WATER QUALITY AND QUANTITY ASSESSMENT OF AGRO WELLS IN VAVUNIYA DISTRICT FOR DOMESTIC AND AGRICULTURAL USES

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ABSTRACT

The Vavuniya district is in the Northern Dry Zone of Sri Lanka. Agro wells constructed in the regolith above the hard rock are the main groundwater resource for the people in this area. Due to rapid development and increase in population, the need of water for agriculture and domestic purposes within the area, became one of the prime issues. Though the agro-wells are constructed for agricultural purposes the people in this area, use these wells for domestic and drinking purposes. Therefore, this study was designed to assess the agro well water quantity and quality for agricultural and domestic purposes.

Groundwater recharge is estimated for upland permanent grass and for a common vegetable (egg plant) using a modified soil moisture balance method. Near surface storage, a new component of the soil moisture balance is introduced to represent continuing evapotranspiration on days following heavy rainfall even though the soil moisture deficit is high. Water level fluctuation hydrographs from selected agro-wells are available from February 2004 to March 2005 to observe the field conditions. The recharge is calculated by water level fluctuation method using the specific yield multiplied by the rise of water level. Then the plausibility of the model output is examined to understand the model's ability to represent the field conditions. Uncertainties and variations in parameter values are explored using sensitivity analyses.

Calculated potential recharge by the modified soil moisture balance for permanent grass is 297.4mm. This recharge is bit higher than the other dry zone areas may be due to higher number of surface water storage systems such as Vavuniya tank, Thandikulum, Veppankulum, Karaiyankulum and others which hold substantial amount of water during a year. This study indicates that

the improved single store soil moisture balance model is a reliable approach for potential recharge estimation for this area.

pH, turbidity, conductivity, and feacal coliform were analyzed using the water quality kit while nitrate-N, nitrite-N, ammonium-N, chloride, fluoride, calcium, magnesium, sulphate, were analyzed using the UV/Visible Spectrophotometer. Water quality assessments were done on randomly selected 10 wells in the Thandikulum and Kurumankadu area.

All the wells showed lesser turbidity below 5 TU. pH of all the wells was in the range of 6.4-7.4. All the wells can be categorized as low salinity water. The thermotolerant feacal coliform was much higher in some wells near residential areas. Nitrate-N was higher in well numbers 1, 6, 9, 15, 17and 21 which was above the recommended level of 10 mg/L for drinking water. The ammonia concentration was increased after rainfall and it exceeds the recommended level of 0.2 mg/L for drinking water. In all the wells the nitrite-N was below the recommended rate of 3mg/L and sulphates were below recommended level of 600 mg/L for drinking water. Chloride ions were within the permissible limit. The maximum limit of F^- for insignificant risk (1.5 mg/L), exceeded by some of the wells and were in the range of 0.28 mg/L to 1.74 mg/L.

The areas associated with the agro wells are categorized into three aquifer vulnerability zones AVA1, AVA2 and AVA3. Deeper wells away from the pollution sources are better for domestic purposes compared to the others. However this research project indicates that the water quality of agro wells is recommended for agricultural purposes in this area but not for drinking purposes unless these wells are located in AVA3 zone and water is treated.