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A study on groundwater recharge and fluctuation of Kalluamarri village in Madakasira mandal of Andhra Pradesh

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■ **ABSTRACT :** Pennar is an important river of Ananthapuram district where 80 per cent of the district is drained by the river. Ground water levels were monitored from a network of 71 observation wells four times in a year. The depth to water level during pre-monsoon (2005) range from 2.53 to 19.67 m below ground water level. Less fluctuation is observed in the areas where the water levels were comparatively shallow during pre-monsoon and where the slope is less. Generally in kalluamarri village September, October, November are the months where in the ground water levels are increasing. Similarly during the months from January to May there is no recharge of ground water.

■ **KEY WORDS :** Pennar, Ground water, Kalluamarri, Fluctuation, River

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Pennar and some parts of Krishna basins are drained in this district, mainly Pennar river enters the southern part of the district from Karnataka state near chavlum village near Hindupur town and Vedavati river drains predominantly in the western part of district, which is a tributary to Tungabhadra. Pennar and its tributaries like Chitravati, Papagni, Maddileru, Tadakaluru, Maravanka and nearly, 80 per cent of the district is drained by the river. Ananthapuram district is divided into 90 minor basins. The chief sources of irrigation in the district are tanks, wells and canals. The major irrigation project in the district is Tungabhadra high level canal project stage- I and II with an ayacut of 51,771 ha and 6 medium irrigation projects. Apart from irrigation projects, there are 5353 irrigation tanks and about 87,000 wells. The gross irrigated area is 1,54,000 ha and the net irrigated area is 1,25,000 ha in the district. Out of net area irrigated area of 31 per cent is from surface water irrigation and 69 percentis from ground water irrigation.

Depth to water level :

Ground water levels were monitored from a network of 71 observation wells four times in a year. These observation wells, tapping the phreatic aquifer, include dug wells and shallow bore wells. The State Ground Water Department has also established 144 observation wells and 70 piezometers with 61 automatic water level recorders. The depth to water level during pre-monsoon (2005) range from 2.53 to 19.67 m below ground water level. The shallow water levels of <5 m are observed in Northern and South Eastern part of the area. The depths to water levels between 5-10 m are observed in North Western part and Eastern part of the area. Deeper water levels of >10 m bgl are observed in majority of the district.

Water level fluctuation :

Majority of the district shows rise in water level between pre and post monsoon period of 2005 (2-4 m).

Rise of water level upto 2 m is observed in North Western and Southern parts of the district. Rise of water level of >4 m is observed in North Eastern part of the district. Water level fall of 2 m is observed in North Western fringe of the district. Less fluctuation is observed in the areas where the water levels were comparatively shallow during pre-monsoon and where the slope is less.

METHODOLOGY

Soil water balance method:

Water balance models were developed in the 1940s by Thornthwaite (1948) and were later revised. The method is essentially a bookkeeping procedure, which estimates the balance between the inflow and outflow of water. Here, the volume of water required to saturate the soil is expressed as an equivalent depth of water and is called soil water deficit. The soil water balance can be represented by,

$$R_1 = P\text{-}Ea + a\Delta W\text{-}R_n$$

where

R_1 =Recharge

P = Precipitation

Ea = Evapotranspiration (60 %)

ΔW = Change in water stage

R_n = Runoff water (40 % of rainfall)

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Data on below ground water recharge for Kallumarri village Madakasira Mandal (mm) :

Below ground level piezeometric readings obtained for kallumarri village, Madakasiramandal for 2001-2012 obtained from the ground water department, government of Andhra Pradesh for the period 2001-2012. It has been observed during the year 2007 October there was highest ground water recharge *i.e.* about 3.94m or 3940mm. This is due to highest amount of rainfall received in the year October, 2007. Generally September, October November are the months varying the ground water levels are increasing. Similarly during the months from January to May there is no important in ground water levels due to non rainfall and also sevior high temperatures in the region. The ground water recharge was very weaker during 2012 as the rainfall received only 412.8 mm based on these observations are we can plan to develop the crops during the months of June to December that the

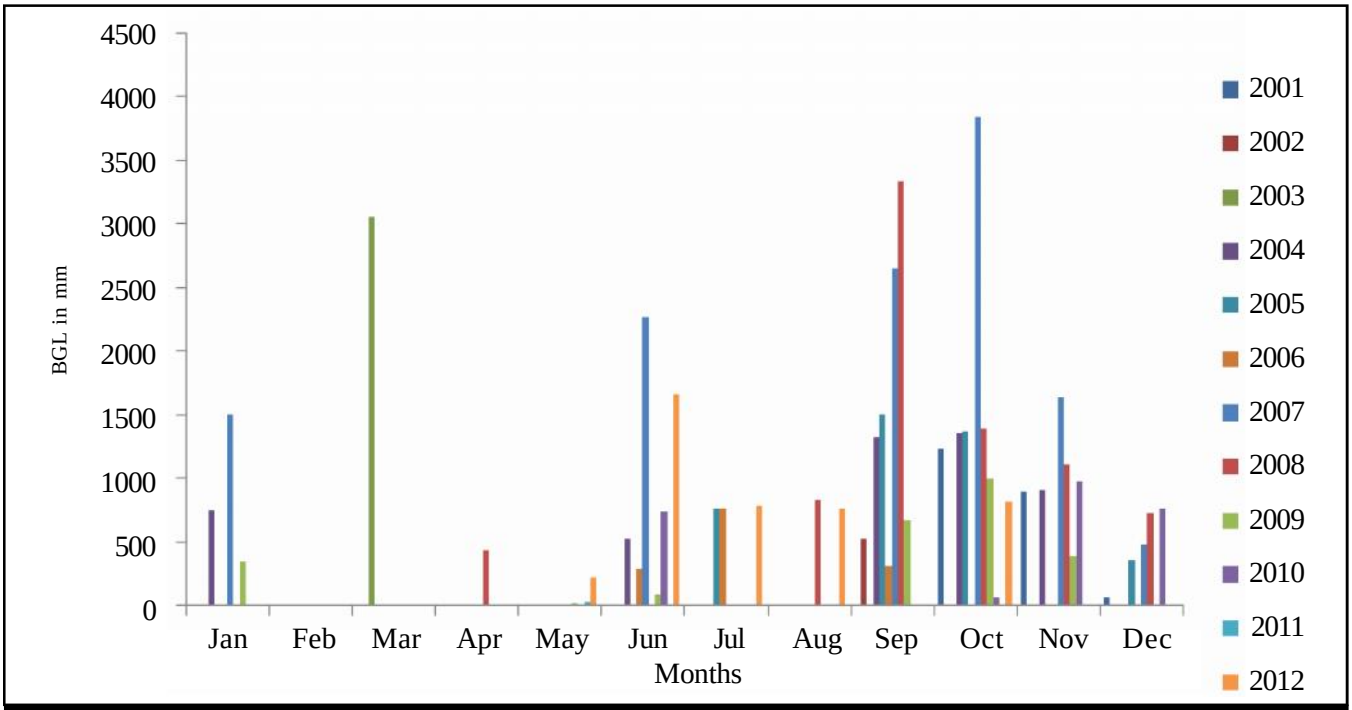

Fig. 1 : Ground water recharge during from 2001-2012 in Kallumarri village

low water requirement crops probably vegetables or low water requirement crops like jower and other millets as shown Fig 1.

Data on below ground water fluctuation for kallumarri village Madakasira Mandal (mm) :

Below ground water level data was obtained from the ground water department, government of Andhra Pradesh for kallumarri village, Madakasira mandal. The piezeometric levels recorded for 2001-2012 were

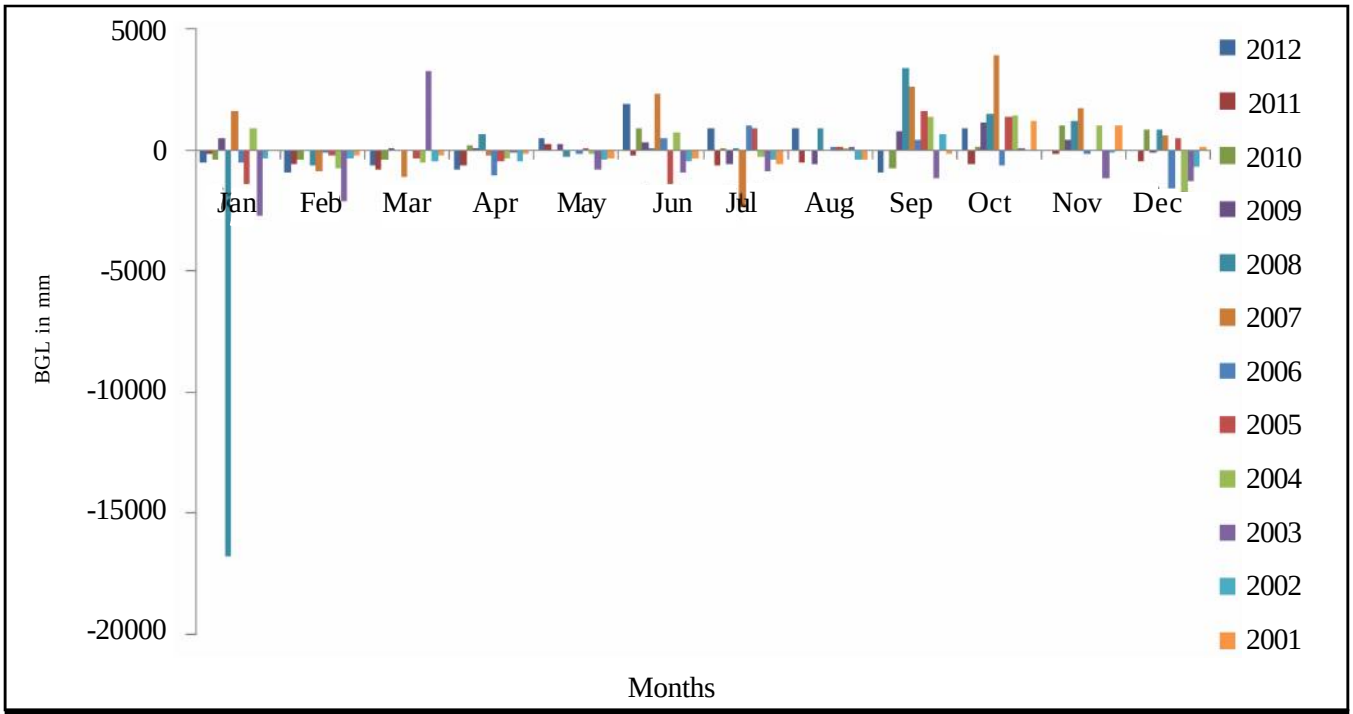

Fig. 2 : Ground water fluctuation during from 2001-2012 in Kallumarri village

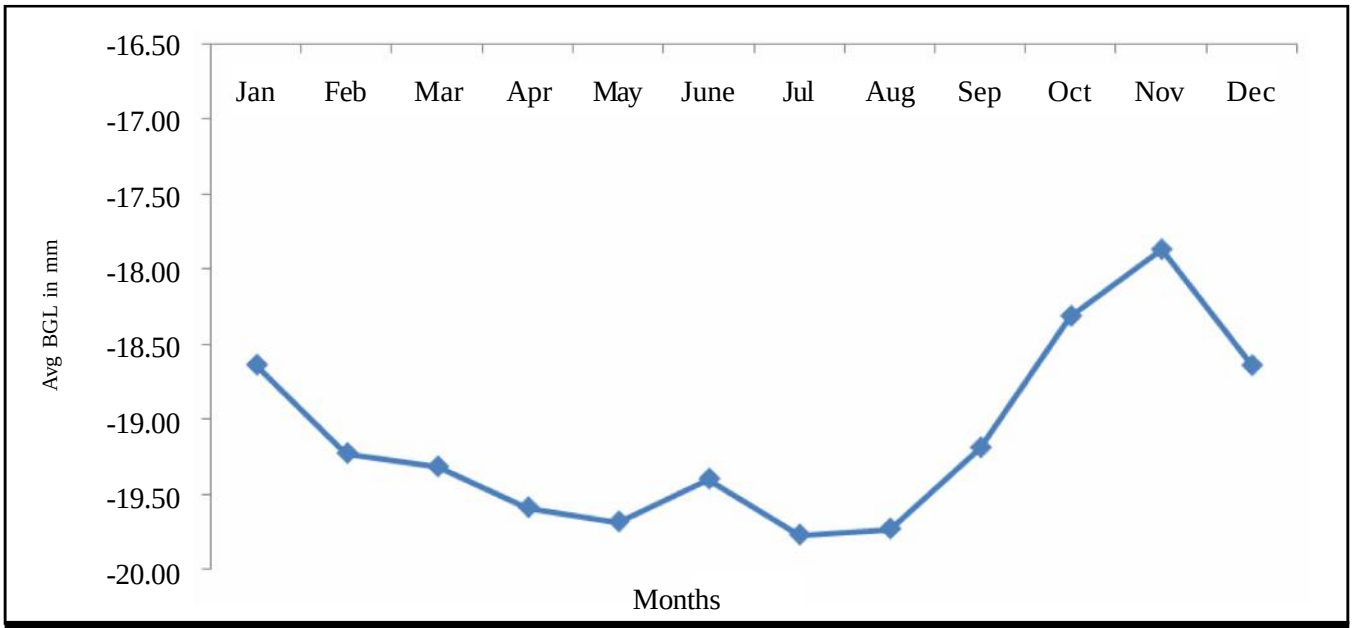

Fig. 3 : Ground water table fluctuation based on 12 years (2001-2012) data in Kallumarri village

obtained as analyzed from the data. It was found that there is no recharge of ground water from January-June months except in few cases. Ground water recharge takes place monsoon months of June-December. However, during 2007 the highest ground water recharge was noticed during October 2007 *i.e.* 3940 mm as shown Fig. 2. From the average piezeometric values for last 12 years obtained from kallumarri village, Madakasira mandal. It was found that the ground water fluctuations between *i.e.* 18.64m below ground level in January to 17.87m in the month of November. Hence, this data is useful designing appropriate water lifting devices in this region as shown Fig. 3. Similar work related to the present investigation was also carried out by Bhagyashri *et al.* (2011); Enokela *et al.* (2012); Gosselin *et al.* (2006); Jiu and Zhonghua (1999) and Patil and Saptarshi (2012)

Conclusion :

– The kallumarri village in the October, 2007, there was highest ground water recharge *i.e.* about 3.94 m or 3940 mm. this is due to highest amount of rainfall received in the year October, 2007. Generally September, October November are the months where in the ground water levels are increasing. Similarly during the months from January to May there is no recharge of ground water.

– These study high lights the water dynamics in Ananthapuram district. Based on the study the researches, Administrators can plan advocating for various crop management practices and crop insurance and the former oriented approaches.

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