

## **Impact by Agrowells on Hydrgeological Conditions in Matale District**

S.R.R.P. Samarakoon and Ruwan Rajapaksha,  
S.M.P.G.S. Kumara

*Dam Safety & Water Resources Planning  
Project  
Water Resources Board*

### **Abstract**

The study is focused on the groundwater challenges in the Matale district where groundwater used for irrigated agriculture is considered to be very high. Agro wells and deep tube wells are the main sources of groundwater supplement the water available from irrigation canals. The criteria for placing agro wells was also taken into consideration.

A survey was conducted to identify the distribution of agro wells, their distribution pattern, and distance between wells in five divisional secretariats of Matale district - Damubulla, Galewela, Naula, Pallepola, and Laggala-Pallegama. After carrying out a water quality assessment program, suitable well points were selected to monitor groundwater levels on a monthly basis to examine the relationship between water level decline and abstraction.

Hydrographs prepared show areas where heavy pumping have resulted rapid water level decline and also show recharge and discharge responses during wet and dry seasons respectively.

Carbonate and Bi-carbonate water types are dominate in the area while alkalinity, phosphate, and hardness record high values in the deep aquifer. Water quality in the shallow aquifer seems to be good with most parameters within the permissible levels. Water quality assessment was conducted during the wet and dry seasons to determine the influence of recharge and discharge on groundwater quality.

Groundwater level monitoring in wells that belong to private parties is of concern as there is no assurance of static water levels at the time of measuring. Plans are underway to install automatic data-loggers to address this problem.

### **Introduction**

Matale district has been known to have an over extraction of ground water due to the prevalence of large number of agro wells. The process for study the priority areas of water level changes and water quality, and water quality trends associated with the over extraction situation. The area consists of high-grade metamorphic rocks belonging to the Highland Complex and post tectonic pegmatites (Cooray, 1984) including crystalline limestone, garnet-sillimanite gneiss, charnockitic gneiss and quartzite. All show a general strike trend of NW-SE and compositional layering is the prominent



heavy pumping rates, industrial water supply tube wells and wells located close to the previous shallow aquifer monitoring points were considered to select these locations. Statistical analysis was used to analyze the similarities and extract the best point to long term monitoring.

geomorphological formations, and structures that are dominant in the study area.

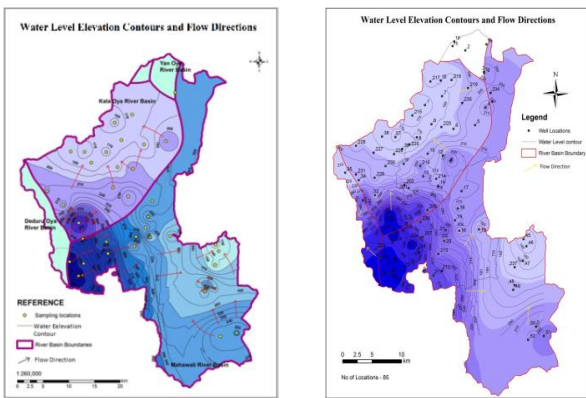


Fig.02: Potentiometric Contour maps

Potentiometric contour maps (Figure: 02) indicate three main flow directions

## Results and Discussion

North- West, South-East, and South-West. Southwestern part of the project area, where shallow regolith aquifer exists, and contour lines of potentiometric level are characterized by steep slope. The direction of ground water flow and water divides is generally controlled by the

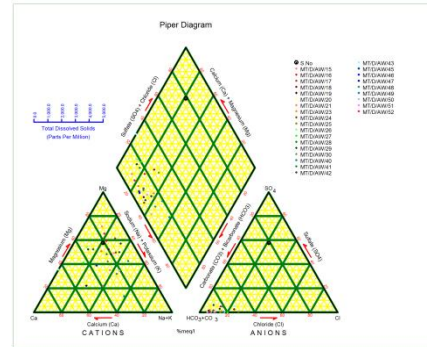


Fig. 03: Piper Diagram of Kala Oya Basin

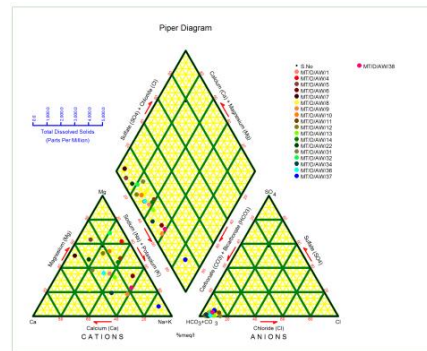


Fig. 04: Piper Diagram of Mahaweli Basin

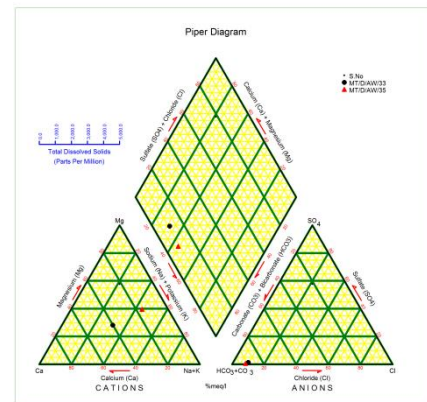


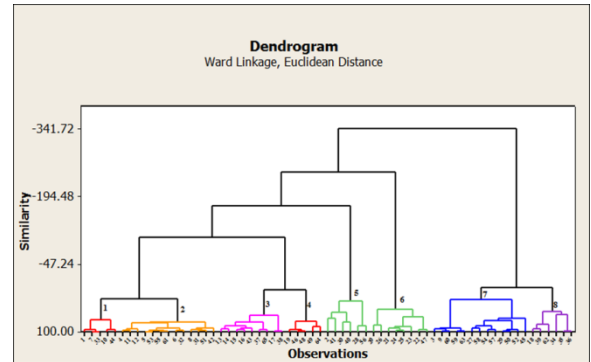
Fig. 05: Piper Diagram of Deduru oya Basin

Piper diagram shows that all the samples have very high amounts of  $\text{HCO}_3^-$  and  $\text{CO}_3^{2-}$  and lower amounts of  $\text{SO}_4^{2-}$  and  $\text{Cl}^-$ . Accordingly, this water is carbonate bicarbonate type water which may be due to the existence of carbonate rocks in the area.

According to the analysis (in dry period and wet period), chemical constituents present in water (Appendix A Figure: A1, A2) are not highly effecting to humans or environment. Alkalinity, total hardness, TDS, pH and turbidity values exceeded the drinking water standards given by Sri Lanka Standards but other constituent studied lies well below the desirable levels. In most places pH values are higher than the desirable level. That is due to certain dissolved minerals, such as Calcite, Dolomite etc. this high values occurring relatively dry area in the pilot area. Turbidity is high due to surge effect of the pumping for agriculture. Mud particle is the main reason for high turbidity in the wells. Fluoride concentration is high at the upper part of the pilot area that is close to Anuradhapura district that contains Hornblende Biotite Gneiss like rocks constitutes in F- rich minerals.

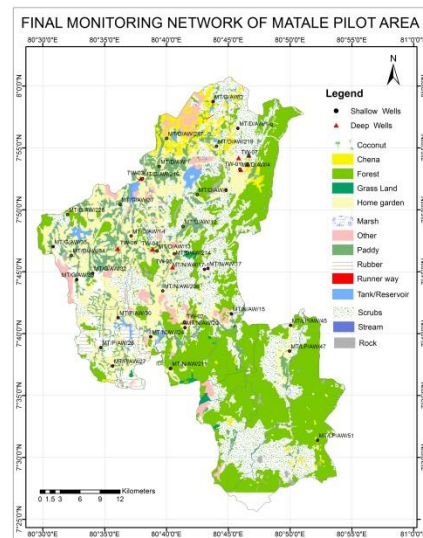
Statistical results displayed as a Dendrogram providing a visual summary of the clustering process. In this case sampling locations were

divided into eight main groups. According to the result of this study long term monitoring points were selected in the area

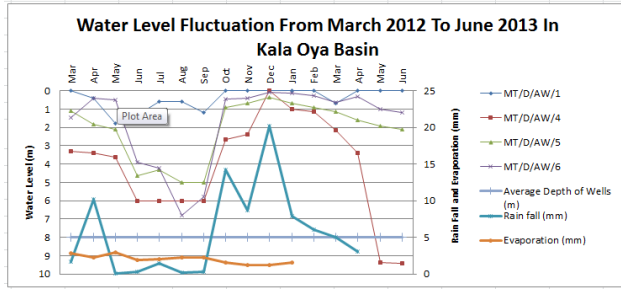


**Graph .01: Dendrogram of Q-mode HCA of the investigated location from Matale pilot area**

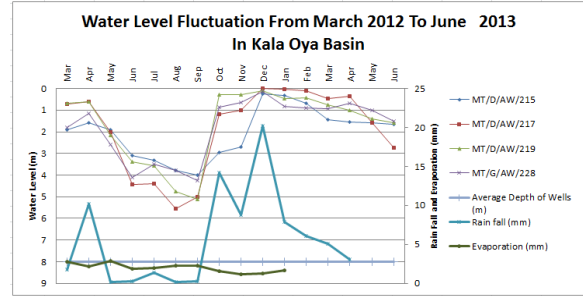
Considering all these results and information, final monitoring network was stabilized using 42 wells including 34 agro wells and 8 test tube wells.



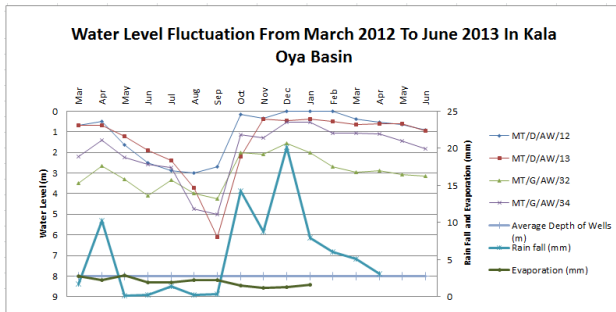
**Fig.05: Selected long term monitoring network**



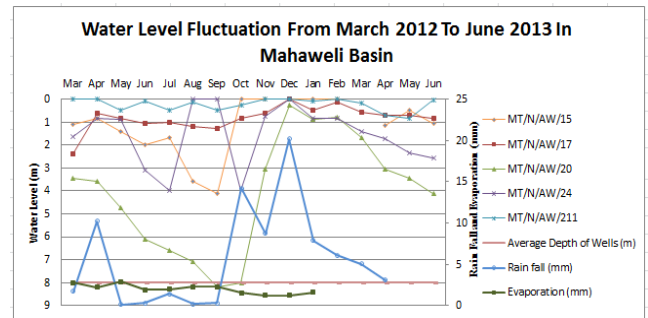
Graph. 02: Water level fluctuation of selected agro wells in Kala Oya basin from March 2012 to June 2013



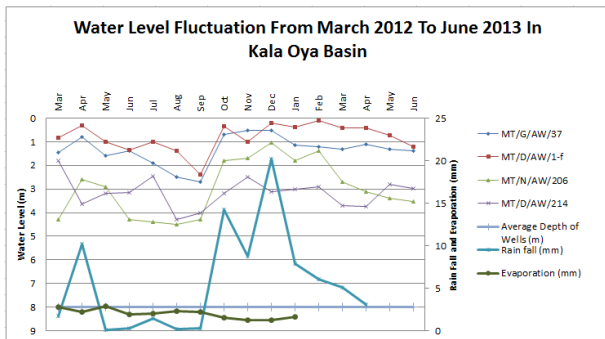
Graph. 05: Water level fluctuation of selected agro wells in Kala Oya basin from March 2012 to June 2013



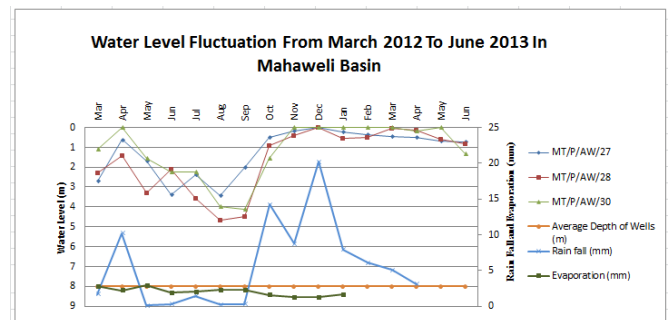
Graph. 03: Water level fluctuation of selected agro wells in Kala Oya basin from March 2012 to June 2013



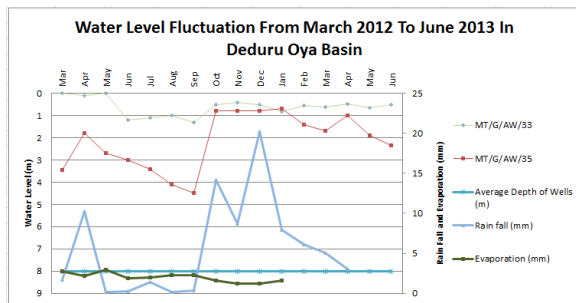
Graph. 06: Water level fluctuation of selected agro wells in Mahaweli basin from March 2012 to June 2013



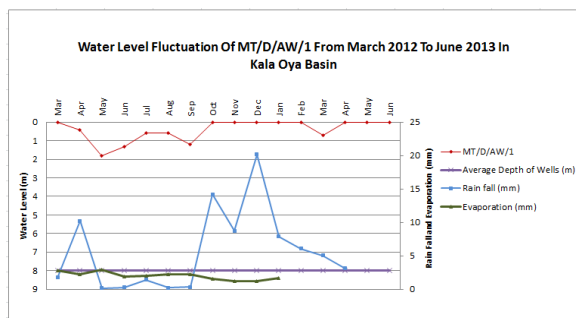
Graph. 04: Water level fluctuation of selected agro wells in Kala Oya basin from March 2012 to June 2013



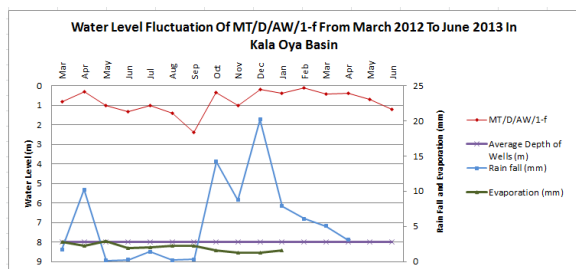
Graph. 07: Water level fluctuation of selected agro wells in Mahaweli basin from March 2012 to June 2013



Graph. 08: Water level fluctuation of selected agro wells in Deduru Oya basin from March 2012 to June 2013



Graph. 09: Water level fluctuation of selected agro wells in Kala Oya basin from March 2012 to June 2013



Graph. 10: Water level fluctuation of agro well MT/D/AW/06 in Kala Oya basin from March 2012 to June 2012

## Conclusions

This study provided information on the changes to water level and water quality variation with respect to related environment, recharging pattern, seasonal climate, cultivation pattern and cultivation area, during the dry and wet season.

The over abstraction situation should be studied according to the seasonal pattern and crop cultivation pattern

According to this study (in dry period and wet period), chemical constituent present in water is not highly effecting to humans and environment.

Quality data was also useful for advising users how long it will take before water is safe to use for drinking, and to take an idea about selecting monitoring points which can be arranged for the long term monitoring and for the development of monitoring network.

The results of this study should be used to direct further investigations before being used as a basis for water management actions.

The study result was used to select the long term monitoring network in the pilot area. 34 agro wells and 8 test wells have been selected for this network. This should be

done in conjunction with check of each river basin for over extraction based on geology, land degradation, potential point sources and any anthropogenic activity at present.

## **Recommendations**

The water level measurements and information should be collected monthly and considered crop growing stages.

## **References**

Cooray, P.G., 1984. An introduction to the geology of Sri Lanka.

Panabokke C.R. & Perera A.P.G.R.L. (2005). Ground water Resources of Sri Lanka.