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EFFECTIVE LAND AREA IN CROP PRODUCTION

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ABSTRACT

A number of fields which were prepared for vegetable production were measured to establish the gross area and the area reserved for beds.

The area reserved for beds in each field was then expressed as a percentage of the gross field area, thus giving the effective area to be used in crop production.

The effective area is therefore the area in which activities such as planting, spraying, fertilizer application and harvesting will be confined and concentrated with respect to the gross area.

INTRODUCTION

The cultivation of fields for vegetable crop production invariably give rise to furrows and beds. The bed is the area reserved for activities of crop production, and the furrow is mainly used for access through the field.

In this field engineering concept, the area occupied by the beds expressed as a percentage of the gross field area is considered as the effective area in crop production, since it is the area capable of producing the results of crop production inputs.

The objective of the study was to evaluate the effective area of a number of fields used for vegetable production.

PROCEDURE

The length and width of rectangular fields were measured and recorded. In each field, a section was selected and the bed widths of the bed - furrow profile were measured and recorded.

The wheel spacinf of the tractor was 1.3 metres (72 inches) and wheel width was 0.3 metres (12 inches). Tillage implements used were disc plough, furrow body (in some cases) and rotary tiller. Soil type was a Vertisol.

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DATA ANALYSIS

The first parameter, the gross field area, FA, is a relationship between the length and width of each field. The bed area, BA, is a relationship between the sum of the individual bed widths and the length of the field.

The effective area, EA, is expressed in terms of the bed area and the gross field area.

These parameters are defined as follows:

$$FA = W \times L \quad \text{----------(i)}$$

$$BA = L \left[\sum_{i}^{n} w_i \right] \quad \text{-------(ii)}$$

$$EA = \frac{(BA)}{(FA)} 100 \quad \text{----------(iii)}$$

in which

FA	=	gross field area	(hectares)
W	=	width of dield	(metres)
L	=	length of field	(metres)
BA	=	area of beds	(hectares)
w_i	=	width of an individual bed	(metres)
n	=	number of individual beds	
Σ	=	sum	
EA	=	effective area	(percentage)

The gross field area, area of beds, and effective area were calculated by using the above equations (i); (ii) and (iii), respectively.

In the analysis linear dimensions were measured in metres, and the areas computed in hectares. The effective area was computed as a percentage.

RESULTS AND DISCUSSION

In view of the vital importance of land in crop production, precise knowledge of not only the gross area, but also the utilizable or effective part of the land is essential for the economic and efficient planning of the land resources.

Table 1 summarizes the results of the effective area as a function of the gross area and the area allocated for beds (ridges). From these results it can be seen that the effective area can vary from 65 percent to 85 percent of the gross area of a field in this context.

The furrows present in the field are not considered as contributing to the effective area, but are viewed primarily for access to the productive area.

The total width of the beds was determined by adding the individual bed widths. The individual bed widths varied and this variation can be attributed to the properties exhibited by the soil, and the soil reaction caused by the application of mechanical forces in the cultivation process.

Soil properties such as moisture content and clod size determine the final bed-furrow profile. The moisture content affects the size of the resulting clod size in that at low moisture contents, the soil will fragment easier from the action of tillage forces. Also the number of tillage operations, especially rotary tilling, decreases the clod size, and hence increases the uniformity of the bed width.

SUMMARY AND CONCLUSION

In its simplest sense, the effective area means useful or utilizable area in crop production.

Fields were measured to determine their gross area and bed area. The effective area was computed by expressing the bed area as a percentage of the gross field area.

It was found that even though the same equipment characteristics such as wheel width and spacing were constant, the final bed-furrow profile width can vary and is reflected in the size of the clods.

It can be concluded that the effective area be considered where practical, when crop production results are reported in terms of gross unit area in association with the factors of production.

Table 1.--Summary of Field Areas

Field No.	No. of Beds	Gross Field Area (ha (acres)	Bed Area ha (acres)	Effective Area (%)
		Acres	Acres	%
1	35	1.75 (4.32)	1.33 (3.29)	76.0
2	38	1.89 (4.67)	1.46 (3.61)	77.25
3	25	1.25 (3.09)	0.97 (2.4)	77.60
4	15	0.74 (1.83)	0.54 (1.33)	72.97
5	17	0.86 (2.12)	0.56 (1.38)	65.12
6	15	0.73 (1.80)	0.58 (1.43)	79.45
7	29	1.38 (3.41)	1.15 (2.84)	83.33
8	19	0.91 (2.25)	0.76 (1.88)	83.52
9	20	0.94 (2.32)	0.79 (1.95)	84.04
10	17	0.84 (2.20)	0.58 (1.43)	65.17

Conversion factor: - 1 hectare = 2.47 acres

Table 2.--Statistical Parameters

Field No.	No. of beds	Average Bed Width	Standard Deviation	Variance
		m		
1	35	1.30	0.16	0.027
2	38	1.32	0.17	0.030
3	25	1.33	0.14	0.018
4	15	1.23	0.17	0.030
5	17	1.21	0.26	0.066
6	15	1.46	0.20	0.041
7	29	1.52	0.12	0.013
8	19	1.53	0.13	0.017
9	20	1.51	0.12	0.015
10	17	1.21	0.26	0.066