RAINFALL PROBABILITY AND DROUGHT ANALYSIS IN PELWATTA SUGARCANE PLANTATION FOR IRRIGATION SCHEDULING

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ABSTRACT

The production of sugar cane under rainfed condition is affected by the rainfall, being a chief limiting climatic factor, at Pelwatta in Sri Lanka. This uncertain rainfall, in its length, quantity, distribution and spatial variability, creates a moisture deficit at different stages of the sugar cane crop and ultimately results in a considerable loss in the cane yield. This can be overcome by selecting appropriate planting and harvesting dates to ensure the utility of every drop of incident rainfall that falls on land to its maximum. A study was undertaken to statistically analyze the available rainfall data at Pelwatta sugar cane plantation and conduct a water balance study to determine the possibility of supplying supplementary irrigation.

The probability occurrence of rainfall, incidences of drought, spatial variability of rainfall and water balance were analyzed using rainfall records of a duration of 15 years and 17 rainfall stations of Pelwatta sugar catchment.

Models of annual rainfall pattern and probability of drought incidences of every month, and year were developed using a probability density function of gamma distribution. A two parameter Gamma probability model was fitted to the annual pattern of the catchment with a mean amount of 2.3 mm rainfall per rainy day and 0.5914 of shape parameter. The observed and predicted results using the model showed a significant correlation ($r^2 = 98.93$). Occurrence of drought incidences were modeled using the same two parameter Gamma

probability model with different parameters for every month which also showed the ability of the model to predict incidence of drought with high correlation of observed and predicted values. A similar model was derived for the prediction of annual probability of incidence of drought.

The suitable planting and harvesting dates and crop risk assessments for two planting seasons of sugar cane were distinguished using confidence limits of weekly expected rainfall derived from a logarithmic transformation of the skewed data. Considerable spatial variability of rainfall during the Maha , Yala seasons and the two inter monsoonal periods over Pelwatte catchment was observed which may be attributed to the influence of Balangoda hill range.

The water balance study emphasized the need of supplementary irrigation during Yala season since the soil moisture level always remained below the critical moisture level. The total amount of water yielded during Maha season showed the inadequacy of water for supplementary irrigation for the entire catchment area in the following season.

Therefore, soil moisture conservation measures (mulching) or exploitation of ground water sources closer to the nearby perennial rivers would be the possible alternate remedies to avoid drought stress and increase the production of sugar cane.