

Soil Site Suitability for Maize in Banswara District, Rajasthan

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Abstract: *In this study an effort has been made to utilise the soils resource information of the area to evaluate soil-site suitability for maize cultivation. The area having an annual rainfall of 900 mm, soil depth 100 cm with sandy clay loam to clayey texture (27 to < 60 % clay) and with a good drainage is most suitable for maize. Such area constitutes to 53.4 per cent in the district of Banswara. Soils, with very shallow depth, having very high clay content, poor drainage or excessive slopes are appeared to be unsuitable. (Keys words: Soil potential rating, soil suitability, maize)*

Soil survey, classification and mapping of soils, helps in understanding the soil potential and suitability for crop planning. Several workers have worked out the suitability of soils for various crops (Bhaskar *et al.* 1987; Anonymous 1986; Kuhad & Karwasra 1991, and Srivastava *et al.* 1991). However, such information on soils of Banswara district of Rajasthan is lacking and it is thus imperative to evaluate the soils of this district for their suitability for maize cultivation.

MATERIAL AND METHODS

Banswara district has an area of 5067 sq km, and occupies the southern most part of the state and lies between 23° and 24°N Lat., and 74° and 74°48' E Long. The climate

is subhumid, subtropical and is characterised by hot and dry summers and cool winters. The mean temperature is 26.2°C. The MAST is 32°C and MAWT is 20.7°C. The temperature regime is hyperthermic. The moisture regime is Ustic. Twenty one dominant soil families were mapped based on the physico-chemical and morphological characteristics. FAO methodology (1976) for land evaluation was adopted to compute soil suitability classes such as : S1, highly suitable - land having no significant limitation; S2 - moderately suitable - land having slight limitations causing moderate severity; S3 - marginally suitable - land having aggregation of severe limitations; N1 - currently not suitable - land having limitations which cannot be overcome at the current level of technology or at current-

ly acceptable costs. The characteristics and management requirements of maize for optimum production were identified based on important land qualities.

RESULTS AND DISCUSSION

Land evaluation relates land mapping unit (LMU) to the specific land utilization type (LUT). The important characteristics are presented in Table 1. Though the rainfall is quite high (900-1200 mm), its distribution is erratic. The most of it, is received during July and August. The potential evapotranspiration generally exceeds precipitation for most of the year except during the rainy season. The growing period is 100 days (Sehgal *et al.* 1990) thus restricting the choice of rainfed crops.

The specific land utilization type in the study area is annual cropping of maize (rainfed) for subsistence by small to marginal farmers with low capital resources, using mostly bullock drawn farm implements.

Land Use Requirement : In general, maize requires a freely drained, well aerated, deep soil (100 cm) without compaction and free from salinity or alkalinity. Some of the selected require-

ments of soil and climate for maize as per Sys (1985) are shown in Table 2. Land qualities such as rooting depth, availability of moisture, resistance to erosion, conditions for seed germination, ease of working, influence the suitability of land for a specific use.

Land Quality Ratings : It is oftenly difficult to have a direct measure of a land qualities and in turn the land use. Table 1 shows the land quality rating for maize, which are based on threshold values of some important characteristics to maize. The ranges have been worked out from discussion with local agronomists and farmers of the area. Each mapping unit was matched with the requirement for maize and potential rating for each of the mapping unit allotted after considering the land qualities (Table 2). It is seen that 53.4 per cent of the area (2707.3 ha) is highly suitable. It comprises the mapping units - 6,7,8,12,13,14 and 17. The area marginally suitable is constituted to 17.2 per cent (872.5 ha) and comprised the mapping units of 3,4,5,16,21,24 and 26. The area currently not suitable for growing maize (Fig.1) is constituted to 26.6 per cent (1346 ha) and covers the mapping

TABLE 1. Criteria and rating of land use requirements for maize cultivation

Land use requirements	Rating index				
	S1	S2	S3	N1	N2
Available Water					
AWC(mm/m)	150	100-150	75-100	50-75	50
Texture	C,Sic,Sicl Si, Sil	Sl,Fs,Ls	Fs	S, Cs	S,Cs
Soil depth (cm)	100	50-75	20-50	20	20
Nutrient Status					
CEC Cmol(p+)kg ⁻¹ soil	12	8-12	8	-	-
OM (%)	0.8	0.4-0.8	0.4	-	-
Slope (%)	0-8	8-16	16-30	30-50	50
Drainage	Well	Well imperfect	Poor S.Exc	V.poor	V.poor
Soil reaction (pH)	6.5-8.0	8.0-8.5 5.0-6.5	8.5 5.0	8.5	-

Texture : C = clay; Sic = Silty clay; Sicl = Silty clay loam; Sl = sandy loam, Fs-Fine sand; Ls = Loamy sand; Cs = Caose sand

TABLE 2. Suitability of different land units

Mapping land unit	Land quality						Suitable		Yield* (q ha ⁻¹)
	(m)	(x)	(o)	(s)	(r)	(c)	Class	Subclass	
1	S3	S1	S3	S1	N1	N1	N1	r,e	NA
3,4	S1	S1	S3	S1	S3	S1	G3	o,r	6-7
5	S2	S2	S3	S1	S3	S1	S3	o,r	6-7
6,7,8	S1	S1	S1	S1	S1	S1	S1		30-35
9,10	S3	S1	S3	S1	N1	N1	N1	r,e	-
11	S3	S1	S3	S1	N1	S1	N1	r	-
12	S1	S1	S1	S1	S1	S1	S1		30-35
13	S1	S1	S1	S1	S1	S1	S1		30-35
14	S1	S1	S1	S1	S1	S1	S1		30-35
15	S3	S1	S3	S1	N1	S1	N1	r	-
16	S1	S1	S1	S1	S3	S1	S3	r	6-7
17	S1	S1	S1	S1	S1	S1	S1		20-35
21	S3	S1	S3	S1	S3	S3	S3	m,o,r,e	5-6
23	S3	S1	S3	S1	N1	N1	N1	r,e	6-8
24	S1	S1	S1	S1	S3	S3	S3	r,e	6-8
25	S3	S1	S3	S1	N1	S2	N1	r	8-9
26	S1	S1	S1	S1	S1	S3	S3	r	7-9

m - moisture, x - mineralogy, o - drainage/oxygen requirement s - salinity, r - relief, e : erosion

* The yield figures are derived after discussion with local agronomists.

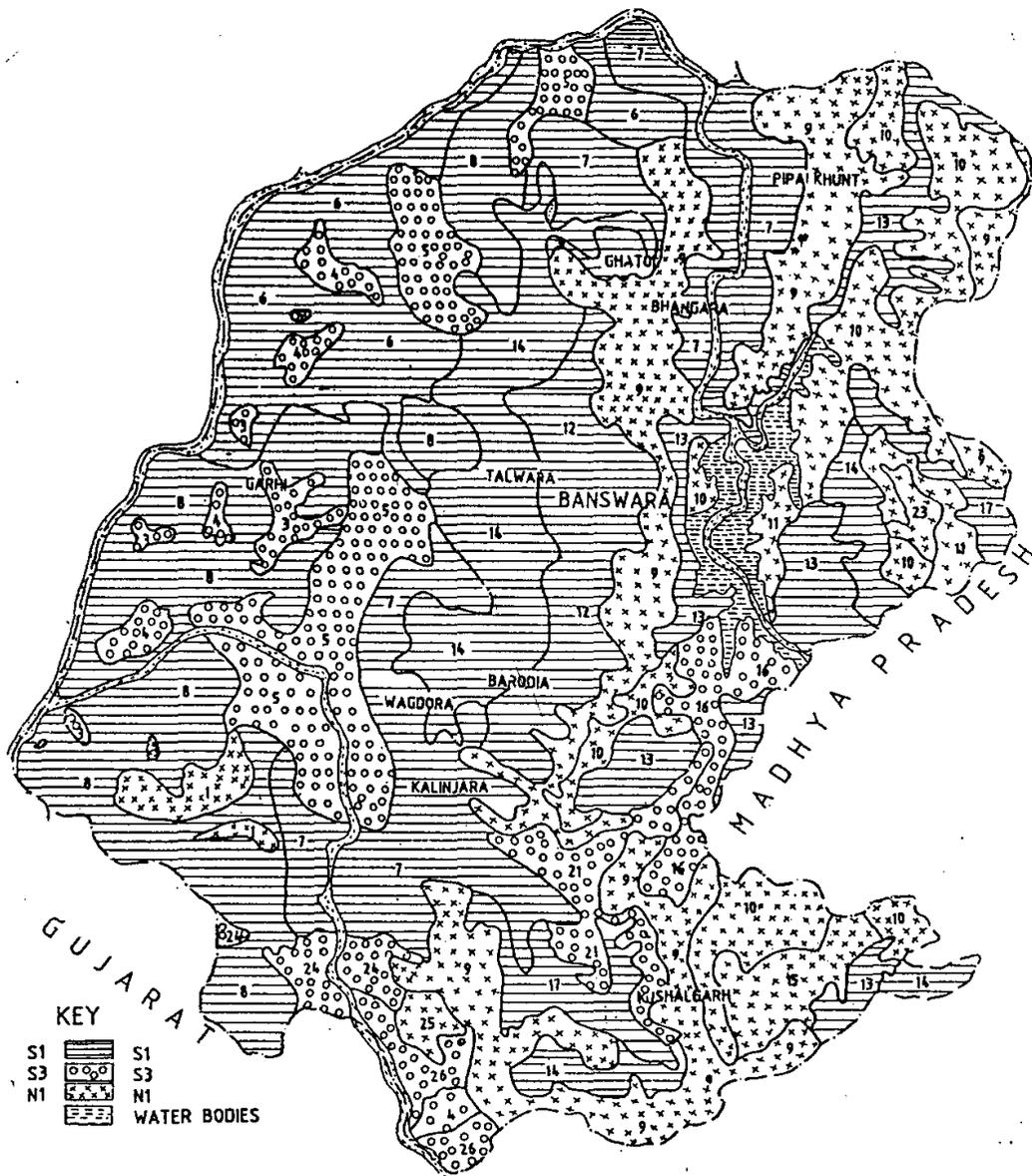


Fig. 1. Suitability of soils of Banswara district for maize

unit of 1,9,10,11,15,23 and 25.

Land Improvement and Potential Suitability: The mapping units (Table 2) which qualify as marginally suitable, suffer from the constraints like drainage and rooting depth and in few cases excessive slope. The management requirements for overcoming the problem of poor moisture retention (due to excessive drainage) includes incorporation of fine clay and silt from the lake floors or areas which have clay texture, straw mulching and higher doses of organic matter. Steeper lands could be made suitable by constructing field bunds across the slope and planting maize across the slope to check erosion. By adopting this measures, the class S3 land may be brought to class S2 land. Thus from the study it is observed that 2707 ha area (53.4% of mapped soils) becomes highly suitable and 872 ha area (17.2 %) remains marginally suitable for maize cultivation if the present level of management practices are carried out.

The study reveals that the data collected during the soil resource surveys are useful to work out suitability

of different soil units for specific crops or specific land use by comparing the requirements of the desired land use with the existing land qualities.

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