OBJECTIVES

- To give a sustainable access to water (quality and quantity) to the households of the target villages
- To improve the sanitary conditions in the villages, such as the hygiene, nutrition and health within the households
- To decrease the workload for women and teenagers who fetch water outside of the village

STEPS FOR IMPLEMENTATION

1. Technical surveys and designs

Technical surveys and studies in the targeted villages are an essential step before the implementation of water supply systems. These studies will determine the relevance of the construction and the feasibility of it.

During this phase, the consulting team, along with DHO staff, visited each targeted village in order to collect various data. A village meeting is organised on the first day to present the objectives of the mission and collect first information about water access in the village. After that, the different springs that have been identified will be inspected by the consulting team. The following data are collected at the spring:

- Topographic data to establish the hydraulic diagram of the water supply system and to locate all the elements of the system (break pressure tank, water reservoir, tap stands, air valves...)
- Water quality testing of the spring: samples are taken at the spring then sent to a laboratory of analysis of the principal physical-chemical parameters (pH, hardness, turbidity, manganese, fluoride, iron)
- Measurement of the flow rate: The calculation of the water demand is based on a daily consumption per capita of 60 L of water. A growth of population of 3% for 10 years is taken in account.

When all these data are gathered, the consulting group is ready to design the gravity-fed system. Technical manuals are edited and presented to the DHO for approval. They contained information about water quality and quantity, its situation in the village (number of households, access to water, accessibility...) and detailed work plans for implementation (work dimensions, design of the construction, building material quantity, cost estimation)...
2. Village contracts

Before launching a construction or a rehabilitation of water supply system in a village, it is important to sign a contract to establish the relationships between the project, the village beneficiaries and the District Health Office. The contract is read out loud during a village meeting, so everyone can ask questions afterward if some incomprehension remained. If the villagers agree to the conditions, the village head, the project representative, the head of DHO and the District Governor sign the contract and each counterpart receives a copy of it.

Each contract specifies the roles, activities and responsibilities of each counterpart. It also states some particular clauses that can be different according to each situation. For example, in Northern Laos, many UXO (Unexploded Ordnance) still pollute the area, so it is stipulated in the contract that the project cannot be held responsible in case of injury or death due to UXOs.

During the construction phase, the beneficiary households are fully involved in the process, as they have to provide labour force and some materials (sand, gravel and planks). The workload demanded from the beneficiaries is specified in the contract so the villagers are fully aware of the involvement asked from them and no misunderstanding can remain when they decided to work with the project.

3. Selection of building material supplier

In order to select the supplier for building materials, quotation requests should be sent to several suppliers within the province. Each proposal should include the company information, the price tables for each village, the total prize sheet, the estimated delivery time, the samples of pipes, and the available brochures and catalogues on the proposed material.

The criteria used to select the supplier are:
- The price of the offer
- The quality of the material
- The experience of the company

After the bid analysis, a contract is signed with the selected supplier.

Advantages and disadvantages of the gravity-fed system:

- Meet water use needs at the user’s doorstep, is relatively simple to maintain and can be developed by the community to household level supply
- The water treatment systems (sand and gravel filters, sedimentation tanks) are low cost, minimal use of mechanical equipment, easy to operate and maintenance
- Suitable springs located higher than the village are not always available.
4. Construction phase

The construction phase of a gravity-fed water supply system lasts around 40 days per village (flexible depending on the village’s situation). During this period, the project’s team, the District technicians and the villagers work together following several steps of implementation:

**Water intake:** When the spring is located too far away from the village, the catchment of water is done on a stream after the spring. Often, in the stream, the level of turbidity is high (organic materials and sediments) and the catchment boxes have to be equipped with gravel filters (two filters, one after the other), so the finest elements can be trapped in the first basin located immediately after the catchment boxes. Then, water in the village’s basins can reach a turbidity level below the current standard.

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Mr Viengthong, Water supply maintenance committee member, Poukeo village

“ Our village exists for 21 years now and access to water has always been the main constraint. We were using the water of small streams but it wasn’t enough during the dry season, especially in April and May. In addition, our population is growing which put more pressure on water resources. [...] Previously, a project came to build us a water supply system, using the stream named Thong. It was functional only one month, then the water stopped coming to the village. Agrisure’s project told us that the problem came from the pipes and material used which were not resistant enough. So, the villagers did organise a meeting for the second time to decide for the water supply. They went to analyse various streams but the Thong stream was still the more appropriate. And then all the villagers agreed to work with the project to build a sustainable water supply system. [...] Now, life is easier because we don’t have to fetch water at the stream “

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**Header tank:** The header tank or sedimentation tank is one element of the system located just after the water intake. It has a double function:

- To allow the water to settle and retain the suspended particles that could have transited through the filters
- To allow the complete filling of the main pipe that feeds the storage tank in the village

**Break pressure tank:** This tank has for function to bring down the water pressure in the pipes. The pipes used have a limited resistance to the internal pressure applied by the water (around 6 bars of resistance). The pressure increases by one bar every 10 meters of elevation difference. Which means that the water pressure has to be brought down every 60 m of elevation difference. Air release valves are also installed on the main pipeline to periodically evacuate the air trapped in the pipes that lead to water flow drops.
Trenching and pipes system: One of the tasks asked to the villagers is to dig the trenches where the pipes will be buried. The trench size should be ideally between 70 to 100 cm deep to avoid damage by livestock, people or weather.

The pipes used by the project are high-density polyethylene pipes (HDPE). Even though more expensive than PVC pipes, the HDPE pipes are very resistant to pressure and have the lowest repair frequency rate. Galvanised Iron pipes (GI) are also installed in areas where pipes cannot be buried in the ground.

When the pipes have to cross a river (or a creek), a suspended channel has to be built. Concrete pillars are build on each side of the obstacle and a steel cable is tighten between them. Using steel wires, PVC pipes, covered with metallic tapes in order to protect the pipes from the sun’s rays, are attached to the steel cable. Then, the HDPE pipes are enclosed in the PVC pipes channel.

To be aware of before implementation:

- Flow of water varies depending of the season. Estimations have to be done for all the periods of the year. The construction phase should be done during the dry season when the flow is low and the path to the spring/stream accessible.

- Pipes have to be fully buried in order to maintain a long life-span of the system. Permissions should be obtain from the landowners of the fields where the pipelines will be buried.

- Timing is very important for construction with a voluntary workforce. It musts fit the community’s seasonal pattern of activities.

- Material and tools should be ordered and on site before the construction begins. Any shortage in materials and delay during the construction can destroy motivation.

Water storage tank: A water storage tank is built in the village to provide a total volume of storage equivalent to one day’s consumption. Capacities of tank depends on the quantity of water produced by the spring in one night. The tank has to be elevated above the village.

Drainage pit and tap stands: The number of tap stands depends on the population in the village (one tap for 100-150 persons). Tap stands have a gutter and drainage to a soak away to prevent the creation of water bodies in the village and potential mosquito breeding sites. Fences are erected around the taps to keep animals away.
5. Creation and training of the Village water supply maintenance committee

To ensure that the villagers will benefit from the water supply system for a long time, a village maintenance committee has to be set up. The committee is ideally composed of 6 persons: a president, a treasurer, two technicians and two hygiene volunteers. They are elected during a village meeting and are trained to perform their roles. During this village meeting, the monthly contribution amount is also decided according to the needs for maintenance, the costs of materials and the village standards of living.

The president organises the committee meetings, approves the payments using the maintenance fund, validates the account book at the end of each month, contacts the District Health Office if technical assistance is needed and keeps spare-parts and tools.

The treasurer collects the monthly contribution from each family, records all payments and incomes in the account book, records all interventions on the system in the maintenance record book, make the payment to the technicians and purchase spare-parts and tools.

The technicians clean and inspect the system every month, do simple repairs, change broken parts and report problems to the committee. They are trained during the construction phase of the system and receive a monthly allowance.

The hygiene volunteers organise the cleaning of the water points and explain to the villagers the importance of taking care of the system for the hygiene and the health of the village.

6. Inauguration of the water supply system

When the construction of the gravity-fed water supply system and the set-up of the village maintenance committee are done, the water supply system is handed to the District by the project, then to the villagers by the District Authorities. Representatives of the project, the Governor office, the District Health Office and the village cluster are invited by the villagers for an inauguration ceremony. The conclusion report of this construction is read out loud and the guests are invited to visit the water tank and the tape stands. The project offers a spare-parts and tools kit.

Mr Singkham, Water supply maintenance committee member, Poukeo village:

“The water supply maintenance committee collects money from each household in order to buy new taps, washers and seals, for the benefit of all. The contribution for the water supply system is 500 kip per person and per month. We need this fund because our system requires high maintenance. The stream is far located (7 km) from the village, the pressure of the water is high in the pipes, especially during the rainy season and many wastes blocks off the pipes. The village technicians have to check the system every month and clean the filters. The maintenance fund is also used to allocate a small monthly allowance to these technicians.”