

A STUDY ON PRE-HARVEST FORECAST MODEL OF GROUNDNUT YIELD USING WEATHER PARAMETERS FOR JUNAGADH DISTRICT OF GUJARAT

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ABSTRACT

Aims of the investigation was to develop models for forecasting ground yield at Junagadh district on the basis of weather variables using weekly data of meteorological standard week (MSW) for the groundnut season (kharif). The weekly average of weather variables (rainfall, maximum and minimum temperature, morning and afternoon relative humidity and sunshine hours) over a span of 30 years period (1985-86 to 2014-15) has been used. Week wise approach of the weekly data was used as per original scale. Four models were fitted, considering up to 12, 13, 14 and 15 weeks after sowing during the crop period. Earliest and reliable forecasts of groundnut crop yield for Junagadh district, using 15 weeks crop period model was the best fitted because in this model R^2 was more than 83% with lowest SE 210.37

Keywords: pre-harvest forecast model, goundnut yield, weather parameter

INTRODUCTION

The overall growth of the Indian economy depends upon the performance of agriculture, which depends, quite a lot, upon the weather conditions every year and yield of most of the crops are fairly below the levels of these achieved in other countries. Indian economy is mainly based on agriculture. Timely and reliable forecast of crop yield is of great importance for monsoon dependent country like India, where the economy is mainly based on agricultural production (Vinaya *et al.*, 2017). Groundnut crop grown mainly under rain fed as well as irrigated condition, the fluctuations in yield levels over the years are due to weather behavior.

The approach used for estimating and forecasting yield was original weather variables and week wise approach. The time trend was included as an explanatory variable in this approach. For early forecast, 5, 4, 3 and 2 weeks intervals before harvesting were considered. The stepwise regression procedure was adopted using 30 years data for selection of variables. Main object of the investigation was to develop suitable statistical models for forecasting groundnut productivity in Junagadh district of Gujarat.

OBJECTIVE

To study on pre-harvest forecast model of groundnut yield using weather parameters for junagadh district of Gujarat

METHODOLOGY

The past data of productivity of groundnut crop for Junagadh was collected from the Department of Agriculture and Cooperation, Government of Gujarat (Anonymous 2015-16). The corresponding data on weather parameters were collected from the weather meteorological observatory situated in the Junagadh Agricultural University, Junagadh. For this study weekly average weather data were collected for the growing season of groundnut.

Variables considered

Y : Average groundnut yield of the district in kg/ha.

T : Time trend, no. of year.

X_1 : Weekly total rain fall (mm)

X_2 : Maximum temperature (°C)

X_3 : Minimum temperature (°C)

X₄ : Morning relative humidity (%)

X₅ : After noon relative humidity (%)

X₆ : Sunshine hours (hrs.)

Statistical methodology

The studies based on Fisher’s technique, linear, curvilinear and multiple regression techniques in estimation of groundnut crop yield. In the present investigation, using original weather variables, week wise approach was used. Analysis was carried out to formulate the relationship for estimating the groundnut yield (Y) and influences of important weather factors (X_is) on the groundnut crop in Junagadh district of the Gujarat state. Due to technological advancement, the time trend (T) assumed to be present, therefore time variable also considered as one of the independent variables in the study. In week wise approach of the weekly data were used as per original scales. The data on weather variables were collected as per requirement and for groundnut season in the meteorological standard week (MSW).

Mathematical expression

$$Y = A + \sum_{i=1}^P \sum_{j=1}^w a_{ij} X_{ij} + bT$$

Where , Y = Average groundnut yield of the district kg/ha

A = Constant

X_{ij} = Observed value of ith weather variable in jth week, i = 1,2... P = 6 and j = 1, 2,...w = 12, 13, 14 and 15

T = Year, (T = 1, 2, 3,30)

a_{ij} and b = Partial regression coefficient associate with each X_{ij} and time trend, respectively.

RESULTS AND DISCUSSION

Among the 12, 13, 14 and 15 weeks after sowing period models, 14 weeks crop period model was best fitted(Model-IV). It was three weeks before harvest of the crop.

The result related to the 14 week crop period,

represented in the following table. It was revealed that there is a positive and significant effect of time trend (T) on the crop of the groundnut. The positive and significant effect of rainfall was observed on the third week period of the crop. The positive and significant effect of maximum temperature and sunshine hour were also observed on the crop on tenth and fifteenth weeks of the crop period respectively. Negative and significant influence of evening relative humidity observed on twelfth week crop period.

The analyzed result was show that the R² was 83.62 % and SE was 210.37 as per the following table.

Table : Regression equations for 14 week crop period of Junagadh district

Variables in model	Models for different years			
	Model-I (27 year)	Model-II (28 year)	Model-III (29 year)	Model-IV (30 year)
Constant	2014.12	1997.53	2193.57	2381.45
T	22.45	21.94	22.66	23.44**
X ₁₀₃	28.43	27.06	28.94	30.84**
X ₂₁₀	90.34	91.97	92.54	93.73*
X ₅₁₂	-13.34	-12.33	-15.76	-14.07*
X ₆₁₅	4.231	3.996	4.132	4.834*
S.E.	218.34	215.32	213.56	210.37
R ² (%)	79.03	80.36	81.93	83.62

*Significant at 5% level.

It could be noticed from the different four models for the 14 weeks crop period, model-4 , shown on the table was the best fitted because of the highest R² value and lowest SE. Therefore, the following forecast model of groundnut yield for Junagadh district is recommended,

$$Y = 2381.45 + 23.44**T + 30.84* X_{103} + 93.73*X_{210} - 14.07* X_{512} + 4.834* X_{615}$$

(R² = 83.62%, SE=210.37)

CONCLUSION

It could be concluded that there is a positive and significant effect of time trend (T) on the crop of the groundnut. The positive and significant effect of rainfall was observed on

the third week period of the crop. The positive and significant effect of maximum temperature and sunshine hour were also observed on the crop on tenth and fifteenth weeks of the crop period respectively. Negative and significant influence of evening relative humidity observed on twelfth week crop period. Recommended forecast model of the groundnut crop for forecast was 14 weeks period and model-4 of the 30 years data sets, due to highest R^2 and lowest SE.

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