

# Mission Report

## Technical knowledge transfer concerning siphon filter and rope pump in North-West Vietnam



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**Separate Annexes**

4	Terms of Reference & Time schedule
5	Suggestion for monitoring of filters

## 1 Introduction

This report has been made by Henk Holtslag for the assignment given by SNV Vietnam to Arrakis, concerning a TA mission regarding construction, installation and maintenance of the siphon filter and the rope pump technologies in Vietnam. The mission was executed from 14-28 September 2008.

For Terms of reference and schedule see Annex

### 1 Context

In Vietnam some 10 million people in rural areas do not yet have access to an improved water source with water that is safe to drink. Where centralised piped water systems are to costly, decentralised systems are needed both at community and family level. The objective of the NTP2 programme is to increase in rural areas the access to water and sanitation. SNV supports with information and pilots with small scale options as innovative water filters to treat water at the household level (Pureit and Siphon water filters) and an innovative low cost hand pump for both communal and family use (rope pump). The Dutch organisation ARRAKIS was requested to advise in these aspects in cooperation with the NGO Ideas at work from Cambodia. The target group of a first training in Lai Chau included local authorities and NTP II (especially, DARD, pCERWASS, WU, pilot district and commune representatives) Lai Chau Water Supply Company (LCWSC), and other relevant persons.

### 2 Activities

The mission and training schedule was prepared by communicating via telephone and E mails. During a 13 days mission to Vietnam activities were carried out as formulated in the TOR and trainings plan, see Time schedule Annex 1. In the first week in Hue in the workshop Huy Phat preparing two rope pumps, week two in Lau Chai installing pumps, proving training to local staff community leaders and SNV staff, plus demonstrating siphon filter. Mr Vince Whitehead from Cambodia arrived on Saturday 20 September and all activities were done in cooperation. The field visit to the families using a siphon filter were very instructive and in general families were happy with the filter. 3 installed rope pumps now function as examples and give an indication of market potential and input for a pilot project as is now being prepared by the Dutch organisation Water rights and SNV.

## 2 Results & Conclusions

### 2.1 General Conclusions

Regarding the Siphon filter, the results of the pilot were positive, users were satisfied and the filter seems to add a promising low cost option to the existing water treatment options used in north Vietnam and further pilots will improve details on user training, distribution etc

Regarding rope pumps 3 models were installed for demonstration purposes, first reactions were positive, peoples reactions to all 3 models were positive. This technology until now was unknown in this area. Adaptations are needed to make the pump fit for local materials and to further reduce cost which will be done in a pilot with more pumps. The cooperation with Ideas at work has been very fruitful and resulted in exchange of experiences that will result in cost reduction of the pump and more efficient market introduction. After the training period both participants and organizations expressed the training was useful.

### 2.2 Specific activities-results

In the following section for *each specific requirement according the ToR (in italics)* activities and results are reported.

### 2.2.1 Siphon Filter

*- Knowledge about operation and maintenance of siphon filter*

25 persons including 6 technicians of the LCWCS, staff of SNV, technicians of workshop were informed regarding basic theory aspects, and practical functioning of the siphon filters regarding use and maintenance aspects.

*- Current households are able to fully operate and maintain the siphon filters for their water treatment*

During field visits Households were explained on aspects as unclogging the filter by backwashing and scrubbing, importance of putting the plastic protection, the need for 0.5 to 0.7 meter of height difference and the need to cover the lower container to protect it from recontamination

*- House holds are willing to consider purchasing the siphon filter and/or rope pump*

In the pilots it appeared that families are willing to pay the value of around 7 US\$ for a filter. At this cost or a bit more a feasible commercial supply chain can be installed if filter volumes increase to a level of 10.000 or more

#### **General impression, after field visits**

Filter users are satisfied, Some families still used boiled water and used other water filters  
Would pay 7,5 US\$ or more for filter, Reduces calcium  
Extra advantage compared to candle filters, it can be used to take to the field

#### **Observations, most common problems**

- User did not have manual
- Users did not fill in diary, monitoring sheet
- Did not know backwashing
- Removed plastic jar, (more prone to breaking)
- Did not use prefilter
- Lost scrub pad
- Reduced flow because ;
  - Filters was not used at maximum height difference because of low position of storage, bend in the siphon hose
  - Filter clogged; users did not know backwashing

### 2.2.2 Rope pump

*-Knowledge about operation and maintenance of rope pump*

25 persons including technicians of the LCWCS were informed regarding basic theory aspects of the rope pump different models. Three rope pump models were installed and basic training was given on use and maintenance aspects

*-Consultant and LCWSC are able to select appropriate rope pump models for the geographic circumstances in NW Vietnam.*

The circumstances in north Vietnam are such that there are hardly any boreholes. Almost all existing wells are of the hand dug type. The participants of the training were informed on appropriate pump models for wells with a well rim and wells without a well rim as well as how to improve the surroundings of the well. Well cover, slab and soak pit.

*-LCWSC is able to do the complete distribution, installation, maintenance and replacements of components of the rope pump in NW Vietnam.*

In the training experiences from other countries were explained to the participants on the production and distribution of the rope pump, the concept of supply chain and actors in the

chain. Based on the installed rope pumps LCWSC has the input to decide on possible production, and distribution.

- *Technicians of LCWSC have basic knowledge on installation use and maintenance aspects*
  - *LCWSC is able to do the complete distribution, maintenance and replacements*
  - *Stakeholders receive concrete recommendations concerning next steps for manufacturing (if feasible) and distribution of siphon filter and rope pump in North-West Vietnam.*
  - *Stakeholders in the 3 target provinces understand the added value of the siphon filter and rope pump.*
  - *Stakeholders understand the approach of introduction, piloting and rollout of low cost appropriate technologies for water & sanitation.*

Regarding these aspects activities were

- Production of 2 rope pump models in Hue and one rope pump from Cambodia,
- Installation of 2 rope pump in the Phong Tho district
- Installation of 1 rope pump A model short base form Hue at a demonstration well at the work shop of LCWSC in Lai Chau
- Theory on 6 water treatment options at household level and demonstration of ceramic siphon filter
- Calculations and first trials on adjustments to reduce cost of the Rope pump A model based on experiences of firsts 2 pumps installed.

Additional activities were meetings with several possible future actors as Mr Quang director of IDE, UNICEF in Hanoi, mr Lynh director of the factory that produces Rope pumps in Hue, SNV Hue

### **3 Specific Conclusions**

#### **3.1 Siphon filter**

- The siphon filter adds a new low cost option and has several advantages compared to the existing POU (point of use) treatment options as the Pureit filter, the Korean candle filters, boiling and chlorinating.
- Despite some problems the general impression after the field test of 50 filters is that filter users are satisfied with this product and see the benefits.
- House holds are willing to purchase the siphon filter at a cost of 7 to 10US\$
- A special application was found where the filter could easily be taken and used in the rice fields. Which is quite unique for POU filters.
- After basic instructions people can operate and maintain the siphon filters

#### **3.2 Rope pump**

- The Rope pump is an unknown pump option in the north of Vietnam
- The rope pump is useful in areas where there is no electricity or where electricity suffers from outages or is expensive and can be used on wells from 1 to 40 m deep.
- Compared to The UNICEF model hand pumps the rope pump can pump from deeper wells, has a bigger pump flow capacity and is simpler to produce and repair in local conditions
- The actual cost of the pump of 80 - 100 US\$ is relatively high for the very low income families.

- With some adaptations to local materials it is possible to reduce cost of a rope pump to 50 - 60US\$. (off factory). With that cost there seems a market on part of the some 60.000 existing hand dug wells in north Vietnam
- With the demonstration of the 3 models LCWSC and others are able to select the appropriate rope pump model for the geographic circumstances in NW Vietnam
- In combination with a cement well cover and slab, the rope pump is a tool to upgrade existing hand dug wells at communal and family level
- The training was a first step with which LCWSC and others have basic knowledge regarding production, installation, maintenance and further introduction of rope pumps
- With existing infrastructure, materials and skills and local workshops it is possible, to produce the rope pump in North Vietnam

## 4 Recommendations

### 4.1 Filters

#### Local Production

- Before considering local production it is recommended to get a better impression of the market potential of the Siphon filters
- For the time being it is recommended to import filters that have a good proven quality. If there proves to be a market of 100.000 or more, the benefits of local production can be investigated regarding aspects as local business development, local labor, cost reduction, independency from import etc.

#### Marketing / Market potential

- Further market investigation is needed to determine the market potential of the siphon filter as compared to alternatives as the Korean candle filters and the Pureit filter.
- As a marketing tool supply free filters to schools health centers, hospitals under the condition that maintenance is guaranteed and they promote the filter.
- Commercial markets are; Urban and Rural families that now buy bottled water. Families that now buy a candle filter. People that now pay for fuel (wood, gas) to boil their water. In general in situations where people do not trust the water quality from piped systems or wells.
- Social markets are ; Schools, Health centers , hospitals, Emergencies
- An important marketing tool is creating awareness on the high cost - benefit of home water treatment in general and the Siphon filter more specifically as one of the most effective home treatment options. Use publications of SIWI, UNICEF and the WHO indicating that benefits can be up to 60 times the investment (Combating waterborne disease at the household level, WHO 2008)

#### Distribution

- Investigate several options for possible distribution / dissemination
- Options are Drug stores , Stores selling health products, Stores for domestic products that now sell imported candle filters from Korea, Petrol stations
- Other distribution options are: the Tupper ware model, Women groups, Church groups,
- In general the low cost of a filter does not justify the use of a credit system, but it could be considered to give credit to groups
- To also reach the very poor families that can not pay the complete cost of the filter, a subsidy could be considered. If this is the case “voucher system” or other distribution systems should be used to not disturb the market and to help the commercial supply chain.

### **Supply chain**

- In order to create a commercial supply chain take in account that all parties in the supply chain need to make enough profit. There needs to be a Profit based sustainability
- Use experiences of the dissemination of bed nets (Treated anti mosquito nets). In Africa these bed nets are given for free or with a Voucher to pregnant women if they come for regular check up in the health centre.
- In the follow up activities investigate interest and possible cooperation with organizations specialized starting up supply chains for instance IDE (experience with Treadle pumps etc). EW, who is creating supply chain for siphon filters in India and African countries.

### **Scaling up / follow up of pilot**

- To facilitate acceptance it is recommended to test and get a certificate of the filter via a government approved water lab in Vietnam.
- Continue with the introduction of filters to get more information. Arrakis can support with an advance for circa 200 filters in the short term
- Propose a bigger number of 1000 filters in a proposal for a business plan now prepared with SNV and Water rights
- Disseminate filters in concentrated areas to reach a certain critical mass (Better to disseminate 10 filters in one village than 1 filter in 10 villages)
- Idea mentioned by SNV, every family that now has a filter finds 4 other families that would like a filter

### **Training / Monitoring**

- Regarding the user sheet, test if people understand the sheet, adjust if needed, keep it on maximum 2 pages, make a durable plastic laminated version for filter users
- To be able to do a good monitoring a good baseline study is needed
- Further improve the monitoring system, for instance make household diary shorter, easier to fill in and see. Include indicators such as: avoided medical cost, avoided cases of diarrhea etc. See suggestions in annex 3
- Use experiences of organizations, people specialized in monitoring similar products as the Pot filter by UNICEF, Cambodia, Suzan Murcott of MIT, Mark Sobsey WHO.

## 4.2 Rope pumps:

### Local production

- Combine features of Cambodia and Hue model for instance, reduce materials on the wheel, the cover and guide box.
- Produce pistons instead of buying end caps. PE pistons can be produced with a small manual PE Injection press that is commercially available.
- Use standard PVC pipes for pump pipe (with smaller wall thickness)
- To avoid inventing wheels or errors it is recommended to consult advisors of Ideas at work and / or Arrakis before changing designs details
- The workshop at the LCWSC has basic facilities to produce the first rope pumps but is recommended to select one or 2 other bigger workshops if local production is considered
- Appropriate rope pump models are the A model (short base) for wells with a well rim and the A model long base of the Windlass model rope pump for hand dug wells without a well rim. In both cases it is recommended to installed a well cover of cement or other material
- See also recommendations in annex 4.

### Marketing / market potential

- Before local production is starting adapt the design to reduce cost. This is essential to increase market potential.
- Target price for A model short base, 8 meter deep should be 50-60US\$ (off factory)
- In the follow up of pilot the pump should have a brand name, combined with 'approved certificate' for the workshops that have been trained. With a certificate quality is easier to control.
- Use the experience of the Cambodian organization 'Ideas at Work' as they have disseminated over 1000 rope pumps and ARRAKIS who have trained and advised in local production in some 10 countries
- More demonstration pumps in real situations are needed to determine if households are willing to purchase a rope pump

### Distribution/Supply Chain

- Investigate options for cooperation with organizations for with experience in starting a supply chain for instance IDE that have introduced similar products (UNICEF pump, the Jibon Pump, Treadle pump)
- On the long term decentralized production is recommended, for instance every 50-100 km a production unit depending on population and number of wells.
- Where the sales of filters would typically be shops, gasoline stations, the rope pump sales in general is directly from the workshops where they are reduce cost.
- Different from filters the rope pump has a relatively high volume and local production reduces transport and installation cost. Also for repairs it is essential to have a local workshop nearby that EW, who is creating supply chain for siphon filters in India and African countries.

### Training / Monitoring

- If the proposal for a further pilot works out it should be determined if the 100 rope pumps will be imported from Cambodia or will be directly produced in Vietnam. With due training and quality control the last seems possible.



### 4.3 General

To increase the awareness of new low cost water and sanitation technologies it is recommended to create **smart tec centres**. These centers should be able to demonstrate the technologies at their center, and also have the capacity to train in production, installation and maintenance of the same technologies. These centres can be established at existing water agencies, NGOs, Universities or others. Technologies demonstrated should include all the low cost and innovative technologies adequate for that specific area. For instance:

- manual drilling options (Indian bailer, step auger , Baptist drilling, Jetting);
- 2 models of rope pumps,
- different sizes of wire cement tanks,
- drip irrigation with and without storage tank;
- tube ground water recharge;
- tippy tap;
- conical latrine slab;
- and different treatment options at house hold level including 2 or 3 models of water filters.

**ANNEXES:**

**ANNEX I: Pictures**



Rope pump, Windlass model in Hue



Preparation of rope pump in Factory in Hue



Lai Chai . Meetings with SNV, PPC ao.



Workshop of the Lai Chau water company



Training in Workshop of LCWC



Training in filters and rope pumps



Installation of Hue model Hue on well cover



Hue model on demo well LCWC workshop



Preparing rope pump Cambodia model Village



Installation Pump Cambodia model



Testing Hue model



Demonstration of Windlass model



Invitees are testing the Pump



Demonstration of filter and pump



Field visit to rice field where siphon filter is used



Water from irrigation canal made potable with the siphon filter



Filter used in household with water storage tanks



Presentation / discussion at Lai Chau

## Annex 2 Frequently asked questions Rope pumps

Frequently Asked Questions	Answers
What does the pump cost?	60 – 90 US\$ off factory. Depending on model, volumes of production etc
How much can it pump ?	35 liter per minute from 10 m deep From 5 meter 70 liters , from 20 meter 18 liters
How deep can it pump?	35 meters with one person 60 meter with 2 persons? handles
What are most common problems?	Wear of pistons, wear of rope, slipping of rop on wheel
What size of well can it pump?	It fits in boreholes of 2 inch to hand dug wells of 2 meters
What is maintenance ?	5 drops of oil every week of the bushings. Controlling rope tension
What does maintenance cost?	5 to 10 US\$ / year for replacing of rope depending on use
Can it be powered by engines ?	Yes, it can be powered by any driving force diesel engines, horses, wind
Is the pump patented ?	No. It is public domain, and can be copied, condition is to make good quality to avoid image damage

## Frequently asked questions Filters

Frequently Asked Questions	Answer
What does it cost	Expected 8-12 US\$ retail; price
What is filter capacity	2.5 to 5 liters per hour. 50-100 liters per day
Does filter remove pesticides.	No
Does filter remove viruses	It reduces viruses but filter company does not claim it eliminates all virusses
What does it remove	All turbidity and 99.99 % of all harmful bacteria
Does it remove bad taste, colour	No it does not change taste, and not remove colour. In the future a model with activated carbon will be added.
How often to change the filter element?	It can be used for 7000 liters (0.5 to 1½ year depending on use.
How do I know when to change the filter element	Can be used until diameter is smaller than 50 mm, use measurement tool
What does new filter element cost.	Around 3 US\$
Can it be produced in Vietnam	Yes it probably can, but good to first test market potential with imported model

## **Annex 3; The rope pump in Vietnam, a description of Water rights**

A “new” option to pump water from shallow and deep wells and bore holes is the so called rope pump. With new design inputs this technology proves to be very efficient both for communal water supply, self supply and irrigation in areas where there is no electricity or where electricity is too expensive. After its introduction in Nicaragua (initiated by SNV) there now are some 80.000 rope pumps installed in some 30 countries. World-wide there now are some 3 million people that use this technology and it is the fastest growing hand pump in Africa. The rope pump is one in a range of low-cost appropriate technologies for water lifting. Compared to piston pumps it is popular because it is simple and affordable and has a high pump efficiency. The rope pump and other low cost technologies were introduced in Vietnam via a project of ARRAKIS, funded by Aqua for All and demonstrated in Lai Chau in October 2007 via SNV. There seems a market for rope pumps in the North of Vietnam especially in places where there is no electricity and in places with water levels between 1 and 35 meter. (Suction pumps such as the UNICEF hand pump do not work any more at water levels over 6 meter)

SNV, jointly with the NTPII, wants to study the feasibility of rope pumps in the North West of Vietnam. The Netherlands-Vietnam business exchange seminar, organised on 18<sup>th</sup> of March 2008, provided the opportunity to discuss these ideas with Vietnamese private sector, NTP II program, SNV, Aqua for All and Henk Holtslag. It seems possible to create a supply chain of affordable and maintainable rope pumps to be sold to villagers in rural areas.

Partners are:

- SNV-Vietnam because of their expertise in that area and earlier commitment to rope pump technology introduction in Nicaragua and because of their experience in bio gas that is essential for introducing rope pumps and filters.
- Water-Right who can assist with fund search
- Ideas at work and ARRAKIS with technical knowledge and experiences in other countries

*Pilot*

- Water-Right and SNV are preparing a proposal to fund the market introduction in the Northern Region of Vietnam, in the provinces of Dien Bien, Lai Chau and Lau Cai and obtain information on market and performance. This will answer questions on the technique, the organisation, the financing, the marketing and the required controls.
- After a preparation period of 4 –5 month, a 12 - 15 month pilot (1st quarter 2009) is started.

*products*

- Hand Water pumps, well covers to avoid the contamination of wells and bring cleaner water to the surface compared with a bucket on a rope, plus water filters to make clean and safe drinking water available to many people.
- These pumps are more expensive than existing suction pumps, but have clear advantages over them. They have a longer life time, are less prone to corrosion, have a larger flow rate and greater depth range, and can be installed in places where other pumps do not function any more and are easier to maintain.

**Affordability.**

- A large production volume will lower the product costs so that the product will become available to the lower end of the market, serving the bottom of the pyramid (BOP).
- Rural people can spend 30 – 40 \$ on health, water, energy and transportation. We estimate that local families can spend 5-10 dollars per month on a lease to buy contract for pumps that will improve their lives considerably. For a group of families that amount will not be a problem at all.
- Commercial activities as a spin off from the instalment of a rope pump will make it possible for them to get a micro finance loan. The pilot will lead to spin-offs.

- Total cost of the pump includes transportation to location, installation, maintenance costs and cost of financing. In the pilot phase we will sell the pump at prices that are in line with a realistic and fair level of productivity on the longer term in order to get a fair view on the market possibilities. Offering a pay back schedule of 12 to 24 month, the monthly debt collection amount is expected to be around 5-7 \$ per month.
- From these figures it is clear that the project on a larger scale can be successful if the assumptions prove to be correct. That is why we must consider the pilot also a fact-finding effort in order to realise the long term goal of a nation wide introduction of the rope pump.

#### *Market potential.*

- Potential market: in pilot provinces there are 60.000 wells.
- In whole Vietnam there are about 3million hand dug wells (UNICEF) if we also take in ponds and rivers there are an estimated 4 million locations that need solutions. Rope pumps will be a solution to many of these locations. The pilot will give us more information on the possibilities.
- Some 500.000 locations are of interest on the long term, serving almost 10 million people.

#### *Conditions*

- To realise the pilot there must be good quality pumps and filters of various types involved.
- There must be a sales organisation and also a reputable and experienced micro credit system in place.
- Sufficient staff with the right skills must be available
- The pilot will be audited by local external auditors.

#### **Pilot project.**

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SNV and Water-Right are discussing to start a pilot project for rope pumps and water filters. Including the installation of 100 rope pumps- The pilot must show the real market for these products of people who are prepared to buy the pump (cash or with loan). This information will deliver inputs for an overall plan for a larger scale. The proposal for a next phase must include the conditions for a self supporting infra structure in all aspects, financially, technically etc.