

Soil-Site Suitability for Major Field Crops in Hanumankoppa Micro-Watershed Under Northern Transitional Zone of Karnataka

Key words : Landscape, Soil-site characteristics, Suitability criteria.

The yield influencing factors for important crops have to be evaluated and the results obtained may be applied for higher production of these crops through proper utilization of similar soils occurring elsewhere in same agro-climate sub-region under scientific management practices (Khadse and Gaikwad, 1995). Hence a necessity is always felt for more soil database and climatic parameters to evaluate the suitability of land forms for different crops. The findings can also be extended to other soils having comparable soil-site characteristics.

Based on cadastral map and scanned toposheet of the micro-watershed area, ten pedons, representing dominant soils of three physiographic units viz., uplands (P1,P2,P3,P4 and P5), midlands (P6 and P7) and lowlands (P8, P9 and P10) were selected and studied in the field. The horizon-wise soil samples were collected and analyzed for physico-chemical and chemical characteristics by adopting standard procedures (Jackson 1979) and the major soil-site characteristics of the landscapes (Table 1) matched with suitability criteria for major field crops such as wheat, maize, cotton, soybean, groundnut, sorghum, chilli, paddy and sunflower were evaluated using criteria given by FAO (1993).

Cotton:

The uplands, midlands and lowland soils were marginally suitable for cotton. Mainly because of severe limitations of erosion and organic matter in uplands, more number (>3) of moderate limitations in midlands and severe limitation of drainage in lowlands.

Wheat:

Wheat comes up well on soils having soil depth 100 cm, AWC from 170 to 200 mm, clay content from 48 to 56 per cent, CEC from 43 to 53 cmol (p+) per kg and organic carbon from 0.63 to 0.74 per cent (Bhaskar *et al.*, 1996). The upland pedons (P1, P3 and P4) were moderately suitable, because of moderate soil limitations. The upland pedons (P2 and P5) were marginally suitable, owing

to more number (>3) of moderate limitations. The midlands (P6 and P7) were moderately suitable, because of moderate limitations of soil and climate. However, lowlands (P8, P9 and P10) marginally suitable due to poor drainage.

Maize:

The area having an annual rainfall of 900 mm, 100 cm soil depth and sandy clay loam to clay texture (27 – 60% clay). Drainage is most suitable for maize (Giri *et al.*, 1994). The upland pedons (P3 and P4) were moderately suitable due to moderate limitations of slope, coarse fragments whereas other upland pedons (P2 and P5) were marginally suitable due to more number of moderate limitations in slope, coarse fragments and organic carbon. Similarly, lowlands were marginally suitable due to poor drainage whereas midlands were moderately suitable.

Soybean:

The soil depth, texture, slope and plant available water were major attributes influencing the yield (Wadodkar, 1996). The lowland pedons (P8, P9 and P10) and midland pedons (P6 and P7) and upland pedons (P3 and P4) were moderately suitable, owing to moderate limitations of soil and climate. The upland pedon (P2) was marginally suitable because of severe limitation of erosion. Similarly, upland pedon (P5) was also marginally suitable due to more number (>3) of moderate limitations of slope, erosion, organic carbon and climate.

Sorghum:

The factors that influencing sorghum yield are rainfall, temperature, slope, Base saturation, CaCO₃, CEC and texture. The upland pedons were marginally suitable, because of severe limitations of slope, erosion and organic carbon and the midland pedons were moderately suitable whereas lowland pedons were marginally suitable due to poor drainage.

Table. Major soil-site characteristics of Hanumankoppa micro-watershed for soil –site suitability.

Physio-graphic unit	Climate				Land form characteristics				Physico-chemical characteristics (weighted averages)					
	Rain-fall (mm)	Max. temp. (°C)	Min temp. (°C)	RH (%)	Slope (%)	Ero-sion	Drainage	Depth (cm)	Sub-sur-face coarse frag-ments	Tex-ture	pH	OC (%)	CEC (cmol (p+)/kg)	Base satu-ration (%)
Uplands														
P1, P3,P4	933.4	32.2	19.4	68	5-8	e2	Well	130+	23	scl	6.29	1.28	25.0	74
P2	933.4	32.2	19.4	68	5	e2	Well	100+	29	scl	5.90	0.36	14.8	70
P5	933.4	32.2	19.4	68	5-8	e2	Well	100+	26	sl	6.10	0.45	14.6	75
Midlands														
P6, P7	933.4	32.2	19.4	68	2-3	e1	Modera-tely well	120+	19	scl	6.95	0.53	22.6	75
Low lands														
P8,P9,P10	933.4	32.2	19.4	68	<1	e0	Poor	127+	9	cl	7.28	0.99	21.1	81

Groundnut:

The upland pedons were moderately suitable owing to severe limitations of slope, erosion and lowland pedons were not suitable (but potentially suitable) because of poor drainage. However, midland pedons were moderately suitable due to moderate limitations of drainage and fertility. Similarly, Satyavathi and Suryanarayan Reddy (2004) reported that Typic Haplustalfs in Telangana region were moderately suitable for growing groundnut as they exhibited similar limitations in soil fertility and physical characteristics.

Sunflower:

The midland pedons were moderately suitable due to moderate limitations of slope, drainage and soil limitations. The upland pedons (except P5) were marginally suitable whereas lowland pedons were not suitable but potentially suitable owing to poor drainage conditions.

Chilli:

The upland and midland pedons were marginally suitable, due to severe limitations of slope, drainage and more number (>3) of moderate

limitations of climate and soil whereas lowland pedons were permanently not suitable due to poor drainage.

Paddy:

The upland pedons (P1, P3 and P4) were permanently not suitable due to very severe limitations of drainage and slope. The other upland (P2 and P5) and midland pedons (P6 and P7) marginally suitable due to slope, erosion and drainage. However lowland pedons were moderately suitable due to moderate limitations of climate and fertility factors.

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