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Characterization of paddy (*Oryza sativa* L.) growing soils in Raichur district

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Abstract
An investigation was carried out to understand the soil nutrient status of selected paddy growing areas in Raichur district, for characterization of 120 composite samples. characterization revealed that soils were neutral to slightly alkaline range with low soluble salts. Soils were low in available nitrogen, medium in phosphorus and potassium status and sufficient in Ca, Mg, S and micronutrients.

Keywords: Characterization, paddy, nutrient status

Introduction
Rice is the most staple food crop of India and it occupies 23.3 per cent of gross cropped area of the country. Rice contributes 43 per cent of total food grain production and 46 per cent of total cereal production. It continues to play a vital role in the national food grain supply. It is the staple food of nearly half of the world population and considered as the "global grain". It ranks third after wheat and maize in terms of worldwide production. Rice is grown under wide range of latitudes and altitudes and is the anchors of food security in the world (Anon., 2008) [1]. The demand for rice is increasing year after year with increase in population which is expected to 140 mt by the year 2025 (Paroda, 1998) [5]. Paddy soils are heterogeneity in nature, complex interrelationships existing between physical, chemical and biological soil properties have long been recognized. Their responses along with management induced soil changes like tillage, liming, fertilizers and manure amendments result in soil nutrient variation within cropped fields. The variation of soil properties in space and time implies that soils have varying capacity to retain and supply nutrients to rice crop. On the other hand there is a need to explore full potential of existing paddy growing lands by managing the field input application in combination with physical, chemical and biological properties to enhance the productivity. Currently, agricultural inputs such as seeds, irrigation, fertilizers, and pesticides have been applied as evenly as possible over a given field, but the yield at the end of the growing season often varies across the field. Changes in soil texture, organic matter, salinity, subsoil characteristics, and water holding capacity are all factors that can cause changes in yield.

Materials and Methods
Survey work was conducted during the month of June 2012 in paddy growing areas in Raichur district of zone 2 (Northern dry zone). The representative soil samples (40 samples from two villages) were collected from paddy growing areas of Raichur (Kalmala & Kasabe camp), Manvi (Siravar & Chagabavi) and Sindhanurtaluks (Jalihal & Hanchinal) based on the uniform slope of land, cropping pattern, previous crops grown and quantity of fertilizer applied. These soils are subjected to chemical analysis and categorized into low, medium and high with respect to available N, P and K status. Standard soil analysis methods were employed for the analysis.

Results and Discussion
Soil pH, EC and Organic Carbon
Soils were neutral to alkaline in reaction ranged from 7.01 to 9.01 with an average pH was 7.97 and standard deviation 0.30. Being predominantly saline, it was logical that pH of these soils was slightly alkaline (Table 1). The paddy growing soils were non-saline (with an average EC value of 0.39 dSm^{-1}) and standard deviation 0.12. Prevailing climate with excess water favoured leaching of salts from the soil surface leads to salinity. Paddy being susceptible to moderate soil salinity, the crop is preferably grown in non-saline fields.

Similar observations of slightly alkaline pH and non saline nature of soils have also been reported by Bali *et al.* (2010) [2]. Soil organic carbon status remained low to medium 1.7 to 5.6 g kg^{-1} with anthe average was 3.52 g kg^{-1} and standard deviation 1.09 due to intensive cultivation practice and lower application of organic manures.

Available major nutrients

Among the surveyed samples, all soils were low in available nitrogen ranged from 100 to 278 kg ha^{-1} with an average nitrogen of 208.21 kg ha^{-1} and standard deviation 45.84, medium in available P_2O_5 ranged from23 to 54 kg ha^{-1} with an average of 33.98 kg ha^{-1} and standard deviation 8.18 and majority are medium in available K_2O ranged from 208 to 542 kg ha^{-1} with an average of 324.73 kg $ha^{-1}$and standard deviation 66.12 and represented the category of 'LMM'. The poor status of soil organic carbon resulted in low status of available nitrogen.

Table 1: Soil chemical properties and major nutrients status in paddy growing areas

	pH (1:2.5)	EC (1:2.5)	OC (g ha^{-1})	N	P_2O_5	K_2O
				← (kg ha^{-1}) →		
Range	7.01-9.01	0.17-0.89	1.7-5.6	100-278	23-54	208-542
Average	7.97	0.39	3.52	208.21	33.98	324.73
SD	0.30	0.12	1.09	45.84	8.18	66.12

Available secondary nutrients

The exchangeable calcium ranged from 8.08 to 18.95 c mol (p^+) kg^{-1} with an average of calcium 14.90 mg kg $^{-1}$and standard deviation 2.65, magnesium ranged from 2.6 to 6.7 c mol (p^+) kg^{-1} with an average of magnesium 4.90 cmol (p+) $kg^{-1}$and standard deviation 0.98 indicating soils were calcareous in nature and available sulphur ranged from 5.67 to 28.11 mg kg^{-1} with an average sulphur of 14.26 mg kg^{-1} and standard deviation 5.22 indicating soils are above critical level. The DTPA- zinc ranged from 0.11-1.98 mg kg^{-1} with an average zinc of 0.91 mg $kg^{-1}$and standard deviation 0.40, Fe ranged from 2.12 to 8.88 mg kg^{-1} with an average Fe of 5.47 mg $kg^{-1}$and standard deviation 1.64, manganese ranged from 1.06 to 6.80 mg kg^{-1} with on average manganese 3.37 mg $kg^{-1}$and standard deviation 1.32 and copper 0.02 to 1.90 mg kg^{-1} with an average copper of 1.2 mg kg^{-1} and standard deviation 0.37 (Table 2). Ananthanarayana (1978) reported that higher exchangeable Ca and Mg content in black soils than red or laterite soils. The mediumsulphur status in the study area might be attributed to leaching loss and crop uptake. Majority of these soils had adequate quantity of available micronutrients. This may be attributed to low to medium soil organic matter content which might have enhanced the microbial activity in the soil and consequent release of complex organic substance (chelating agent) which form stable chelates with these elements thus decrease the susceptibility to precipitation, fixation, oxidation and leaching of micro nutrients (Tisdale *et al*. 1995).

Table 2: Secondary and micronutrient status in soils of paddy growing areas

	Exch.Ca	Exch.Mg	Available S (mg kg^{-1})	Zn	Fe	Mn	Cu
	← [cmol (p^+) kg ha^{-1}] →			← (mg kg^{-1}) →			
Range	8.08-18.95	2.60-6.70	5.67-28.11	0.11-1.98	2.12-8.88	1.06-6.80	0.02-1.90
Average	14.90	4.90	14.26	0.91	5.47	3.37	1.2
SD	2.65	0.98	5.22	0.40	1.64	1.32	0.37

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