

The performance of an infiltration gallery used as a simple water treatment option for a small rural community - Goviefe-Agodome in the Volta Region, Ghana

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Abstract

An infiltration gallery was successfully installed at Goviefe-Agodome in Ghana after unsuccessful attempts at obtaining groundwater for the community. Results obtained from laboratory analysis carried out on water samples taken from the infiltration gallery showed that most of the physico-chemical characteristics of the filtered water were within the WHO (1993) guidelines and were higher than the raw water parameters. Leaching of lime and other constituents of cement used in the construction work accounted for the increase in ionic content. The bacteriological quality of the filtered water was acceptable. The pond needed protection from human contact and a simple iron removal system was installed to remove excess iron in the filtered water.

Introduction

The provision of reliable and safe water for the majority of the population living in rural areas is a major challenge for the government of Ghana (Andani, 1996). It is for this reason that the government and several NGOs have initiated many water projects for rural communities. In the Volta Region many schemes utilising surface or groundwater sources have been implemented to provide water to about 1.7 m. people. In spite of the wide water supply coverage in the region, many communities still have no access to a reliable supply of potable water because of the seasonal drying up of wells and ephemeral streams. One such community is Goviefe-Agodome (N6°42.53', E0°20.14'), which has no safe and reliable source of potable water because previous attempts to harness groundwater resources have been unsuccessful. The only source of water in the community is a pond that was created by making an earth dam across a dry stream channel. The source is considered highly unsafe for potable uses because of animal and human contact with the pond water. This situation necessitated the provision of a simple water treatment facility to improve potability. A simple infiltration gallery was therefore built to serve that purpose. This technical note highlights the performance of the infiltration gallery.

Objectives

The objectives of the study were to:

- Improve the potability of the water source for Goviefe-Agodome
- Evaluate the performance of the installed infiltration gallery.

Material and methods

Description of site

Goviefe-Agodome is a farming community with a population of about 2 500 people mostly engaged in food crop cultivation at

subsistence level and agro-forestry. Goviefe is located in the Volta Region of Ghana, 60 km south of Hohoe, the district capital. The settlement lies 1 km gradient of the source of water supply, a pond. The pond is circular in shape with a diameter of about 100 m. It is generally perennial and dries up only after long periods of drought, generally uncharacteristic of the area.

Design and operation of the facility

The inhabitants of the village constructed the facility based on the following considerations:

- Availability of raw materials
- No usage of chemicals
- No mechanical or electrical moving parts
- A system that is easy to operate and maintain and simple enough to be managed by a village community.

The facility consists of three shallow wells located in series which are 54 to 74 m away from the pond (Fig. 1). Two of the wells (pre-filter and filter wells) are square. These were charged with filter media. Sand of effective size 0.52 mm and uniformity co-efficient of 2.308 was used as filter medium. The sand was readily available, easy to clean and could be used without screening. The third well (filtered water collection well) is circular with a diameter of 1.4 m. This size was chosen to allow free movement during the construction of the well and also to create additional space for storage, since water demand is high in the mornings.

To ensure the use of locally available materials, sandcrete blocks joined together by cement-sand-water mix (mortar) were used as a lining to protect the walls of the wells. Four-inch PVC pipes were used as conduits to carry raw water from the pond through the filter system into the collection and storage well. Ordinary portland cement was used to prepare mortar for joining and cementing of the sandcrete blocks. Details of construction as well as the material schedule are described in Asare (1996). A hand-pump was mounted on the collection well to draw filtered water. Due to long retention time in the pond most of the suspended particles settle in the pond before reaching the filters. The filters can be operated for long periods before clogging takes place. For

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