



## WATER, SANITATION, ENVIRONMENT and DEVELOPMENT

### Low-cost water supply

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#### Introduction

Kenana Sugar Estate is one of the largest irrigated sugar estates in the world. The planted area is about 35300 hectares. Above 10,000 workers are employed in farming works. With their families the population goes up to more than 60,000. They live in small camps and villages scattered across the estate. Potable water is supplied to them using mobile tankers and water is stored in big containers stationed on those camps and villages.

The system being dependent on the mobile trucks, repair and maintenance problems which are very common in developing countries like Sudan are of direct impact on water supply to those farmers. Another solution, more reliable and preferably cheaper is therefore needed.

Bannaga village is one of the villages in the estate that lies at about a half kilometer distance from a main irrigation canal in which a low cost water supply system using a pressure roughing filter was tried.

#### Objectives

The main objective of this work was to supply this village and in future similar villages with filtered, partially treated water through stand pipes near each small group of families.

#### Materials and methods

##### Raw water supply line

Galvanized 3" pipes, valves and connectors were used to build a supply line from the irrigation canal as shown in fig.(1). The water service level in the stilling basin of the irrigation canal is about 9 meters above the ground level. This water head was used to syphon the water through the pipe line to the pressure roughing filter and from there to the stand pipes for the use of the village people.

System priming is of course necessary at initial operation and after maintenance that requires disconnections in the pipeline. This could be achieved in the following manner:-

With the gate valve (fig. 1) in closed position the line is to be filled with water manually using buckets or similar containers. The non-return valve on the canal side of the line stops water from flowing into the canal during this operation. After completely filling the line the filling pipe is

then to be tightly closed. Opening the gate valve allows water to suddenly fall out from the line. This creates a vacuum in the line large enough to open the non-return valve and sucks water out from the canal into the system.

The water pressure at the inlet of the filter is approximately 0.8 bar. The flow as measured at the this side of the filter using a water flowmeter was found to be 25.5 cubic meters/hour. On the normal consumption rates of the estate which is 10 gallons per capita per day, this system could therefore satisfy about 7,000 persons.

The turbulent flow in the stilling basin offers a raw water supply free of bilharzia and other pathogenic parasites, because it does not provide suitable environments for snails and algae to multiply.

#### The roughing filter

A steel sided container with layers of sand (fig.2) was used to provide a roughing filter. From the inlet water passes through the filter media to the outlet.

This type of treatment is known to reduce turbidity by 50 to 70% and bacteria by approximately 80%.

Simple chlorine dosing instrument can be added to kill remaining bacteria and to provide residual chlorine thus insuring a water supply free from faecal contamination .

Roughing filters generally are maintenance free. Only back washing is usually required after some months depending on the turbidity of the raw water. Pressure gauges on the inlet and outlet sides could be used for this purpose. A simpler method for the villagers is the flow rate from the stand pipes. When that decreases remarkably the filter is then to be backwashed.

#### Conclusion

The pressure roughing filter provides a low cost method of water supply to villagers beside main irrigation canals in agricultural schemes. The water supply is expected to be free from bilharzia. If simple chlorination is added the water will be free from faecal contamination.

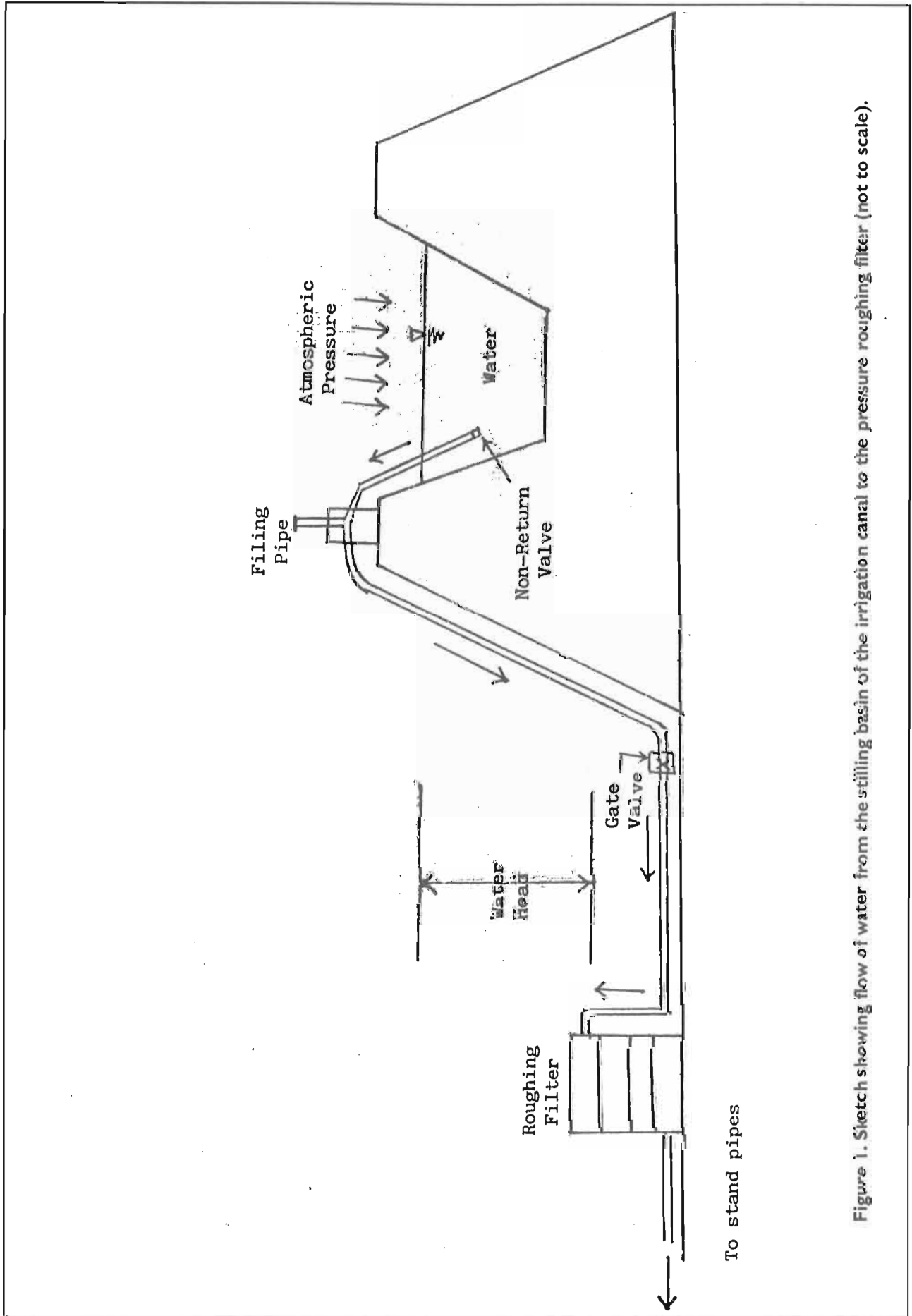
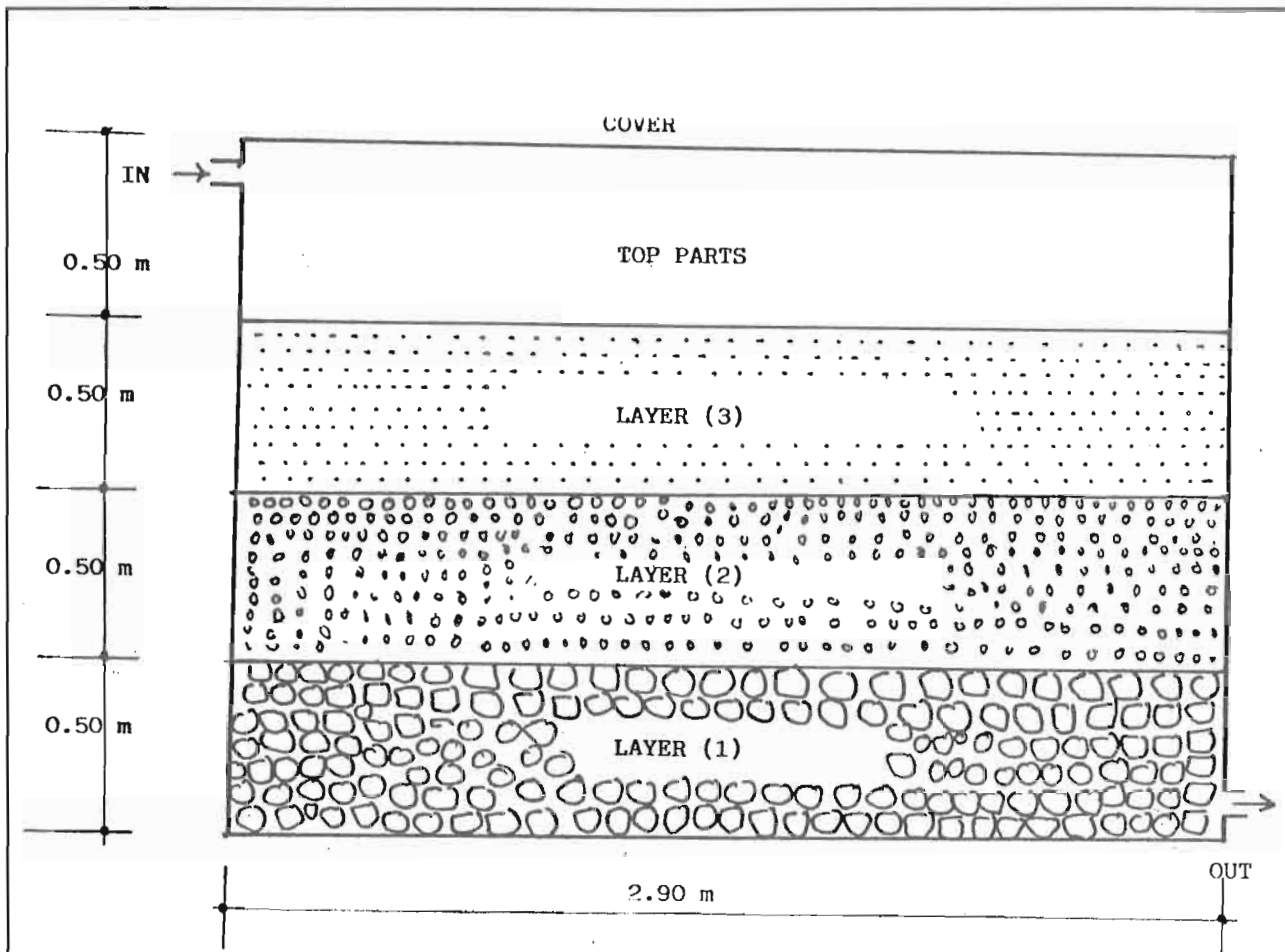


Figure 1. Sketch showing flow of water from the stilling basin of the irrigation canal to the pressure roughing filter (not to scale).



NOT: The closed roughing filter is a steel tank with 2.90 m length, 2.40 m width and 2.00 m height.

- Filter media:

Layer (1) : 50 - 100 mm size support gravel

Layer (2) : 25 - 50 mm size gravel

Layer (3) : 5 - 25 mm size gravel

Top Part : Used for removing any suspended materials.

Figure 2. Dimensions of the closed roughing filter

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## **References:**

Heber, Gahriele (1985) Simple methods for the treatment of drinking water. Published by Vieweg.

Dr. Elhassan, B.M. and Dr. A/Magid, I.M. (Rural and Urban water treatment.

Dr. Farag M.A. sanitary engineering.

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