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DPRK: Water and sanitation in three counties of Kangwon province (Thongchon, Chonnae, Popdong)

1. THONGCHON TOWN AND SURROUNDING RURAL AREAS
(Thongchon County, Kangwon Province, DPRK)
Thongchon is a countryside town located along the coast about 50km southward from Wonsan (the main provincial town in Kangwon Province). The road is pretty rough, especially after the last flood occurred in October 2001, when many of the bridges were destroyed and nor rehabilitated yet, therefore it takes approximately 1h and 15' to reach Thongchon from Wonsan. The main economic activity of the town and of the whole county is agriculture. The general context can be define as rural and only in the case of the central part of the town as semi-urban.

The total population of the town, and surrounding rural areas referring to it, is of 24,759 people or 5,830 households with an average of 45 (4.25) people per household. The original population was a lot smaller when the main water supply system (WSS) was constructed about 30 years ago and was mainly resident in the area that now is only the central part of the town.

At the moment the town WSS serves not more than 12,000 people living in the central area well below their daily demand because of:

- the considerable leakages existing in both the main transmission and distribution pipes;
- the low availability of electricity (in average 56h/day) that does not let the accumulation of the necessary water volume in the tank.

The remaining population lives in the surrounding rural areas close to the seaside and uses shallow wells and other ground unprotected water sources (small streams) whose water is reported to be brackish given the high sea water influence.
The main water supply system (WSS). The WSS was constructed in the 70's by the people of the county using cast iron pipes made in DPRK.

- The water source is located about 3km far southward, close to the railway, and is a shallow well with a diameter of about 5m and a depth of about 10m, the water level being in average 2.53.0m below the ground level (3.54.0m from the top cover of the well). The minimum water level in the well is reached in May and June at the end of the dry season, while the maximum in July and August, when the heavy rains normally come; the maximum difference being however only 50cm.

- According to the county authorities and community leaders, the yield and quality of the source did not change over the past 30 years. The well is said to have sufficient yield, but there was never a water meter in use, and good quality water but no water quality test is however currently taken. The structure is in pretty good condition, but some of the rings need to be repaired and the suction pipes replaced; the well to be cleaned, accurately measured and tested (both in quality and quantity).

- Very close to the well is the pump house hosting 2 huge very old centrifugal pumps (220/380V; 60Hz; 446kg; 75kW; see picture) that have been used alternatively as recommended. The yield used to be 180m3/hr so that only 7hr pumping were originally needed for filling the water tank 1250m3 volume that was abundantly covering the total water demand.

- At the moment, it takes 15hr to fill the tank, the actual yield of the pumps being much lower (around 90m3/hr, considering also the leakages existing in the transmission pipe). Therefore, given the daily availability of electricity, the total volume of water made available to the population per day can vary between 416.5m3 and 500m3. This means 3542lt/person/day considering a total population of 12,000 people.

- However, most of the institutions (schools, nurseries, etc.) are located in the central part of the town and are

used also by the people living in the surrounding rural areas, so that we can estimate that the final water quantity available every day per person is still below this threshold and therefore much below the actual water demand.

- The transmission pipe is a 300mm diameter cast iron pipe, 3000m long, highly corroded and with many leakage points. Observing the ponds formed at any of these points (see picture), the volume of water lost in the transmission pipe seems to be significant. The pipe passes under the railway and then through rice fields before reaching the tank

- When the WSS was constructed, the centrifugal pumps were enough powerful for bringing water up to main hill where the tank is located, the difference in altitude between the source and the tank being 56m. Just a few years later, however, another pump station had to be built at the foothill (about 2.5km from the main pump station) where 2 booster pumps where located.

- The booster pumps are both very old and one is not functioning anymore. Often, when the electricity is available only at brief intervals, water is pumped directly to the distribution line from the booster pump without reaching and being accumulated in the tank.

- The water tanks are two: one with a reservoir of 1000m3 and the other of 250m3, the total volume that can be accumulated being 1250m3. The structures look fine, although the concrete shows minor cracks that should be repaired before major damages with consequent losses occur.

- From the tanks there are two main distribution lines, bringing water by gravity force to the houses and institutions, the difference in elevation between the tank and the most distant point of the distribution line being 46m. These two pipes are also cast iron ones, 200mm diameter (one is 1700m long, the other 1900m) and are also in poor conditions and severely leaking.

- The service pipeline network reaching the houses is then made of PVC pipes with diameters varying from 100mm to 30mm and seems also to have leaking problems.

Needs. The MoCM representatives in Pyongyang expressed different needs for Thongchon WSS from what was then requested by the rural community leaders of the county and verified after inspection and discussions in the field assessments.

- MoCM suggested a new transmission pipeline of 200 mm (in stead of the original of 300 mm) and, if possible, a complete overhaul of the water distribution system. In detail the requests were the following: a) 3000m 200mm new polyethylene pipe; b) 6000m 100mm and 4000m 50mm new polyethylene pipe for the distribution lines; c) 12000m 25mm new polyethylene pipe for service pipes.

- Local leaders (county FDRC and system attendants) clearly expressed the need of new centrifugal and booster pumps and of a new transmission pipe as a first priority, and of new distribution pipes as a second priority. For the rehabilitation of the service lines, they said they do not need assistance since they can still have pipes and they can manage by themselves. They also said that the water need of the rural areas surrounding the town (the remaining 12,759 people) is also very important and they are exploring new water sources in the area, aiming at providing the households living in the area close to the sea with good fresh water. Until now they did not find a feasible technical solution. When asked why they did not think to extend the main WSS to the other part of the town, they said no-one knows whether the exploited water source (shallow well) has enough water. The distance between the tank and the marginal part of the town close to the sea is about 2.5km. County people are ready for implementing the works in March and April plus from October 10 to the end of November. In December, January and February is still too cold; in May and June the rice fields where the transmission pipeline passes are flooded for rice cropping and it impossible to dig the trench; in July and August there is usually the main rainy season with abundant floods; in September and first ten days of October they are busy with the harvesting.

Problems analysis. The problems assessed can be summarised as follows.

1.The largest part of Thongchon population does not have access to safe drinkable water neither in their houses nor in the main institutions as nurseries, kindergartens, schools and hospital.

2. As reported by the community leaders, the diffusion of diarrhoea is quickly increasing especially among most vulnerable groups using brackish water from unprotected shallow sources close to the sea.

3. Professional de-qualification and technical obsolescence is diffuse among local skilled personnel and this causes a low exploitation of safe available water sources and decreased awareness of the hydrogeological context.

4. No reliable water quality data nor sanitation statistics on the targeted population are available at town and county level.

Proposed solutions. The proposed solutions aim on one hand at rehabilitating the existing infrastructures and improve the availability of safe water in the main part of the town where most of the institutions are, on the other hand at identifying new feasible solutions for answering to the water needs of the surrounding areas.

1. Functioning and efficiency improvement for the existing WSS through rehabilitation and maintenance, provision of spare parts.

2. Better exploitation of the existing safe water resources.

3. Enhancement of rural community awareness on the hydrogeological context and on exploited and unexploited water sources characteristics.

4. Strengthening of water testing and sanitation data collection capabilities of the county anti-epidemic centres.

Activities.

1. Substitution of the old centrifugal pumps with new ones able to pump water up to the water tank, without need of the booster pumps; installation of a new transmission pipe; partial rehabilitation of the water tank; installation of new pipes for the main distribution lines; installation of water meters for water use accounting and other necessary fittings.

2. Partial rehabilitation of the shallow well, cleaning and installation of new suction pipes; pumping tests for verifying the yield; assessment of the other shallow wells and already utilised water points existing in the surrounding areas and yield tests; installation of hand-pumps where feasible.

3. Accurate hydrogeological assessment and training to be carried out by a specialist hydrogeologist together with a team of local skilled persons; identification of new feasible solutions, as the extension of the WSS to the other part of the town or the construction of new infrastructures.

4. Provision of water testing and transport equipment for the county anti-epidemic centres; provision of training on up-dated water analysis techniques.

1.1 RI POTAN near Thongchon
(Thongchon County, Kangwon Province, DPRK)

This village with total population 1830 people has no piped water supply anymore. Water used to be collected from a deep well under the rice fields. From there, the water was pumped to a reservoir 400m away where it supplied the village by gravity. This system is not longer working due to the breakdown of the pump system. The 150mm diameter pipeline from the pump to the reservoir has partially been removed. In addition, all the PVC service pipes are in bad shape. At present, villagers draw water from reasonable maintained shallow wells at several locations in the village. The concrete of the wells are in good condition, but the platform is cracked at several places. People take water with private buckets, which are stored at home. The area around the well is clean.

The complete pumping system is probably beyond repair and should to be replaced. The pumping houses and shaft are still in good condition, but besides this, the complete water supply system should be replaced (pump, transformer, transmission pipelines and service pipes).

However, from the results of the feasibility study the complete rehabilitation of the system came out not to be cost-effective since too expensive if compared with the small population. The alternative possible solution was to equip the village wells with hand pumps.

During the following assessment, the Ri could not be visited because of the complete road inaccessibility after the flood. This solution was then proposed to the community leaders and county FDRC representatives and refused. They said that the people of the Ri do not look for this temporary solution but for a more sustainable one, as the rehabilitation of their WSS.

Conclusions. Taking into consideration the findings of both visits, the intervention in Ri Potan is in the final analysis considered not feasible at this time and therefore not included in this project proposal and postponed.

(For completeness, it is also important to point out that after the last flood IFRC decided to assist some villages in Thongchon County - in particular, Ryong Chon 3, Ryong Chon 1 and Jong San villages - providing new pipes and a new pump).

However, a further accurate assessment as soon as the road will be accessible is strongly suggested for the identification of new feasible solutions, as the rehabilitation of the complete WSS or exploitation of other available water sources. The assessment could be carried out together with the one to be developed in Thongchon at the

beginning of the project. Moreover, the support foreseen for the county anti-epidemic centres will let the availability of more reliable water quality data that will positively influence the development of this assessment activities.

2. CHONNAE town
(Chonnae County, Kangwon Province, DPRK)

Chonnae town is an industrial town 45km far from Wonsan northward (1hr and 10' driving along the bumping road first passing trough Munchon).

It is a dusty, grey urban conglomeration along the main river whose water is precious for the important cement factory activities as well as for many women who use it for washing clothes. Arriving in Chonnae the first images are the chimneys and the hundreds of labourers working in the cement factory (built in 1930's) and in the coalmine.

The town has 6400 households, 27250 inhabitants and a WSS constructed in 1953.

- The water source is a 5m deep fracture in a limestone cave This basin covers an area of about 50m2 and is not protected, the risk of chemical and biological contamination being therefore high. This needs to be investigated and if necessary a new source developed or a filter station built.

- The pump station is very close to the limestone cave and hosts a huge and old pump connected to electric motor (195358). The motor had a capacity of 190kWh and the pump of about 200m3/hr. Therefore, originally, it took only 4 hours to fill the 800m3 reservoir about 35m higher than the cave. Nowadays 10 hours are needed due to the under-performance of the aging pump and motor and the water losses along the transmission pipe. Both the electric motor and the pump need frequent repairs and need to be replaced.

- The transmission pipe is a cast iron one, 200mm diameter and 1000m long. Many joints are leaking.

- The main distribution pipes are also cast iron ones, 2000m long 100mm diameter one, 2500m long 70mm diameter the other. Both are highly corroded and leaking.

Needs. The MoCM representatives in Pyongyang expressed partly different priority needs for Chonnae WSS from what was then requested by the rural community leaders of the county but consistent with the main findings of the system inspection.

- MoCM asked for: a) 2 new pumps (each 110120m3/hr), one for replacement of the existing old pump, another for stand-by (alternative use); b) 2 new electric motors (each 190kWh); 2000m 100mm and 4000m 200mm new polyethylene pipes for transmission and distribution.

- Local leaders (county FDRC and system attendants) clearly expressed as first priority the need of new distribution pipes and as second priority the need of new transmission pipe and new pumps.

Conclusions. Taking into consideration the findings of both visits, the intervention in Chonnae is in the final analysis considered not feasible within the current Echo projects call and therefore is not included in this project proposal. The main reasons are the following:
1. Given the growing population of the town (because of the industrial activities calling people from the countryside), the existing water supply system seems to be totally inadequate in all its parts. The only substitution of pumps and pipes is not going to answer to the water needs of the town. The water source has to be accurately examined and likely a new water source has to be found and exploited. The water tank is not sufficient anymore. However, the re-assessment, re-planning and reconstruction of the 1. whole system will be a demanding task if long-term solutions are pursued and are not feasible in such an emergency project of 10 months duration.

2. If looking for a temporary improvement, the substitution of the electrical parts and main distribution lines could seem a positive step forward. However, this aspects deserve much care both from a technical and social point of view. In fact, if the water source is contaminated as suspected (unfortunately the collected water samples could not be analysed by the existing anti-epidemic centres that lacked reagents and other equipment) it does not make any sense to make it available in larger quantity to the growing population. Moreover, when purchasing new electrical equipment it is important to have the transmission pipe adequate to the new pressure and not over-leaking at any joint.

3. Chonnae can not be considered a rural area or context, as foreseen for the interventions to be implemented through these Echo funds.

However, a further accurate hydrogeological and technical assessment is strongly suggested for the identification of a feasible solution to be implemented in future, as the rehabilitation of the complete WSS or exploitation of

other available water sources. The assessment could be carried out within the project timeframe together with the implementation of the intervention in cooperative farm "Upnongjangni" close to Chonnae.

Moreover, the support foreseen for the county anti-epidemic centres will let the availability of more reliable water quality data that will positively influence the development of this assessment activities.

2.1 COOPERATIVE FARM "UPNONGJANGNI" near Chonnae (Chonnae County, Kangwon Province, DPRK)

This agricultural co-operative farm is 2km far from Chonnae and is very important for the town itself, since part of the population work in the town industries.

There are 2600 people living in the cooperative farm and two separate water supply systems should provide them with water. System 1 serves 1000 people, while system 2 serves 1600 people.

System 1 (WSS 1).

- The source is a shallow well near the river from where the water is pumped to a reservoir about 500m far from the pump with a difference in altitude of about 30m.

- From the reservoir, the water flows by gravity force to the houses.

- The system was designed for 40m3/hr but, when working, it delivers only 20m3/hr for 5÷6hr/day. However, the pump and electrical motor (14kWh) break down frequently.

- In addition, the system needs a new 4km pipeline.

- The well is closed and appears to be in good condition.

System 2 (WSS 2).

- The source is a shallow well near the river from where the water is pumped to a reservoir. From the reservoir, the water flows by gravity to the houses.

- The system works pretty well even if below the standards it was designed for. It should have a capacity of 60m3/hr (240l/person/day with 5÷6hr/day electricity) but only 60l/person/day are normally made available.

- Like for system 1, the well is closed and appears to be in good condition. In addition, the pump functions properly.

- The electrical motor however is on loan from an agricultural project and, with a capacity of 40kWh, too strong for its purpose. It consumes too much electricity and they have to return it to the farm.

Needs.

- MoCM asked for: a) 2 new pumps (one 40m3/hr, another 10m3/hr); b) 2 new electric motors (one 14kWh, another 8 kWh).

- Local leaders (county FDRC representatives) asked for new pumps and motors and new pipes. County people are ready to work for the implementation during the months of March and April, plus October and November (for the same reasons of Thongchon town and of all the other rural areas of the province).

Problems analysis. The problems assessed can be summarised as follows.
1. Almost half of the population living in cooperative farm "Upnongjangni" near Chonnae does not have access to safe drinkable water neither in their houses nor in the public institutions; the remaining part of the population will not have access to safe drinkable water as soon as they return the pump to the farm it was borrowed from;

2. As reported by the community leaders, the diffusion of diarrhoea is increasing especially among the families who do not receive water from the WSS;

3. Professional de-qualification and technical obsolescence is increasing among local skilled personnel and this causes a low exploitation of safe available water sources and decreased awareness of the hydrogeological context.

4. No reliable water quality data nor sanitation statistics on the targeted population are available at farm and county level.

Proposed solutions. The proposed solutions aim on one hand at rehabilitating the existing infrastructures and improve the availability of safe water in both parts of the cooperative farm, on the other hand at improving the availability of reliable water quality data and therefore the awareness on water related diseases at farm and

county level.

1. Functioning and efficiency improvement for the existing WSSs through rehabilitation and maintenance, provision of spare parts.

2. Better exploitation of the existing safe water resources.

3. Enhancement of rural community awareness on the hydrogeological context and on exploited and unexploited water sources characteristics.

4. Strengthening of water testing and sanitation data collection capabilities of the county anti-epidemic centres.

Activities.

1. Substitution of the old pumps and motors with new ones for WSS 1 and purchasing of a new adequate pump for WSS 2; installation of new transmission and distribution pipelines for WSS1; installation of water meters for water use accounting and other necessary fittings.

2. Partial rehabilitation of the shallow wells, cleaning and installation of new suction pipes; pumping tests for verifying the yield.

3. Accurate hydrogeological assessment and training to be carried out by a specialist hydrogeologist together with a team of local skilled persons.

4. Provision of water testing and transport equipment for the county anti-epidemic centres; provision of training on up-dated water analysis techniques.

3. POPDONG TOWN
(Popdong County, Kangwon Province, DPRK)

Popdong is a small rural town in the mountains about 60km westward from Wonsan. From the main road Wonsan-Pyongyang a dirt road leads in the main valley across the mountains; it takes about 1hr and 30' 4-wheels driving from Wonsan to Popdong.

The main economic activities are agriculture (maize, potatoes, some rice) and small food processing local industries. 60% of the population works in the agriculture sector, while the remaining 40% in the other sectors (mainly in the institutions and food processing). The agriculture activities start in March to June and continue from September to the beginning of November, the rainy season lasting usually from the end of June to mid August.

There are 1810 households (8900 people with an average of almost 5 people per household) living in Popdong, 1510 receive water by gravity in their houses from the main WSS, while the remaining 300 households don not have water in the houses and use small unprotected ground water sources (springs, see picture).

The main reasons why these 300 household are not connected to the main WSS are the following:

- when the system was first constructed the all population of the town area was a lot smaller;
- the system was many times damaged by the frequent floods occurring in this mountain area and was then repaired somehow with the materials available, but it kept loosing efficiency in the past 40 years, while the population was growing.

The main water supply system. The WSS was constructed in the 1961 by the people of the county using every kind of pipe available (PVC, cast iron, wood of different diameters). Therefore, the diameter and other characteristics of the pipes were not chosen on the basis of the calculation and planning, but on the availability of material.
- There are 5 different water sources serving the system by gravity pipe schemes, all located in the mountains around the town. 4 of the 5 transmission pipelines bring water to the main tank that is located in a optimal position for the distribution by gravity to the houses. The last one serves directly a part of the town without passing through the tank. When asked why the did not selected only one good spring, the community leaders answered that the only source sufficiently abundant for the town is 20km far from it and the route is too rough for implementing a long lasting pipeline. (This source was not surveyed during the assessments).

- The main source (S1) is 4.5km far from the tank and is connected to the it through a 150mm diameter pipeline made of different pipes. The community leaders say this source is a natural spring. However, when it was surveyed during the last assessment, considering the general hydrogeological context of the area it was pointed out that a natural spring in that position was very strange. After further inquiring, the oldest community leaders said that under the sealed and covered box (never opened and checked since it was constructed 50 years ago)

there is a borehole, about 50m deep. Underground water was casually discovered during the research of coalmines in the areas and there was no need to install any pump, since water had enough pressure to come up to the ground surface. A sort of spring box was then constructed, sealed and a transmission pipeline laid toward the town.

- The second source (S2) is a natural spring (with box) 3km far from the tank and is connected to it through a 150mm diameter pipeline made of different pipes. This pipeline was repaired somehow a lot of times after being damaged by the floods and is now leaking in many points.

- The third source (S3) is in a stream 1.8km far from the town and is connected directly to the distribution network through a 100mm main transmission pipe made of cast iron. There was a sand filter working until ten years ago but now it became obstructed. People therefore use another pipe directly from the stream for filling the small catchment

- The fourth (S4) and fifth (S5) sources are minor ones, respectively 2.7km and 2km far from the tank made of 150mm and 100mm diameter pipelines of different materials.

- The tank is an underground one, protected and still in good conditions. The total capacity is 300^3, the diameter being almost 6m and the depth almost 12m. Visible inspection of the contents of this central reservoir revealed rather dirty water.

- Many leakages are visible along the main transmission pipes and there is no precise control (no water meter is installed) on the real quantity of water that reaches the tank and is then released to the houses. Usually the tank attendant wait for the tank being full before opening the gate valve (very old and leaking one). Theoretically the system could produce 2800m3/day (300l/person/day), but at present only the tank can be filled only one a day. In addition, much water is lost in the distribution network, but it is unknown how much the town citizens actually receive. What is sure is that water is not enough for covering the demand of 300households out of 1810 (more than 16% of the population) and that the other 1510 households receive less than 40l/person/day.

- This reservoir is connected to the town distribution system by 2 main distribution pipelines about 4km long (150mm diameter) that are leaking in many points. The service distribution system appears to have problems as well, but the actual condition is unknown.

Needs.

- MoCM asked for: a) rehabilitation of 2 transmission pipelines (3750m 150mm and 3050m 100mm new polyethylene pipe); b) rehabilitation of the 2 distribution pipelines (2760m 60mm and 6310m 40mm); c) rehabilitation of the service pipe network; d) rehabilitation of spring catchments and of the tank (43tons of cement, 12tons of iron bars 8 or 12); substitution of valves (10pcs 150mm, 20pcs 100mm, 15pcs 60mm, 15pcs 40mm).

- Local leaders (county FDRC and system attendants) asked for the rehabilitation of the 3 main transmission pipelines (1st priority) and possibly for the rehabilitation of the 2 distribution pipelines (2nd priority). They said people can work in the implementation of the water infrastructures in March and April and from the end of August, but also during the summer if the rain is not too heavy.

Problems analysis. The problems assessed can be summarised as follows.
1. 300 households in the marginal parts of Popdong town do not have access to safe drinkable water; the remaining part of the population is at risk because of the poor conditions of the exploited water sources and of the pipelines.

2. As reported by the community leaders, the diffusion of diarrhoea is increasing especially among the 300 families who do not receive water from the WSS;

3. Professional de-qualification and technical obsolescence is increasing among local skilled personnel and this causes a bad (or no) maintenance of exploited water sources and decreased awareness of the hydrogeological context.

4. No reliable water quality data nor sanitation statistics on the targeted population are available at town and county level.

Proposed solutions. The proposed solutions aim on one hand at rehabilitating the existing infrastructures and improve the availability of safe water in all the parts of the town, on the other hand at improving the exploitation of existing safe water sources and the availability of reliable water quality data and therefore the awareness on water related diseases at town and county level.

1. Functioning and efficiency improvement for the existing WSS through rehabilitation and maintenance, provision

of spare parts.

2. Better exploitation of the existing safe water resources and extension of the WSS to 300 households

3. Enhancement of rural community awareness on the hydrogeological context and on exploited and unexploited water sources characteristics.

4. Strengthening of water testing and sanitation data collection capabilities of the county anti-epidemic centres.

Activities.

1. Rehabilitation of at least 2 transmission and 2 distribution pipelines and extension of the distribution and service pipes to the non-served part of the town; installation of water meters for water use accounting and all other necessary fittings.

2. Opening and cleaning of the borehole box, test of the water quantity and quality; re-planning and re-construction of the catchment tank; rehabilitation of the other 2 main spring boxes; pumping tests for verifying the yield.

3. Accurate hydrogeological assessment and training to be carried out by a specialist hydrogeologist together with a team of local skilled persons.

4. Provision of water testing and transport equipment for the county anti-epidemic centres; provision of training on up-dated water analysis techniques.

3.1 COOPERATIVE FARM "UP" near Popdong
(Popdong County, Kangwon Province, DPRK)

This co-operative farm is very close to Popdong (a few km and 5' driving). As in every farm or Ri there is one director in charge for everything and 2 vice-directors: one is in charge for agriculture, the other for "people life" including water, buildings, etc.

There are 624 households living in the farm (3118 people) that is divided in 7 working team areas or villages.

Each village has its own water source (small streams) and partial pipeline systems. People use these streams water both for drinking and for clothes washing.

- The condition of the spring boxes are very poor (see picture) and all of them need to be cleaned, rehabilitated and adequately sealed.

- The pipelines are old PVC ones (from 40 to 60mm diameter depending on the village) that bring very small water to the houses because of the abundant losses.

- Only one village has a small water tank. As in Popdong town, the water supply system is gravity feed, one spring box (about 50m - 100m above the village) is connected to the tank, which is, turn connected to the village. The diameter of this 2km long pipeline is 60mm. The pipeline from the tank to the village is 1.5km long and has a diameter of 100mm..

- All the other villages do not have any tank - accumulation point - so that they are strictly dependent on the trend of the small streams. At the end of the rainy season there are no shortages of water, although much water is leaking from the distribution pipes.

- However, at the end of the dry season, the yield of the spring is much reduced and the farm hardly receives any water (see picture). There were some small tank in the past but they were destroyed by the flood and never reconstructed because of lack of materials

- The authorities propose new a 50mm pipeline of 1.5km length to a new spring and the construction of a new spring box.

Needs. The MoCM did not submit any specific request for cooperative farm "UP".

- Local leaders (county FDRC and the vice director in charge for people life in the farm) asked for the rehabilitation of the water tank and transmission pipes (1st priority) and possibly for the rehabilitation of the distribution pipelines (2nd priority). They said people can work in the implementation of the water infrastructures in March and April and from the end of August, but also during the summer if the rain is not too heavy.

Problems analysis. The problems assessed can be summarised as follows.
1. 624 households in this cooperative farms do not have access to safe drinkable water;

2. As reported by the farm vice-director, the diffusion of diarrhoea is increasing;

3. Professional de-qualification and technical obsolescence is increasing among local skilled personnel and this causes a bad (or no) maintenance of exploited water sources and decreased awareness of the hydrogeological context.

4. No reliable water quality data nor sanitation statistics on the targeted population are available at farm and county level.

Proposed solutions. The proposed solutions aim on one hand at rehabilitating the existing infrastructures and improve the availability of safe water in all the 7 villages of the farm, on the other hand at improving the exploitation of existing safe water sources and the availability of reliable water quality data and therefore the awareness on water related diseases at town and county level.

1. Functioning and efficiency improvement for the existing WSS through rehabilitation and maintenance, provision of spare parts.

2. Better exploitation of the existing safe water resources.

3. Enhancement of rural community awareness on the hydrogeological context and on exploited and unexploited water sources characteristics.

4. Strengthening of water testing and sanitation data collection capabilities of the county anti-epidemic centres.

Activities.

1. Construction of small water tanks and rehabilitation of all the transmission and distribution pipelines; installation of water meters for water use accounting and all other necessary fittings.

2. Opening and cleaning of all the spring boxes and adequate rehabilitation of the structures and covers; test of the water quantity and quality.

3. Accurate hydrogeological assessment and training to be carried out by a specialist hydrogeologist together with a team of local skilled persons.

4. Provision of water testing and transport equipment for the county anti-epidemic centres; provision of training on up-dated water analysis techniques.