Int.J.Curr.Microbiol.App.Sci (2017) *6*(10): 3074-3083

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 10 (2017) pp. 3074-3083**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.610.362

Soil-Site Suitability Evaluation for Groundnut (*Arachis hypogaea*) in Western Saurashtra Region of Gujarat, India

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Keywords

Pedon, Soil site suitability, Evaluation, Groundnut and limitations.

Article Info

Accepted:
26 September 2017
Available Online:
10 October 2017

A B S T R A C T

A detailed soil survey was undertaken in Porbandar taluka, Porbandar district with the aim to assess the status and potential of land resources for the production potential and suitability evaluation for groundnut. The area of the taluka has been divided into four major landforms *viz.*, hill, pediment, pediment & alluvial plain and coastal plain. Based on the variation in physiography and soil characteristics, 16 soil pedons were studied in the taluka. Pedon P1 occurring on hill which are moderately shallow, sandy, mixed, calcareous, skeletal, Hyperthermic, Lithic Ustorthents whereas pedon P2 belongs to pediment which are moderately shallow, clayey, mixed, calcareous, Hyperthermic, Lithic Haplustepts in nature. Pedons from P3 to P8 occurring on coastal plain which are moderately shallow to very deep, fine/loamy, mixed/smectitic, calcareous, Hyperthermic, Vertic/Lithic/Typic Haplusterts. Pedons from P9 to P16 occurring on coastal plain which are very shallow to very deep, clayey/clayey skeletal/sandy/fine, mixed, calcareous, Hyperthermic, Lithic/Aridic/Torretic/Typic Haplustepts/Ustorthents/ Ustipsamments/ Haplusalids/ Halaquepts/ Torripsamments in nature. These soils are moderately alkaline (7.88 pH) to very strongly alkaline (9.64 pH), low (0.39%) to very high (1.65%) in organic carbon, non to very low saline (EC 0.12-1.99 dsm-1) and very low (0.28%) to high (23.77%) in calcium carbonate. Coarse fragment of the soils varies from 10-50%. Soil has been assessed for suitability of groundnut as per the criteria given by Naidu *et al.*, 2004. Soils of the pedon P3- P8, P11 and P12 were moderately suitable, whereas pedon P1, P2, P10, P13 and P16 was marginally suitable for the cultivation of groundnut. Soils of pedon P9 and P14-15 were not suitable for the groundnut cultivation due to extreme values of depth, texture, pH, organic carbon and water logging respectively. Potentially soils of pedon P13 was moderately suitable in contrast to P14 and P15 which are marginally suitable.

Introduction

Groundnut is an important oilseed crop, possessing a high nutrition value as it contains 40-48% oil, 26% protein, 12% starch, 5% soluble sugar and 2% crude fiber. Production potential of any crop is principally affected by soil-site parameters as conditional by climate, topography, fertility and management level (Sehgal, 1987 and 1991). Increasing population at faster rate of the country enforced the intensive use of natural resource

for the feed of its inhabitants and increase assorted use of land resources which expand their degradation and in-turn decline in soil fertility, and finally poor factor-productivity. However, growing the crops without proper consideration of soil and site characteristics has observed with continuously low yield with soil health downturn. We need to be using the natural resources according to their capacity to satisfy the needs of its inhabitants. This can be achieved through proper investigation of land resources and their scientific evaluation. Therefore, it is necessary to interpret the soil-site characteristics of any place in terms of their suitability for the important crops grown in the region.

Information on soil-site suitability of groundnut crop in different landforms of Porbandar taluka is skimpy. Hence, it is desirable that the groundnut crop should be grown as per the suitability in different kinds of soils as well as climate and physiography. Several workers have worked out the suitability of soils for various crops such as wheat (Sharma, 1999), cotton (Mandal *et al.*, 2002) and sorghum (Pakhan *et al.*, 2010). Considering this, soil-site requirement of groundnut for the region was developed talking into account the available literature and field and local experience as suggested by Naidu *et al.,* (2006) and FAO (1976). Keeping above theory in mind the study "soil-site suitability evaluation for groundnut in soils of Porbandar taluka, Gujarat for the improved livelihood and sustainable agriculture in the region" has been done (Fig. 1).

Materials and Methods

Location and climate

The study area falls under AESR 5.1 (Central Kathiawar peninsula, hot dry semiarid ESR with shallow loamy clayey black soil, medium AWC) along the Arabian Sea coast. It lies between $21^0$13'to $21^0$58'N and $69^0$22' to $70^0$01' E. The temperature regime is megathermic in hill slope, upper piedmont and lower piedmont and iso-megathermic in piedmont plain and coastal area. Average rainfall of last 10 years of the block is 877 mm with the length of growing period (LGP) is 90-120 days.

Soil sampling and analysis

Soils of the taluka have been surveyed and mapped on 1:10000 scale using existing, digital base maps and IRS P6 imagery (ICAR-NBSS&LUP, Annual Report 2016 and 2017). Sixteen representative soil pedons of four landforms viz., Soils of hill, pediment, piedmont & alluvial plain and coastal plain were selected for present study. The pedons were studied on defined land forms for morphological characteristics following the procedure given in Soil Survey Staff (1951). Soil samples collected from the typifying pedon and analyzed for their soil genesis, physical, physic-chemical, chemical and nutrient status properties following standard procedures and the soils were classified according to soil taxonomy (Soil Survey Staff, 1999). Soil pH was measured in 1:2.5 soil water suspension using glass electrode pH meter. Electrical conductivity was measured in 1:2.5 soil water supernatant solutions with the help of conductivity bridge (Jackson 1973). The organic carbon was determined by rapid titration method (Walkley and Black 1934) and $CaCO_3$ by rapid titration method (Puri 1930).

Soil-site suitability evaluation

The soil-site suitability was carried out using the FAO (1976) and Naidu *et al.*, (2006) with slight modification by Sys *et al.*, (1991 and 1993). Suitability classes were determined

with regards to the number and intensity of limitations. The soils were evaluated in different suitability classes viz., S1: Highly suitable, S2: Moderately suitable, S3: Marginally suitable and N1: Currently not suitable. Thus, the evaluation was done by comparing the land characteristics with suitability levels of the crop requirement tables (Naidu *et al.*, (2006). The degree of limitations suggested the suitability class of each soil for a particular crop. The potential land suitability subclasses were determined after considering the improvement measures to correct the limitations.

Results and Discussion

Soil characteristics (Physical and chemical)

The data regard to soil characteristics of dissimilar landforms of the pedon P1-P16 is adjacent in Table 1.

Soils of hill (Pedon P1)

The sand, silt and clay content of the pedon were recorded 63.59, 14.17 and 22.24% with shallow depth class. The pH of the soil was strongly alkaline which might be due to salt deposition in soil layers due to high temperature and very low rainfall. These findings are similar to those of Sharma and Bhaskar (2003). The organic carbon content recorded very high (1.65%) due to high vegetation on the hills whereas calcium carbonate content of the soils were recorded around 7.56%. The EC and CEC values of the area recorded around 0.31 dsm^{-1} and 26.63 cmol (p^{+}) kg^{-1} respectively with sandy clay loam skeletal texture and 30-35% coarse fragments. Similar observations were also observed by Savalia *et al.,* (2009).

Soils of pediment (Pedon P2)

The sand, silt and and clay content of the pedon were recorded 24.22, 43.67 and 32.11% with moderately shallow depth class. The pH of the soil was moderately alkaline which might be due to irrigation with salty water and high temperature. These findings are similar to those of Sharma and Bhaskar (2003). The organic carbon content recorded very high (1.09%) due to high application of farm yard manure and green manure whereas calcium carbonate content of the soils were recorded around 9.34%. The EC and CEC values of the area recorded around 1.16 dsm^{-1} and 56.25 cmol (p^{+}) kg^{-1} respectively with clay loam texture and 10-15% coarse fragments.

Soils of pediment and alluvial plain (Pedon P3-P8)

The sand, silt and clay content of the pedon P3 recorded 24.95, 46.84 and 28.21% respectively with moderately shallow depth class and strongly alkaline in nature. These findings are similar to those of Sharma and Bhaskar (2003). The organic carbon content of the pedon was recorded 0.68% indicating the medium range of carbon content whereas calcium carbonate content was 7.33%. The EC and CEC of the soils were observed 0.51 dsm^{-1} and 53.53 cmol (p^{+}) kg^{-1} respectively with clay loam texture. Similar observations were also observed by Savalia *et al.,* (2010).

In pedon P4, sand, silt and clay content were recorded 48.11, 27.69 and 24.20% respectively which represents loam texture in nature with moderately shallow depth class. The soil pH recorded around 8.73 which indicate the strongly alkaline class may be due to coastal impact. The organic carbon content of the pedon was 0.88% which indicates the high values of the carbon in the soil. The calcium carbonate content of the soil recorded around 4.15%. The EC and CEC of the soil were 0.32 dsm^{-1} and 47.55 cmol (p^{+}) kg^{-1} respectively. Similar observations were also observed by Savalia *et al.,* (2009).

In pedon P5, sand, silt and clay content was recorded 13.45, 30.96 and 55.59% respectively which represents clay texture in nature with moderately deep soils. The soil pH recorded around 8.77 which indicate the strongly alkaline class may be due to coastal impact and irrigation with salty water. The organic carbon content of the pedon was 0.68% which indicates the medium range of the carbon in the soil. The calcium carbonate content of the soil recorded around 4.07%. The EC and CEC of the soil were 1.51dsm^{-1} and 73.64 cmol (p^+) kg^{-1} respectively.

In pedon P6, sand, silt and clay content were recorded 44.61, 28.75 and 26.64% respectively with deep depth class. The pH of the pedon noticed around 9.44 which fall under very strongly alkaline in nature may be due to coastal impact and irrigation of the fields with highly salty water. The organic carbon content of the pedon was recorded 0.78% indicating the high range of carbon content whereas calcium carbonate content was 9.44%. The EC and CEC of the soils were observed 0.66 dsm^{-1} and 48.91 cmol (p^+) kg^{-1} respectively with loam texture.

In pedon P7, sand, silt and clay content was recorded 16.0, 58.47 and 25.53% respectively which represents silty loam texture with deep soils. The soil pH recorded around 8.25 which indicate the moderately alkaline in nature. The organic carbon content of the pedon was 0.68% which indicates the medium availability of carbon in the soil. The calcium carbonate content of the soil recorded around 10.28%. The EC and CEC of the soil were 0.69 dsm^{-1} and 67.39 cmol (p^+) kg^{-1} respectively.

In pedon P8, sand, silt and clay content were recorded 30.27, 39.78 and 29.95% respectively with deep soils. The pH of the pedon noticed around 8.54 which falls under strongly alkaline in nature may be due irrigation of the fields with highly salty water and high temperature. The organic carbon content of the pedon was recorded 0.72% indicating the medium range of carbon content whereas calcium carbonate content was recorded high around 23.77%.

The EC and CEC of the soils were observed 0.21 dsm^{-1} and 52.72 cmol (p^+) kg^{-1} respectively with clay loam texture. These findings are completely in agreement to those of Selvaraj and Naidu (2013), Gandhi and Savalia (2014) and Meena *et al.*, (2012).

Soils of coastal plain (Pedon P9-P16)

Sand, silt and clay content of pedon P9 and P10 was recorded 49.91, 10.49, 39.6% and 31.29, 34.57, 34.14% respectively with the soil texture of clay loam skeletal. Soils of pedon P9 observed with very shallow depth whereas pedon P10 with shallow soil depth with moderately and strongly alkaline in nature respectively. Pedon P9 noticed with high organic carbon in contrast pedon P10 which recorded low organic carbon in the soils, whereas calcium carbonate was noticed significantly different in both areas with 0.28 and 19.60% respectively. EC and CEC of the pedons were recorded 0.12 dsm^{-1} & 26.09 cmol (p^+) kg^{-1} and 1.99 dsm^{-1} & 34.78 cmol (p^+) kg^{-1} respectively. Soils of pedon P9 and P10 observed with coarse fragments 40-50 and 10-15% respectively.

In pedon P11, sand, silt and clay content was recorded 71.34, 12.35 and 16.31% respectively which represents sandy loam texture with deep soils. The soils of the area recorded the moderately alkaline in nature with calcium carbonate content of 16.42%. The organic carbon content of the pedon was 0.39% which indicates the low availability of carbon in the soil. The EC and CEC of the soil were 0.40 dsm^{-1} and 25.82 cmol (p^+) kg^{-1} respectively.

In pedon P12, sand, silt and clay content was recorded 18.51, 26.93 and 54.56% respectively which represents clay texture with moderately deep soils. The soil pH recorded around 8.85 which indicate the strongly alkaline class may be due to coastal impact. These findings are similar to those of Sharma and Bhaskar (2003). The organic carbon content of the pedon was 0.58% which indicates the medium availability of the carbon in the soil. The calcium carbonate content of the soil recorded around 14.75%. The EC and CEC of the soil were 0.29 dsm^{-1} and 62.77 cmol (p^{+}) kg^{-1} respectively. Similar observations were also observed by Savalia *et al.*, (2010).

Table.1 Physical and chemical properties of typifying pedons of Porbandar taluka, Gujarat, India

Pedon	**Depth (cm)**	**Size, class and particle diameter (mm) Total (%)**			**OC (%)**	**$CaCO_3$ (<2mm) (%)**	**pH (1:2.5) H_2O**	**E.C. (1:2.5) H_2O (dsm^{-1})**	**CEC Cmol (p^{+}) kg^{-1}**	**Texture**	**Coarse Fragments (%)**
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<.002)							
P1 :Sandy, Mixed, Calcareous, Skeletal, Hyperthermic, Lithic Ustorthents											
Sinhjarnes	28	63.59	14.17	22.24	1.65	7.56	8.57	0.31	26.63	scl	fg30-35
P2:Clayey, Mixed, Calcareous, Hyperthermic, Lithic Haplustepts											
Sisli	45	24.22	43.67	32.11	1.09	9.34	8.18	1.16	56.25	cl	fg10-15
P3: Fine, Mixed, Calcareous, Hyperthermic, Vertic Haplustepts											
Ishvariya	65	24.95	46.84	28.21	0.68	7.33	8.55	0.51	53.53	cl	-
P4: Loamy, Mixed, Calcareous, Hyperthermic, Lithic Haplustepts											
Advana	45	48.11	27.69	24.20	0.88	4.15	8.73	0.32	47.55	l	-
P5: Fine, Mixed, Calcareous, Hyperthermic, Vertic Haplustepts											
Sodhana	98	13.45	30.96	55.59	0.68	4.07	8.77	1.51	73.64	c	-
P6: Fine, Mixed, Calcareous, Hyperthermic, Vertic Haplustepts											
Vachhoda	150	44.61	28.75	26.64	0.78	9.44	8.69	0.66	48.91	l	-
P7: Fine, Smectitic, Calcareous, Hyperthermic, Typic Haplusterts											
Raravada	140	16.00	58.47	25.53	0.68	10.28	8.25	0.69	67.39	sil	-
P8: Fine, Smectitic, Calcareous, Hyperthermic,Typic Haplusterts											
Visavada	150	30.27	39.78	29.95	0.72	23.77	8.54	0.21	52.72	cl	-
P9: Clayey Skeletal, Mixed, Calcareous, Hyperthermic, Lithic Ustorthents											
Palkhada	16	49.91	10.49	39.6	1.17	0.28	7.88	0.12	26.09	cl	fg 40-50
P10: Clayey, Mixed, Calcareous, Hyperthermic, Lithic Haplustepts											
Ratdi	35	31.29	34.57	34.14	0.43	19.60	8.65	1.99	34.78	cl	fg10-15
P11: Fine, Mixed, Calcareous, Hyperthermic, Aridic Haplustepts											
Bharavada	125	71.34	12.35	16.31	0.39	16.42	8.66	0.40	25.82	sl	-
P12: Fine, Mixed, Calcareous, Hyperthermic, Torretic Haplustepts											
Baradiya	80	18.51	26.93	54.56	0.58	14.75	8.85	0.29	62.77	c	-
P13: Sandy, Mixed, Calcareous, Hyperthermic, Typic Ustipsamments											
Bhavpara	150	86.97	1.18	11.85	1.07	20.96	8.62	0.23	17.39	s	-
P14: Fine, Mixed, Calcareous, Hyperthermic, Typic Haplusalids											
Keshod	150	9.25	50.44	40.31	0.97	14.88	9.64	1.46	42.93	Sic	-
P15: Fine, Mixed, Calcareous, Hyperthermic, Typic Halaquepts											
Keshav	155	26.45	20.95	52.60	0.78	15.19	8.77	0.89	35.60	c	-
P16: Sandy, Mixed, Calcareous, Hyperthermic, Lithic Torripsamments											
Oddar	20	85.50	1.95	12.55	1.29	22.55	8.63	0.86	12.14	ls	-

Table.2 Climatic and soil-site suitability criteria for groundnut (FAO, 1976, Sys *et al.*, 1991 and NBSS&LUP, 1994)

Soil-site characteristics			Rating			
		Unit	Highly suitable S1	Moderately suitable S2	Marginally suitable S3	Not suitable N
Climatic regime	Mean temperature in growing season	°C	24-30	22-23 31-33	20-21 34-40	<20 >40
	Total rainfall	mm	700-1000	500-700	350-500	<350
Land quality	Land characteristics					
Moisture avalilablility	LGP for Bunch varieties	Days	100-125	90-105	75-90	-
	LGP for Spreading varieties	Days	120-135	105-120	90-105	-
Oxygen availability in roots	Soil drainage	class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture surface	class	ls, sl	cl, sicl, scl	c, sic	-
	Texture sub-surface	class	sil, l, scl, cl, sicl	sc, sic, c	s, ls, sl, c>60	-
	pH	1:2.5	6.0-8.0	8.1-8.5, 5.5-5.9	>8.5 <5.5	-
Rooting conditions	Effective soil depth	cm	>75	51-75	25-50	<25
	Coarse fragments	Vol %	<35	35-50	>50	-
Soil toxicity	Salinity (EC saturation extract)	dS/m	<2.0	2.0-4.0	4.0-8.0	>8.0
	Sodicity (ESP)	%	Non sodic	5-10	>10	-
Erosion hazard	Slope	%	<3	3-5	5-10	>10

Table.3 Suitability analyses of typifying pedons for Groundnut in Porbandar taluka, Gujarat, India

Pedon	Climate	Slope (%)	Drain -age	Texture (S)	Texture (SS)	Depth (cm)	$CaCO_3$ (%)	pH	EC (dsm^{-1})	Sod	O.C. (%)	Actual land suitability class	Potential land suitability class
Pedon 1	S2	S3	S1	S2	S1	S3	S3	S2	S1	S1	S1	S3	S3
Pedon 2	S2	S1	S1	S3	S1	S3	S3	S3	S1	S1	S1	S3	S3
Pedon 3	S2	S1	S1	S2	S1	S2	S3	S2	S1	S1	S2	S2	S2
Pedon 4	S2	S1	S1	S1	S1	S3	S3	S2	S1	S1	S1	S2	S2
Pedon 5	S2	S1	S1	S3	S1	S1	S2	S2	S1	S1	S1	S2	S2
Pedon 6	S2	S1	S2	S1	S1	S1	S2	S3	S1	S1	S1	S2	S2
Pedon 7	S2	S1	S2	S3	S1	S1	S2	S2	S1	S1	S1	S2	S2
Pedon 8	S2	S1	S2	S3	S1	S1	S2	S2	S1	S1	S1	S2	S2
Pedon 9	S2	S2	N	S2	S2	N	S1	S3	S1	S1	S1	N	N
Pedon 10	S2	S1	S3	S3	S2	S3	S2	S3	S1	S1	S1	S3	S3
Pedon 11	S2	S1	S2	S2	S2	S1	S1	S3	S1	S1	S1	S2	S2
Pedon 12	S2	S1	S3	S3	S2	S1	S2	S2	S1	S2	S2	S2	S2
Pedon 13	S2	S2	S1	S1	S3	S1	S1	S3	S1	S1	S1	S3	S2 (s,t)
Pedon 14	S2	S1	S3	S3	S2	S1	S2	S3	S1	N	S1	N	S3(d, ss)
Pedon 15	S2	S1	S2	S2	S1	S1	S2	S3	N	S3	S1	N	S3 (r, d, s)
Pedon 16	S2	S1	S2	S2\	S1	N	S1	S3	S1	S1	S1	S3	S3

Note - S1: Highly suitable, S2: Moderately suitable, S3: Marginally suitable, N: Currently not suitable
S - soil, t - texture, d - drainage, ss - salinity/sodicity, r - reaction

Fig.1 Location map of Porbandar taluka, Gujarat, India

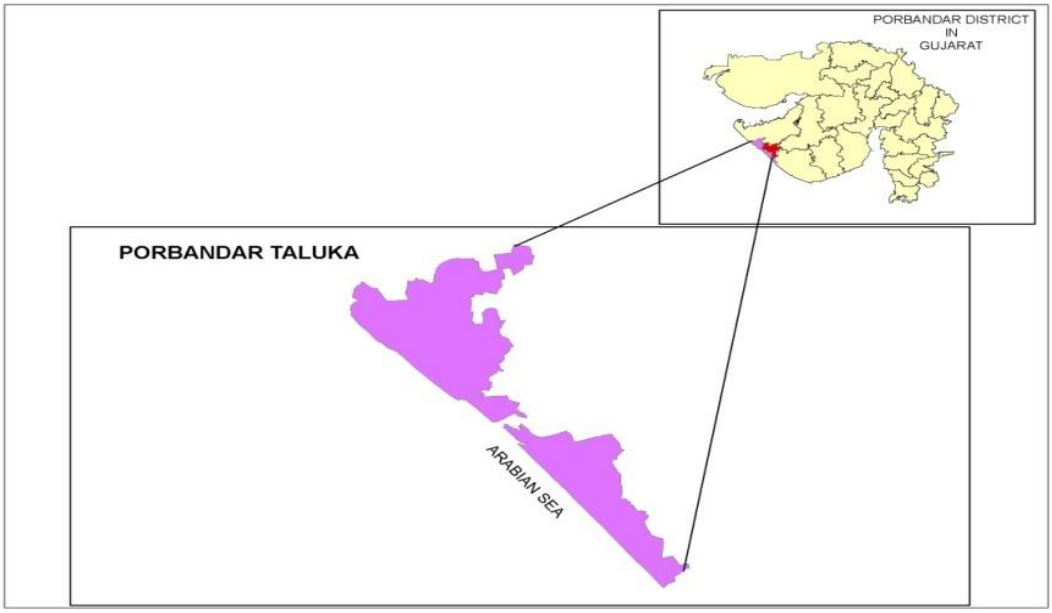
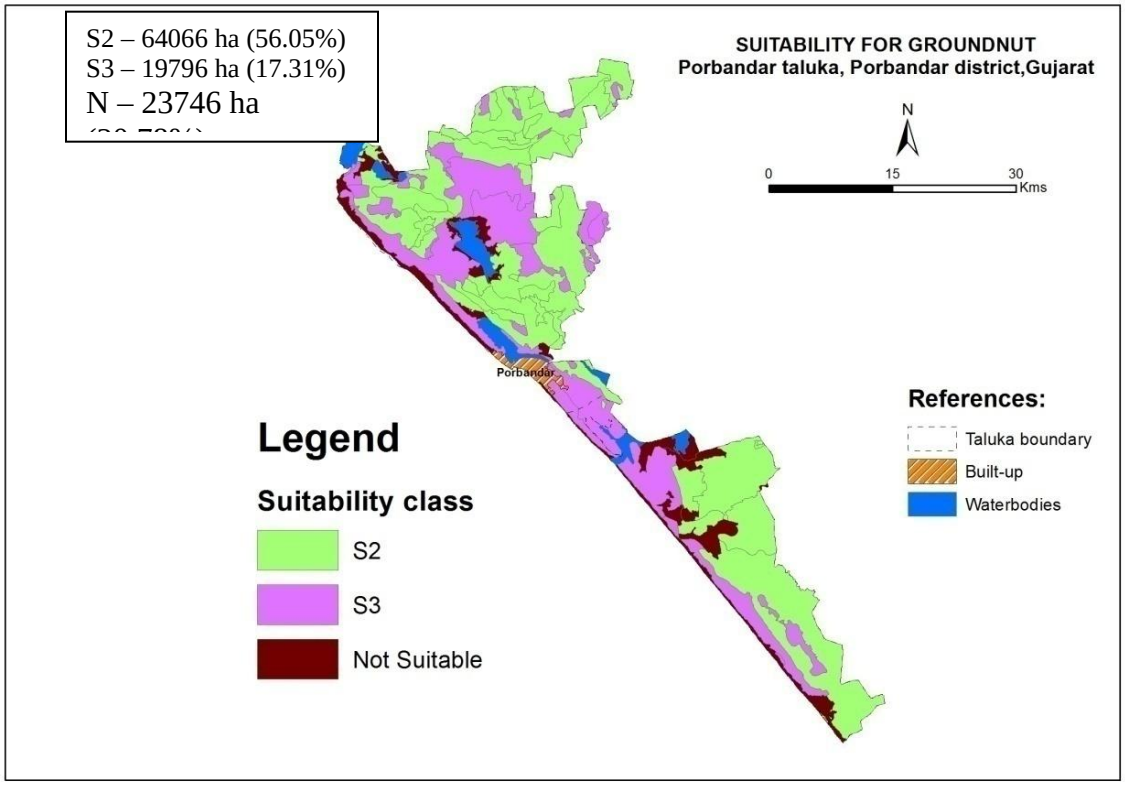


Fig.2 Suitability analysis of Groundnut in soils of Porbandar taluka, Gujarat, India



Soils of pedon P13, sand, silt and clay content was recorded 86.97, 1.18 and 11.85% respectively which represents sandy texture with deep soils. The soils of the area recorded the strongly alkaline in nature with calcium carbonate content of 20.96%. The organic carbon content of the pedon was 1.07% which indicates the high availability of carbon in the soil. The EC and CEC of the soil were 0.23 dsm^{-1} and 17.39 cmol (p^{+}) kg^{-1} respectively.

Soils of pedon P14, sand, silt and clay content was recorded 9.25, 50.44 and 40.31% respectively which represents silty clay texture with deep soils. The soils of the area recorded the very strongly alkaline in nature due to coastal impact with calcium carbonate content of 14.88%. The organic carbon content of the pedon was 0.97% which indicates the high availability of carbon in the soil. The EC and CEC of the soil were 0.46 dsm^{-1} and 42.93 cmol (p^{+}) kg^{-1} respectively.

In pedon P15, sand, silt and clay content was recorded 26.45, 20.95 and 52.60% respectively with deep soil. The soils of the area recorded the strongly alkaline in nature due to coastal impact with calcium carbonate content of 15.19%. The organic carbon content of the pedon was 0.78% which indicates the high availability of carbon in the soil. The EC and CEC of the soil were 0.89 dsm^{-1} and 35.60 cmol (p^{+}) kg^{-1} respectively with clay texture.

In pedon P16, sand, silt and clay content was recorded 85.50, 1.95 and 12.55% respectively which represents loamy sand texture with very shallow depth. The soil pH recorded around 8.63 which indicate the strongly alkaline class may be due to coastal impact and faulty irrigation. These findings are similar to those of Sharma and Bhaskar (2003). The organic carbon content of the pedon was 1.29% which indicates the very high availability of the carbon in the soil. The calcium carbonate content of the soil recorded around 25.55%. The EC and CEC of the soil were 0.86 dsm^{-1} and 12.14 cmol (p^{+}) kg^{-1} respectively. Similar observations were also observed by Savalia *et al.*, (2010).

Soil-site suitability for groundnut

The soil characteristics and criteria used for suitability evaluation are presented in tables 1 and 2 and suitability map is represented in Figure 2.

Soils of hill (Pedon P1)

The soils associated with this pedon belong to Lithic Ustorthents and currently marginally suitable for the groundnut cultivation because of major limitations like slope, shallow depth and poor soil texture.

Soils of pediment (Pedon P2)

Soils of this pedon belongs to Lithic Haplustepts and currently marginal suitable for the groundnut cultivation due to poor soil texture, shallow soil depth, and high value of pH but the productivity of groundnut in these soils may increase with soil related amendments like sand mixture and gypsum application.

Soils of pediment and alluvial plain (Pedon P3-P8)

Pedon P3, P5 and P6 which are grouped under Vertic Haplustepts are moderately suitable for groundnut cultivation in the area. The major limitations of these pedons are poor texture, depth and poor texture, strongly alkaline in nature and poor drainage, high pH respectively which doesn't allow crop for very good germination and restrict the crop to get maximum yield which could be achieved under most favorable conditions. Physical and chemical condition of this soil can be improved with some soil amendment practices like sand mixture, gypsum

application, farm yard manure application and removal of salts through good irrigation water.

Pedon P5, which is grouped under Lithic Haplustepts, is moderately suitable for groundnut crop. These soils showed limitations *viz.*, shallow soil depth and low $CaCO_3$ content. Pedon P7 and P8 which are grouped under Typic Haplusterts are also moderately suitable for the groundnut cultivation. The major limitations of the area for groundnut crop are poor soil texture, poor drainage and high pH. The productivity of these pedon can be improved by improved drainage, mixing with farm yard manure and green manure.

Soils of coastal plain (Pedon P9-P16)

The soils associated with pedon P9 belong to Lithic Ustorthents and currently not suitable for the groundnut cultivation because of major limitations like very poor drainage, very shallow depth, high soil reaction and poor texture whereas pedon P10 soils classified under Lithic Haplustepts which are marginally suitable shallow soil depth, poor texture, drainage and high soil reaction.

Management practices are much needed in these soils to maintain the fields for the crop cultivation. Soils of pedon P11 and P12 are taxonomically classified as Aridic Haplustepts and Torretic Haplustepts which are moderately suitable for the groundnut cultivation in the taluka.

The major constraint of these pedons are poor drainage, poor texture and high soil reaction may be due to coastal effect. Productivity of this area can be increase equivalent to highly suitable category through improvement of above mentioned factors in addition to application of farm yard manure/green manure and gypsum application. Pedon P13 soils are belongs to Typic Ustipsamments and marginally suitable for the groundnut cultivation due to poor texture and salinity/sodicity problem. Potential of these soils are moderately suitable with soil and texture related management practices for the longer period.

Soils of pedon P14 and P15 classified as Typic Haplusalids and Typic Halaquepts which are currently not suitable for the cultivation of groundnut due to very poor drainage texture, and salinity/sodicity related production constraints.

These soils are potentially marginal suitable with salinity/sodicity, drainage and texture related management practices in addition to farm yard manure and gypsum application. Pedon P16 belongs to Lithic Torripsamments which are marginally suitable due to very shallow soil depth, poor texture and high soil reaction. Productivity of these soils can be increased with farm yard manure and gypsum application.

The soil-site suitability evaluation study revealed major limitations of the area such as texture, high pH, saline/sodic soil, saline irrigation water and and poor drainage. Mixing the gypsum in shallow skeletal soils with conservation agricultural practices is necessary to improve soil health and groundnut productivity (Table 3).

Frequency of irrigation with saline water should reduced and may use with mixing of good quality of water. Improved drainage facility in low-lying areas also helps to improve the soil health which results higher productivity of crops.

The soils of pedon P3-P8 and P11-P12 are more suitable to grow the groundnut compared to other pedons whereas soils of pedon P9-P10 and P14-P15 are not beneficial

to grow the groundnut due to various limitations. Hence, judicious use of organic manures in combination with inorganic fertilizers in these soils not only pave the way to achieve sustainable yield of groundnut but also to sustain the soil fertility without deterioration for future generations.

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How to cite this article:

Meena, R.L., T.P. Verma, R.S. Singh, B.L. Tailor and Singh, S.K. 2017. Soil-Site Suitability Evaluation for Groundnut (*Arachis hypogaea*) In Western Saurashtra Region of Gujarat, India. *Int.J.Curr.Microbiol.App.Sci.* 6(10): 3074-3083. doi: https://doi.org/10.20546/ijcmas.2017.610.362