

## THE INFLUENCE OF RAINFALL ON GROUND WATER QUANTITY AND ITS CHANGES: A STUDY IN SELECTED AREAS OF PORATIVUPATTU DS DIVISION IN BATTICALOA

**S. Mathanraj and MIM. Kaleel**

Department of Geography,  
South Eastern University of Sri Lanka, Sri Lanka.  
smathan02@gmail.com, kaleelmim@yahoo.com

### ABSTRACT

Groundwater is an essential natural resource for sustaining domestic life and environment. Rapid development of agriculture, economy and increase of population growth due to the resettlement of past war recovery were caused to the water quantity. Moreover, due to uneven distribution of rainfall in both time and the space, water resources are dwindling. The study is undertaken to identifying the seasonal changes ground water especially the drinking water. Through this, the changes of water level, influence of rainfall were examined with appropriate data. Rainfall data of 146 years from the meteorological department, the formula and 5, 11 years standard deviation of moving average were used to analyze the groundwater quantity. Meteorological department's reports, images were utilized for this study, published reports and statistical records were employed to collect as secondary data. MS Excel, GIS software were used for data analysis. Seventy domestic wells were randomly selected for the study. The different measurement tools were used to measure the well water level. The water level was measured in equal six times in one year. The results confirm that the positive and higher value of groundwater by the rainfall during Northeast monsoon period. This established with deviation of rainfall and the measured well water level. Thus, keeping the balance of tank water level, surface runoff and groundwater level, the performance of the water level could be stabilized. The development of the new tanks, its irrigation system and drinking water supply also reduce the water shortages in the study area. Temporary water retaining structures should be constructed to facilitate the infiltration. Further, rainfall water should be saved for future use. Controlling the intensive use of water pumps for drainage and making the farmers aware about the water wastage and pollution is also important for the water stability.

**Keywords:** Domestic, Runoff, Agriculture, Monsoon, Irrigation.

### INTRODUCTION

Groundwater defined as the water beneath the earth's surface, often between the saturated soil and rock that supplies wells and springs. Many factors are determined the ground water level and nature as topographic, geology, climate conditions, natural vegetation and an important feature is rock.

The demand of water has gradually increased more than past century because of the trends of the global population. Intense agricultural activities, industrial activities and domestic uses are caused to the over consumption of groundwater. When there is not enough potable water for a given population the threat of water problem is realized (Panabokke, 2007).

However, the study areas' physical features and climate conditions are indicating the dry zone characteristics. While water protection and conservation differ from country to country, in these area is taken the most suitable.

## STUDY AREA

The District of Batticaloa itself consists of several administrative divisions, of these; Porativupattu Divisional Secretariat division has been located in Southwest part of Batticaloa district. It has an extent of 180 sq. m. It consists of 43 Grama Niladhari divisions and 136 villages. Its population is 47,180 and consists of 12,883 families. 22,902 males and 24,278 female live it (Divisional Secretariat Porativupattu, 2014).



## OBJECTIVES

- Identifying the seasonal changes of ground water table by the domestic wells in Porativupattu
- Improve the ground water quantity for domestic usage through the changes of ground water table
- To formulate the solution for the high wastages of domestic water for future generation

## METHODS AND MATERIALS

### Primary Data

The sampling of 70 households has been randomly selected for the study from 7 GN Divisions, as well as questionnaire survey has been done for 70 households. These 140 households' data were used to the study.

Further, the water level for June, August, October, December in 2014 and February and April have been measured in a particular order, of these, the water level measured in the end of these months to identify the changes of ground water quantity. Monthly and annual rainfall changes and the trends of vapour and vaporization were calculated on the research that depending on rainfall

Different equipment has been used to measure the water level of each well. They are measuring tape, bell, rope and cone shape tool by aluminum. Hereby, well depth, well water level, sea level elevation and the changes of season-to-season have been observed.

### Secondary Data

Rainfall and temperature data from Department of Meteorology, census report of Sri Lanka, Reports and Documents from Porativupattu Divisional Secretariat, published researches, maps and collections from the web were secondary data of the survey.

### Data Analysis

The water level measurement tool were used to measure the water level of selected wells and observed the seasonal changes that used the formula is  $W = (B+G) - L$ .

W – Water level from sea level  
L – Water level from well top  
B – Well height from surface  
G – Elevation of particular area.

The groundwater levels of June 2014 were filed in the end of month and, depth of wells, water level and sea level elevation were considered on the measurement, as same as, August, October, December 2014 and February, April 2015 water level were measured. The average consumption of drinking water was calculated from 70 users. To examine the ground water changes due to the trend of rainfall variation for the period of 146 years, obtained from meteorological department were analyzed using

the moving average and average deviation techniques. MS Excel, SPSS, GIS software were used for the study.

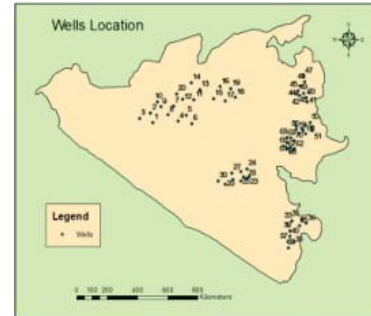
## RESULT AND RECOMMENDATION

Water is the most precious resource for the human beings. Since the earliest times, water from beneath the ground or groundwater, has been exploited for domestic use, livestock and irrigated agriculture.

### Well types and its distribution in Porativupattu

There were two types of wells identified during the visit, seasonal wells and permanent wells. Surface water has been decreasing due to the dry season at the same time water demand is increasing to meet the needs of people.

The resulting loss of ground water has high level by the vaporization of the study area that is in July and August of the year. Around 85% of wells are seasonal wells, whatever, 15% of wells are permanent wells. The 67% of study area's people are suffering to get the fresh water during the dry season.



### Water level changes in selected areas of Porativupattu

Groundwater occurs in many different geological formations. The volume of water contained in the rock depends on the percentage of these openings or pores or voids in a given volume of the rock, which is termed the porosity of the rock.

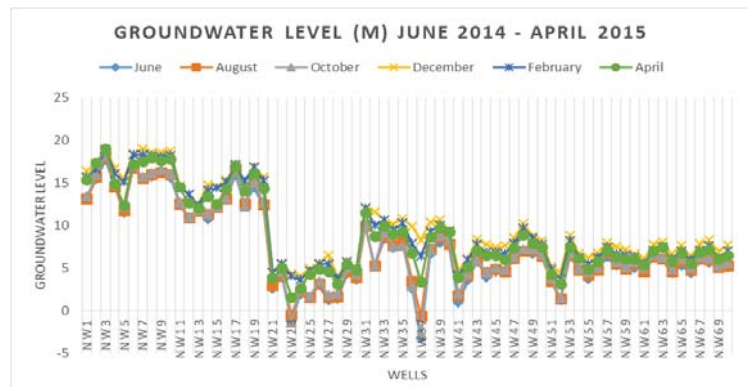


Chart 1: Groundwater Level 2014 -2015

The chart 1 illustrates the water level changes in between the selected wells. The water level is high from sea level in NW1 to NW20 wells' area and it is average in NW21 to NW30 wells and NW41 to NW50 wells. When compare with June's, August's and October's water level, the water level of February is massively increased and compare with December's water level this has a little bit decreased. The water level was totally varied when compare with past months. We can see the trend of the water level, NW3, NW7 to NW11, NW14 to NW17, NW31, NW33, NW34, NW39, NW40, NW47, NW48, NW53, NW57 to NW60, NW62, NW64 to NW70 numbred wells are high level of water and the other wells have average level of water. If we see this, each area has not contained the equal water level. We can see the wells NW20 – NW40, NW60 – NW70 has almost balanced the water level.

### Temperature and Rainfall

Sri Lanka has two main climatic seasons, wet zone and dry zone, of these, the study area has been in the dry zone. The annual average temperature of study area is 28.3°C that changes due to the seasons.

The trends of rainfall deviates in this area, in past, 2011 had being 298.4mm as a high average rainfall of the years and 1968 had being 72.1mm as a low average rainfall of the years (Department of meteorology, 2015).

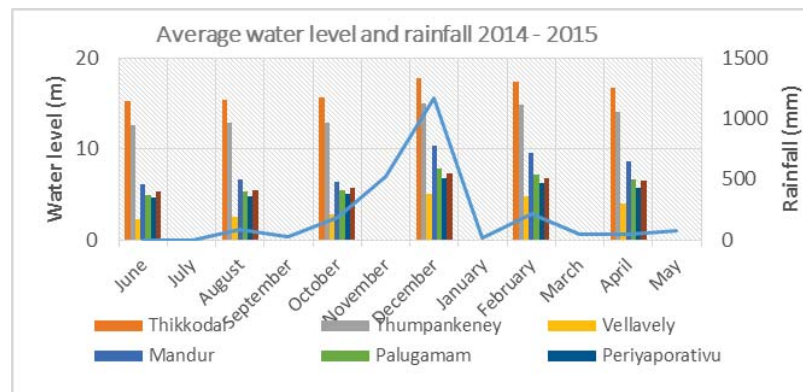


Chart 2: Average water and rainfall 2014 – 2015

According to the chart 2, the average amounts of water level were observed in June, August and October 2014. The main reason for this, very less mm rainfall were recorded in June (0mm), August (82.7mm), October (184.1mm), 2014 and April (43.7mm), 2015. Very high rainfall was registered in December (1,164.2mm) 2014 and the average rainfall 217.7mm got in February. The water level is also very high in this period. Nevertheless, June, August, October, and April were got the very low rainfall but seem the water level was above the rainfall. The possibility of this, the irrigation got the major role to produce the water. Otherwise, there were no another source for the water.

In order to solve the problems, the following recommendations are suggested from the research.

The ways to eliminate the water shortages are; to educate to change consumption and lifestyles, to recycle wastewater, to control the over chemical usages, to improve the traditional agricultural practices, to improve irrigation system, to improve the better sanitation facilities, to recharge of the ground water from rainfall, to develop efficient desalination vegetation, to develop the drainage and water supply, to improve mangrove replantation and conservation and control the water pollution through legislations and awareness programs.

## CONCLUSION

Ground water is the most precious resource for human beings all over the world. The water level fluctuates in every areas of Sri Lanka. This is depending on the bedrock and soil.

The selected 70 wells in Porativupattu were the most suitable, that was selected in different locations and the each wells contained different water level. The ground water level is very high level in the rainy season as well November, December and January but it is also a little high in October and February but, in other season, the water shortage occurred in the study area. Thus, public participation and the proper management activities by government for water conservation will reduce the water shortage in the study area.

## REFERENCES

- Effects of Human Activities on The Interaction of Ground Water and Surface Water [Online]. Available from: <http://pubs.usgs.gov>. [Accessed: 17<sup>th</sup> February 2015]
- Facts About Global Groundwater Usage (2015), National ground water association, Available from: <http://www.ngwa.org/Fundamentals/use/Documents/global-groundwater-use-fact-sheet.pdf>. [Accessed: 21<sup>st</sup> March 2015]
- Karen G. Villholth. (2007) Senior Researcher – *Groundwater Management*, IWMI, Pretoria, South Africa. PP. 67-80
- Palitha Manchanayake & Madduma Bandara, C.M. (1997) *Water resource of Sri Lanka*. National Science Foundation of Sri Lanka, Colombo-07. P. 34.
- Panabokke, C.R. (2007) *Ground water conditions in Sri Lanka*. National Science Foundation of Sri Lanka. Colombo-07. PP. 30-40
- Ranjith Premalal De Silva. (2004) *Water resources research in Sri Lanka*. Symposium Proceeding of The Water Professionals' Day 2004, University of Peradeniya.