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PRELIMINARY REPORT ON SOIL CONDITIONS IN POHNPEI ISLAND

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Introduction

The soils of the Island of Pohnpei are grouped into 18 different ones (U. S. Dept. Agri., 1982). Much of these soils are limited for agriculture because of mainly physical conditions such as steep slope, stoniness and poor drainess. So the high mountainaous areas in the interior of this island that are ca. 60% of total area therfore, are not suited to agriculture. The surrounding areas of the interior and the perimeters of the islands are developing for agricultural uses. It is also known that these soils are not so high in fertility or chemical status.

In this study, the authors tried to examine the differences in chemical conditions among the cultivated soils of different managements, comparing with those of an uncultivated (control) soil.

Materials and Methods

As the representative of Pohnpei soil profile, one plot from moderate slope covered mainly with *Clinostigma ponapensis* MOORE et FOSBERG was selected and the soil samples of eleven layers to 1m depth were collected. Nineteen samples were also collected from the

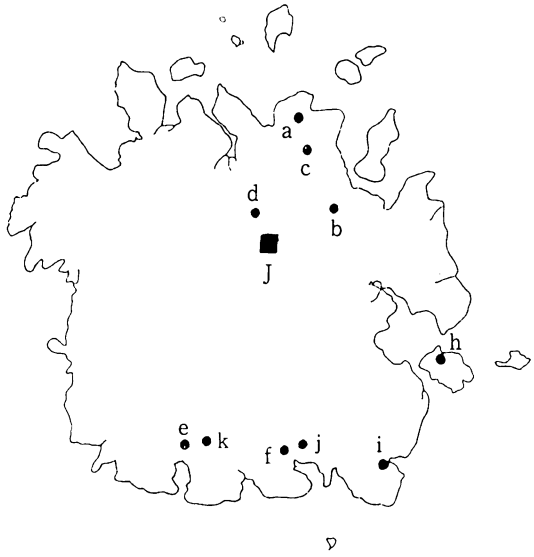

Fig. 1 Location of sampling plots.
● : upland field
■ : uncltivated plot

topsoils (0-10cm) of different cropping fields. These sampling plots is shown in Fig.1. Principal chemical characteristics of them were measured as pH, total carbon and nitrogen contents and, amounts of exchangeable cations, CEC available phosphorus contents and P absorbances. These measurements were carried out by the usual methods.

Results and Discussion

As the fundamental profile of the island, J plot having thick layer was selected. Sampling of this profile was made at each 10cm depth to 1m depth except upper 2 layers where samples of 0-5, 5-10cm were taken. From their color and other chemical data, the profile could be divided into three horizons namely A_0-A (0-5cm), A (5-15cm) and B (15-100cm). Their summarized data were shown in Table 1. All the samples showed relatively high value of CEC and very low degree of base saturation. Among the exchangeable cations (bases), Ca^{++} was characterized by its extremely small amount as usual soils. Accordingly the samples showed low pHs. Another distinct characteristics of them were almost full absence of Truog-P, indicating the easily developing of P deficiency to plant growth, though the P absorption (fixation) by soils were not so high as the case of volcanic ash soils. The textural and mineralogical studies haven't been done yet, the heavy texture and the presence of kaolin minerals is suspected by these results.

Meanwhile the chemical conditions of topsoils of upland fields that are considered to be originated from any layer of the above-mentioned J profile are very changeable from to sample to sample, except nearly zero of available P for all the soils tested. These different chemical conditions were primarily due to the kinds of cropping or soil managements. The soils could be grouped roughly into two types: the soils in high and low nutritional status. Of the nineteen soils examined, seven soils belonged to each both groups were picked out and their obtained chemical values are shown in Table 2, where sample d series were collected from

Table 1. Chemical properties of J profile

Sample No.	Depth (cm)	Horizon	Color	pH		Acidity (me/100g)		T-Carbon (%)	T-Nitrogen (%)	C/N
				H_2O	KCl	KCl	CaOAc			
J-1	0- 5	A_0-A	10YR 4/4	5.15	4.32	–	–	5.59	0.458	12.2
J-2.3	5- 20	A	10YR 4/6	5.14	4.54	0.53	6.83	2.96	0.232	12.9
								(2.95~2.96)	(0.209~0.254)	
J-4~11	20-100	B	10YR 4/8	5.19	4.38	2.12	8.60	0.24	0.025	9.99
								(0.12~0.46)	(0.200~0.031)	

No.	Exchangeable Bases (me/100g)				CEC	Base Sat.	Avail. P	P absorption	
	Ca	Mg	K	Na	(me/100g)	(%)	(mg/100g)	(%)	coeffi.
J-1	0.18	0.18	0.38	0.50	21.8	5.69	tr.	–	–
J-2.3	0.08	0.09	0.23	0.49	23.4	3.77	tr.	57.8	1640
	(0.05~0.12)	(0.06~0.12)	(0.36~0.10)	(0.49~0.48)	(21.0~25.7)	(3.29~4.24)			
J-4~11	0.04	0.09	0.05	0.46	18.9	3.52	tr.	54.4	1550
	(0.01~0.08)	(0.05~0.19)	(0.04~0.07)	(0.11~0.59)	(16.4~22.4)	(1.64~4.57)		(50.9~57.1)	(1450~1620)

Table 2. Chemical properties of upland soils

Sample No.	pH		Acidity (me/100g)		T-Carbon (%)	N-Nitrogen (%)	C/N
	H_2O	KCl	KCl	CaOAc			
b	6.40	5.44	0.39	4.75	4.87	0.53	9.19
d-4	7.73	7.70	0.06	0.34	2.12	0.17	12.2
h-1	7.57	7.29	0.12	0.19	1.93	0.19	10.3
h-2	7.93	7.71	0.13	0.35	2.30	0.27	8.55
d-1	5.33	4.62	0.42	6.48	3.25	0.29	11.2
d-2	5.33	5.43	0.14	2.28	0.85	0.12	7.37
d-3	5.34	4.72	0.17	4.61	2.87	0.21	13.9

No.	Exchangeable Bases (me/100g)				CEC (me/100g)	Base Sat. (%)	Avail. P (mg/100g)	P absorption	
	Ca	Mg	K	Na				(%)	coeffi.
b	15.2	4.49	3.66	0.57	37.6	63.6	tr.	40.0	1140
d-4	14.4	0.53	0.26	0.12	22.0	69.5	tr.	34.6	1280
h-1	16.6	0.77	0.46	0.14	23.8	75.6	tr.	39.0	1110
h-2	16.7	0.79	0.98	0.15	34.0	54.7	tr.	40.7	1120
d-1	0.50	0.31	0.24	0.42	18.6	7.90	tr.	40.9	1160
d-2	0.20	0.08	0.11	0.37	13.3	5.71	tr.	40.0	1140
d-3	0.50	0.13	0.30	0.40	15.3	8.70	tr.	28.6	810

Nabeshima Farm and b from a private farm and h from high school farms. The soils of Group I are under relatively good management with application of fertilizers or manures. Vegetables such as egg plant are cropping there. On the fields of Group II, pepper, raddish and soybeen were cultivated under poor manuring managements.

It is clearly shown that there are great differences in chemical conditions between the soils of Group I and Group II. The CEC of Group I soils appeared to be increasing presumable due to application of organic materials. Moreover the base saturation degrees of them are becoming distinctly higher than those Group II. The increases of base saturation, especially in Ca^{++}, might be the effects of limiting fertilizer application. These were also reflected on the distinct rising in pH and decrease of hydrolytic acidities of Group I soils. Even in Group I soils, the amounts of available P was very small.

The results indicated that low fertilities of the pohnpei soils can improve much more by the intensive soil management. Much application of phosphorus materials are needed at present.

Reference

U. S. Dept. Agri., Soil Conservation Service. 1982. Soil survey of Island Ponape, Federated states of Micronesia., General soil map units., Detailed soil map units: 3-22.