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RAINWATER HARVESTING: AN IMPORTANT TECHNIQUE FOR SUSTAINABLE MANAGEMENT OF WATER. A CASE STUDY OF USGAON PONDA, GOA.

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Abstract

Now-a-days, the transformation in lifestyle of human beings has naturally increased the pressure on the groundwater and the water system. This leads to the deteriorating quality and quantity of water. Thus, there is an urgent need for the conservation of water resources. In the present study, rain water harvesting techniques have been successfully implemented.

Keywords*:* Rainwater harvesting, recharge pit, recharge shaft, Goa.

Introduction

Water is an essential and significant component of all life forms that exist on the surface of Earth. It is the most abundant and widely distributed substance on the planet (Shiklomanov 1998). The study of water resources has been done since the ancient Vedic era (Gurjar and Jat 2008; Nag 2006).

Hydrological cycle is the continuous process of exchange of water from the Earth's surface to the atmosphere and back to the Earth surface. In fact, it is a water transfer cycle, which is continuously occurring in the nature and has three important phases: evaporation, precipitation and runoff (Raghunath 2006). The hydrological cycle is the source of all forms of precipitation which is received by the Earth's surface.

In the contemporary period, the qualitative and quantitative deterioration of water resources is evident. Due to the transformation in the land use pattern, increase in the impervious surfaces and urbanization, the proportion of evaporation, precipitation and runoff has changed. Because of the high standard of living, the demand for the fresh water has increased and intensified the pressure on the underground water resources. Such circumstances have prompted us to conserve the water for the future use.

Rainwater harvesting and conservation is the scientific activity or technique related to the direct collection of rainwater and storing it for future use to meet the demand of human consumption. Water harvesting includes the capture, diversion and storage of rainwater for plant irrigation and various uses (Waterfall 2006). The collected rainwater can be stored for the direct use or can be used for recharging the groundwater. It involves collection, first flush (for eliminating first few showers), storage, filtration (for direct reuse / recharge) and reuse now or later (store after disinfection). Rain water can be harvested for immediate use or for future use. India relies largely on the south-western monsoon for water (Nag 2006). Based on the above discussion and the latest trends by Central Ground Water Board and Centre of Science and Environment have impressed importance of rainwater harvesting throughout India.

Study Area

The study area is MRF tyre company plant which lies in the Ponda Taluka of North Goa District. The coordinates of the area is $15^0$25'05.03"N Latitudes and 74^0 04'27.96"E Longitude. The area receives abundant annual rainfall of about 4000mm per year (Department of Water Resource – Government of Goa). According to Koppen's classification of Indian climate, the climate falls under Tropical Monsoon type with short dry winter season and evergreen rain forests (Husain 2008). Laterites and lateritic soils with variable thickness are found from high plateau of Sahyadri to the low coastal plains (Wagle1993).

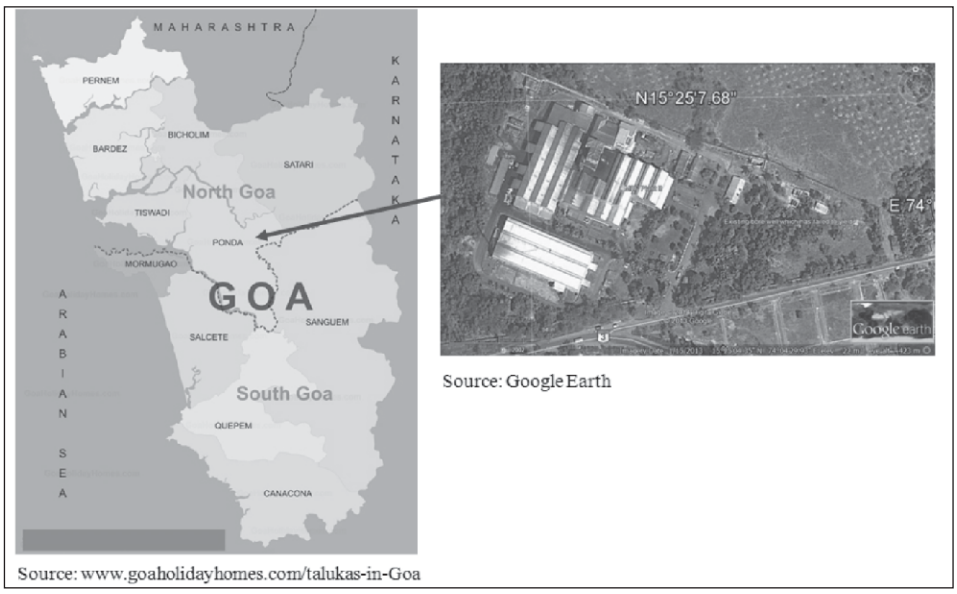

Fig. 1. Location of the Study area

The area is covered with hard laterite having a soil cover of about 30 cm. The laterite is devoid of any cracks and joints, as a result most of the water escapes as run-off. There are two aquifer systems in this area, they are:

1. Shallow, unconfined aquifer in hard laterite which may not be yielding good quantity of water due to topographical set up of the area.
2. Deeper aquifer may be occurring below 30 meters either jointed quartz schist or gravel beds.

Aim and Objectives of the Present study

- Introducing rain water harvesting and ground water development at MRF Plant II.
- To introduce rain water harvesting system and attain self sufficiency of water at MRF plant II in the long run.

- Enhancing the surface water management and to achieve ground water development by artificial recharge through the means of specially designed recharge shaft, recharge bores and recharge pits.

Methodology

The study area was surveyed and inspected for collecting the primary data. Resistivity studies were used as a tool for the calculation and verification of the different runoff coefficients. The premises have huge rain water potential as well as demand for water. Therefore, depending on the water demand, two recharge pits were constructed. During the monsoon, recharge test pits were

observed. Also a recharge shaft was made to enable water flowing from forest land.

Results and Discussion

Before commencing the project, it was decided to study the underlying strata. The Resistivity study was undertaken and interpretations were done by a team of hydro-geologists.

Depth in metres	Anticipated Strata	Remark
0 to 1 m	Top soil	-------
1.0 to 6.0 m	Hard laterite	-------
6.0 to 10.0 m	Moderately hard laterite	-------
10.0 to 36 m	Silt soil and soft laterite	-------
36.0 to 100 m	Could bequartzChlorite Schist with fracture at 36 to 50 m & 60 to 90 m	Bore Well Water Zone

Table 1. Predictions given by the Hydrogeologist using Resistivity Studies

According to the predictions given by the Hydrogeologists, the drilling of borewell was carried out. However, during the first borewell drilling, the underlying strata exhibited clay deposits beyond 60 metres. As the drilling activity did not yield any result of the underlying strata, it was abandoned. This resulted in the change of design. One major recharge pit with recharge bore-hole and second recharge pit was planned to construct. The abandoned borewell was used as a recharge point for the second recharge pit. Also, a recharge shaft was constructed to use the water entering from the forest land.

Fig. 2. Final Photo of Recharge Pit with water regulators for existing drain

Detailed studies were carried out before the implementation of the project. During the last monsoon season, the recharge behavior of one structure (recharge pit) was observed. The detail of

the observed area is as follows:

Sr. No	Area type	Area (sq. m)	Annual RWH Potential (cubic meters)= area X roc(runoff coefficient)X4m(annual rainfall)
1	Forest land	2,67,000 approx.	3,20,400(roc=0.30)
2	Major roof tops	12,290	41,786(roc=0.85)
3	Pa ved area	4,100	10,660(roc=0.65)
4	Open area	65560	78,672(roc=0.30)
	TOTAL	**3,48,950**	**4,51518m3/year**

Table 2. The annual Rainwater Harvesting potential according to the area types.

The Rainwater holding and desilting volume capacity of Recharge pit-1 is about 7500 litres and also, the recharge volume capacity is about 6000 litres. The finding while constructing Recharge pit-1 structure to divert existing storm water was as expected. The diameter of borehole is 12 inches and it recharges shallow aquifer.

After considering all the findings and behaviour of existing Recharge pit, the annual rainwater harvesting potential of the forest land was calculated, which is 320,400 cu m. Hence, a single large massive structure (Recharge Shaft) was planned to construct. During the monsoon season, this structure will manage the surface water runoff, if required the reuse of the stored water and will avoid water logging in the area

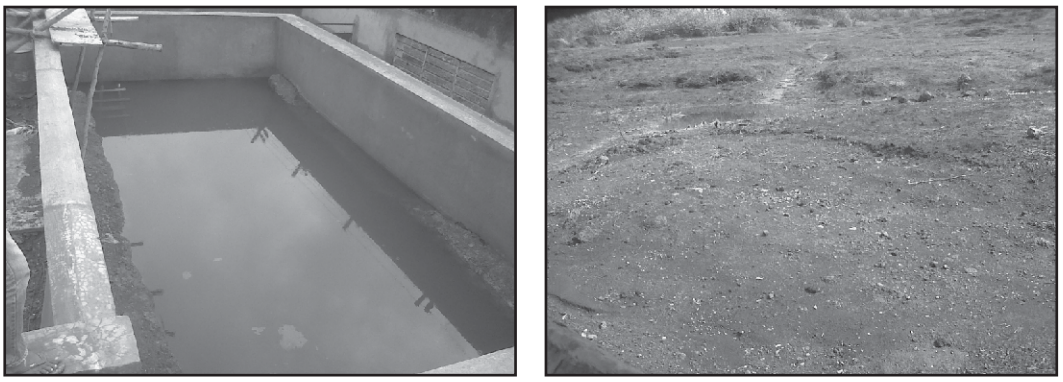

Fig. 3. Recharge Shaft(Left) and its rainfall catchment area.

The recharge shaft had the capacity to hold over 275 cu m of surface rain water. The desilting chamber and filtration chamber were provided before allowing surface rain into the recharge shaft. The drains are provided with water regulators to divert the water after eliminating first few showers of first rain. It not only helped in preventing water logging but also started yielding water till March end or even mid of April. The quantity was almost 50 to 80 Kilo litres per day.

Conclusion

In the study area, not only that the rainfall is abundant but ground water (shallow and well as deeper aquifers) is still abundant and unpolluted in many areas. But due to the increasing imbalanced industrialization and urbanization, water resources are slowly deteriorating. The solution for this problem is the intelligent management of rainfall, which can be carried out with the help of Rainwater harvesting techniques. These techniques not only reduce the pressure on the local aquifers and municipal water systems but also increase the independence of water users by increasing the water table. It is also important that rainwater harvesting structures should withstand water pressures, last for longer periods, ensure safety to structures and surrounding living beings. The project was therefore successful in many ways and it also helped us understand the need of proper exploration of the area and the performance analysis of ground water recharge.

Acknowledgement

We sincerely acknowledge MRF Ltd, Usgaon, Ponda, Goa and the team of Lila Digital and Environmental Solutions Pvt Ltd - Panaji, Goa for allowing us to use the data, photo, inferences and information for the project which was successfully implemented by them.

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COMPARATIVE STUDY BETWEEN CONSUMER SELLING OF PROVISION STORES IN AUND AND SANGAMWADI, PUNE

Maya Unde Manisha Pawar

Abstract

Grocery market caters for our daily needs. It Includes edibles required for daily diet both in raw and finished forms. The provision store depends upon consumer demands, population, urbanzition, human Angle, economic conditions and changing life style etc. Provision store were converted into super markets selling other items like dairy product, bekery product, fruit and vegetables ready made foods etc. There has been transformation of provision stores in super market to ,malls.

key words: Changing life style, population, economical condition changes in the grocery store.

पुणे शहरातील औध व संगमवाडी प्रभागातील किराणा दुकानातील वस्तु विक्रीतील बदलांचा तुलनात्मक अभ्यास

प्रस्तावना :

मानवी भूगोलाची आर्थिक भूगोल ही एक उपशाखा आहे. पृथ्वीवरील मानवी सभोवतालचा परिसर पर्यावरण आणि व्यवसाय यांचा विचारपूर्वक अभ्यास आर्थिक भूगोलात केला जातो. कोणत्याही प्रदेशाचा क्षेत्राचा आर्थिक विकास हा प्रामुख्याने त्या त्या क्षेत्रातील व्यापाराच्या स्वरूपावर अवलंबून असतो. व्यापार हा मानवाचा तृतीय श्रेणीचा व्यवसाय आहे. व्यापार म्हणजे वस्तुची खरेदी व विक्री करणे होय. वस्तुची खरेदी व विक्री ही बाजारपेठेत चालते.

किराणा बाजारपेठ ही एक मानवाच्या दैनंदिन जीवनातील आवश्यक खादयपदार्थ पुरवणारी बाजारपेठ आहे. किराणा बाजारपेठेत मानवाच्या आहारात आवश्यक असणारे खादय पदार्थ कच्च्या व पक्या मालाच्या स्वरूपात आढळतात. प्रादेशिक विविधतेनुसार या मध्ये विविधता आढळते. ग्रामीण व शहरी बाजारपेठेत मागणीनुसार किराणा मालाचा पुरवठा केला जातो. ग्रामीण भागातील किराणा दुकानात फक्त जनरल वस्तु मिळतात. परंतु शहरातील किराणा दुकानात जनरल किराणा व्यतिरिक्त दुग्धजन्य व बेकरीतील पदार्थ तयार पदार्थ उपलब्ध असतात. विक्रेय वस्तुनुसार दुकानांमध्ये विविधता आढळते.

१. किरकोळ विक्री (Retail Shops) : या दुकानामध्ये किरकोळ वस्तुंची विक्री केली जाते.

२. घाऊक विक्री (Whole Sale Shops): या दुकानामध्ये किरकोळ वस्तुंची विक्री करणाऱ्या दुकानांना व ग्राहकांना होलसेल किंवा कमी दरात किराणा मालाचा पुरवठा केला जातो.

३. मोठा बाजार (Super Markets): या दुकानाचा किरकोळ वस्तुंच्या विक्रीबरोबर प्रक्रिया केलेले इतर तयार खादय पदार्थ उपलब्ध असतात. एकाच ठिकाणी सर्व खादयपदार्थ कच्चा व पक्क्या स्वरूपात उपलब्ध असतात अशा प्रकारची विविध वस्तुंचा पुरवठा करणारी वेगवेगळ्या प्रकारची दुकाने बाजारपेठेत आढळतात. तसेच वस्तु खरेदी करणारे ग्राहकही बाजारपेठेत असतात. त्या वस्तु खरेदीनुसार वस्तु विक्री रचनेत बदल होतात.