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Characterization and Delineation of soil properties of AnbilDharmalingam Agricultural College and Research Institute Farm, Tiruchirappalli

Hemalatha, S.[1], Sharuk Khan, M[1], Kalimuthu, D[1], Meiyanandhan, M[1], Sherene[2*], P. Balasubramaniam[3] and P. Masilamani[4]

[1]Final year B.Sc (Agri) students, TNAU, ADAC&RI, Trichirapalli, Tamil Nadu.
[2]Assistant Professor, TNAU, Department of SS &AC, ADAC&RI, Trichirapalli, Tamil Nadu.
[3]Professor & Head, TNAU, Dept. of SS &AC, ADAC&RI, Trichirapalli, Tamil Nadu.
[4]Dean, TNAU, ADAC&RI, Trichirapalli, Tamil Nadu.

(Corresponding author: Sherene)
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ABSTRACT: Soil fertility status indicates nutrient wealth of the farm.Delineation is the process of mapping of soils, based on their physico chemical properties for interpreting and depicting soil spatial distribution on a map. Delineation of spatial maps for nutrient management is an effective strategy for precision agriculture. The present investigation was carried out in Anbil Dharmalingam Agricultural College and Research Institute Farm, in Srirangam taluk of Tiruchirapalli district in Tamil Nadu, noted for its sodicity problems. The study involved spatial array analysis of soil properties of 35 geo-referenced soil samples collected from every field in the farm. Soils were analyzed for pH, EC, organic carbon, and available N, P, K by following standard procedures. Soils were found highly alkalineand normal EC with low available Nitrogen, medium in available Phosphorus and medium to high in Potassium with low organic carbon status throughout the farm. This spatial variability was delineated using RS GIS arc software. The developed spatial distribution maps will be crucial in site-specific nutrient management for sodic soils of ADAC&RI Farm, Tiruchirappalli. The generated spatial maps will be useful for the researchers to take up decision on selecting experimental platform for doing any research activities like salt tolerant variety evolution, agronomical and physiological aspects.

Keywords: Characterization, Soil mapping, fertility status

I. INTRODUCTION

Soil mapping is the process of delineating natural bodies of soils, classifying and grouping the delineated soils into map units, and capturing soil property information for interpreting and depicting soil spatial distribution on a map. Tiruchirapalli district is most centrally located in the state of TN. This district has been sub divided into eight taluks comprising 483 revenue villages with a total geographical area of 4,40,412 ha & lies between 78°10' to 79°5'L East longitude and 10°15' to 11°2'N longitude (Soil Atlas, 1998). Anbil Dharmalingam Agricultural College and Research Institute (ADAC & RI) is the fourth Agricultural College established under the Tamil Nadu Agricultural University. The College was originally started at Kumulur, near Lalgudi in Tiruchirappalli district in the year 1989 and shifted to the present campus Navalur Kuttappattu village, 14 kilometer from Tiruchirappalli town in 1992 it was upgraded as Soil Salinity Research Centre by National Agricultural Research Project funding to conduct research on saline / sodicity soil which is unique in this area. This is one of the pioneering centres in India on problem soil, particularly salt affected soils. The study was undertaken to characterize the farm soils of Anbil Dharmalingam Agricultural College and Research Institute, Trichy based on soil properties and to delineate spatial distribution maps to calculate the correct nutrient requirements and to minimize over fertilizing the soil.

II. MATERIALS AND METHODS

Geo coordinates of the sampled areas in ADAC& RI farm was noted using geographical positioning system. Field wise surface soil samples of around 35 numbers were collected in A and D blocks of ADAC & RI farm and analyzed for pH, EC, organic carbon(chromic acid wet digestion method), available Nitrogen(alkaline permanganate method), available phosphorus(Olsen's method) and available potassium(neutral normal ammonium acetate method) by following standard procedures. The mapping was done using RS- GIS-ARC software.

III. RESULTS AND DISCUSSION

From the analysis of various soil parameters, pH value of the fields A3a, A2b, A1a, D1c, and D2c have neutral pH in the range of 7.43 -7.90. All the other fields were alkaline in nature, greater than 8.0. The soil electrical conductivity of the field A3c is in critical range of 2.09

dSm-1 and all the other fields are in Good range. This field alone was classified under saline soil since Ph of the soil was 8.3. Out of 35 soil samples collected, only 10 fields were found in medium to high status ofavailable nitrogen, phosphorus and potassium, 18 fields were in low available nitrogen status and 5 fields were low in both available N and K, but medium to high in phosphorous level. Only one field was found with low N and K, but has high available P status. The soil organic carbon was medium in 5 fields and remaining 30 fields were in low organic carbon status. This was supported by the findings of [1, 2, 3, 4, 5, 6].

The soils of ADAC&RI farm were analyzed for fertility status and the results were furnished as below.

Table 1: Soil fertility status of ADAC&RI, Farm, Trichirapalli.

S. NO	FIELD NO	LATTITUDE	LONGITUDE	pH	EC (dS/ m)	OC %	N kg/ha	P kg/ha	K kg/ha
1	A1a	10.7533	78.6023	7.9	0.13	0.46	376	15.7	229
2	A2a	10.7531	78.6021	8.4	0.54	0.40	267	9.0	199
3	A3a	10.7528	78.6015	7.4	0.15	0.51	282	17.9	235
4	A4a	10.7520	78.6008	8.5	0.18	0.42	220	22.4	215
5	A5a	10.7525	78.6010	8.6	0.21	0.52	251	13.4	294
6	A6a	10.7520	78.6007	8.7	0.51	0.42	267	8.7	329
7	A7a	10.7516	78.6003	8.8	0.58	0.45	298	11.2	417
8	A8a	10.7513	78.6000	9.1	0.39	0.46	314	16.8	281
9	A9a	10.7510	78.5997	9.0	0.66	0.31	204	16.5	431
10	A1b	10.7540	78.6019	8.4	0.12	0.40	235	20.2	215
11	A2b	10.7532	78.6021	7.9	0.51	0.49	282	18.8	224
12	A3b	10.7536	78.6010	8.4	0.80	0.30	376	16.0	293
13	A4b	10.7533	78.6008	8.6	0.20	0.30	329	17.4	534
14	A5b	10.7531	78.6005	8.1	0.14	0.46	267	20.2	171
15	A6b	10.7528	78.5999	8.8	0.26	0.30	235	14.3	436
16	A7b1	10.7525	78.5997	8.9	0.26	0.46	361	17.2	386
17	A7b2	10.7524	78.5995	8.6	0.14	0.40	235	13.4	375
18	A1c	10.7555	78.6010	8.1	0.21	0.42	220	12.5	172
19	A2c	10.7545	78.6009	8.2	0.17	0.36	188	16.2	212
20	A3c	10.7542	78.6005	8.3	2.09	0.35	204	12.7	213
21	A4c	10.7539	78.6002	8.5	0.29	0.46	220	24.6	546
22	A5c	10.7537	78.5999	8.3	0.28	0.50	267	14.6	162
23	D1a	10.7538	78.6027	8.2	0.07	0.44	282	15.7	207
24	D2a	10.7539	78.6030	8.1	0.28	0.43	204	13.0	155
25	D3a	10.7542	78.6033	8.5	0.20	0.59	282	8.7	130
26	D4a	10.7553	78.6041	8.9	0.27	0.42	235	10.0	217
27	D1b	10.7550	78.6044	8.6	0.21	0.47	188	22.3	117
28	D2b	10.7547	78.6025	8.6	0.45	0.56	172	16.5	107
29	D3b	10.7549	78.6029	8.5	0.49	0.55	235	14.4	408
30	D4b	10.7563	78.6018	8.1	0.37	0.36	157	14.4	204
31	D5c	10.7562	78.6031	8.9	0.36	0.49	267	16.2	146
32	D1c	10.7556	78.6011	7.9	0.16	0.31	220	18.8	151
33	D2c	10.7553	78.6020	7.8	0.12	0.46	298	13.1	158
34	D3c	10.7556	78.6024	8.0	0.11	0.43	282	24.2	114
35	D4c	10.7564	78.6022	8.6	0.21	0.46	251	17.5	158

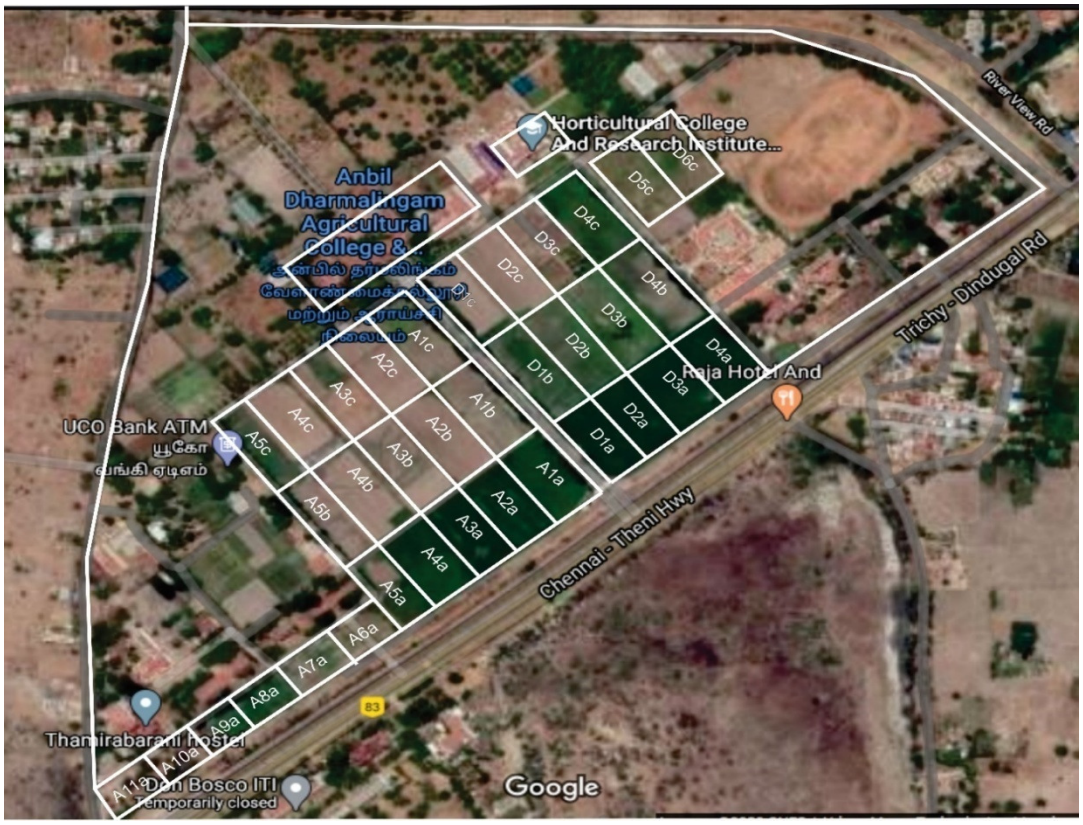
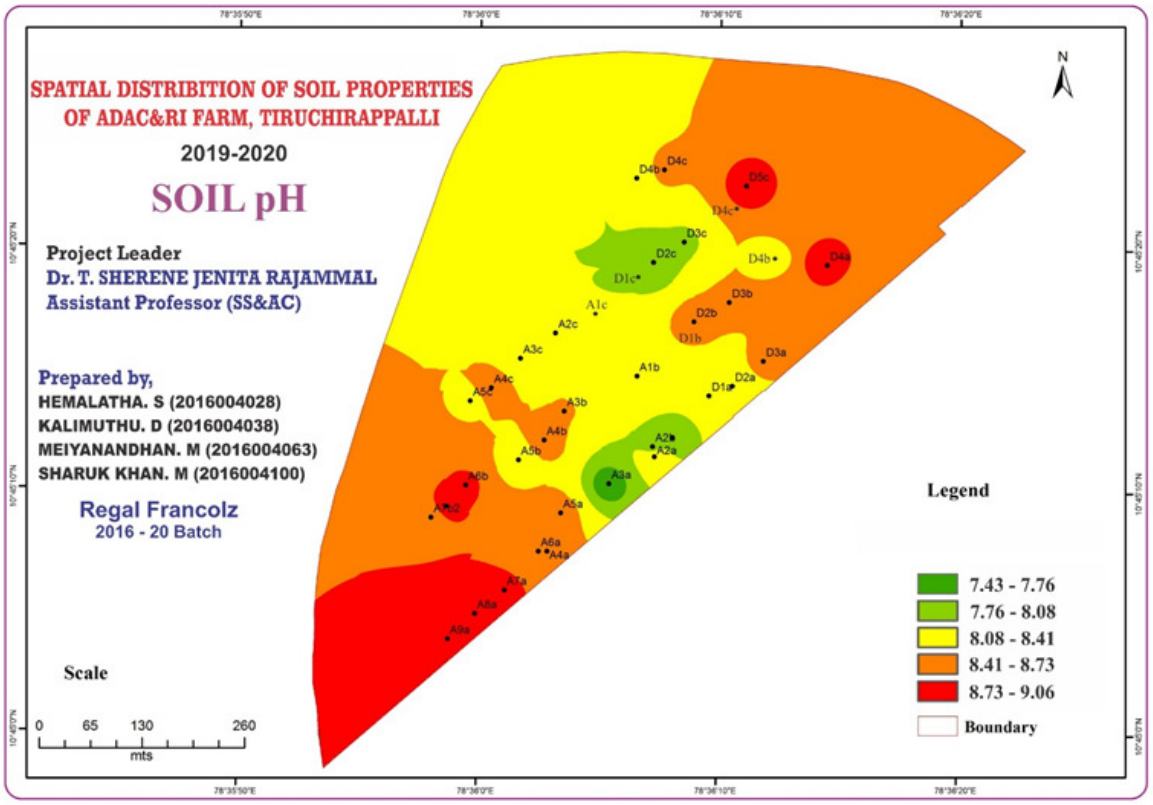
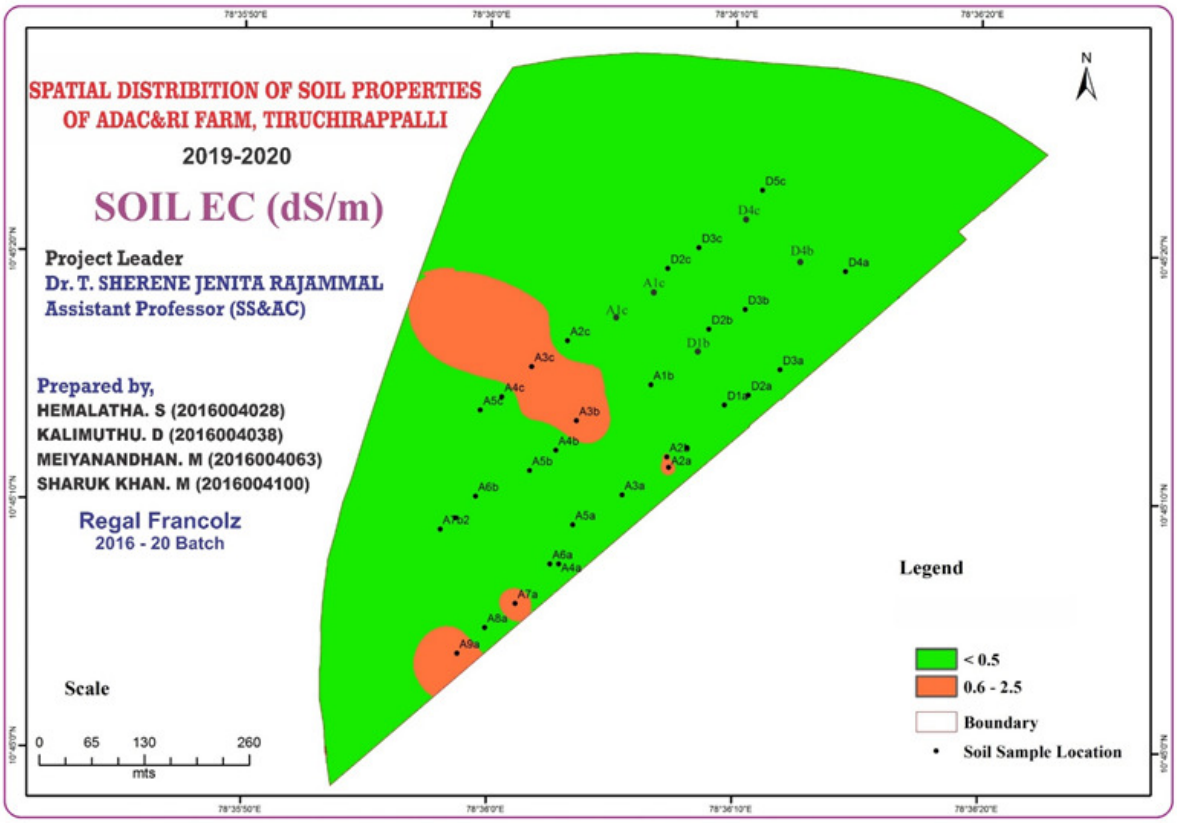
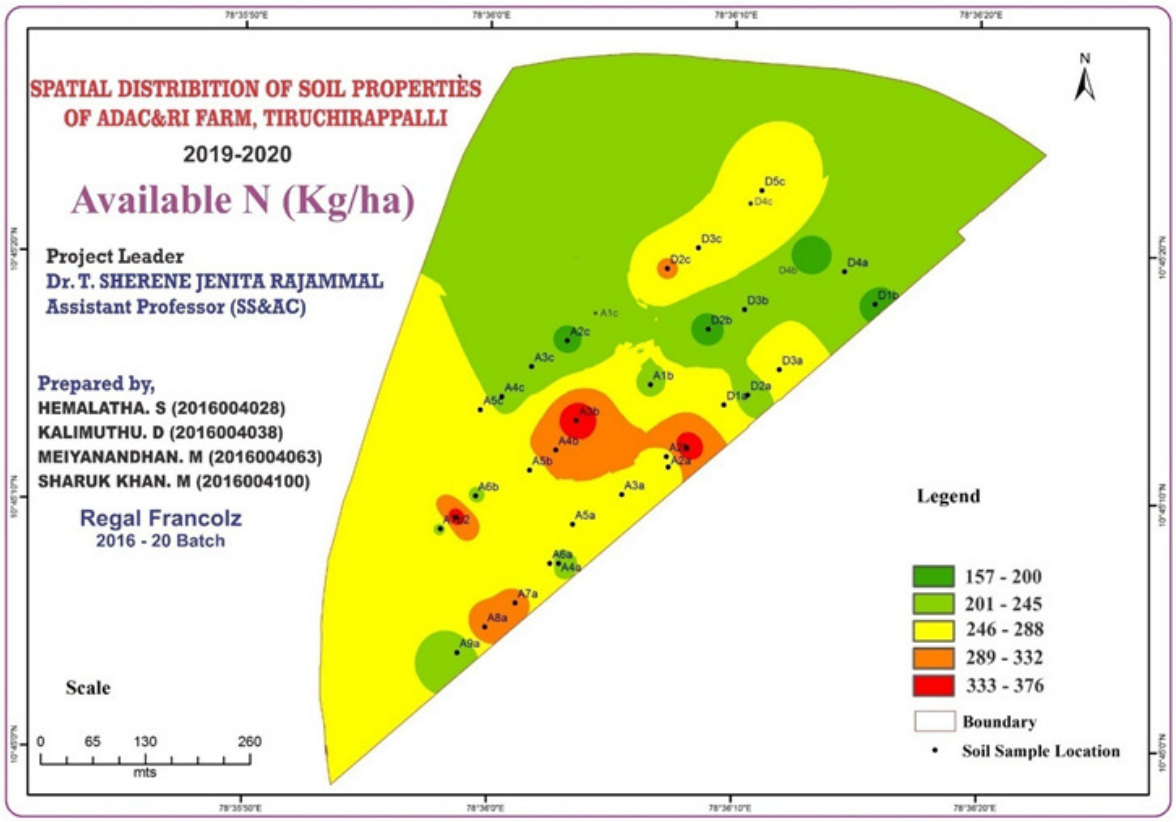


Fig. 1. Anbil Dharmalingam Agricultural College and Research Institute, Farm, Layout –An arial view.




SPATIAL DISTRIBITION OF SOIL PROPERTIES
OF ADAC&RI FARM, TIRUCHIRAPPALLI
2019-2020
SOIL EC (dS/m)
Project Leader
Dr. T. SHERENE JENITA RAJAMMAL
Assistant Professor (SS&AC)
Prepared by,
HEMALATHA. S (2016004028)
KALIMUTHU. D (2016004038)
MEIYANANDHAN. M (2016004063)
SHARUK KHAN. M (2016004100)
Regal Francolz
2016 - 20 Batch
Scale
0 65 130 260
mts
N
Legend
< 0.5
0.6 - 2.5
Boundary
Soil Sample Location


SPATIAL DISTRIBITION OF SOIL PROPERTIES
OF ADAC&RI FARM, TIRUCHIRAPPALLI
2019-2020
Available N (Kg/ha)
Project Leader
Dr. T. SHERENE JENITA RAJAMMAL
Assistant Professor (SS&AC)
Prepared by,
HEMALATHA. S (2016004028)
KALIMUTHU. D (2016004038)
MEIYANANDHAN. M (2016004063)
SHARUK KHAN. M (2016004100)
Regal Francolz
2016 - 20 Batch
Scale
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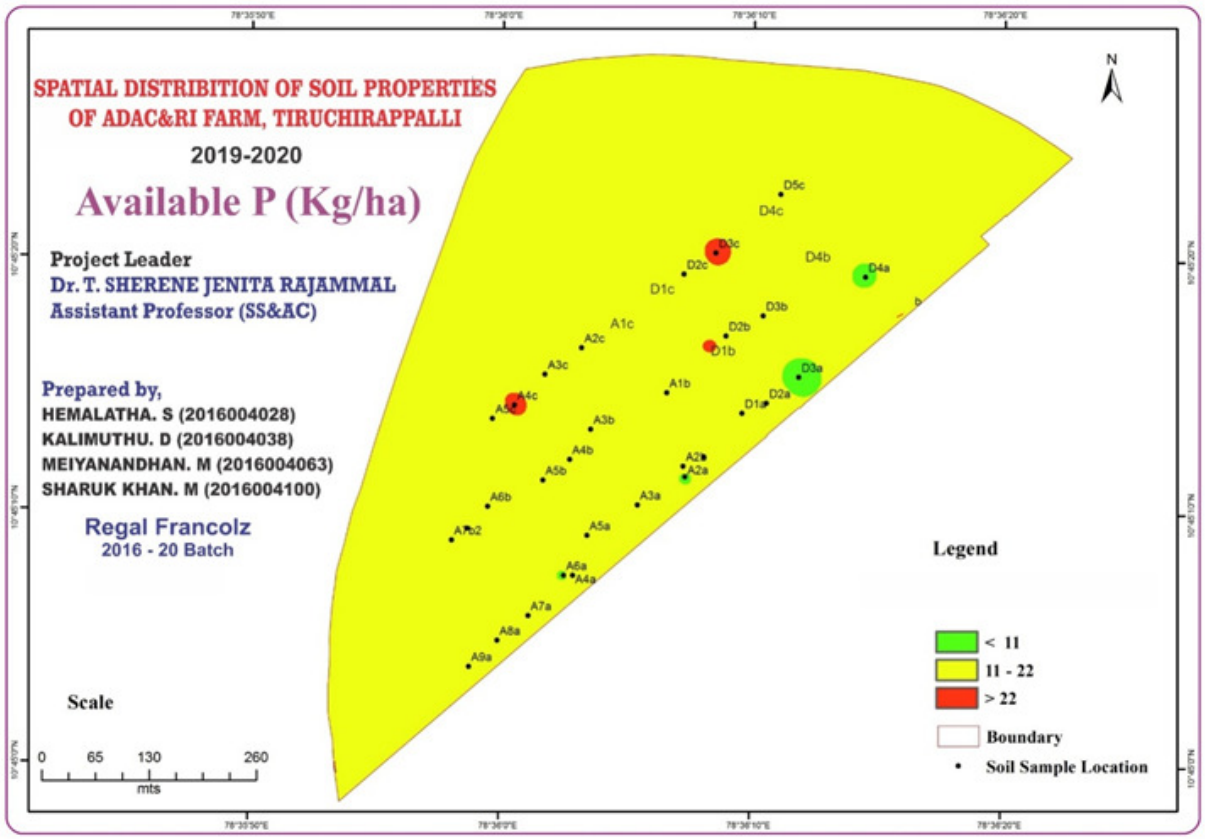
mts
N
Legend
157 - 200
201 - 245
246 - 288
289 - 332
333 - 376
Boundary
Soil Sample Location


SPATIAL DISTRIBITION OF SOIL PROPERTIES
OF ADAC&RI FARM, TIRUCHIRAPPALLI
2019-2020
Available P (Kg/ha)
Project Leader
Dr. T. SHERENE JENITA RAJAMMAL
Assistant Professor (SS&AC)
Prepared by,
HEMALATHA. S (2016004028)
KALIMUTHU. D (2016004038)
MEIYANANDHAN. M (2016004063)
SHARUK KHAN. M (2016004100)
Regal Francolz
2016 - 20 Batch
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mts
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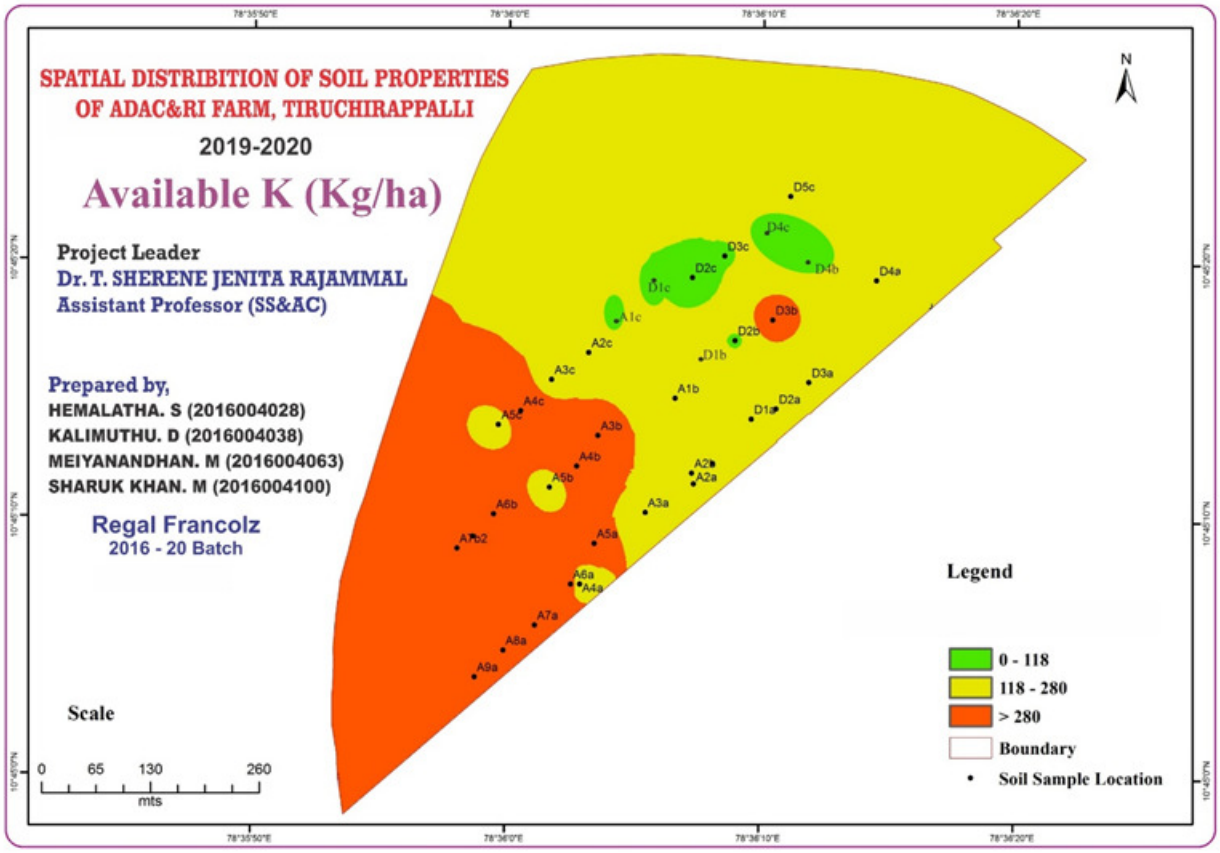
11 - 22
> 22
Boundary
Soil Sample Location


SPATIAL DISTRIBITION OF SOIL PROPERTIES
OF ADAC&RI FARM, TIRUCHIRAPPALLI
2019-2020
Available K (Kg/ha)
Project Leader
Dr. T. SHERENE JENITA RAJAMMAL
Assistant Professor (SS&AC)
Prepared by,
HEMALATHA. S (2016004028)
KALIMUTHU. D (2016004038)
MEIYANANDHAN. M (2016004063)
SHARUK KHAN. M (2016004100)
Regal Francolz
2016 - 20 Batch
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mts
N
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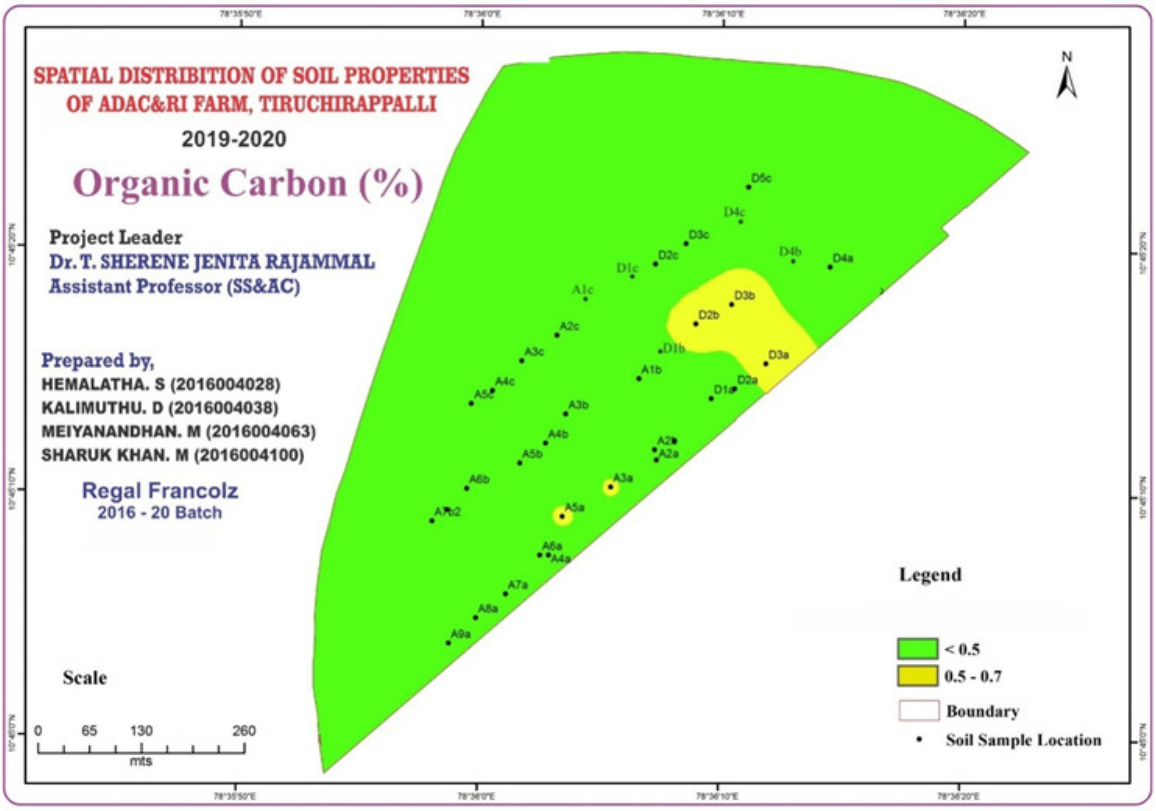
118 - 280
> 280
Boundary
Soil Sample Location



IV. SUMMARY

Based on soil pH and soil EC, more than 50 % of fields are coming under sodic soils, 25 % are in salinity ranges and very few fields are in normal range.Regarding soil fertility status, all the field are in low to medium level of available N, medium to high status of available P and K. Regarding soil organic carbon status, around 95 % of experimental farm was in low category.The generated fertility maps of soils of study area would definitely help the researchers and others to take up research works pertaining to sodic soil and evolution of sodic/salinity tolerant varieties. These maps would help us to locate the soil properties of any field in the farm without actually entering into analytical procedures for the reporting period. However the soil fertility maps need to be updated every year.

V. MANAGEMENT OPTIONS

Since the entire farm represented sodic soils except very few fields, it is insisted to reclaim the field before cultivation. Proper amelioration using gypsum along with sub surface drainage with good quality water would bring the soil to normal condition.Use of organic manures will improve soil organic carbon status.Soil test based fertilizer recommendation is advised with respect to nutrient management.

REFERENCE

[1]. Behera, S. K., & Shukla, A. K., (2015). Spatial distribution of surface soil acidity, electrical conductivity, soil organic carbon content and exchangeable potassium, calcium and magnesium in some cropped acid soils of India. *Land Degradation & Development*, **26**, 71–79. https://doi.org/10.1002/ldr.2306

[2]. Chatterjee, A., Geaumont, B., DeSutter, T., Hopkins, D. G., & Rakkar, M. (2015). Rapid shifts in soil organic carbon mineralization within sodic landscapes. *Arid Land Research and Management*, **29**(2), 255-263.

[3]. Davatgar, N., Neishabouri, M. R., & Sepaskhah, A. R. (2012). Delineation of site specific nutrient management zones for a paddy cultivated area based on soil fertility using fuzzy clustering. *Geoderma*, **173**, 111-118. https://doi.org/10.1016/j.geoderma.2011.12.005

[4]. Monisha. K, K. Soniya and G. Shanmathi, T. Sherene, P. Balasubramaniam, (2019). Diagnosis of sodic soil from normal soils of ADAC&RI farm and to assess the suitability of bore well water for irrigation. In: National conference on Climate Smart agriculture for livelihood securities. 14th September, ADAC&RI, Trichy.

[5]. Timm, L. C., Pires, L. F., Centeno, L. N., Bitencourt, D. G. B., Parfitt, J. M. B., & de Campos, A. D. S. (2020). Assessment of land levelling effects

on lowland soil quality indicators and water retention evaluated by multivariate and geostatistical analyses. *Land Degradation & Development*, **31**(8), 959-974.
[6]. Verma, R. R., Manjunath, B. L., Singh, N. P., Kumar, A., Asolkar, T., Chavan, V., ... & Singh, P. (2018). Soil mapping and delineation of management zones in the Western Ghats of coastal India. *Land Degradation & Development*, **29**(12), 4313-4322.