Physicochemical Charaterization of Agericultural Soils Used for Cultivation of Rice in Lakhimpur District of Assam, India

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Abstract

The present study deals with the quality checking of agricultural soil used for rice cultivation keeping in Lakhimpur district os Assam, India in view of the global environmental pollution scenario. Secondary data showing decreased trend in rice production in recent time in the study area is the background of this study. Assessment of various physic chemical parameters for agricultural soil used for rice cultivation will be helpful to adopt appropriate measure for expected rice production in near future.

Key Word: Soil, Rice, Production, Pollution etc.

Introduction

Rice is known as principal crops of Assam. According to Barah et al. (2001), now a day's about twenty six modern rice varieties are cultivated in Assam using deep water, shallow water, irrigated and upland diverse eco-systems. Rice has historical as well as cultural relevance from ancient time. Rice has been listed as the major food in the consumption basket in Assam.

One of the largest producers of white rice and brown rice is India which accounts for one fifth of all world rice production. Rice is treated as India's pre-eminent crop, and is considered as the staple food of the people of the eastern and southern parts India as per article "India: A Country Study:Crop Output" *published in* Library of Congress, Washington D.C. *September 1995*.

The growth in agricultural production is essential for any economy, particularly in an agrarian economy where the food demand over strips the supply due to population growth, apart from being the staple food. Despite its importance in every sphere of the agrarian economy, the performance of crop in the recent years has been unsatisfactory, which made Assam a net deficit state.

As per Ogen (2007), the agricultural sector is multifunctional in nature and has the potential of impart multi-level contribution and effect on socio-economic and industrial fabric of any nation.

Stewart reported that the agricultural sector has the potential to be the industrial and economic springboard from which the country's development can take off.

However, the growth scenario of rice in the state has been quite unsatisfactory. This is may be due to Pollution of the environment. Soil is a natural sink for various pollutants and contaminants. When pollutants or contaminants find their way into the soil, they interact with the soil and thereby change the chemical and physical properties of the soil. However, natural source of soil pollution or contamination cannot be ruled out. It is from the soil that plants get physical support, air, water, temperature moderation, nutrients, and protection from toxins. The conversion dead organic matter into nutrients for plants and animals takes place in the soil (Edori et al., 2017).

Different environmental contaminants or pollutants are discharged into the environment as waste without regard to rules and regulations (Inobeme et al., 2014).

The environment has limited capacity to contain these pollutants depending on environmental factors. While some ecosystem can retain or carry certain pollutants to an appreciable level, others may be very vulnerable to such negative consequences.

Soil naturally is composed of various minerals, organic constituents and broken rocks which have been altered by environmental reactions [Peter WB (1999) and Chesworth (2008)] and thus it is felt necessary to analyse the agricultural soil charater in order to understand the whether the agricultural soil samples selected for research are degraded or not.

Methodolgy

The agricultural soil from each block under all the sub divisions of Lakhimpur district of Assam, India will be collected for physico chemical assessment. The collected soil samples will be tested in order to characterize for parameters like Water Holding Capacity(WHC), Moisture content (MC), pH, Electrical conductivity (EC), organic carbon (OC), Organic matter (OM), Cation

Exchange Capacity (CEC), Potassium(K^+), Sodium (Na^+), Calcium (Ca^+), Magnesium(Mg^{2+}) Nitrate ($NO3^-$) and Chloride (Cl^-) etc.

Standard method will be adopted to analyze water holding capacity and moisture content of the collected agricultural soil samples.

P^H meter and Electrical Conductivity Metre will be used for the determination of P^H and Electrical Conductivity.

Flame photometer will be used to analyze Na and K in the collected soil samples.

AAS (atomic absorption spectrophotometer) may be engaged to analyze Ca and Mg.

Standard analytical methods will be employed for the determination of the rest of the physicochemical parameters.

Study Area

Lakhimpur district of Assam, India is selected for the present study. The economy of Lakhimpur is mainly based on agriculture. Assam Tea, rice, rapeseed, mustard seed, jute, potato, sweet potato, banana, papaya, areca nut, sugarcane and turmeric are the major crops that are cultivated mostly in the study area. The name Lakhimpur is believed to be originated from the word *Lakshmi*, the goddess of prosperity. The district is mainly dependent upon agriculture and paddy. Paddy is regarded locally as *Lakhimi*. The word *pur* means *full*. Lakhimpur therefore means full of paddy or the place where paddies are grown abundantly.

Besides, the soil of the district is alluvial and fertile for which crops flourish without use of any artificial manure or hard labour. Over and above fish, meat, vegetables, milk were abundant in this district. Others say that the word originated from *Lakhsmi Devi*, the mother of Bhuyan Raja who was the descendent of King Arimatta.

Lakhimpur is one of the administrative district in the state of Assam, India. The district lies between 26º48' and 27º53' Northern latitude and 93º42' and 94º20' East longitude . The area of Lakhimpur district is 2277 square kilometre. The rate of literacy is 78.4 percent as per 2011 census. Dhemaji district of Assam and Subansiri river are on the east of Lakhimpur district while the north of the Lakhimpur district is bounded by Siang and Papumpare District of Arunachal Pradesh. The river Brahmaputra along with Majuli District stands on the southern side and Gahpur sub division of Biswanath District is on the West.

The population of Lakhimpur district is 1042137 comprising male 529674 and female 512463 as per 2011 census. The sex ratio is 965 as per 2011 census. The density of population is 457 per square kilometer.

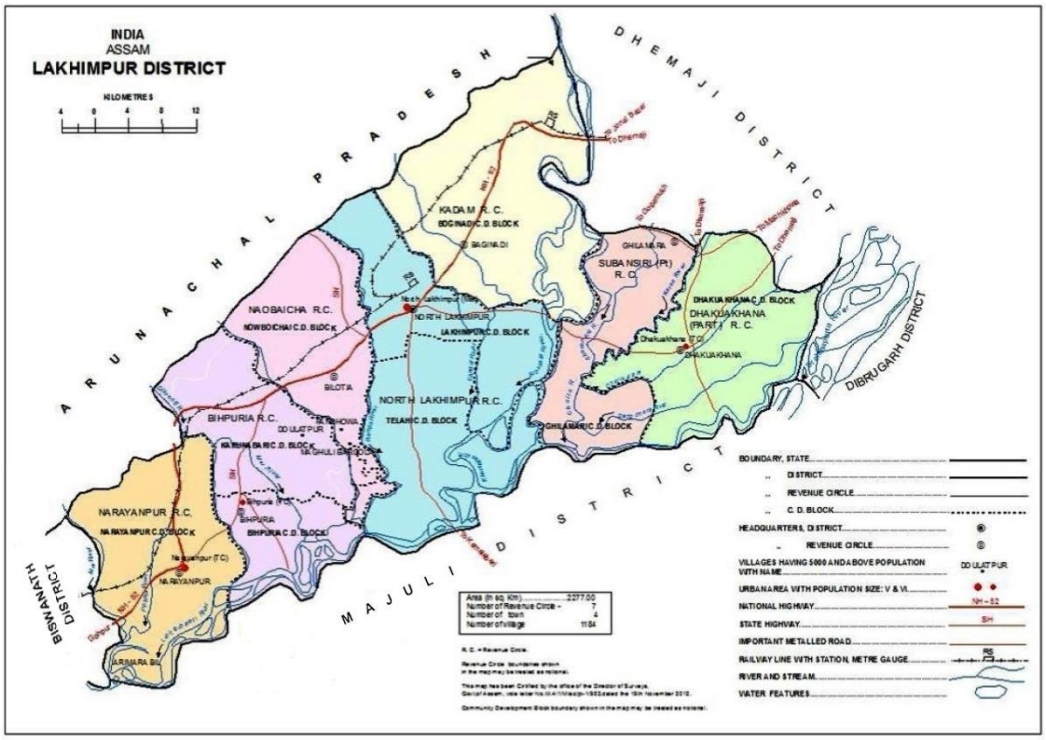

Fig 1: Map of Lakhimpur District of assam, India

The district consists of two sub divisions namely Dhakuakhana, and North Lakhimpur .There are nine blocks in Lakhimpur district namely Narayanpur, Bihpuria, Karunabari, Nowboicha, Telahi, Lakhimpur, Boginodi, Ghilamari and Dhakuakhana.

The blocks under the North Lakhimpur sub division are namely Narayanpur, Bihpuria, Karunabari, nowboicha, Telahi, Lakhimpur. The blocks under the Dhakuakhana sub division are Boginodi, Ghilamari and Dhakuakhana.There are a total of seven revenue circles in Lakhimpur district of Assam namely North Lakhimpur, Bihpuria, Naobaicha, Narayanpur, Dhakuakhana, Kadam and Subansiri. North Lakhimpur Sub-division consists of four Police stations namely North Lakhimpur, Boginadi, Laluk and Bihpuria. Dhakuakhana Sub Division consists of two Police stations namely Dhakuakhana and Ghilamara.

There are 228 villages under North Lakhimpur subdivision.

The main rivers of Lakhimpur district are The Brahmaputra,The Subansiri , The Ranganadi and The Dikrong. The important reserved forests of Lakhimpur district are Ranga Reserve, Kakoi

Reserve, Dulung Reserve and Pava Reserve. The various tree species found in the forest area of Lakhimpur districr are mainly Hollock (Terminalia Myriocarpa) , Urium (Bichotia Jauvanica), Nahar (Mesua Ferrea), Ajhar (lagerstroemia speciosa), Simolu (Bombax ceiba/Salmalia Malabarica), Sum (Machilus), Sualu , Gomari (gmelina orborea), Sissoo (Dalbergia Sissoo), Jutuli (Altingia excelsa), Silikha (Terminalia Chebula), Neem (Azadirachta Indica), Sopa (Magnolia) etc. Most the forests are tropical rain forests.

The river Subansiri has legends of gold washing, but now there is no major exploration of minerals in this district. There is now only some minor exploration for petroleum by ONGC in Dhakuakhana Sub-division (Source: Official Website of Lakhimpur District, Assam, India, retrieved on 3rd May, 2019, 10.48 am).

Collection of Sample

Four agricultural land used for rice cultivation situated in four directions viz. North, South, west and East in each block will be selected for collection of surface soil. The soil samples will be collected from the following blocks under the subdivisions of North Lakhimpur and Dhakuakhana. The collected samples will be processed as per standard method. Then the samples will be used for analysis of various parameters.

Name of Subdivision	Name of Block
North Lakhimpur	Narayanpur
	Bihpuria
	Karunabari
	Nowboicha
	Telahi
	Lakhimpur
Dhakuakhana	Boginodi
	Ghilamari
	Dhakuakhana

Table 1: List of block under North Lakhimpur and Dhakuakhana sub division

Result and Discussion

The result and discussion will be analyzed mainly by the following three approaches followed by other standard procedures.

A. The experimental value obtained for the given parameters will be compared with permissible limit value at international and national level.

i. water holding capacity(WHC)
ii. moisture content (MC)
iii. pH
iv. electrical conductivity (EC)
v. organic carbon (OC)
vi. organic matter (OM)
vii. cation exchange capacity (CEC)
viii. potassium(K^+)
ix. sodium (Na^+)
x. calcium (Ca^+)
xi. magnesium(Mg^{2+})
xii. nitrate ($NO3^-$)
xiii. chloride (Cl^-)

Suitable conclusion may be drawn by comparing the experimental values with the limit values. The graphical representation will help to understand the status of soil pollution scenario.

B. Statistical test of significance will be carried out using ANOVA.

C. Correlation analysis will also be employed to examine the relationship between the various parameters in the collected agricultural soil samples.

Conclusion

The testing of collected agricultural soil samples may help in assessment of essential soil nutrients for good quality of agricultural products and productivity. The analysis may help the farmers to adopt requisite measures to solve the problems related to soil nutrients, amount of which fertilizers to be used to increase the yield of crops.

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