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Crop Management Factor (C) for Runoff and Soil Loss Under Different Cropping Systems

G. S. Sutaria* and N. K. Patel

B. A. College of Agriculture, Gujarat Agricultural University, Anand Campus, Anand

ABSTRACT

A study was conducted at College Agronomy Farm, Gujarat Agricultural University, Anand during 1992 and 1993 on runoff plots of size 25.2 m x 2.4 m on 0.75 per cent slope with loamy sand soil, to evaluate cropping management factor of the Universal Soil Loss Equation. Crop management factor (C) values for both runoff and soil losses were low under sole groundnut crop and was high under sole bidi-tobacco and pigeonpea crops but it declined considerably when groundnut crop incorporated as intercrop with both the crops.

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INTRODUCTION

The cropping management factor of the USLE combines the influence of many variables : kind of crop, residues, weeds, rotational practices, organic matter, fertilizer treatment, cultivation and tillage practices etc. Tejwani *et al.* (1975) evaluated erosion control effectiveness of some important crops at Soil Conservation Research Station, Dehradun. In view of above, the present study was undertaken to obtain information on cropping management factor (C) of important crops of the region.

MATERIALS AND METHODS

Runoff plots (25.2 m X 2.4 m at 0.75 per cent slope), located at College Agronomy Farm, GAU, Anand, were used in this study. Anand is situated at 22°35' N latitude and 72°55' E longitude in the *Charotar* tract of middle Gujarat and is 45.1 metres above mean sea level. The average annual rainfall of the area is 864.0 mm received entirely from the South-West monsoon currents. July and August are the months of heavy precipitation. Taxonomically, the soil is classified as Typic Ustifluvents. The soil is loamy sand in texture, locally known as *Goradu* soil. Bidi-tobacco, pigeonpea, pearlmillet and maize are main crops of this region.

Runoff and soil loss data were collected after the crops were sown. The runoff collected was recorded daily at 8.00 AM and representative runoff samples taken for estimation of soil loss. There were ten treatments consisted of sole crop of pearlmillet

*Present address : Assistant Professor, Main Dry Farming Research Station, GAU, Targhadia.

(PM), pigeonpea (PP), bidi-tobacco (BT) and groundnut (GN) and their intercropping systems including cultivated (CF) and absolute fallow (AF) treatments.

The cropping management factor is the ratio which compares the soil loss or runoff from cropped land with that from cultivated baren fallow plot (Wischmeier, 1960). Erosion control effectiveness of each crop was approximated on the basis of four crop stage periods (Narain and Verma, 1982). Four crop stage periods selected were :

Period 1 : Seeding to one month after seeding,
Period 2 : From one to two months after seeding,
Period 3 : From two months after seeding to crop harvest and
Period 4 : From crop harvest onwards.

Per cent erosion index for each crop stage period was worked out by averaging two years data. Ratio of soil loss from respective cropped plot to soil loss from cultivated baren fallow was worked out period-wise and 'C' factors was then calculated as :

$$C = \frac{ET\% \times \text{Soil loss } \%}{100 \times 100}$$

Cropping management factor (C) for a crop is the total of 'C' values for four crop stage periods.

RESULTS AND DISCUSSION

Results of present study presented in Table 1 indicated that the highest C-values for both runoff (0.900) and soil loss (0.820) were recorded under sole crop of bidi-tobacco,

TABLE 1

Crop management factor (G) for runoff and soil loss under different cropping systems.

Cropping system	*Runoff*			*Soil loss*		
	1992	*1993*	*Average*	*1992*	*1993*	*Average*
AF	0.329	0.307	0.318	0.101	0.085	0.093
SPM	0.324	0.655	0.489	0.181	0.374	0.277
SPP	0.789	0.878	0.833	0.680	0.686	0.683
SBT	0.905	0.895	0.900	0.846	0.794	0.820
SGN	0.171	0.607	0.389	0.078	0.351	0.214
PM + GN	0.317	0.695	0.506	0.188	0.473	0.331
PP + GN	0.347	0.738	0.542	0.234	0.510	0.372
BT + GN	0.423	0.779	0.601	0.278	0.590	0.434
PM + PP	0.390	0.756	0.573	0.240	0.514	0.377
CD (0.05)	0.151	0.067	0.039	0.073	0.061	0.047

followed by sole pigeonpea, but it declined considerably when groundnut was taken as intercrop in both the crops. Since the optimum date of transplanting of bidi-tobacco is during the first fortnight of August, fields ramain fallow during rainy months of June-July and also very slow growth after transplanting resulted in higher C- values under bidi-tobacco crop and that under pigeonpea was due to relatively slower growth rate during this period. Sutaria (1994) showed that July and August months, contributing 72.4 per cent of annual rainfall erosion index and thus these months are most critical for soil erosion under Anand conditions. The effectiveness of groundnut in reducing C-values could be attributed to the close growing habits and flat geometry of the canopy and its favourable effect on soil properties. It is also evident from data that groundnut crop gave minimum values of C factor for runoff (0.389) and soil loss (0.214).

The C-value for runoff (0.489 and soil loss (0.277) under sole pearlmillet was lower than that for pearlmillet based intercropping systems (PM+GN, PM+PP). This could be attributed to better vegetative cover provided during rainy season.

Conclusion

Incorporation of groundnut with bidi-tobacco and widely spaced pigeonpea crops have great significance in reducing the runoff and soil loss.

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