hiring the Enterprise Development Company, with which Sunlabob has several years of successful experience.