

Short Communication

Computerized Database on Salt Affected Soils for Agroclimatic Regions in Arid and Semi-arid Areas of Western and Central India

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The distribution of salt affected soils in the western and central India is related to severe aridity, undulating topography, deep and poor ground water quality, lack of infrastructure for irrigation and absence of natural surface drainage (Dhir, 1998). The estimated area varies due to differences in methodologies and scale of mapping (DAC,

Rajasthan, Maharashtra and Madhya Pradesh (including Chhattisgarh) States (Fig. 1). Salt affected soil maps on 1:250,000 were georeferenced and digitized using ILWIS software (ver 3.3). Superimposing polygons of salt affected soils and thematic layers of basemap for political boundaries (state/district), irrigation/drainage (canal/river),

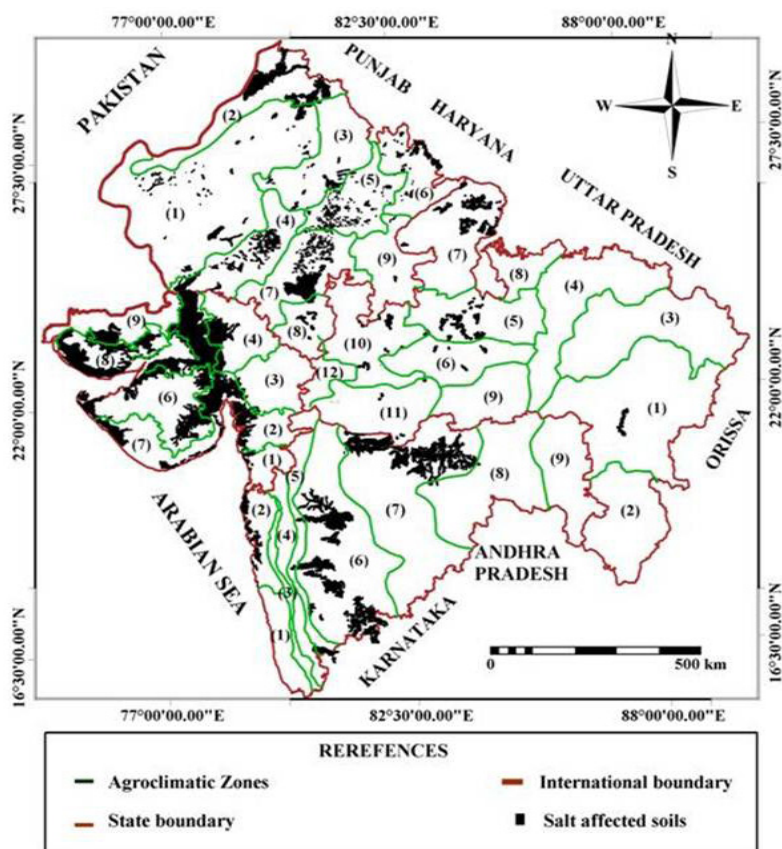


Fig. 1. Distribution of salt affected soils in agro-climateic zones.

1994; NRSA, 1997). An attempt is made to develop a digital database for salt affected soils in Western and Central India for regional and zonal planning using Geographic Information System (GIS).

The study area lies between 15°30' and 30°12' N and 68°04' and 84°30' E comprising of Gujarat,

infrastructure (roads/railways) and settlements (state/district HQ), state maps of salt affected soils were developed. A digital mosaic for Western and Central India was prepared in GIS. Overlaying boundaries of ACR/ACZ (Ghosh, 1991) regional and zonal maps of salt affected soils were developed (Fig. 1). Categories of salt affected soils were identified (Table 1) and these were merged

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Table 1. Description of the soil characteristics used for legend development

SAS code	Categories of SAS	ECe (dS m ⁻¹)	Saline class	pH range	ESP range	Sodic Class	Physiography*
s1	Slightly saline	4.0-8.0	1	<8.5	<15	0	A, F, B, D, H
s2	Moderately saline	8.1-30.0	2	<8.5	<15	0	A, F, B, D, H
s3	Strongly saline	>30.0	3	<8.5	<15	0	G, D, B, H
n1	Slightly sodic	<4.0	0	8.5-9.0	<15	1	F, B
n2	Moderately sodic	<4.0	0	9.0-9.8	15-40	2	F, H
s1n1	Slightly saline, slightly sodic	4.0-8.0	1	8.5-9.0	<15	1	A, F, B, D, H
s1n2	Slightly saline, moderately sodic	4.0-8.0	1	9.0-9.8	15-40	2	F, B
s1n3	Slightly saline, strongly sodic	4.0-8.0	1	>9.8	>40	3	B
s2n1	Moderately saline, slightly sodic	8.1-30.0	2	8.5-9.0	<15	1	F, D, B
s2n2	Moderately saline, moderately sodic	8.1-30.0	2	9.0-9.8	15-40	2	F, D, B
s2n3	Moderately saline, strongly sodic	8.1-30.0	2	>9.8	>40	3	F, D, B, H
s3n1	Strongly saline, slightly sodic	>30.0	3	8.5-9.0	<15	1	F, B, H
s3n2	Strongly saline, moderately sodic	>30.0	3	9.0-9.8	15-40	2	D, B
s3n3	Strongly saline, strongly sodic	>30.0	3	>9.8	>40	3	D, B

*A-Alluvial, F-Peninsular, B-Arid/Aeolian/Aeolian/Aeolian, D-Coastal, G- Mudflats/Mangrove Swamps, H-Others

to two categories viz., saline and sodic soils for management purposes.

Salt affected soils (22.2 lakh hectares) in Gujarat (Table 2) are distributed in the coastal (18%), arid (24%), alluvial (22%) plains and others (H) units (36%). These soils are saline (76%) and sodic (24%) in nature. Saline soils are highly variable and their characteristics are primarily influenced by periodic inundation of saline sea water along the coastal plain (Joshi and Sahai, 1993). Moderate (6%) and strongly (19%) sodic soils are found in coastal and others (H) plains associated with black soils and sodic ground water (Dubey *et al.*, 1995)

In Rajasthan, salt affected soils occupied 3.75 lakh hectares and are distributed in arid (74%) and

alluvial (6.5%) plains. These soils are saline (52%) and sodic (48%) in nature. Slight and moderately saline soils (50%) are distributed in arid and alluvial plains underlain by saline ground water (Dhir, 1998) and also distributed in canal irrigated region with absence of natural surface drainage (Singh and Kar, 1991). Slight to moderately sodic (48%) soils are distributed in arid and alluvial plains associated with fine textured black soils (Dhir, 1998)

In Maharashtra, saline (30%) and sodic (70%) soils are distributed in peninsular (94%), coastal (5%) and mudflats/mangrove swamps (0.9%). Slight and moderately (29%) saline soils are located in peninsular plain influenced by saline ground water and periodic sea water inundation in coastal and mudflats/mangrove swamps regions. Sodic soils are variable and are located in the peninsular plain with complex black soils and poor quality ground water. The sodic soils of Madhya Pradesh (139720 ha) are located in the peninsular plain in black soil region

Significant extent (2222000 ha) of salt affected soils is distributed in ACR XIII located in low rainfall (550 mm) zone of Gujarat. The zonal distribution showed considerable areas in North West (45%), Rann of Kachchh (13%), Bhal and Coastal (13%) and North Saurashtra (13%) zones. Salt affected soils occupied 357453 ha in ACR VIII and are distributed in sub-humid southern plain zone (28%) of Rajasthan and Gird Zone (45.5%) of Madhya Pradesh (Table 3). Salt affected soils covered 104538 ha in ACR XIV of Western Rajasthan with low rainfall (253 mm), sandy plain and saline

Table 2 Extent of salt affected soils (ha)

Code	Gujarat	Rajasthan	Maharashtra	Madhya Pradesh
s1	432953	90276	146893	-
s2	235621	97377	31166	-
s3	-	7915	6031	-
n1	-	6585	6842	32928
n2	-	440	-	1059
s1n1	604883	92024	254400	49990
s1n2	-	2475	6837	12543
s1n3	-	12	154589	-
s2n1	254212	38505	-	27440
s2n2	122441	14714	-	12456
s2n3	400730	-	-	2357
s3n1	114474	22865	-	947
s3n2	50236	1035	-	-
s3n3	14628	718	-	-
Total	2222000	374942	606759	139720

Table 3. Distribution of salt affected soils in agro-climatic zones

Zone Code	Description of agro-climatic zones	Area (ha)	Zone Code	Description of agro-climatic zones	Area (ha)
Gujarat			Maharashtra		
<i>Agro-climatic Region XIII: Gujarat Plains and Hills Region</i>			<i>Agro-climatic Region XII: West Coast Plains and Hills Region</i>		
1	South Gujarat Heavy rainfall area	19845	1	Northern Konkan Coastal Zone	52280
2	South Gujarat Zone	44532	2	Sub-montane Zone	3465
3	Middle Gujarat Zone	9080	3	Western Maharashtra Plain Zone	20556
4	North Gujarat Zone	135572	<i>Agro-climatic Region IX: Western Plateau and Hills Region</i>		
5	North West Zone	1005109	4	Western Maharashtra Scarcity Zone	321314
6	North Saurashtra	295247	5	Central Maharashtra Plain Zone	207014
7	South Saurashtra	117854	6	Central Vidarbha Zone	2130
8	Bhal and Coastal region	296100	Total		606759
9	Rann of Kachchh	298661	Madhya Pradesh		
Total		2222000	<i>Agro-climatic Region VII: Eastern Plateau and Hills Region</i>		
Rajasthan			1	Chhattisgarh Plain Zone	10038
<i>Agro-climatic Region XIV: Western Dry Region</i>			<i>Agro-climatic Region VIII: Central Plateau and Hills Region</i>		
1	Arid Western Zone	45392	4	Kymore Plateau and Satpura Hill Zones	130
2	Irrigated North West plain Zone	70996	5	Vindhya Plateau Zone	20864
3	Transitional Plain of Inland Zone	24850	6	Central Narmada Valley Zone	4746
4	Transitional Plain of Luni Basin Zone	62116	7	Gird Zone	63559
<i>Agro-climatic Region VIII: Central Plateau and Hills Region</i>			8	Jhabua Hills Zone	4367
5	Semi arid Eastern Plain Zone	32043	<i>Agro-climatic Region IX: Western Plateau and Hills Region</i>		
6	Flood Prone Eastern Plain Zone	25193	10	Malwa Plateau Zone	29549
7	Sub-humid Southern Plain Zone	103004	11	Nimar Valley Zone	6467
8	Humid Southern Plain Zone	10485	Total		139720
9	Humid South East plain Zone	863			
Total		374942			

ground water. These are distributed in the irrigated North West plain (19%), Transitional Plain of Luni Basin (17%) and Arid Western Zones (12%). Saline soils are dominating in ACR XII distributed in Konkan coast and Western Maharashtra Plain zones with annual precipitation >2500 mm. Salt-affected soils occupied 617481 ha in ACR IX covering parts of Maharashtra and Madhya Pradesh under semi-arid and humid temperate (750-1250 mm) climate. Sodic soils (10010 ha) are dominant in ACR VII covering Chhattisgarh plain zone of Maharashtra.

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