FORECASTING MODELS TO ESTIMATE ANNUAL COCONUT YIELD BASED ON MONTHLY WEATHER

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SUMMARY

A forecasting model to predict annual yield of coconut using month-wise climatic factors, were tried using two methods. A total of 167 palms of WCT variety in the age group of 45-50 years were selected from CPCRI, Kasaragod, grown under rainfed condition receiving recommended dose of fertilisers, for the period 1955-1983. Observations on 18 climatic factors representing three basic agro-climatological variables viz., solar radiation, temperature and soil moisture (or evapo-transpiration) were collected from the weather chart of CPCRI, Kasaragod, for the period 1955-1980. Weather variables and square root of annual yield of coconut were assumed to follow multivariate normal distribution.

Forcasting models were obtained by way of two-stage

analysis. The first stage of analysis is common for the two methods employed. Eighteen climatic variables contributing more than 20 per cent to the yield variation with the annual yield of previous year, treated as an index of weather variables of the foregone season were selected using step-wise regression analysis for each calender month in the first stage.

In method I, step-wise regression analysis was performed, using 19 selected variables from the first stage of analysis. The model obtained in this method is:

$$Y = 20.68 - 0.052\,(RHAN\text{-}SEPT) + 0.118\,(EV\text{-}JUL) - 0.08\,(STF\ 15\text{-}APR) - 0.062\,(STF\ 15 - DEC) + 0.116\,(SSH\text{-}MAY)$$

where Y is square root of annual yield of coconut
RHAN : Relative humidity in the afternoon
EV : Evaporation
STF 15 : Soil temperature at a depth of 15 cm in the forenoon
SSH : Sunshine hour
giving $R^2 = 0.853$.

In method II, 19 variables selected in the first stage of analysis were subjected to Principal component analysis. First nine components which could explain about 90 per cent

of the variation were selected as predictor variables. Step-wise regression analysis was performed using these selected components. The multiple regression equation obtained in this method is:

$$Y = 20.04 + 0.145\ (P1) + 0.029\ (P3) +).049\ (P4) - 0.804\ (P6) - 0.224\ (P7) - 0.008\ (P9)$$

whefe Y is square root of the annual yield of coconut. P1, P3, P4, P6, P7 and P9 are selected principal components representing a linear combination of 19 selected variables of 1st stage with $R^2 = 0.824$

The model in method I is simple and does not involve much computational procedure, whereas the model in method II requires lengthy computation. Presence of multi-collinearity has resulted in the non-significance of four of the regression coefficients obtained through step-wise regression on the first method. The method II intends to reduce the multicollinearity of the variables by way of principal component analysis.

However, both the methods are equally good in giving forecasting models to predict annual yield of coconut with good reliability.