

Short manual on the Tube Recharge, 2d edition, July 2011

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Context

Many hand dug wells dry up at the end of the dry season, because of a limited infiltration of rainwater in the ground. Reasons for this can be changing rain patterns, less rain, heavy rainfall in short time, erosion, loss of vegetation, compact topsoil layers etc. Options to increase the infiltration of rainwater and recharge of ground water layers (aquifer) are above or underground dams, sand dams, the planting of trees and plants such as vetiver grass, making contour canals, spate irrigation etc. See also the 3R concept (Retention, Recharge, Reuse) See www.bebuffered.com

One option to increase the watervolume in the aquifer is the so called "Tube recharge" which is a low-cost option combining a manually drilled hole with a drainage tube, a filter and a storage tank or pond. Part of the rainwater, that otherwise would run off to rivers or evaporate, thus can penetrate into the soil and reach the first aquifer. To note the effect of a Tube recharge it is advised to install it near a well that dries up in the dry season. Depending on flow patterns of the ground water, part of the recharged water will stay around the well and can be pumped up in the dry season. The tube recharge idea was finalist at the Development market place in 2006 in Washington.

Experiences

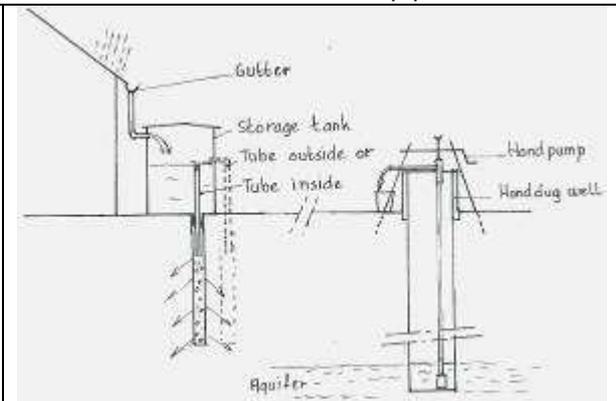
Pilots in Ghana, Zimbabwe, and Zambia in EU funded projects indicate that families that made a Tube recharge, now have water in their well during the whole year in wells that before were dry during 2 to 4 months. The Tube recharge is only useful in areas where all or part of the rain water runs off to rivers. The volume of the storage tank or the pond depends on the situation. For instance, in areas with low infiltration and few but intensive rains, a large storage is needed. Further testing is going on. Underneath follows a basic guideline for production. In general hands on training is needed to produce the soil punches and make a well functioning Tube recharge.

Tube recharge with Rooftop rainwater harvesting tank

One option is to combine a new or existing roof top rain water harvesting tank with a tube recharge. The advantage of this option compared to the ground run off, is that the water is relatively clean when it enters in the ground. Eventually a cloth filter can be connected to the PVC pipe.



Example in Ghana. Here a low cost Ghana gutter system is installed; water enters in a wire cement storage tank of 1 m³. The lower part of the tank is used for storage



In a new system the Tube recharge can be made inside the tank. With existing rain water harvesting tank the Tube recharge can be made outside the tank

Tube recharge with ground run off

Where a storage tank is not possible or too expensive the Tube recharge can be mounted in a hand dug pond. Guideline to make this system:

- Start 5 to 20 meters "upstream" from a well or borehole that dries up in the dry season.
- Drill a 2 inch hole with a Step auger or a soil punch. The depth should be such that it passes the compact top layers and reaches a somewhat permeable layer. In general 4 to 6 meters is enough. The recharge hole should not reach the aquifer to avoid contamination of the

ground water with surface water. (If water quality of water in wells is a problem, the water can be disinfected with boiling, chlorine or filtered with low cost household water filter as a pot filter or a siphon filter)

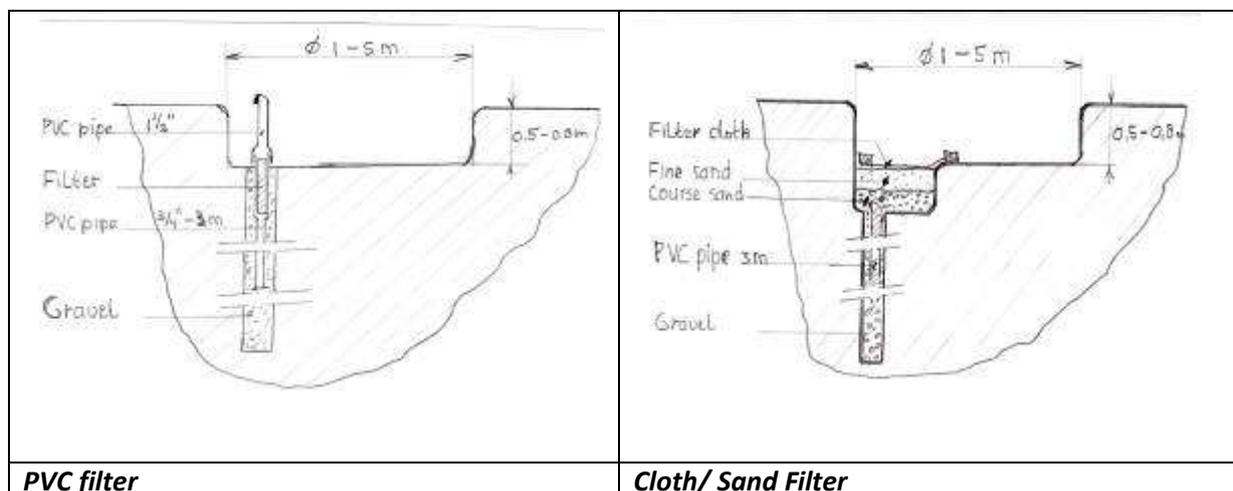
- Test the recharge capacity of the hole after drilling by filling up the hole with water. It should absorb 2 litres per minute or more. If less, drill deeper.
- Plug the hole with a cloth, and make a small pond of 0.5 to 1 meter deep and 1 to 5 meter diameter. (Make sure the 2 inch hole is at one side of the pond to be able to reach it). The size of the pond can be 1 to 10 cubic meters and depends on the absorption capacity of the soil and the rain pattern. For instance low absorption and little rains requires a big pond.
- Remove the cloth and fill up the hole with gravel till 2 m from the top and install the PVC filter or sand filter.



Filter options

Filter options in a system with a ground run off are a PVC filter or a Cloth / Sand filter

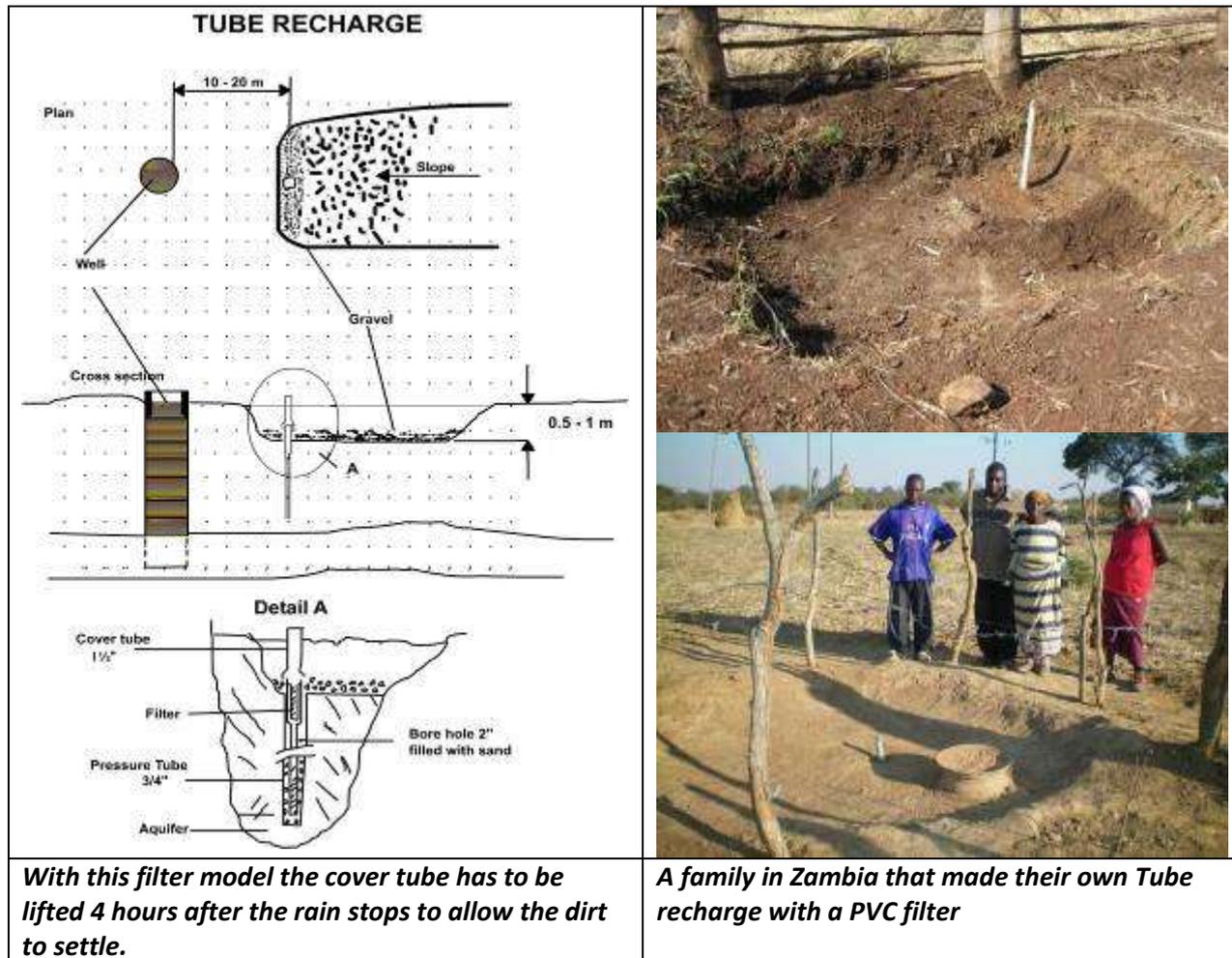
PVC filters can be used in combination with ground run off where dirt is flowing into the pit. With this option the dirt needs to settle before the PVC cap is opened and the “cleanwater” enters in the ground. In general it is best to reduce the speed of the water by vegetation as much as possible to avoid erosion and the pond from filling up with sand and clay. **Cloth / sand filters** can be used with rooftop catchment or in situations where relatively little dirt accumulates.



PVC filter

Cloth/ Sand Filter

Model with PVC filter



How to make a PVC filter

- Cut the pressure tube (3/4" PVC pipe) at 2 meters length. Make 4 cuts of 1 inch on one side, heat it and bend the 4 parts outwards. This to fix the pressure tube.
- Cut slots at the lower part of the pressure tube to facilitate the water flow.
- Connect the pressure tube with a PVC pipe of 1" (0.3 m long) by heating and twisting.
- Make a 0.5 m cover tube of 1 1/2". Heat the top part and twist it like a "candy paper". Heat the bottom part and make a socket so it fits over the bottom cover tube
- Make a filter that fits in the 0.3 m 1 1/2" tube. The filter is made of 1" tube and slots made with a hacksaw. The top end of the 1" tube is closed by heating and twisting.
- Place the set of tubes in the borehole in such a way that the top of the Cover tube is just above the water level if the pond would be full. The Pipe with the filter should be just above the ground level in the pond
- Fill up the space around the tube with fine gravel or coarse sand. Seal the top part with clay.

How to use

- When rain has filled the pond, wait for some hours until the dirt has settled.
- Take off the cover tube and the water will flow via the pressure tube into the ground.
- When the pond is empty, put back the cover tube, wait for the next rain and repeat this.
- Maintenance consists of cleaning the pond and unclogging the filter or tube. This can be done by moving a stick with a cloth up and down the pressure pipe.

Materials:

- Pressure tubes can be made of poly pipe (black plastic) or PVC with diameters of 20 mm or more. Length of 1-3 m depending on the depth of the hole.
- Cover tube of 1 1/2". 1 piece of 0.3 m and 1 piece of 0.5 m
- Filter tube of 1". 1 piece of 0.3 m

Photos PVC filter



The top of the pressure tube is made of a 1.5 Inch PVC pipe, which is heated and wound around a PVC pipe or, in this case, a black poly pipe



A filter screen is made by cutting slots in an 1 inch PVC pipe and by heating and closing it at the top



The pressure pipe is made of a PVC pipe or in this case a black poly pipe



The assembled parts are placed in the hole, than filled up with gravel, at the top sealed with clay

How to make a cloth / sand filter

The pond of a Tube recharge with a cloth/sand filter is similar to the model with a PVC filter. The PVC part is simpler. The difference is that the model with a cloth sand filters is permanent and the PVC pipe is covered with sand a cloth filter

Photos cloth / sand filter



Make a hole with the soil punch and a the pond



Fill up the 2 inch hole with gravel or course sand till 2 meters from the top and place the PVC filter



The filter pipe made of ¾" or 1 inch pipe, closed at the top with slots made with the hacksaw



At the lower side bigger slots and the end opened to fix the pipe in the gravel



Then the filter pipe is covered with fine sand



On top of the sand a cloth filter is placed made of a maize bag and a ring of 12 mm round steel bar



Mount 4 ropes in the corner of the cloth filter to lift it when it needs cleaning



In case the cloth filter is made of Wood, put bricks on top to avoid that the cloth filter starts floating.

Costs

The costs of a tube recharge consist of costs for pressure pipe and filter (5 to 20 US\$). NGOs can lend drilling equipment (step auger or soil punch) to the family. The time needed to make a tube recharge depends on the geological situation and depth needed. In cases where there are no stones or boulders a 5 to 10 m hole can be made in one day with a step auger or soil punch. If made by the families themselves labour cost can be minimum. Material cost of augers or soil punches that can make holes to 10 meters deep costs around US\$ 75 and can be used for many holes. In general a short hands on training is needed to produce the soil punches and make a well functioning Tube recharge . More information, www.connectinternational.nl