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Prediction of Brinjal (*Solanum melongena*, L.) Yield From Partial Harvest

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ABSTRACT

The analysis of picking-wise fruit weight (yield) data of 1200 brinjal plants (Cv. Doli 5) collected separately from uniformity trial revealed that a plot of 20 plants (2 rows each of 10 plants) spaced 0.75 m x 0.75 m is of optimum size for field experimentation. The data were further utilized to predict total production of crop well in advance from first few pickings. The yield data of 1200 basic units were grouped into 60 experimental plots (samples) each of 20 plants. The following linear models were derived to predict total brinjal yield ($\hat{Y}$) on the basis of partial harvest upto 3rd picking.

$\hat{Y} = (2.746 + 0.0026\ X_{23})$ x 888.89 ... (R^2 - 0.83)

$\hat{Y} = (4.108 + 0.0016\ X_{123})$ x 888.89 ... ... (R^2 = 0.86)

Where : $\hat{Y}$ = Predicted yield of brinjal (kg/ha)

X_{23} = Sum of the yields of 2nd and 3rd picking 9kg/2 plants)

X_{123} = Sum of the yields of 1st, 2nd and 3rd picking (kg/20 plants)

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INTRODUCTION

The approaches followed to predict the yield of crops like cereals, pulses etc. may not be useful for predicting total yield of brinjal crop which is the sum of the yields obtained from individual pickings. To record pickingwise data is time consuming and costlier procedure . In survey work, collection of crop production data still becomes more difficult because of transport and supervision difficulties. It is therefore, worthwhile to examine the feasibility of prediction of the vegetable production by observing only the partial harvest data. For accurate prediction it is necessary to adopt optimum sample size for brinjal crop so as to get maximum information from experimental material.

Several experiments have been conducted with annual crops to determine the most suitable size and shape of plots (sample) necessary to minimise the effect of soil variability on error component associated with experimental plots. However, very scanty work has been done with regards to vegetable crops. The present investigation was therefore taken up on brinjal crop to find out optimum size and shape of the plot and predict yield of the crop from partial hervest data.

TABLE 1

The picking-wise average coefficient of variability per unit area for plots of different sizes for fruit weight of brinjal.

Units	Pickings							Total yield
	1.	2.	3.	4.	5.	6.	7.	
1.	82.3	64.4	59.4	61.4	65.7	74.1	76.9	39.1
2	61.3	49.0	52.0	49.1	49.5	58.1	54.8	30.1
3	52.6	40.7	44.0	42.8	44.0	48.2	45.3	25.7
4	46.8	37.4	39.3	40.6	38.6	46.4	39.3	24.0
5	44.2	34.0	36.5	38.7	36.6	42.7	36.6	22.7
6	40.6	32.0	34.3	37.8	35.3	40.5	33.5	21.3
8	35.5	27.9	28.9	33.3	29.5	37.6	29.9	18.9
10	35.0	26.3	27.7	34.2	23.5	35.7	27.1	18.6
12	32.0	23.9	26.8	33.9	9.4	34.3	25.2	17.7
15	30.6	22.3	25.4	32.5	27.8	32.9	23.8	16.5
16	28.6	21.4	21.0	28.7	23.1	31.5	22.6	15.2
20	27.4	20.1	12.2	31.0	25.2	30.5	20.9	15.5
24	26.0	18.1	19.6	29.5	23.6	30.3	20.5	14.6
25	27.2	18.5	20.5	30.3	23.4	31.1	21.1	14.4
30	25.6	17.8	19.9	30.3	23.8	29.4	19.2	14.3
40	21.3	14.5	15.3	23.6	18.7	23.0	16.1	11.9
48	22.6	14.3	13.9	26.6	19.1	28.4	17.8	12.4
50	23.0	15.2	14.6	28.7	21.0	27.9	16.1	12.5
60	21.1	14.1	15.7	28.7	21.3	26.9	15.2	12.6
75	21.3	14.0	16.1	29.0	20.1	28.0	13.4	12.1
80	16.1	9.8	11.2	16.2	11.7	15.6	11.8	8.4
100	18.3	12.1	10.7	27.3	19.2	25.7	13.0	11.2

MATERIALS AND METHODS

Uniformity trial of brinjal crop (variety Doli 5) was conducted during the year 1989 at the College Agronomy Farm, Gujarat Agricultural University, Anand. The plant-wise fruits weight was recorded for 1200 plants. Each plant formed basic unit. Therefore there were 1200 basic units under study. In all nine pickings were obtained in a period of five weeks. The data on fruit weight recorded in each pickings were subjected to statistical analysis.

The 'maximum curvature method' was used to determine optimum plot size (Federer, 1955). The plots of size 2, 3, 4, 5, 6, 8, 10 .... 80 and 100 units were formed by combining fruits weight of adjacent units both length wise as well as width wise. A curve of C.V. % against plot size was prepared. The optimum plot size was taken as the point on the curve just beyond the point of the maximum curvature.

For predicting total fruits yield optimum plot size of 20 units was utilized. Whole field of 1200 units was divided into 60 plots each of 20 units (2 rows x 10 plants). Picking-wise fruits yield data for these 60 plots were also generated from original record of 1200 plants. The total yield of brinjal was worked out by summing the yields obtained in individual pickings. Simple linear regression equation was worked out for predicting total fruits yield on the basis of yield obtained in the first picking as well as total yield of first two pickings, total yield of first three pickings and so on.

RESULTS AND DISCUSSION

The C.V. % per unit area (Table 1) decreased with the increase in the plot size, either by increasing the length of plot or by increasing the number of rows upto 80 units and thereafter there was little increase in variability for 100 units plot size. The decrease in C.V. per cent beyond 16 units plot size was not proportional to the amount of land used. So 16 units size was considered as the point of maximum curvature. The optimum plot size is one just beyond the point of maximum curvature. Therefore 20 units was considered as optimum plot size (2 rows x 10 plants).

The regression analysis (Table 2) indicated the beat fit when partial harvest of first three pickings were considered. The sum

TABLE 2

Regression coefficient of total yield on different pickings.

Pickings	*b*	R^2
1	0.0032 (0.0003)	0.65
2.	0.055 (0.0051)	0.66
3	0.0031 (0.00032)	0.61
4	0.0022 (0.0003)	0.73
1 + 2	0.0024 (0.00017)	0.78
2 + 3	0.0026 (0.00016)	0.83
3 + 4	0.0018 (0.00011)	0.81
1 + 2 + 3	0.0016 (0.00009)	0.86
2 + 3 + 4	0.00014 (0.00006)	0.91
1 + 2 + 3 + 4	0.0011 (0.00004)	0.94

Figures in parenthesis are standard error.

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of yields of second and third pickings also gave better fit. The equation fitted was :

(1) $\hat{Y} = (2.746 + 0.0026\ X_{23}) \times 888.89$ .... ($R^2 = 0.83$)

(2) $\hat{Y} = (4.108 + 0.0016\ X_{123}) \times 888.89$ ... ($R^2 = 00.86$)

Where,

$\hat{Y}$ = Predicted total yield, kg/ha

X_{23} = Total yield of second and third pickings, kg/20 plants

X_{123} = Total yield of first three pickings, kg/20 plants

It can be concluded from the present investigation that (1) the optimum plot size of 11.25 sq.m. should be used for field experimentation on brinjal Doli 5 and (2) total brinjal production could be forecasted using partial harvest data of first three pickings precisely.

REFERENCE

Federer, W. T. (1955). Experimental Design. The MacMillan Co., New York.