Use of Satellite Data and Farmers Eye Estimate for Crop Yield Modeling

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1. INTRODUCTION

Forecasting of crop production is one of the most important aspect of agricultural statistics system. Yield forecasts at present are based on eye estimates and the final crop production estimates based on objective crop cutting surveys become available long after the harvests. This as such calls for the necessity of objectives methods for pre-harvest forecast of crop yields. In the present study, therefore an effort is made to use the farmers eye estimate more objectively as a auxiliary variable along with the spectral indices to improve the efficiency of crop yield models for forecasting crop yield. Farmers estimates were obtained for the same fields in which crop cutting experiments were conducted. The study was conducted for district Rohtak of Haryana State which is one of the major wheat growing areas having an acreage of more than 66 percent under wheat crop during Rabi season. In the present study the yield data for the Rabi season for the years 1995-96 and 1997-98 from general crop estimation surveys based on crop cutting experiments for wheat crop for district Rohtak, Haryana has been used. The satellite data has been used for 1995-96 from IRS-1B, LISS-II of path 30 and Row 47 of 17th February, 1996. The total area of Rohtak district is covered in one sub scene B_2 of 30-47. For 1997-98 IRS-1D data of sensor LISS-III of path 95 and row 51 for Feb. 4th, 1998 has been used.

Integrated yield model using spectral data and farmers eye estimate of crop yield

In the present study suitable models using spectral vegetation indices in the form of NDVI and farmers eye estimate as explanatory variables in the regression model have been developed for improved crop yield forecasting models

The usual linear regression based models have been developed with the crop yield (y) as the dependent variable and three independent variables, namely RVI (x_1), NDVI (x_2) and the farmer's eye estimate of crop yield of the corresponding plot (x_3). The model has been developed using the data for the Rabi 1995-96. This model has been used to forecast the crop yield for Rabi 1997-98 using the independent variables for 1997-98.

The results and predicted value of crop yield using different independent variables independently as well as together are given in the table . From this table it is seen that R^2 value is 0.45 and 0.54 respectively when only RVI and NDVI alone are used However the R^2 value is 0.86 when only farmers eye estimate is used as the explanatory variable and theR^2value increases to around 0.90 when it is used along with RVI or along with NDVI or along with both RVI and NDVI together.

The deviation of the predicted yield from the actual yield is very low. In almost all the cases it is less than 2%

Table . Wheat crop yield forecasting model using RVI (x_1), NDVI (x_2) and the farmers eye Estimate (x_3) as independent variables for district Rohtak for forecasting crop yield for Rabi 1997-98 . (using the model based on data for Rabi 1995-96).

	R^2	a	b	Predicted value(Q/hac.) $\hat{\hat{y}}$	%S.E.	Percentage of Deviation
$y = a + b_1 x_1$	0.451596 (3.102028)	3.3445 (0.5724)	4.251948 (1.998869)	35.86 (4.8568)	13.5434	0.1653
$y = a + b_1 x_2$	0.543511 (2.830157)	-6.18267 (2.721178)	44.87417 (5.024239)	35.86 (4.7004)	13.1071	0.1652
$y = a + b_1 x_3$	0.867496 (1.124314)	2.036448 (1.52888)	0.216212 (0.021125)	34.85 (2.1200)	6.0828	3.0619
$y = a + b_1 x_1 + b_2 x_2$	0.59259 (2.03613)	-3.798801 (8.212242)	$b_1 = -2.53(5.09)$ $b_2 = 55.99(46.45)$	35.22 (5.2418)	14.8829	1.9872
$y = a + b_1 x_1 + b_2 x_3$	0.90009 (1.00829)	0.785252 (1.479713)	$b_1 = 1.14(0.51)$ $b_2 = 0.17(0.02)$	34.86 (1.8352)	5.2647	3.0424
$y = a + b_1 x_2 + b_2 x_3$	0.90345 (0.99122)	-1.049277 (1.865161)	$b_1 = 11.21(1.67)$ $b_2 = 0.17(0.025)$	34.86 (1.8046)	5.1771	3.0430
$y = a + b_1 x_1 + b_2 x_2 +$	0.90406 (1.02274)	-2.144346 (4.132285)	$b_1 = -0.77(2.57)$ $b_2 = 18.25(23.99)$ $b_3 = o.17(0.025)$	34.86 (1.7992)	5.1613	3.0433

Actual crop yield for Rabi 1997-98 =35.92 (Q/hac) (Figures in braces give the standard error)

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