MODELS OF RAINWATER CATCHMENT FOR WATER SUPPLY IN NIGERIA

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ABSTRACT

One of the greatest problems in Urban and rural areas in Africa is the provision of good water. As at present, water resources development and management is constrained not only by capital but also by manpower and politics. And with no solution in sight for these problems, it appears government may never ever be able to improve the water supply situation in most of these areas. Against this background, this paper presents an independent, simple and affordable alternative to the futile reliance on government for water supply - the rainwater catchment technology. The technology is illustrated using several models to cover both domestic and agricultural water needs. The models are home grown and easy to adopt.

INTRODUCTION

Rainwater harvesting through well developed catchment systems is attractive as an independent source of water supply for households in Africa because it is usually clean and simple to collect. The rainwater technology simply involves the harvesting and storage of rainwater for future use. The technology is based on the fact that rainwater can be collected during the rainy season and used in the dry season (Morgan, 1990). Hence, the rainwater catchment system can be described as a method of deliberately collecting and storing rainwater to provide a supply of water. The process is also referred to as rainwater harvesting.

Indeed, as we are probably aware, in most parts of Africa as in Nigeria, rain falls heavily for over 8 months of the year and very lightly or none at all for the remaining 4 months. It therefore means rainwater can be harvested in the rainy season and then stored for use throughout the dry season.

Against this background, some models for harvesting and storing rainwater for future use are reviewed. This is with a view to drawing attention to an untapped resource in the continent of Africa - the rainwater which is ubiquitous especially in the wet season. The

rainwater if collected and stored in sufficient quantity could meet the individual needs of urban or rural dwellers throughout the year. There are two major types of rainwater catchments: roof catchments and ground catchments. Both of them have been analysed in the form of models that can be adopted by rural and urban dwellers in Nigeria and the entire continent of Africa. The models are simple, familiar and modest in cost.

A. Roof Catchment Models

Rainwater from roof tops can be collected in raised, ground level or underground receptacles. Ground level receptacles like small buckets, tin basins, plastic containers and metal tanks have been widely used (UNEP, 1983). In Nigeria, roofs are either corrugated galvanized metal sheets or thatch roofs. Galvanized roofs are mostly common in urban areas whereas the thatch roofs are found in the rural country-side. Roof harvesters can either be constructed in rectangular, pitched or square forms or with gable to serve as catchments.

Whatever the roof design, the following methods can be used to collect clean water from roof tops:-

(i) The Swing Funnel Method

The swinging funnel method involves a funnel which is attached to the roof to ensure separation of the first flush of rainwater from the later cleaner rains. The swinging funnel is the main collector of rainwater from the roof and could be fabricated from metals (see fig. 1).

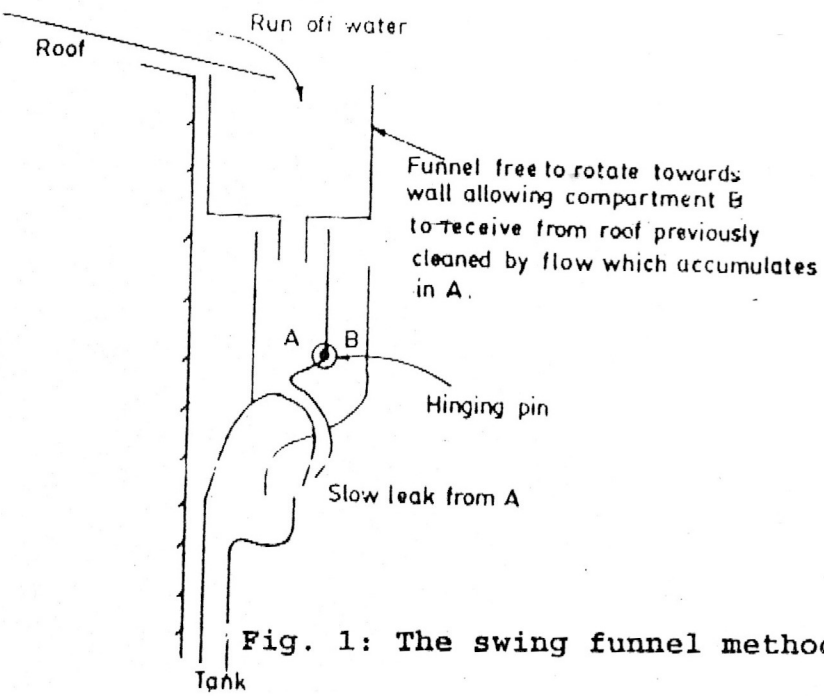

Fig. 1: The swing funnel method

order to solve the problem of size of tanks, households are advised to take the calculation of Akintola (1987) into account thus:

"A household with an average of 8 people require 400 litres of water per day. Thus for 150 days of the dry season (as is the case in most areas in Southern Nigeria), ... 60,000 litres of water will be required to last the period. A storage tank of 4m' will adequately serve this purpose".

B. GROUND CATCHMENT SYSTEMS OR MODELS

Rainwater can be harvested especially for agricultural purposes using the existing topography of the area. This method is different from the roof catchment system in that the harvester surface is the ground terrain of the area in question. So, depending on the land configuration of the area, any of the following techniques can be applied to collect water and store for especially agricultural uses.

(i) NATURAL Depressions:

Depressions such as natural lakes, valley bottoms, slopes below escarpments, cavities and other natural ground depressions can be used as micro-catchment rain water harvesting surfaces to supply water to crops, wildlife and livestock. It is a common practice in the semi-arid northern region of Nigeria. The problem associated with this method is that of evaporation, percolation and pollution.

(ii) Rock dome outcrop catchment

Granitic areas in Nigeria and the entire continent of Africa with rock outcrops or domal structures stand to benefit from this catchment method. Areas with this kind of topography, rock dome outcrop, can construct a low brick wall around the base of the outcrop and make impervious the surface of the base of the rock dome by cementing. Water running down the dome can therefore be retained and directed into storage tanks to serve agricultural or domestic uses (see Fig. 3).

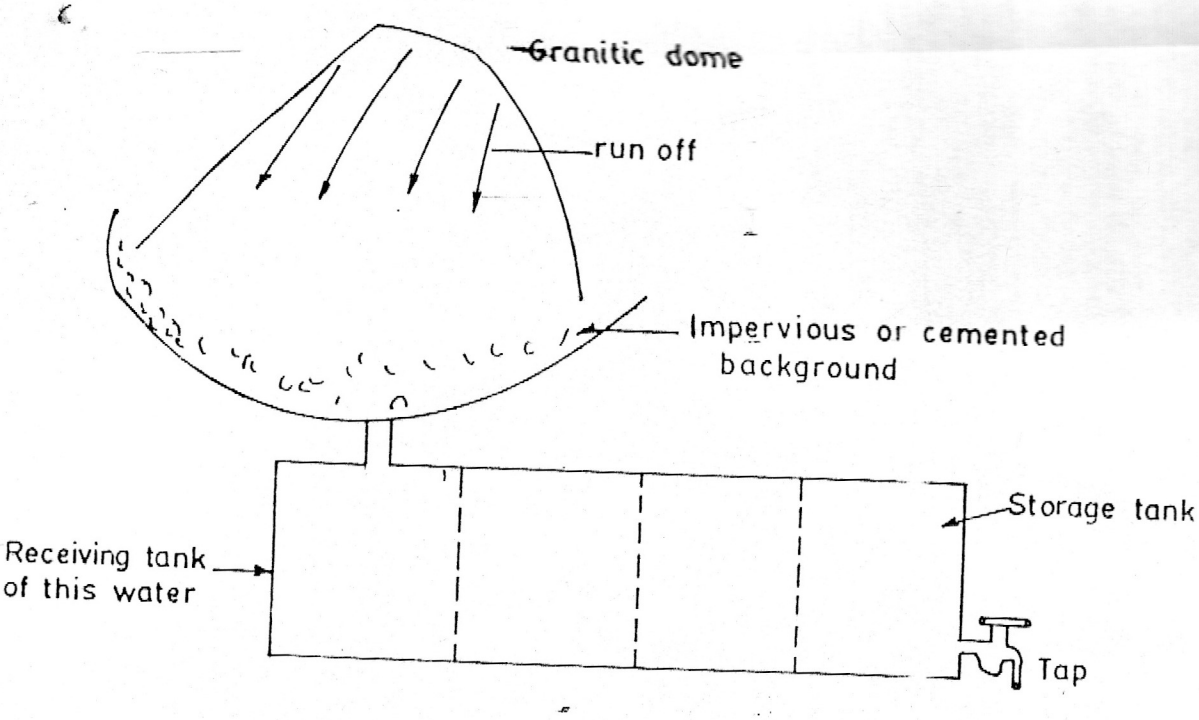

Fig. 3: Rock Dome Outcrop Catchment

(iii) Silt traps, terracing and recession pools

People who live along floodplains and gentle slopes can harvest rainwater using agricultural terraces, silt traps and recession pools to retain both water, soil and alluvium during rains for agricultural uses. The design, however, require basic information on watershed Characteristics, precipitation and stream flow.

(iv) Artificial Ground Catchments

Artificial ground catchments for storing rainwater include excavation along hill slopes, the use of paved surfaces, ponds, small earth dams and canals. The topography of the given site should determine whether or not artificial depressions along a hill slope should be constructed (See Figures 4 & 5 next page).

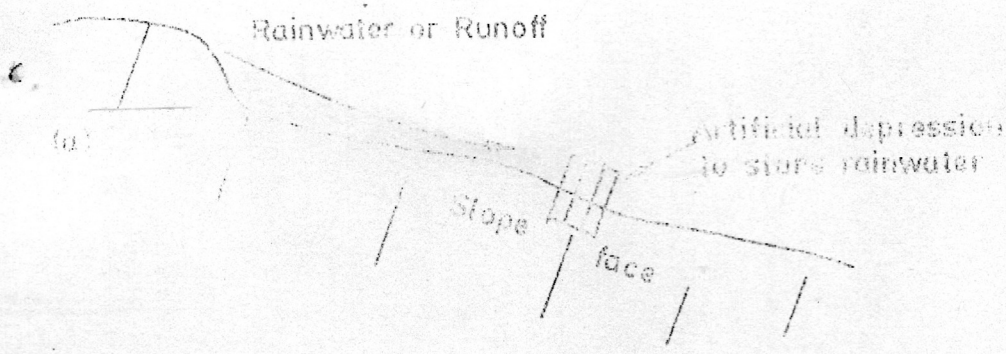

Fig 4. Natural Slope

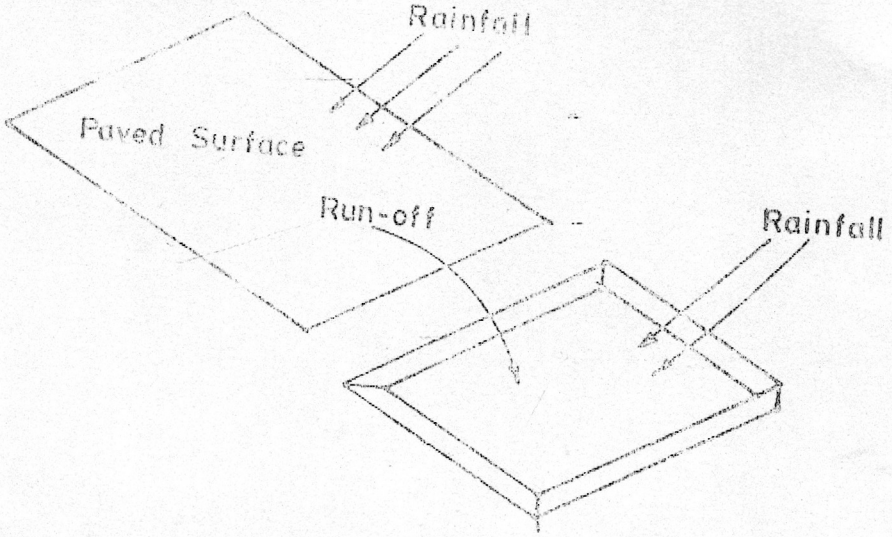

Fig 5. Paved Surface Catchment

Conclusion

Rainwater collection is a traditional habit of the people of Africa especially in the rural areas and in most urban centres. It is therefore not a strange technology as is with the case of sinking a borehole or digging a deep well. We have always been collecting rainwater using little containers, and so the quantity stored is usually small and unable to meet our water needs in times of scarcity. This paper is merely asking us to enlarge the water pot so as to receive enough rain. In other words, this is a call for optimal use of the seasonal resource of our environment which comes to

us every year. Rainwater is simple to collect since it is supplied close to the user. It happens just above one's roof and when properly covered, it can be free of pathogens.

Today most African Governments are unable to meet the water demands of their citizens due to factors which range from economic, political, social to technical constraints. The adoption of the technology of rainwater catchment is akin to self help, the best form of help, by the citizens of these countries. The collection and storage of rain water using the catchment models presented in this paper would go a long way into alleviating the water problem of most places in Africa and it is a technology that has been tried in several places and is therefore versatile, convenient, cost effective and efficient.

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