Volume 6, Number 3, 1997

ISSN 1115-2923

Transactions of the Nigerian Society for Biological Conservation.

The Nigerian Society for Biological Conservation

TRANSACTIONS OF THE NIGERIAN SOCIETY FOR BIOLOGICAL CONSERVATION

ISSN 1115-2923

The Official Publication of the Nigerian Society for Biological Conservation

Trans. Nig. Soc. Biol. Conserv. 6:157 - 160 (1997)

ON THE AGRICULTURAL POTENTIAL OF THE CROSS RIVER WETLAND AT ITU, AKWA IBOM STATE

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ABSTRACT

Soils from three sites in the Cross River flood plain at Itu were analysed and evaluated for agricultural possibilities. Soil texture and organic matter values indicated high suitability of the soils for cultivation. However, exchangeable cation concentrations were low. But proper management practices could convert the floodplain into a bread basket, considering the success of subsistence cultivation in the area. Implications to the Nigerian food situation are discussed.

Key Words: Wetland, soil, agriculture, Akwa Ibom State.

INTRODUCTION

Wetlands are those portions of the terrestrial habitat submerged or saturated with water. Wetlands could be natural or man-made, permanent or temporary, freshwater or marine. The alluvial deposits in wetlands contain minerals and dissolved nutrients which tend to make them naturally fertile ecosystems (Hollis et al, 1988). Wetlands tend to have unique soils that differ from adjacent uplands and are among the most productive ecosystems. Hence the high productivity of many wetlands in a significant way contribute to human food supplies from both water and soil.

In the tropical zone, wetlands provide the most valuable agricultural lands particularly in Africa, in places where there is relatively low rainfall. Africa's floodplains play an indispensable role in the traditional land use systems and the survival strategies of many people. In Nigeria, flood plains are key areas for the survival of millions of people. Some wetlands in Nigeria include the Lake Chad basin, Benue river, Sokoto - Rima, Cross River and Niger Delta flood plains. In all these areas, wetland agriculture is the most predominant form of human activity. Different forms of agriculture ranging from crop production, livestock keeping and fish production are practised in different parts of Nigerian wetlands. In Akwa Ibom State, swamp rice is cultivated in the major swamps e.g. in Ini Local Government Area, while in the flood plain at Itu, assorted types of vegetables e.g okra (*Abelmoschus esculantus*), pumpkin (*Telfaria occidentalis*) and water leaf (*Talinum triangulare*) are cultivated.

However, despite their importance, relatively few studies of the potentials of the wetland soils in Akwa Ibom State, in terms of crop production have been undertaken except in the major swamps where commercial agriculture is envisaged but hardly ever practised (Halcrow 1994). The aim of this paper is to examine the fertility status of the Cross River wetland soils near Itu with a view to evaluating the agricultural possibilities of the area.

Study Area

The study areas lie in Itu Local Government Area, Akwa Ibom State of Nigeria and can be located at the intersection of latitude 5°20'N and 8°00'E. It lies at the confluence of Enyong Creek and the Cross River. The soils consist of alluvium developed from sediments deposited by the river.

The flooding of the plain is a result of mainly runoff inputs from the catchment area. At the onset of the rains the Cross River receives runoff, increases in volume and overflows its banks. During each flood, large quantities of sediments are deposited, gradually building up the fertile flood plain which is used for cultivation.

Methods of Study

Three sites within the flood plain near Itu were chosen at Atan Onoyom, Itu Urban and Oku Iboku. The three sites were designated Site I, Site II and Site III respectively. All sites were regularly inundated, by flood waters and were waterlogged during the rainy season. Each site had an area of at leaset 2 hectares above normal water level in the channels. Generally site elevation varied between 50m to 100m above sea level. At the time of sampling, there was no crop on the sites although they were often alternately under crop and swamp grass fallow.

From each site, ten soil samples were randomly obtained to a depth of 0-15cm using a soil auger. The approach of sampling the soil at uniform predetermined depths was to enhance comparison of results from the different sites. The soil samples were air-dried, crushed and passed through a 2mm sieve and analysed using routine laboratory methods. Particle size composition was determined using the hydrometer method of Bouyoucos (1962); exchangeable cations were extracted in neutral ammonium acetate, then calcium, magnesium and potassium determined by atomic absorption and sodium by flame photometry. Effective cation exchange capacity was determined as the summation of exchangeable cation and exchange acidity (IITA 1990). Organic matter was obtained by the Walkley-Black wet oxidation method; nitrogen by the Macro-djehldahl digestion methods and phosphorus by the Bray No. 1 method (Jackson 1970). Exchange acidity was determined according to Maclean (1965) and pH was measured in 1:2 soil to water ratio using glass electrode

RESULTS AND DISCUSSION

The particle size proportions of the wetland soils are shown in Table 1. Sand content was similar in the three sites with mean values ranging from 45.2% to 49.6%. Hence the texture of most samples was similar and it is inferred that the source of sediments and pattern of deposition were also similar. The texture generally ranged from sandy loam to sandy clay although a few were clay, clay loam and silt loam. Clay content ranged from 3.0% to 28.2% with a mean value of 14.4%. From the FAO (1976) fertility rating, the soil texture is highly suitable for crop production (See table 2). The sandy clay and sandy clay loam textures are known to favour aeration of soils and easy penetration of soils by plant roots.

Table 1: Characteristic of the Cross River flood plain soils from three sampling sites*

Soil Properties	Site I	Site II	Site III	ANOVA P
Sand %	45.2± 7.7	48.0± 11.0	49.6± 8.0	<0.001
Clay %	28.2± 9.1	22.2± 12.1	30.0± 5.4	<0.001
Silt %	26.4± 6.0	29.8± 10.2	20.8± 4.0	<0.05
Ca (meq/kg)	5.5± 1.6	5.6± 1.3	5.2±1.7	NS
Mg (meq/kg)	2.9± 1.0	2.7± 0.8	2.7±0.9	NS
Na (meq/kg)	0.1± 0.01	0.1± 0.01	0.1±0.04	NS
K (meq/kg)	0.03± 0.01	0.03± 0.02	0.03±0.01	NS
EA (meq/kg)	6.3± 4.4	5.8± 3.0	3.0±1.5	<0.01
ECEC(meq/kg)	14.7± 5.0	13.7± 1.4	1.0±3.6	<0.001
pH	5.0± 0.4	4.8± 0.3	5.0±0.3	NS
O.M%	5.1± 0.6	4.4± 1.1	3.5±1.8	<0.05
AV.P (mg/kg)	6.9± 2.1	12.1± 8.0	21.1±4.0	<0.05
N%	0.2± 0.03	0.2± 0.04	0.2±0.01	NS
B.S%	60.1± 20.1	61.3± 14.4	73.2±10.1	NS

* Each value is mean for at least ten samples. OM = Organic matter, Av. P = Available phosphorus, ECEC = effective cation exchange capacity, E.A = Exchangeable acidity, BS = base saturation.

Table 2: Rating of Some soil characteristics for fertility evaluation (FAO 1976).

Characteristics	S_1	S_2	S_3
Texture	L,SCL	LC,C	LS,SC,C
CEC (Cmol/kg)	20	15-20	10-15
O.M.%	2-3	1-2	1
Bray P-I (mg/kg)	40	10-40	10
Exch. K (Cmol/Kg)	0.40	0.20-0.40	0.10-0.20
pH	5.5-7.5	4.5-5.5	4.0-4.5

S1 = Highly suitable
S2 = Moderately suitable
S3 = Marginally suitable
L = Loam
SC = Sandy Clay
SCL = Sandy clay loam
LC = Loamy clay
LS = Loamy sand
C = Clay

The pH values were moderate, indicative of high acidity levels (4.8 ± 0.3 to 5.0 ± 0.3) which however are not injurious to crop production, by the FAO rating. The soils of the wetlands had organic matter values greater than 3.0% which also indicate high fertility. However the soils had low phosphorus levels ranging from 6.9mg/kg to 12.1mg/kg in all the sites, indicating a deficiency in phosphorus levels.

Exchangeable calcium and magnesium ranged from 5.2 meq/100g to 5.5 meq/100g and from 2.7 meq/100g to 2.9meq/100g respectively. Potassium and sodium had mean contents of 0.03 meq/100g and 0.11 meq/100g respectively. These low values of exchangeable action resulted in a low ECEC which ranged from 10.0 meg/100g to 14.0 meg/100g, making the soils to be marginally suitable, on this account, for cultivation.

The values of other soil properties (exchangeable acidity, nitrogen and base saturation) were indicative of favourable agricultural environment although some management practices may be required particularly in terms of increasing acidity of the soils when empoldered. Information on aluminium levels and toxicity is required and should be investigated in further studies.

Variability was generally low and moderate among the measured soil variables indicating that sediment deposition was uniform on the flood plain. Sand and clay showed least variabilities while silt was moderately varied in all sites. The most variable chemical properties were potassium, exchangeable acidity and available phosphorus. The particle-size fractions showed statistically significant differences between sites ($P<0.05$ - 0.01) while magnesium, ECEC, pH and exchangeable acidity were the chemical properties that showed significant variation ($P<0.01$-$P<0.001$) between the sites (Table 1).

At the subsistence level, the flood plain is extensively farmed; being fertile, it is indeed the "Mesopotamia" of the region, where agriculture is dependent on the timing and duration of the floods and therefore seasonal. Perennial agriculture is practised. During low water as the flood recedes, crops e.g. *Telfairea accidentalis*, trifoliate yam, maize, okro and garden eggs are planted between November and January and are harvested in early July before the plain is re-inundated. As the wet season sets in rice is planted on fallow fields. Only the inputs of existing labour capacity and skills of the local communities are required. The labour is mostly supplied by women who plant and tend the crops.

The importance of the flood plain cannot be over-emphasized. Nigeria's oil wealth which was sudden in the nineteen seventies had disrupted agricultural production in several ways. It accelerated the rate of rural-urban migration which weakened the rural labour force for traditional agricultural production. Old men and women, left behind in the villages where the bulk of agricultural production comes from were unable to produce enough food to meet urban demands. Also the presence of oil money encouraged the importation of food from foreign countries although such food crops could be cheaply produced within the country; particularly if wetlands were harnessed for perennial cultivation.

Akwa Ibom State ranks high in terms of population growth when compared with many states in Nigeria. With a growth rate of 3.0% (Ukpong 1997), fallow durations have been drastically reduced particularly in the urban peripheries as there is high competition for land among other uses. In consequence, continuous cropping has become predominant, with the potential of reducing soil fertility. In addition the peasant farmers, not understanding the complexities of soil fertility, has resulted in the failure by governmental agencies to implemented well-integrated soil management strategies. For this reason agricultural productivity has tended to be low and the wetlands appear to be the key to future sustainable food supply.

CONCLUSION

The FAO (1976) fertility rating indicates that the floodplain soils at Itu, Akwa Ibom State have higher agricultural potentials than are currently being expressed through subsistent cultivation. The problem of low soil fertility, where apparent can be managed by the application of organic and mineral fertilizers or other technique of soil fertile restoration.

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