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THE APPLICATION OF RAIN-WATER HARVESTING TECHNOLOGY FOR HEALTH STATION IN A RURAL ETHIOPIA

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ABSTRACT

Rain-water Harvesting is an appropriate technology suited especially for less developed countries. Such technology has economic importance for its provision of clean water supply without using costly items such as pipes,pumps,fuels etc..
This simple technological system has not been widely, used in Ethiopia. The purpose of this paper is to demonstrate the application of Rain-Water Harvesting technology for a health station in rural Ethiopia using locally available materials.

INTRODUCTION

Some countries are blessed by having good amount of lakes, rivers, underground fresh water reservoirs and abundant rain. Ethiopia has; however, of limited amount of such natural resources. Moreover, Ethiopians are mostly settled on highlands that keep them away from the natural available water sources. This condition forces the villagers to use animal transportation system or on foot travel to long distances to get their daily water needs. Obviously, they could carry only little amount of water which is substantially small to satisfy their needs. And this happenes with no prior consideration of the hygiene of the water which has an impact on the health of the people.

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The Ministry of Health of Ethiopia builds health station facilities with less regard of the availability of water in the target areas. It has been found that the only alternative for the health workers was to use human or animal means for bringing water from the place where water is available. The hyginic and cost conditions also make the situation more difficult.

In several parts of the world, especially rural and tropical islands rain water catchment and storage reservoirs have been constructed since ancient times (1). Harvesting Rain-water for human consumptions in a large or small scale, has been used by Nissen-Peterson who was stationed with his family in a very arid area at Makindu, Kenya had successfully lived using three rain catchment systems -- roof catchment for human consumption, ground surface catchment for cattle, irrigation vegetables and crops (2). Another example is that of the community based water supply and sanitation project at Gelegede at Subukuria, Kenya where roof rain catchment is on completion (2). Nisses-Paterson remarks that a family with a corrugated iron roof,or any other hard surface roofing materials and a minimum of rainfall could have a safe supply at his door steps (3).

Based on the above ideas, the World Health Organization (WHO) has stated that 1 mm. of rainfall on 1 square meter of roof will yield about 0.8 litres of water annually allowing for evaporation and other losses (4). To elaborate the above points,

for a roof of 6 x 8 meters and assuming an average annual rainfall of 900 mm., the amount of rainwater which can be collected may be estimated as:

6 x 8 x 900 x .8 = 35, 040 litres per year

If we divide this into 365 days it will be 96 plus litres per day.

If we assume that there are 5 people in the household they could be supplied with about 19 litres of clean water per day, which is above the actual per capital water consumption per day in Ethiopia.

OBJECTIVES

The objective of this paper is to demonostrate an appropriate Technology that may alleviate water problem/shortage of health station using locally available materials.

METHODS AND PROCEDURES

The construction was started using the following procedures:-

1. Information was collected on - Rainfuall, Vegetation, Rainfull seasons.

2. Daily water consumption of the health station was determined.

3. The roof area of the Health Station was measured to find out how much water can be collected.

4. The water demand the surface area, annual rainfall, and the number of months without rain were computed and the reservoir capacity were calculated.

CONSTRUCTION

Based on the above figuers and the local resource, e.g. materials, manpower, construction was started.

1. Concrete pipe was used (culvert) for the ground and elevated reservoirs. This material was found to be cheaper than others, it was locally available, and it was faster to work with than stone masonry, or cement tanks.

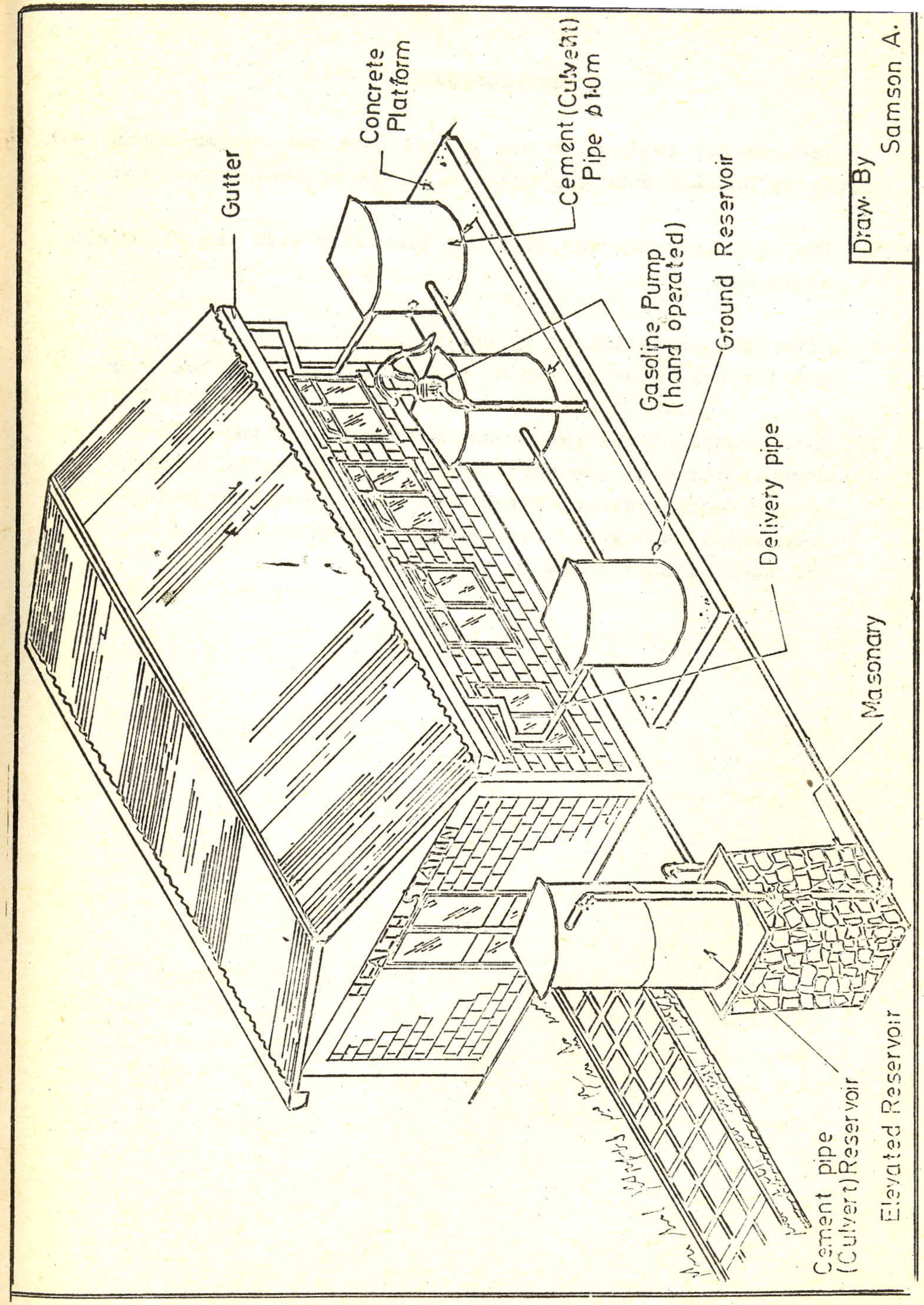
2. A cement platform was built on the ground. It was placed the concrete pipes while the cement platform is still wet so that the rim will be enveloped by the cement, which will make it easier to make it water tight. The concrete pipes were thus placed side by side and connected with pipes.

3. A raised platform was also built for the elevated reservoir using cement and stones. Concrete pipes one on top of the other using a block and tackle were placed on the platform

4. Cutters from the roof were connected to the ground reservoirs arrangement was made or added to the pipe to discard the first rain to waste.

5. A hand operated gasoline pump was installed on the ground reservoir to pump water to the elevated reservoir from which water will flow to the building by gravity.

6. All the reservoirs were further plastered with cement to make them water tight and tested for leakage before they were filled-up for use. All the reservoirs were also covered to avoid sunlight so that algae growth will be discouraged (see the figure).



CONCLUSION

Subsequent evaluation has proved that the system works with virtually no maintenance problem with the following outcome:

1. The construction was fast and rewarding with the materials available.

2. After the installation of the rain cistern the health station has never had water problem through out the year.

3. This method of rain-water harvesting served as demonstration to the surrounding villages. The simple system further demonstrated that rain-water harvesting is an economical, and safe water supply system that could be arranged without pipes or pumps.

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