

Use of Yield Prediction Model in Locating Critical Stages of Growth in Groundnut

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The precipitation at different stages of crop growth has significant contribution in prediction of rice yield (Das and Sajani, 1970). Das and Ramchandran (1971), while forecasting of bajra yield for Ahmedabad district of Gujarat State, located the period in which rainfall had some significant correlation with yields. The influence of rainfall on wheat production in Madhya Pradesh was studied by Bhargava *et al.* (1974). They found that 56 to 89 per cent of variation in wheat was due to rainfall. The effect of rainfall distribution on yield of groundnut at Amreli was studied by Joshi and Kabaria (1972), and accounted for 64 per cent of the total variation in yield.

An attempt has been made to utilize the yield prediction model in locating critical stages of crop growth. The critical stage being the one where occurrence or otherwise of rainfall has significant influence on groundnut yield for Ahmedabad district of the Gujarat State.

The data on average yield per hectare of groundnut in Ahmedabad district of Gujarat State for the past 24 years viz. 1953-54 to 1977-78 were collected from the season and crop reports, while the data on daily rainfall at Ahmedabad for the corresponding

period were collected from the Directorate of Agriculture, Gujarat State, Ahmedabad. Weekly totals of rainfall for the standard meteorological weeks during the groundnut growing season, covering the period from 22nd week to 43rd week, were carried out to utilize them as 22 rainfall variables. Step-wise regression analysis (Efroymson, 1962) was carried out utilizing average yield as dependent and 22 rainfall variables during the crop growing season as independent variables for the purpose of developing the yield prediction model.

The estimates of regression coefficient, their standard errors, R^2 and error of forecasting for the selected rainfall variables in step-wise regression analysis of groundnut yield data of Ahmedabad district are presented in Table 1.

TABLE 1

Estimates of regression coefficients, their standard errors, R^2 and error of forecast for the selected rainfall variables in step wise regression analysis of groundnut yield data of Ahmedabad district.

Selected rainfall variables	Regression Coefficient	S.E.
X_4	2.1101	1.1516
X_6	0.9191 *	0.4327
X_{12}	1.7017 *	0.7111
X_{14}	1.0516 *	0.4640
X_{18}	2.7193	1.5600
R^2	0.6217 **	
Error of forecast	6.36%	

* and ** denotes significance at 5% and 1% levels.

The analysis has helped in predicting the groundnut yield by selecting five variables out of 22 rainfall variables and accounted for 62 per cent of the total variation in yield. The forecast for the groundnut yield can be given earliest by the end of September utilizing the following prediction model.

$$Y = 235.12 + 2.1101 X_4 + 0.9191 X_6 + 1.7017 X_{12} + 1.0516 X_{14} + 2.7193 X_{18}$$

The results further reveal that the variables X_4 and X_6 are the values of the rainfall during germination to vegetative development stage, whereas X_{12} and X_{14} are the value of the rainfall during full pegging to pod development stage. All the four variables have positive significant contribution in yield prediction. This suggests that these two are the critical stages of crop growth, when rainfall has significant influence on groundnut yield.

Sheshadri (1962) reported that hair on the peg and pods of groundnut helps in taking up little moisture thus preventing the pod from excessively drying up and helping it in its proper development. The physiology of water absorption in groundnut indirectly justifies that the rains during this stage help in proper development of pods and hence the higher yield.

The results of this study at Ahmedabad are in confirmation with the results obtained by Joshi and Kabaria (1972), who have reported positive correlation of groundnut yield with rainfall during full pegging to pod development stage. Under the semi-arid condition at Hissar, Singh *et al.* (1971) observed that two irrigations, one at flowering and other at peg formation stage, increased the yield of groundnut. The area of Gujarat comprising Ahmedabad and surrounding districts falls

under semi-arid conditions. The results of this study indirectly support the positive effect of rainfall during pod development with the yield of groundnut.

Thus the critical stages of crop growth obtained as the by-product of the regression analysis of yield and rainfall data of the past 24 years of Ahmedabad district suggest the guidelines in scheduling irrigation for cultivation of irrigated groundnut crop or to suggest a supplemental irrigation in absence of rainfall during critical stage of the crop in Ahmedabad district.

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