

B-65: A model to estimate water availability in agro-wells

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Agro-wells are shallow open wells constructed for irrigating small farms. As this farming situation is relatively new to dry zone farmers, they do not have adequate experience in deciding the extent that can be cultivated with well irrigation. Ground water level rises during the rainy season and it depletes rapidly in the following dry months. The rate of depletion is determined by various factors such as rainfall, ground water level, location, presence of water reserves etc. A study was carried out to develop a methodology to estimate water availability in different months and the cultivable extent under a given well.

The study was carried out at Paindikulama in Anuradhapura district using 30 agro-wells, in 1992. Rainfall and well water level data were collected. Relationships were developed between monthly variation of water level with the rainfall and annual fluctuation range of the ground water level. The fluctuation range is the difference between maximum and minimum water levels and it was included to represent the resultant influence of all factors other than rainfall.

Relationships for natural losses of ground water and effective fraction of rainfall were attempted, to match the observed fluctuations of ground water levels. The model developed was validated using input data collected in 1993 from 28 agro-wells at Paindikulama and Puliyankulama in Anuradhapura district. Observed and estimated well water levels were compared and mean monthly absolute deviations were computed for each well.

The water availability estimation model could be developed with rainfall and maximum and minimum well water levels as input parameters. The effective monthly rainfall (R_e) was found equivalent to $0.1 (R-50)$ during Yala season and $0.2 (R-50)$ during Maha season where R is monthly rainfall. The monthly rise due to rainfall was then related to an unknown variable 'Y' by using R_e . The depletion of water level due to natural water movement could be matched to a multiplication of unknown variable 'X' which varies with the month. Then 2 unknown variables X and Y could be obtained by solving equations written for advancing (October - December) and receding (January - September) phases in the monthly fluctuation curve of ground water level. Maximum and minimum water levels were used to define these phases.

In validating the ground water availability prediction model, it was found that the mean absolute deviation of predicted monthly water levels from observations varied from 0.12 to 0.46 m in 22 wells at Paindikulama giving an average of 0.22 m. The value had the range from 0.2 to 0.34 m in 6 wells at Puliyankulama with an average of 0.29 m. Validation exercise further indicates that the months such as October, November, March etc. show more deviations than other months. However, the receding phase which is more important for agro-well farming could be predicted with minimum deviations.

The Ground Water Availability Prediction (GWAP) Model has input parameters as monthly rainfall and annual fluctuation range of the ground water level in a given location. The model predicts monthly steady levels of ground water table and it is the most determining factor of cultivable extent from a well. The average error of prediction varies from 0.1 to 0.45 m depending on the location. The model needs further refining in order to reduce large prediction errors found in some months.

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