

GROUNDWATER EXPLORATION AND DEVELOPMENT IN THE
VATTULUKKI TRIBAL FARM IN ATTAPPADY

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ABSTRACT

The Vattulukki Tribal Farm is located within the drought prone Attappady Valley in Palghat District. Successful exploitation of groundwater is the key to any developmental programme in the farm. This paper is concerned with aspects related to identification of a potential bore well site within the farm through geophysical surveys, drilling of the bore well and estimation of sustained well discharge and pump setting details through aquifer performance tests. The bore well was found to safely yield about 70,000 litres per day. This developed water source is being presently used for mulberry cultivation and country brick manufacturing which benefits about 50 tribal families who have been settled in the farm.

INTRODUCTION

The Groundwater Division of CWRDM is currently engaged in implementing a research project on the hydrological environment of tribals in the Attappady and South Wynad regions of Kerala. This research project is being implemented with grants from the Planning and Economic Affairs Department, Government of Kerala under the Western Ghats Development Programme. One of the main objectives of the research project is to take up pilot groundwater development activities in these backward areas and thereby demonstrate the viability of such developmental works for achieving economic prosperity. This paper is concerned with one such developmental activity

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which was taken up in the farm area of Vattulukki Tribal Farming Society in Attappady.

The Vattulukki Tribal Farming Society in Attappady is located within Sholayur Panchayat of Mannarghat Taluk in Palghat District of Kerala State. This society started functioning in 1980 in a 500 hectare farm. The objective was to settle about 100 tribal families within the farm and have them engaged in different income generating activities like country brick manufacturing, mulbery cultivation etc. However for several years nothing could be achieved because of lack of properly identified and developed water source. This area forms part of the rain-shadow region of Palghat District in Kerala. Consequently appropriate exploitation of groundwater could be the only key factor for the success of the farming society. Earlier attempts by the farm authorities to develop groundwater met with failures because these attempts were not backed by adequate Science and Technology inputs. The Groundwater Division of CWRDM carried out detailed geophysical surveys in the area, identified a suitable bore well site based on analysis of the data from those surveys, undertook the drilling of the bore well at the identified site, carried out long duration aquifer performance tests, analysed the test data to arrive at estimates of expected sustained discharge from the bore well and made recommendations for installation of a submersible pump in the bore well. All these aspects of the study are presented in the following sections.

GENERAL FEATURES OF THE STUDY AREA

Location and Physiography

The Vattulukki Farm in Attappady covers a total land area of about 500 hectares. It forms part of the Attappady Valley of Palghat District in Northern Kerala. The location map of the farm is given in Figure 1. The farm area forms part of the typical highland region of Kerala. The ground elevations in the farm ranges between 500 and 900 metres above the mean sea level. The area exhibits an undulating topography with upper and lower denudation hills and valley fills.

Hydrogeology

Hornblende Gneiss of Pre-cambrian age is the major rock type seen in the area. Exposures of Pyroxenite is also seen on the Southern side of the area. Quartz veins are also seen exposed in all parts of the area. A basic dyke exposure can be seen trending along the NE - SW direction in the South-eastern corner of the area. The gneissic rocks are found weathered and fractured. The thickness of the weathered rock

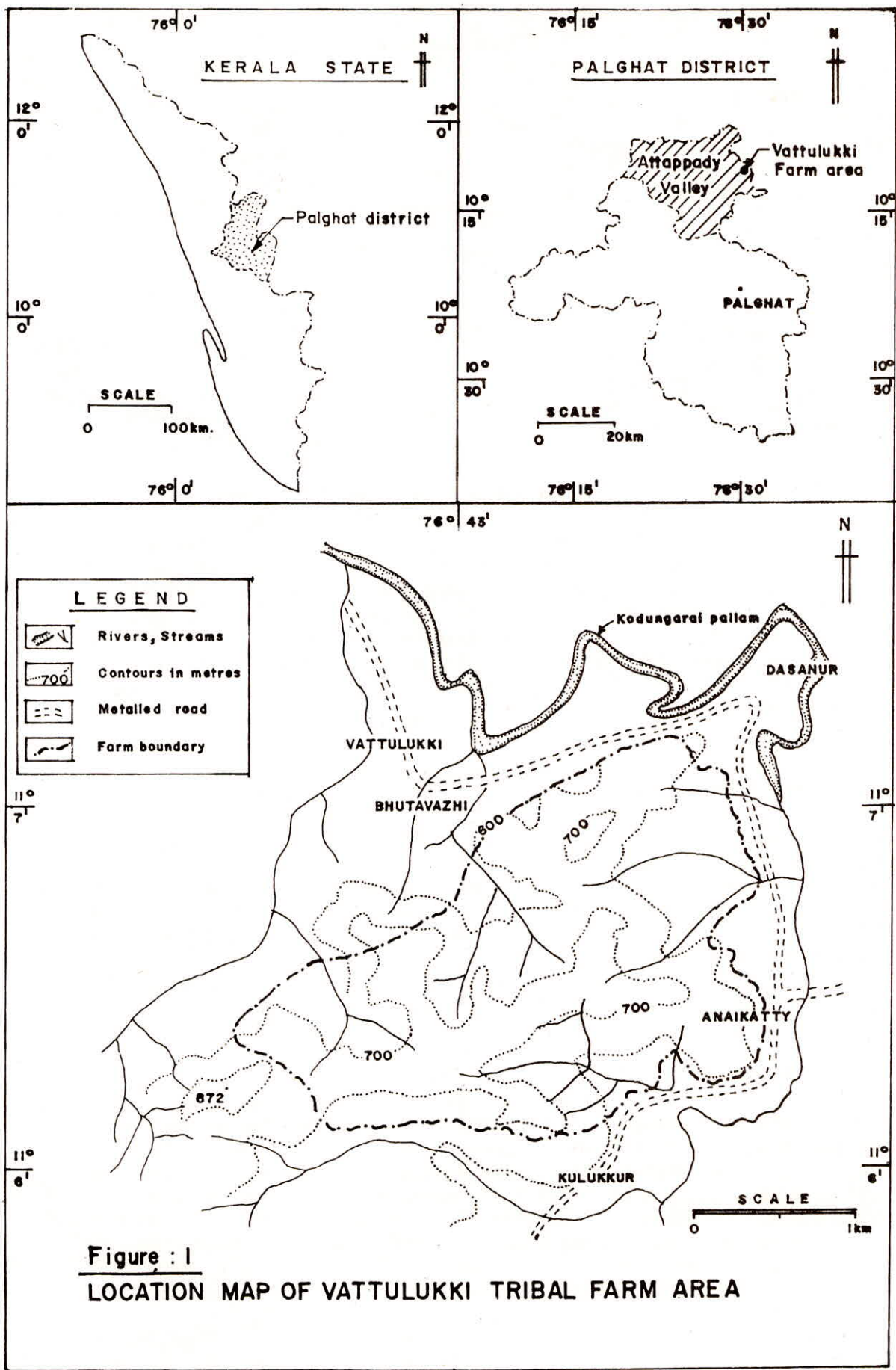


Figure : 1
LOCATION MAP OF VATTULUKKI TRIBAL FARM AREA

as inferred from the dug wells in and around the area range between 3 and 15 metres below ground level.

Groundwater occurs in the weathered and fractured rock formations under water table conditions in the area. The hand dug wells in and around the area have diameters between 3 and 6 metres. Some of these wells are also rectangular with typical sizes of 3 metres x 6 metres. Most of the hand dug wells go dry during summer.

GEOPHYSICAL INVESTIGATIONS

These investigations were aimed at identifying fractured or structurally controlled weaker zones within the farm area and to locate an ideal site for a bore well within that zone. The Terrameter SAS 300 was used for the geophysical surveys and Schlumberger electrode configuration was used.

A number of profiles were carried out along parallel alignments in the N-S direction which were separated from each other by about 50 metres. The total length of each alignment was about 300 metres. The station interval along each alignment was 10 metres. For each station 3 different current electrode separations were used by keeping half of the current electrode distance as 10, 20 and 40 metres. Two readings were taken for each current electrode separation at all stations by keeping half of the potential electrode distances as 2 and 4 metres.

A typical plot of the profiling data for one of the alignments is shown in Figure 2. Similar plots along all the alignments were used to identify an expected fractured or structurally controlled weaker zone. A site where the profile plots showed marked low apparent resistivity values was chosen as the site where a bore well could be drilled. A vertical electrical sounding was carried out at this site. The VES data and the interpreted geoelectric section are given in Figure 3.

BORE HOLE DRILLING AND ESTIMATION OF WELL YIELD

A 6 inch (152.4 mm) diameter bore well was drilled at the identified site to a depth of 51.68 metres. A down the hole hammer rig was used for the drilling. The top 12 metres of the bore well was cased with a blind casing pipe. A plot of the drill time data and a schematic representation of the litholog at the bore well site as inferred from the drill cuttings are shown in Figure 4. The bore well was developed till the water was clear and free of the rock cuttings.

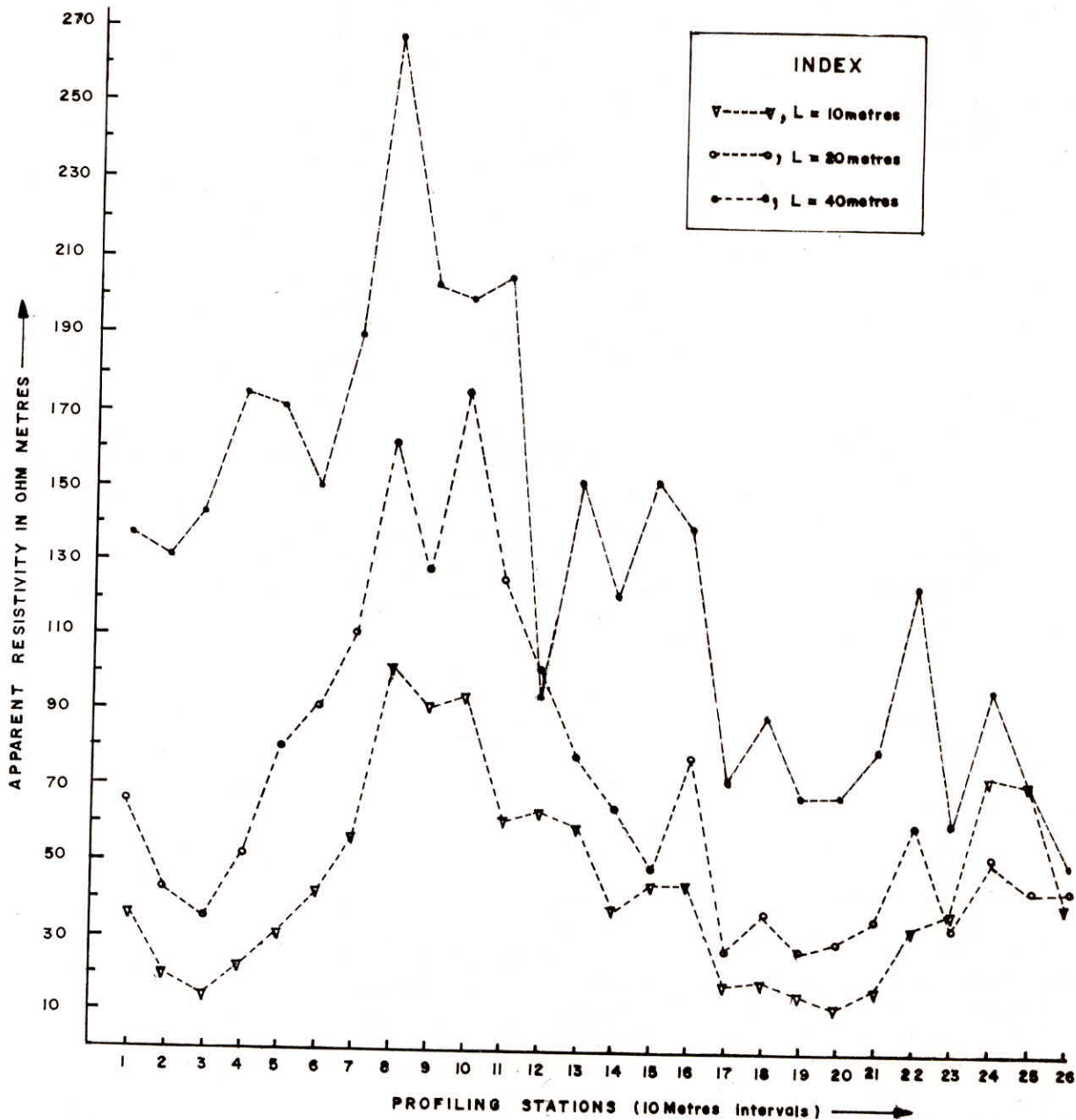


Figure : 2

PROFILING DATA OBTAINED ALONG A TYPICAL ALIGNMENT AT VATTULUKKI

A 7.5 HP submersible pump was lowered in the bore well. The pump setting was at 45.75 metres below ground level. The response of the bore well to different discharges were tested. It was noticed that at discharges more than about 150 litres per minute the drawdown in the well drastically falls within a very short period and sustained yield cannot be maintained. A long duration aquifer performance test was conducted in the

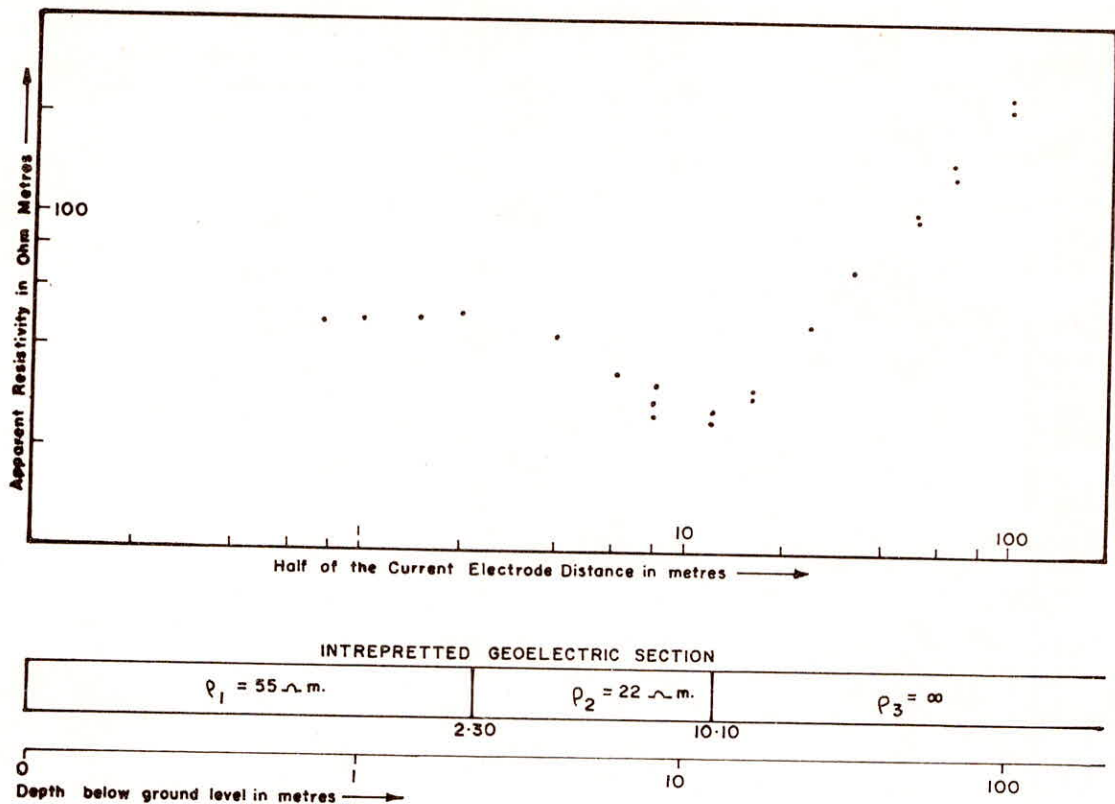


Figure: 3
VERTICAL ELECTRICAL SOUNDING DATA AND INTERPRETTED GEOELECTRIC SECTION AT VATTULUKKI

bore well keeping the discharge as 120 litres per minute. The total duration of the test was 24 hours. Near steady state was reached at the end of the pumping phase. At that stage the drawdown within the bore well was 16.39 metres. Nearly 90% recovery was found to be there within about 100 minutes after the pump was stopped. The analysis of the test data through applications of conventional type curve techniques was found to give the transmissibility of the aquifer formation tapped by the bore well as about $4 \text{ m}^2/\text{day}$.

Based on the above information it can be concluded that the bore well can be safely pumped at a discharge of about 100 litres per minute. The expected maximum drawdown for this discharge can be about 16 metres. The static water level in the well is about 10 metres below ground level. Hence it can be concluded that the submersible pump in the bore well should be set atleast 30 metres below ground level. In order to be on the safe side the pump can be set at a depth of 40 metres below ground level. The bore well can be pumped for about

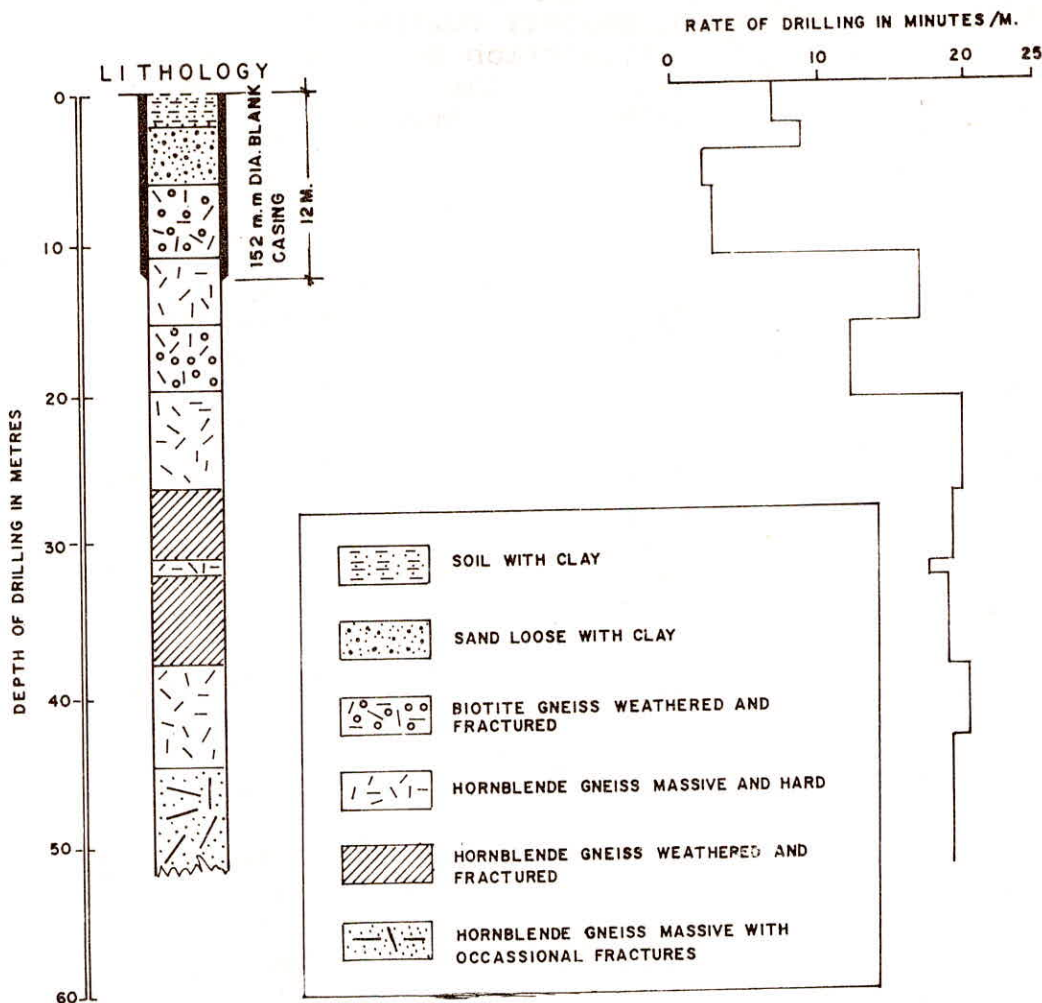


Figure. 4:

DRILL TIME DATA AND LITHOLOG AT BORE WELL SITE

12 to 15 hours each day. Hence the bore well can safely yield about 70,000 litres per day.

CONCLUSIONS

A bore well source was developed in the Vattulukki Farm in Attappady through applications of systematic geophysical and hydrogeological techniques of groundwater exploration. The bore well is capable of discharging about 70,000 litres per day. The recommendations of installing a submersible pump capable of discharging about 100 litres per minutes has since been implemented by the farm authorities and the bore well is presently utilized regularly. About 50 tribal families have been now settled in the farm. The developed water source has now helped these tribals

to be engaged in various income generating activities like country brick manufacturing, mulbery cultivation etc. Similar investigations for exploration and development of groundwater are being planned to be taken up in other difficult terrains having tribal settlements.

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