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Soil and Land Resources Evaluation for Major Crops of Chanvelly Village for Village Level Planning -A Methodological Approach

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ABSTRACT

In the present study eight representative pedons were selected based on topography from various physiographic units identified in Chanvelly village of Ranga Reddy district in Andhra Pradesh. The soils were shallow to very deep (30-110+ cm), reddish brown to very dark greyish brown (5 YR – 10YR), well to poorly drained, neutral to slightly saline (7.2 to 8.40), low to high in organic carbon (0.31 to 0.81 %), low to medium in CEC (12 – 45.1 c mol (p+) per kg, moderately to high base saturated and sandy loam to clayey with variation in relation to physiography. The surface soils were low to medium in available nitrogen (128.4 to 298.2 kg ha^{-1}), low to medium in available phosphorous (9.1 to 28.6 kg ha^{-1}), low to high in available potassium (108 to 291.3 kg ha^{-1}), low to medium in available sulphur (5.0 to 15.0 mg per kg) and low to medium in available zinc (0.32 to 0.86 mg per kg). Based on morphological, physical, physico-chemical, chemical and meteorological data, according to revisions of US Soil Taxonomy revealed that pedon 1 of uplands and pedon 3 and 4 of midlands were classified as order Alfisols. Where as, pedon 2 of uplands classified as Entisol. The pedons 5 and 6 of midlands and pedons 7 and 8 of low lands classified in the order Inceptisols. Land capability classification was done based on the inherent soil characteristics, external land features and environmental factors. There are two land capability classes in the study area, *viz.,* III and IV and four sub classes, *viz.,* IIIsf and IV_W, IV_S and IV_{St}. The physiographic units of study area matched with the suitability for important crops like paddy, chili, cabbage, tomato, cotton and redgram crops. Major soil constraints for crop production are slope, erosion, depth, texture, coarse fragments, drainage, organic carbon, soil reaction and calcium carbonate. Considering these constraints recommendations were suggested in the way to achieve sustainable yields and also to maintain the soil health without deterioration of future generations.

Key words : Land use Planning, Soil characterization, Soil classification, Soil taxonomy, Suitability evaluation

Planning and effective utilization of soil and land resources need the information relating to soil site and characteristic features for cultivation of crops. Each plant species require specific soil-site conditions for its optimum growth. For rationalizing optimum land use, the soil site suitability for different crops needs to be determined effectively. These suitability evaluation models provide guidelines to decide the policy of growing most suitable crops depending on the capacities of each soil unit (Sehgal, 1986).

The soil and land resource inventory at regional and state level are providing a basis for blanket recommendation of various package of practices including fertilizer and other variety of inputs. The inherent diversity in soils and the adopted practices with intensive application, the soils are evidently expressing numerous complex problems, which are identified at different stages. Further, it is becoming difficult to provide solution at later stages. The multi pronged problems of intensive cropping are much diversified in nature and manifesting physically, chemically, biologically and ultimately nutritionally and the blanket recommendations are not providing a suite of solutions, for the correction and improvement

Considering this fact with a view to asses the site specific constraints and provide potential for development and remediation, the present study is planned taking village as a unit and the approach is in consonance with the village land use planning with an utmost objective of optimum resource utilization and management with a focus on sustainable land use. In this entire village soil and land resources are systematically accounted and prepared a resource inventory, which act as ready

Table 1. Morphological features of the pedons.

Pedon No	Hori- zon	Depth	Colour		Texture	Structure			Consistency			Other salient features
			Dry	Moist		G	S	T	D	M	W	
Pedon 1: Typic Haplustalfs (Upland)												
	AP	0-22	7.5 YR 4/6	7.5 YR 3/3	SCL	2	m	sbk	sh	fi	sssp	Clay films around sand were observed
	Bt	22-45	7.5 YR 4/6	7.5 YR 3/4	SCL	3	f	abk	h	fi	sssp	
	BC	45-80	7.5 YR 5/4	7.5 YR 5/4	SCL	3	f	sbk	h	fi	sssp	
	C	80+	7.5 YR 6/3	7.5 YR 5/3	SL	3	f	sbk	vh	fi	sopo	
Pedon2: Lithic Ustorthents (Uplands)												
	AP	0-17	5 YR. 4/6	5YR 3/4	SCL	1	f	gr-sbk	l	fr	sopo	
	A1	17-30	5YR 3/4	5YR 3/2	SCL	1	f	gr-sbk	sh	fr	sopo	
	C	30+	5 YR. 5/6	5YR 4/3	SCL		massive		h	fi	sopo	
Pedon 3: Typic Haplustalfs (Midland)												
	AP	0-12	7.5YR 4/4	7.5 YR 3/3	SCL	2	f	gr	sh	fr	sopo	Clay films around sand were observed
	Bt	30-Dec	7.5YR 4/6	7.5 YR 3/4	SCL	2	f	gr	s	fr	sopo	
	BC	30-60+	7.5YR 4/6	7.5 YR 3/4	SCL	2	f	gr	s	fi	sopo	
Pedon 4 : Typic Haplustepts (Midland)												
	AP	0-14	10 YR 3/2	10 YR 3/2	SC	2	f	sbk	sh	fr	sssp	
	BW	14-45	10 YR 4/3	10 YR 3/2	SCL	3	f	sbk	h	fr	sssp	
	C	45-60+	10 YR 5/6	10 YR 4/4	SCL	3	f	sbk	h	fr	sopo	
Pedon 5 : Typic Haplustepts (Midland)												
	AP	0-20	10 YR 3/1	10 YR 3/2	SCL	2	m	gr	sh	fi	sssp	
	BW1	20-45	10 YR 3/1	10 YR 3/2	SCL	2	f	sbk	h	fi	sssp	
	BW2	45-80	10 YR 4/4	10 YR 4/4	SCL	2	f	sbk	h	fi	sssp	
	BC	80-100	10 YR 5/6	10 YR 4/4	SCL	2	f	sbk	h	fi	sopo	
	C	100+	10 YR 5/6	10 YR 5/6	SL		massive		vh	fi	sopo	
Pedon 6 : Typic Haplustalfs (Midland)												
	AP	0-18	10 YR 3/1	10 YR 3/2	SCL	2	f	gr- sbk	l	fr	sssp	Clay films around sand were observed
	Bt1	18-30	10 YR 3/1	10 YR 3/2	SCL	2	f	gr- sbk	sh	fr	sssp	
	Bt2	30-60	10 YR 7/2	10 YR 2/2	SCL	3	f	sbk	h	fr	sssp	
	BC	60+	10 YR 7/4	10 YR 5/3	SCL	3	f	sbk	sh	fr	sssp	
Pedon 7 : Typic Haplustepts (Lowland)												
	AP	15-Oct	10 YR 4/3	10 YR 2/2	SCL	2	f	gr	sh	fr	sp	
	BW1	15-45	10 YR 4/3	10 YR 2/2	SCL	2	f	sbk	sh	fi	sp	
	BW2	45-80	10 YR 3/1	10 YR 3/2	SCL	2	f	sbk	h	fi	sssp	
	BC	80+	10YR 7/4	10YR 5/3	SL	2	f	sbk	h	fi	sopo	
Pedon 8 Vertic Haplustepts (Lowland)												
	AP	0-17	10 YR 4/4	10 YR 4/3	SC	1	m	sbk	h	fi	sp	
	BW1	17-38	10 YR 4/6	10 YR 4/4	SCL	3	f	sbk	h	fi	sssp	
	BW2	38-60	10 YR 5/6	10 YR 4/4	SC	3	f	sbk	h	fr	sssp	Cracks were observed
	BC	60-110	10 YR 5/4	10 YR 4/4	SCL	3	f	sbk	h	fr	sssp	
	C	110+	10 YR 5/6	10 YR 4/4	SL		massive		h	fi	sopo	

* Symbols used are according to Soil Survey Manual (Soil Survey Staff 1951)

Table 2.: Physical characteristics of the soils.

Pedon No	Horizon	Depth	Sand (%) (2.00-0.05mm)	Silt (%) (0.05-0.002mm)	Cay (%) (<0.002mm)	Texture	Bulck density (Mg m^{-3})	Moisture retention (%)	
								0.33bar	15bar
Pedon 1: Typic Haplustalfs (Upland)									
	AP	0-22	54.6	15.0	30.4	SCL	1.40	12.4	10.0
	Bt	22-45	48.4	14.0	37.6	SCL	1.43	22.6	8.6
	BC	45-80	57.6	10.0	32.4	SCL	1.48	28.4	14.2
	C	80+	70.6	13.0	16.4	SL	1.69	—	—
Pedon 2: Lithic Ustorthents (Uplands)									
	AP	0-17	59.6	11.0	29.4	SCL	1.46	16.8	8.2
	A1	17-30	60.6	9.8	29.6	SCL	1.49	17.2	9.5
	C	30+	64.6	8.8	26.6	SCL	1.55	29.5	10.1
Pedon 3: Typic Haplustalfs (Midland)									
	AP	0-12	57.6	12.0	30.6	SCL	1.62	16.8	8.0
	Bt	30-Dec	52.6	10.0	37.4	SCL	1.74	20.4	10.2
	BC	30-60+	63.2	11.0	25.8	SCL	—	—	—
Pedon 4 : Typic Haplustepts (Midland)									
	AP	0-14	49.4	12.3	38.3	SC	1.38	10.6	4.6
	BW	14-45	65.4	9.8	24.8	SCL	1.45	11.8	5.8
	C	45-60+	67.4	10.0	22.6	SCL	1.56	13.7	6.8
Pedon 5 : Typic Haplustepts (Midland)									
	AP	0-20	51.0	16.4	32.6	SCL	1.33	12.2	6.8
	BW1	20-45	52.6	14.0	33.4	SCL	1.38	11.8	7.2
	BW2	45-80	56.6	13.0	30.6	SCL	1.54	15.6	8.8
	BC	80-100	68.6	9.0	22.4	SCL	1.59	18.3	12.2
	C	100+	74.4	11.0	14.6	SL	1.62	28.2	12.9
Pedon 6 : Typic Haplustalfs (Midland)									
	AP	0-18	62.2	12.2	25.6	SCL	1.36	10.5	6.0
	Bt1	18-30	59.0	9.0	32.0	SCL	1.42	15.6	6.8
	Bt2	30-60	52.2	8.2	39.6	SCL	1.68	20.2	8.2
	BC	60+	55.4	8.2	36.4	SCL	1.79	25.6	14.4
Pedon 7: Typic Haplustepts (Lowland)									
	AP	15-Oct	49.6	20.0	30.4	SCL	1.41	11.9	5.6
	BW1	15-45	54.0	18.0	28.0	SCL	1.44	13.4	6.8
	BW2	45-80	57.0	17.0	26.0	SCL	1.58	17.3	7.2
	BC	80+	68.0	13.4	18.6	SL	—	—	—
Pedon 8 Vertic Haplustepts (Lowland)									
	AP	0-17	49.6	14.0	36.4	SC	1.33	18.6	6.2
	BW1	17-38	52.6	13.2	34.2	SCL	1.42	26.2	6.2
	BW2	38-60	47.5	15.1	37.4	SC	1.45	22.8	6.4
	BC	60-110	59.6	12.1	27.2	SCL	1.48	22.6	8.2
	C	110+	78.6	6.2	15.2	SL	1.59	38.6	10.8

reference reckoned for any planning activity for the development and improvement of village soil and land resources further. The entire study work encompass in accounting of the soil and land resources, which is providing a medium for the crop growth.

Essential soil and land resources of Chanvelly village are diversified in nature and characteristics in supplying nutrients and providing necessary anchorage for the crop growth and development. There are number of variations in growth and disparities in the packages adopted by farmers. Very little attention was paid to study of the soils of this area of Ranga Reddy district and this village is very near to Hyderabad city and viewed to harvest always high value crops, with immediate intrest and not all considering the soil quality and sustenance. Most of the studies conducted earlier were only broad based and were conducted as a part of their study of soils of country or state. Keeping these factors in mind, present study was undertaken to characterization and classification of soils of Chanvelly village of Ranga Reddy district in order to assess their suitability for the localized crops like paddy, chilli, cabbage, tomato, cotton and redgram.

MATERIAL AND METHODS

This village is located between 17°15' and 17°16' North latitudes and 79°05' and 77°06' East longitudes. Physiographically, the study area is located at an average height of 530 m above the mean sea level (MSL), covering an area of 2,150 acres. It is characterized by semi arid climatic condition, with the average rainfall of 1100 mm, of which 74% is received during southwest monsoon, 16 % during northeast monsoon and 8 % during summer season.

Mean monthly rainfall is highest in the month of august followed by september, march, july, april and june. Chanvelly village of Ranga Reddy district comprises of plains criss crossed with one canal and some small streams. The chief canal is Chandrakitha, which coming from Ganapur village side and flow from north-west to south. The mean annual soil temperature is 30.0°C with mean summer and winter soil temperatures being 32.0° and 29.0° C, respectively. The area qualifies for *iso-hyperthermic* temperature regime. The soil moisture control section remains dry for more than 90 cumulative days or 45 consecutive days in four months following summer solistice and it qualifies for *Ustic* soil moisture regime. Tamarind (*Tamarindus indica*), neem (*Ajadiracchta indica*), teak (*Tectona grandis*) and ber (*Zizyphus jujube*) are predominat trees in the study area, with varieties of shrubs.

The study area forms a part of Deccan Plateau. The general slope of the land is from north to south. The lands were characterized in to uplands, midlands and lowlands and were studied in detail various characteristics are presented in table 1. The soil samples representing each horizon of the pedons were collected and characterized for important physical and physico-chemical properties using standard procedures (Soil Survey Staff 1951)

Besides, forty (40) surface soil samples (0-15cm) were also collected covering all the fields of village and these surface samples were analyzed for available macronutrients (N, P, K and S) and micronutrients (Fe, Zn, Cu and Mn) by adopting standard procedures outlined by Jackson (1967) and Lindsay and Norvell (1978), respectively. Surface soil samples were rated in low, medium and high categories as per the limits suggested by Muhr *et. al.* (1965) for available N, P and K. Considering potentials and limitations of the soils, land capability classification was also evaluated up to subclass level (Klingebiel and Montgomery, 1966). Suitability of soils for growing crops was evaluated using criteria given by FAO(1993a).

RESULTS AND DISCUSSION:

Morphology

The pedons 1 and 2 were developed on upland, pedons 3, 4, 5 and 6 on midlands and pedons 7 and 8 on low land area. Soils on low land are very deep and poorly drained whereas the soils on upland and midland are moderately deep to shallow and are well drained. The colour of the soils varied from dark reddish brown (5YR3/2) to pale brown (7.5YR6/3) in upland, very dark grayish brown (10YR3/2) to dark brown (7.5YR3/3) in midlands and dark yellowish brown (10YR4/4) to very pale brown (10YR7/4) in lowlands. In midland the colour did not differ much between horizons in different pedons. Further, the variation of colour from dark grayish brown to dark brown in midland was due to admixture of organic matter and iron oxides. However, the variation of colour in upland varies from dark reddish brown to pale brown. This was found to be influenced mainly by the type of parent material, low organic matter content, warmer temperature regime and moderately high rainfall existing in the area. The colour varied from very pale brown to very dark grayish brown in lowlands, Which might be influenced by the topography and impeded drainage in the sub-surface layers (Vara Prasad Rao *et al.,* 2008).

The texture of soils was found to vary from sandy caly loam to sandy caly. The texture of lowland physiographic units was finer than upland

Table 3. Soil characteristics of Chanvelly village for land evaluation.

P No.	Land form characteristics			Physical and Physico-chemical characteristics(weighted averages)							
	Slope (%)	Erosion	Drainage	Depth (cm)	S.Coarse fragments (vol %)	texture	pH	EC (dS m^{-1})	OC (%)	CEC cmol(p+) / kg	B.S (%)
Upland											
1	3-5	Moderate	Well	80+	23	SCL	7.5	0.33	0.67	21.5	62.5
2	3-5	Moderate	Well	30+	24	SCL	7.3	0.30	0.60	13.0	68.5
Midland											
3	2-3	Moderate	Mod.well	60+	20	SCL	7.8	0.46	0.65	16.8	71.9
4	2-3	Slight	Mod.well	60+	21	SCL	7.9	0.36	0.61	21.8	56.1
5	2-3	Slight	Mod.well	60+	19	SC	7.7	0.67	0.72	33.1	60.7
6	2-3	Slight	Mod.well	100+	18	SCL	7.5	0.66	0.72	23.9	71.4
Lowland											
7	2-3	Slight	Imperfect	80+	18	SCL	8.2	0.81	0.72	23.0	70.8
8	0-1	Nil	Poor	110+	10	SC	7.8	0.76	0.71	24.6	74.5

Table 4. Surface soil nutrient status of study area.

	Macro nutrient status				Micro nutrient status			
	N	P	K	S	Zn	Fe	Cu	Mn
	(kg ha^{-1})			(ppm)	(ppm)			
Upland								
1	198.4	18.7	149.6	8.2	0.49	10.2	0.86	18.6
2	114.5	5.8	138.7	6.6	0.48	12.5	0.29	25.2
Midland								
3	147.3	14.9	203.3	10.1	0.38	12.6	0.96	32.4
4	149.6	10.2	148.3	5.0	0.42	7.6	0.45	18.6
5	155.3	10.9	144.6	6.6	0.32	6.4	0.46	16.3
6	154.8	11.6	146.6	7.6	0.41	7.6	0.48	12.2
Lowland								
7	224.7	27.3	182.1	12.2	0.46	10.2	0.42	19.8
8	296.5	28.6	368.6	15.0	0.61	19.6	0.96	26.6

and midlands mainly due to lateral movement of finer fractions from uplands and midlands, difference in parent material, physiography, insitu weathering and the tranlocation of clay (Basava Raju *et al,* 2005). The structure of the study area varied from weak to strong, fine to medium and granular to sub angular blocky. The variation in soil structure is a reflection of physiographic position of the pedons (Singh and Agarwal, 2003)

The consistency of the soils occur on upland and midlands varied from loose to very hard(dry), firm to friable (moist) and non sticky and non plastic to slightly sticky and slightly plastic (wet). Whereas the soils in low land exhibited slightly hard to hard (dry), firm to friable moist and non sticky and non plastic to sticky and plastic. This physical behavior of soils influenced by dry, moist and wet conditions was not only due to the textural make up but also due to type of clay minerals present in these soils. The C horizon of all the pedons had shown non-sticky and non-plastic or slightly sticky and slightly plastic consistence, which might be due to less amount of clay. Similar findings were also reported by Thangasamy *et al.* (2005) in the soils of Sivagiri micro-watershed.

Soil characteristics:

Physical characteristics:

The physical characteristics of the soils are presented in table 2. All the pedons are characterized by high total sand content ranging from 47.5 to 78.6 per cent in different pedons. The sand content in the solum of lowland pedons was comparatively less than that observed in midland and upland pedons. The sand content was slightly decreased in the horizon immediately below the surface was observed in pedons 1,3 & 6. Silt content in the pedons studied ranged from 8.0 to 18.0 per cent in A and B horizons. There was no distinct difference among the pedons in relation to their landscape position.

Clay content ranged from 16.4 to 37.6 per cent in upland soils, 14.6 to 39.6 in midland soils and from 18.6 to 41.4 per cent in lowland soils. High clay content in soils of low lands as compared to uplands and midlands was due to deposition of final fractions in the low lands from uplands and midlands. In pedons 1, 2, 3, 6, 7, 12, 14 and 15, the sub-surface horizons exhibited higher clay content as compared to surface horizons due to the illuviation process occurring during soil development. Similarly, the illuviation process also affected the vertical distribution of silt and sand content. Similar observations were also made by Tripathi *et al.* (2006) in Kiar-Nagali micro-watershed in North-. The 'A" horizon of lowland pedon 8 showed low bulk density values which could be attributed to high organic matter contributed by leaf foliage. Similar observations were also made by Vara Prasad Rao *et al.* (2008). In all the pedons, moisture retention capacity at 0.33 bar varied from 10.6 to 38.6%. These differences were due to the variation in clay and organic carbon content of the pedons. Similar observations were also made by Thangasamy *et al.* (2005)

Physio-chemical characteristics

Physico chemical characteristics of the soils are presented in table 4. The pH of the soils varied from 7.3 to 7.5(uplands), 7.5 to 7.9(midlands), 7.8 to 8.2(lowlands). The lowland pedons have relatively high pH vales than that of upland pedons. This increase in soil pH down the slope could be due to leaching of bases from higher topography and getting deposited at lower elevations (Sitanggang *et al,* 2006). The electrical conductivity of pedons ranged from 0.30 to 0.81 dS m^{-1} indicating moderate salt content in these pedons. The upland pedons showed a less EC. The EC was slightly higher in the horizons of midlands and lowland pedons. In lowlands, slightly higher EC was recorded as compared to midlands, which can be attributed to the accumulation of salts in lowlands. These results were similar to those of Sitanggag *et al.* (2006) in soils of Shikohpur watershed in Gurgaon district of Haryana.

The lowland pedons were higher in organic carbon content than other pedons. The distribution of organic carbon in these profiles is mainly associated with physiography and land use. The CEC in soils ranged from 13.0 to 33.1 cmol(p+) kg^{-1}, which corresponds to clay content in the horizons. The higher CEC value was observed in A horizon of lowlands (45.1 c mol (p+) per kg) then upland and midland pedons. Similar type of observations was reported by Swarnam *et al.* (2004) in the soil and land environs of Shahibi basin in parts of Haryana and Delhi. The base saturation was found to vary from 38.2 to 93.9 per cent. The A horizon of upland pedons is less base saturated than A horizon of lowland pedons, indicating high degree of leaching in upper slopes. These findings are in concurrence with the results reported by Sitanggang *et al.* (2006).

The nutrient status and soil fertility

The available N content of surface soil samples varied from 47.3 to 296.5 kg ha^{-1} (table 5). The low nitrogen status in surface soils could be attributed to low amount of organic carbon in these soils (Vijay Kumar *et al,* 1994). The available phosphorus

Table 5. Land Capability Classification, Major limitation and Recommendations.

Pedon. No	LCC	Major limitation	Recommendations
1	IV_S	Texture, drainage, slope, coarse fragments, O.C	Bulky organic manure, clay mixing, contour bunding, application of tank silt.
2	IV_S	Texture, depth, slope, drainage, coarse fragments, O.C	Bulky organic manure, ridge and furrow, contour bunding, application of tank silt,
3	IV_S	Texture, depth, soil reaction, coarse fragments, O.C	Bulky organic manure, ridge and furrow, green manuring.
4	IV_S	Slope, soil reaction, Coarse fragments, O.C	Green manuring, addition of organic manure, contour bunding
5	III_{Sf}	Soil reaction,	Green manuring, addition of organic manure.
6	IV_S	Soil reaction, depth, O.C	Green manuring, addition of organic manure, ridge and furrow.
7	IV_S	Drainage	Surface and sub surface drainage, green manuring, bulky organic manure
8	III_{Sf}	Drainage, high $CaCO_3$	Surface and sub surface drainage, green manuring, addition of organic manure.

Table 5. Soil- site suitability evaluation for Major crops.

Pedons	Paddy	Chilli	Cabbage	Tomato	Cotton	Redgram
Upland						
Pedon 1	S3	S2	S2	S3	S3	S2
Pedon 2	S3	S3	S3	N	S3	S3
Midland						
Pedon 3	S3	S2	S2	S3	S3	S2
Pedon 4	S3	S2	S2	S3	S3	S2
Pedon 5	S3	S2	S2	S3	S3	S2
Pedon 6	S2	S2	S2	S3	S3	S2
Lowland						
Pedon 7	S3	S3	S3	S3	S3	S3
Pedon 8	S3	S2	S2	S3	S3	S2

content of the surface soil samples varied between 5.8 to 28.6 kg ha^{-1} which indicates that the soils are medium in available phosphorus. This could be attributed to the fixation of phosphorus by clay minerals and oxides of iron and aluminium (Vijay Kumar *et al,* 1994). The available potassium of the surface soil sample varied from 138-7 to 368.6 kg ha^{-1}. This could be attributed to more intense weathering, release of K from organic residues, application K fertilizers.Similar results were reported by Thangasamy *et al.* (2005). Available sulphur ranged from 5.6 to 15.0 mg kg^{-1}, indicating the soils of this area were deficient in available sulphur.

The available Zinc, Iron, Copper and Manganese content of the profile samples ranged from 0.32 to 0.49 ppm, 12.2 to 6.4 ppm, 0.42 to 0.96 ppm and 12.2 to 32.4 ppm respectively. The available micronutrient content decreased with the depth in all profiles. Similar results were reported by Deepak Sarkar and Sahoo (2000).

SOIL CLASSIFICATION

Based on morphological, physical, physico-chemical characteristics of the soils and climate data, the soils were classified according to keys to Soil Taxonomy (Soil Survey Staff 1998) in to the order Entisols (pedon2) which do not have any diagnostic horizon. The pedons 1, 3 and 6 were classified under Alfisols because of the presence of an argillic (B_t) sub-surface diagnostic horizon and the pedons 4, 5, 7 and 8 were classified under the order inceptisols because of the absence of any other diagnostic horizon other than cambic (B_w) horizon.

Land capability classification

Land capability classification is an interpretative grouping of soils mainly based on the inherent soil characteristics, external land features and environmental factors that limits the use of the land. The classification of units provide information on the physiography, colour, texture, structure of soil, type of clay mineral, consistence, permeability, depth of soil and soil reaction. Each of above factor have definite role to play in behaviour of soil and its management. Based on soil properties, the soils of Chanvelly village have been classified into two land capability classes viz., III and IV (Table 15). Similar observations were also made by Dipak sarkar *et al.* (2002). The study area represented by upland pedons 1 and 2 were classified into IVs, land capability sub-class due to the limitations of texture, soil depth and the midland pedons 3 and 4 were classified into IVs , land capability sub class due to limitations of texture whereas the midland pedons 5 and 6 and lowland pedon 10 were classified as III_{Sf}, capability sub-class due to the limitations of texture, soil depth, coarse fragments and soil fertility limitations. The low land pedon 13 were classified into IVw, land capability sub-class due to poor drainage.

Suitability evaluation

The physiographic units of study area matched with the suitability for important crops like paddy, chili, cabbage, tomato, cotton and red gram crops. The upland pedon 1 and midland pedons 3 and 4 were moderately suitable to chilli, cabbage and red gram with limitations of slope, coarse fragments, and organic carbon and marginally suitable to paddy, tomato and cotton. The upland pedon 2 also marginally suitable all these crops due to slope, depth, drainage and texture. The midland pedons 5 and 6 were moderately suitable for these crops with limitation of depth, organic carbon and soil reaction. The lowland pedon 7 was moderately suitable for these crops due to impeded drainage where as the low land pedon 8 was marginally suitable for these crops due to poor drainage.

The major soil constraints of crop production were identified as texture, erosion, slope, depth, poor drainage and low organic carbon. Similar observations were made by Reddy *et al.*(1998) and Fransis Conant *et al.*(1983). The land capability classes, major soil constraints for crop production and suggested recommendations presented in table 5.

Conclusions

The results lead to a conclusion that the soils of Chanvelly village were shallow to very deep, well to poorly drained, neutral to slightly saline, low to high in organic carbon, low to medium in CEC, moderately to high base saturated and sandy loam to clayey with variation in relation to physiography. Regarding nutrient status the soils were low to medium in available nitrogen and phosphorous, low to high in available potassium, low to medium in available sulphur and low in available zinc. Different landforms of Chanvelly village were classified up to sub-group level. Based on soil properties land capability classes were categorized. The physiographic units of study area matched with the suitability for important crops like paddy, chili, cabbage, tomato, cotton and red gram crops. Major soil constraints for crop production are identified. Considering these constraints recommendations were suggested in the way to achieve sustainable yields and also to maintain the soil health without deterioration of future generations. Primarily this survey explores the potentialities and constraints for the soil and land resources at village level and suggested site specific management strategies for developmental planning.

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