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Status of Soil in Purba Medinipur District, West Bengal– A Review

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ABSTRACT

The Purba Medinipur district has a vast expanse of younger alluvial soils. It is divided into three parts.First, there is a strip of purely deltaic country composed of younger alluvial soils or Entisols bordering the Rupnarayan River and the Hugli River. The second division consists of the coastal alluvial soils of Entisols group. Much of the tract is salifereous and has to be protected from the incursions of the sea by embankments.There is a long narrow and elongated strip of saline and alkali soils of Aridisols group,stretching from Digha to the east of the Haldi river. The remaining portion consists of older alluvium belonging to Alfisols group along the Western portion near Egra and in a very small part to the northwest along the river Kangsabati. The present paper basically deals with the status of soil and related problems in Purba Medinipur district.

1. Introduction

Soil is a major source of nutrients needed by plants for growth.The three main nutrients are nitrogen,phosphorus and potassium.Depending on its location ,a soil contains some combination of sand,silt,clay and organic matter.The district mostly presents large open plains,formed of almost horizontally Gangetic alluvium.The entire district is uunderlain by unconsolidated bedded sedimentary rocks. The important rivers are Rupnarayan, Haldi, Kansabati, Hugli and Keleghai.The district is characterized by sub tropical humid type of climate. The maximum temperature varies between 37^{0}c and 43^{0}c and minimum temperature varies between 7^0 C and 7.8^0 C. The humidity here ranges from 60% to 90% due to the existence of the Bay of Bengal in the south. Average annual rainfall is 1752.6 mm. The occurrence of cyclone with heavy shower is a common feature especially in the coastal parts of the district. Two types of soil are predominant i.e. vindhyan alluvium comprising 122921 ha. and coastal alluvium comprising 181,879 ha.of land.The main crops are-

- Major Kharif Crops - (July to October) are rice, groundnut and Pigeonpea. Abundance of rain water and moderate temperature of the rainy season help to grow these crops.

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- Major Rabi Crops - (October to March) are Wheat, Mustard seed, Rapeseed, Potato, Onion, Lentil, Pea, Gram, etc. Mild day time temperature, night dews, irrigation help to grow these crops during winter season.
- Summer Crops are grown between March and June. Major crops are summer rice, sesame, Watermelon, Guava, Cucumber, Star apple, Jackfruit, Pineapple etc.
- Betel and flower grown in every season.
- Triple crop cultivation is practiced by maximum blocks.

2. Study area

Purba Medinipur district is one of the most important agricultural districts of West Bengal,which came into existence as the 19th district of the state on 1st January 2002 being separated from the earlier undivided Midnapore district.It comprises of four administrative sub-divisions namely-Tamluk, Haldia, Contai and Egra and divided into 25 community Development Blocks with 20 Police Stations and 5 Municipalities. The Head Quarters of the district is Tamluk and the sub-divisional head Quarters are Tamluk , Contai, Egra and Haldia. (Draft Annual Plan on Agriculture,Purba Medinipur 2001,2002).

The newly emerged Purba Medinipur district is located between 21°38'North and 22°30' North latitudes and between 87°27'East and 88°11' East longitudes (Map No. 1). It is surrounded by the Bay of Bengal and Orissa to its south and south-east, Paschim Medinipur district to its west and north, Haora and South 24 Parganas districts to its east. The total population of Purba Medinipur according to 2001 census is 4417377.Annual growth rate is 2.2% and the literacy rate is 66%. Number of agricultural family is 5, 78,176. The roads are of two types i.e. surfaced and unsurfaced. Roads are under the control of Public works Department, Zilla Parishad and Gram Panchayats and many of them have been constructed under Prime Minister's Gramin Sarak Yojana. In 2011 the geographical area of the district is 4.30 lakh hectare and the net cultivable area is 3.048 lakh hectare .47% of land i.e. 1.424 lakh hectare is under potential irrigation facilities & Cropping intensity is 170% in 2011. Surface irrigation covers 1, 08,980 ha. and subsurface irrigation covers 75,510 ha. of land. 47% of the area is potentially irrigated.

3. Method

The study is based on laboratory analysis of the soil samples includes the detection of soil texture, soil organic matter, soil pH and status of N, P, K etc. Also some problems regarding soil such as salinity, erosion, degradation etc. have been discussed very minutely.

4. Results and discussion

4.1 Soil Texture

Texture is an important aspect of soil to be considered in the context of healthy growth of plants. It controls structure, soil temperature, movement of air, water holding capacity, penetration of root, rate of infiltration,nutrient status etc. Plants can penetrate its root and water can infiltrate easily into the soils. But the water holding capacity of clayey soil is more than sandy soil. Because of its higher clay content a heavy textured soil is more fertile than the light textured soils (Das, 2011). Considering the texture of soils in Purba Medinipur, it is found that 46,270 ha.of land with light soil, 31,169 ha.of land with medium soil and 31,169 ha. Of land with heavy soils. Thus the soils of the district exhibit wide variation in their textural characteristics. A map has been prepared to show the distributional pattern of textural types (Map No.2).It shows that all the 25 blocks are mostly under clayey soil. The district is dominated by clayey soils and clay loam soils.In Nandigram-I & II, Mahishadal-I, Patashpur-I & II, Khejuri- I & II, Bhagwanpur-I, Egra-II and Deshpran blocks more than 70% soils are clayey in texture.

In Tamluk, Sahid Matangini, Moyna and Contai-III blocks 60% -70% soils are clayey in nature.The blocks of Panskura-I & II, Nandakumar, Nandigram-I, Sutahata, Haldia, Bhagwanpur-II, Ramnagar-I & II, Egra-I, Contai-I are the blocks where less than 60% of the total area is under clayey soils.On the other hand Moyna, Nandakumar, Sutahata, Haldia, Egra-I blocks are covered with clay loam soils by more than 50% of their area.In Panskura-I and Bhagwanpur-II blocks, 30% - 50% land is covered by clay loam.In Tamluk, Sahid Matangini, Moyna, Nandigram III, Mahishadal, Nandigram-II, Patashpur-I & II, Khejuri-I & II, Bhagwanpur-I, Ramnagar-I, Egra-II, Contai-I & III and Deshpran blocks less than 30% soils are clayey loam. In Tamluk, Sahid Matangini, Panskura-I & II, Nandigram-I, Ramnagar-I & II, Nandigram-I, Sutahata, Haldia, Ramnagar-I & II, Egra-I, Contai-I & Deshpran blocks are covered with sandy loam soil by more than 10% of their area.In Moyna, Bhagwanpur-I, Egra-II and Deshpran blocks less than 10% soils are sandy loam.

4.2 Organic Matter

Besides being the main source of nitrogen, organic matter increases water holding and base-exchange

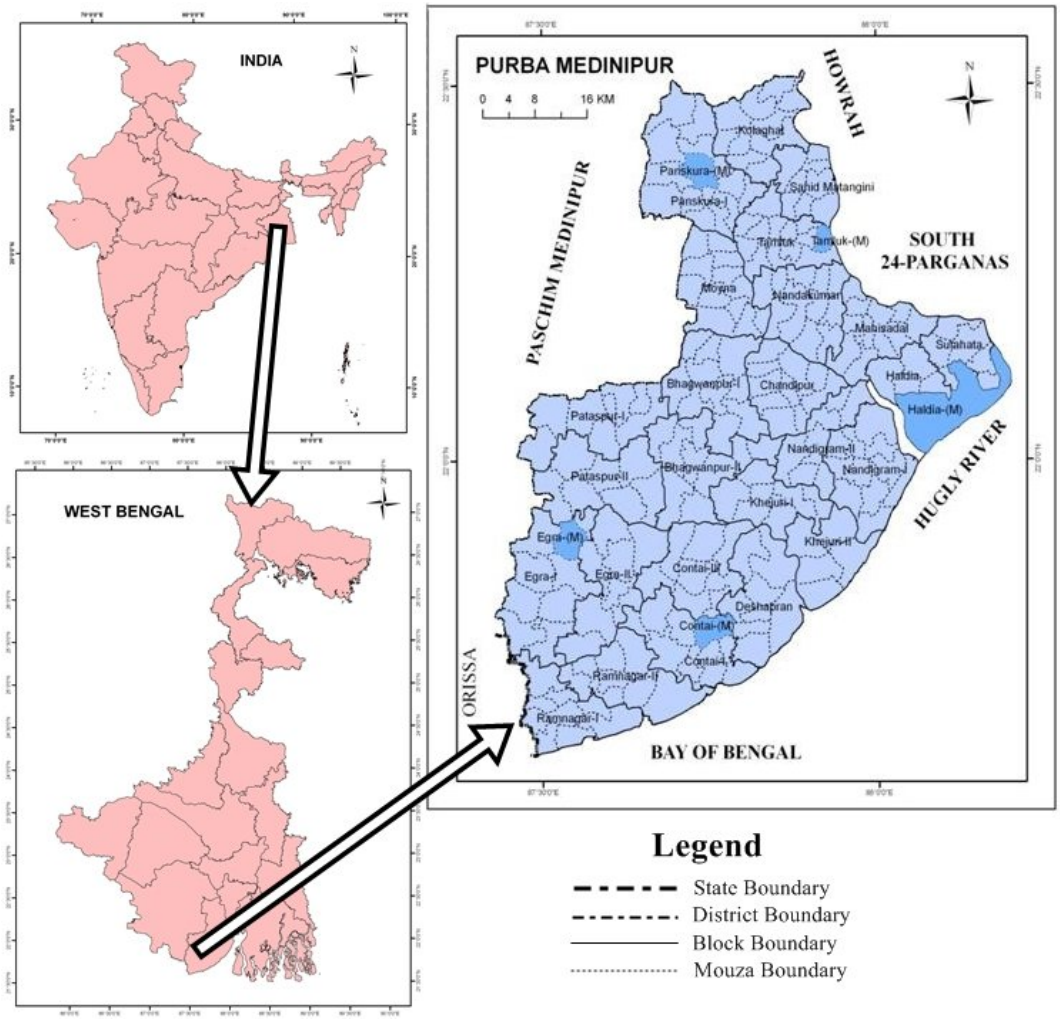

Fig. 1 Location of the study area

capacities of the soil and maintains the supply of the nutrients to the plants. Moreover, it helps the absorption of phosphorus and potassium that enhance the growth of different parts of plant, other than the vegetative part (Das, 2011).

The highest percentage of organic matter (> 0.75%) is found to occur in the south western part of the district i.e. in parts of Egra-I & II, Ramnagar-I, Deshpran, Contai-III, Khejuri-I & II, Bhagwanpur-I & II, Moyna, Sahid Matangini, Tamluk, Sutahata and Nandigram-I blocks.Soils of most of the blocks of the district (Panskura-I, Chandipur and a large part of kolaghat, Bhagwanpur-I, Patashpur-I & II, Nandigram-I & II, Khejuri-I & II, Contai-I, Deshapran, Ramnagar-II etc.)contain 0.50%-0.75% organic carbon.The lowest percentage of organic carbon (up to 0.50%) is found in some pockets of different blocks like Kolaghat, Nandakumar, Tamluk, Haldia, Nandigram-I & II, Khejuri-I & II, Bhagwanpur-I & II, Contai-III, Egra-II, Contai-I, Ramnagar-I & II. So as a whole,the soils of the district is poor in organic carbon content (MapNo.-3).

4.3 Available of pH

The determination of soil reaction in the plant growth is an important matter. Soils may be acidic, alkaline or neutral in chemical reactions (Das & Basu, 2004). Moderately acidic soil is found in part of Panskura-I, Kolaghat, Sahid Matangini, Nandakumar, Sutahata, Bhagwanpur-I, Chandipur, Haldia, Nandigram-I & II, Khejuri-I, Bhagwanpur-II, Patashpur-I, Contai-I & III,

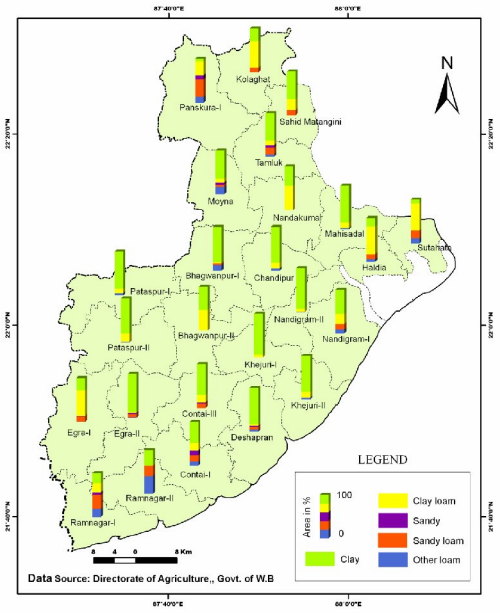

Fig. 2 Distribution of soil texture

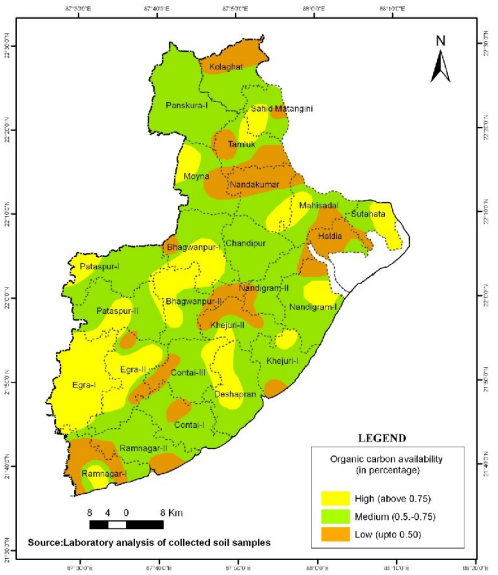

Fig. 3 Spatial variability of soil organic carbon

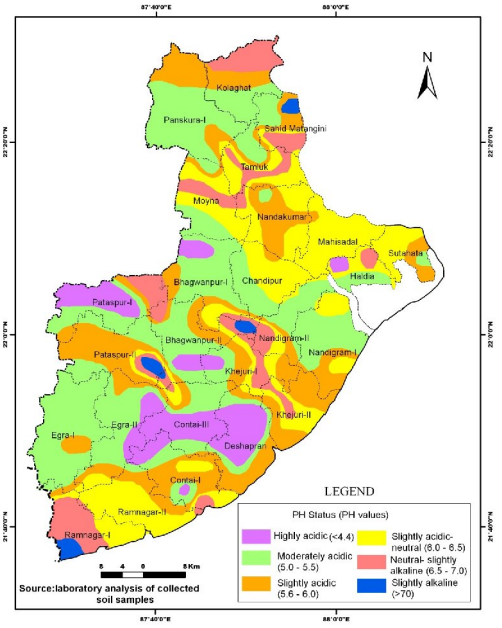

Fig. 4 Spatial variability of soil pH

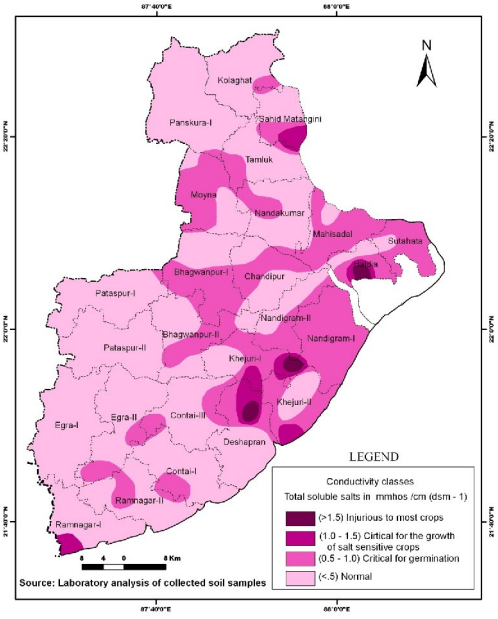

Fig. 5 Spatial variability of electric conductivity

Deshapran, Patashpur-II blocks and in most of the parts of Egra-I & II blocks. Slightly acidic soils are found in northern and south eastern part of the district. Highly acidic soil is found in Patashpur-I, Contai-III, Egra-II, Contai-I, Deshapran, Bhagwanpur-II, Khejuri-I, Bhagwanpur-I, Haldia, slightly acidic to neutral reaction of soils are found in south-western part and North-eastern part of the district. Neutral to slightly alkaline soil reaction prevails in pockets of Ramnagar-I, Patashpur-I,Bhagwanpur-II, Haldia, Nandigram-II, Khejuri-I & II, Bhagwanpur-II, Sahid Matangini, Tamluk and Moyna. Slightly alkaline soil is found in southern part of Ramnagar-I, eastern part of Patashpur-II and in small pockets of Bhagwanpur-II and Sahid Matangini blocks.

Most plants grow best in soils with slightly acid reaction(P^H 6.1-6.5)because all plant nutrients are available in maximum.Generally the terrestrial plants can grow with in a wide P^H range of 4.0-9.5 (Das & Basu, 2004) , (Map No.4).

3.5 Electrical Conductivity

Salt content of the soil samples is determined on the basis of electrical conductivity. The higher the salt content, the lower is the productivity of soil. Map showing spatial variability of electrical conductivity of soils in Purba Medinipur district demonstrates that in most of the blocks EC of soil lies below the tolerable limit.But EC is critical for seed germination in part of Kolaghat, Sahid Matangini, Tamluk, Moyna, Nandakumar, Mahishadal, Sutahata, Haldia, Chandipur, Bhagwanpur-I & II, Khejuri-I & II Nandigram-I & II, Part of Egra-II, Contai-I & III, Ramnagar-I & II, Part of Khejuri -I, and Deshapran blocks .In Haldia and in parts of Deshapran, Khejuri I, Nandigram I, Sahid Matangini blocks soil salinity has become critical for the growth of salt sensitive crops. EC of soils in part of Deshapran, Khejuri-I and Haldia blocks (Map No. 5).are injurious to most crops.

3.6 Available Phosphorus

Phosphorus is an important element of deoxyribonucleic acid and ribonucleic acid. Indirectly it acts as seat of genetic inheritance in plants and animals and protein synthesis respectively. (Brady, 1980).The content of available phosphorus in soils is high in most of the parts of the district (above 90kg/ha).But very low amount of phosphorus (up to 45 kg/ha) is generally found to occur in the southwestern and eastern part of the district that is in part of Haldia, Ramnagar-I & II, Egra-II and Patashpur-II. Part of Sahid Matangini, Moyna, Nandakumar, Mahishadal, Nandigram-I & II, Chandipur, Bhagwanpur-I, Khejuri-I & II, Deshapran, Patashpur-I & II, Egra-I & II, Contai-I, and most of the part of Ramnagar-II, Sutahata and Haldia (Map No. 6).

3.7 Available Potassium

Potassium is an important plant nutrient and it helps to produce amino acid. It also helps production and movement of carbohydrate and starch in various segments of the plant's body (Das, 2011). From the map(Map No.-7) it is clear that though most parts of the district i.e. Sahid Matangini, Tamluk, Moyna, Nandakumar, Mahishadal, Sutahata, Haldia, Patashpur-I & II, Khejuri-I & II, Deshapran, Egra-II, Part of Ramnagar-I & II, Contai-I & III, Egra-I, Bhagwanpur-I & II, Chandipur have high potassium content, moderate potassium content is found in the soils of Panskura-I & Kolaghat, part of Bhagwanpur-I & II, Chandipur, Nandigram-I & II, Contai-I & III, Ramnagar-I & II, and Egra-I and low level of potassium is found in part of Nandigram-I, Ramnagar-I & II.

3.8 Major Problems

Land's own productive capacity and natural structure of soil have decreased gradually. Land degradation, cloding of soil, accumulation of water, increased in salinization, loss of micro nutrients, decline in water holding capacity of soil etc. have created serious problem for agriculture. Salinization is a burning problem in all blocks of Contai and Tamluk subdivision, mainly the land closer to the rivers, oceans and canal. In spite of heavy texture of the soils in northern and western part of the district, the surface soil is lost due to surface run off and soil erosion is noticeable there. In the southern part soil is degraded largely due to coastal erosion. Severe soil erosion is found in Sutahata & Ramnagar-I block.Moyna , Patashpur-I , Bhagwanpur-I & Egra-II blocks are under the threat of very severe soil erosion along with salt water flooding and waterlogging problems. The soils of Sahid Matangini, Pataspur-I, Bhagwanpur-I suffer from severe micro nutrient deficiency. Soil alkalinity is another hurdle problem in this district. In Nandakumar, Chandipur, Mahishadal, Haldia and Deshapran blocks slightly alkaline soil is found.

4. Conclution

Use of organic mulch, cultivation of covered plants, rotation of crop cultivation, use of organic fertilizer, control of weed and pest by eco-friendly methods should be introduced for soil conservation. Special project for salinization should be introduced immediately. A pond with 9-10 feet of depth should be dug covering 1/4 - 1/5 th part of a particular land. The rain water can be stored in the pond. The soil from the excavated ponds is to be used for construction

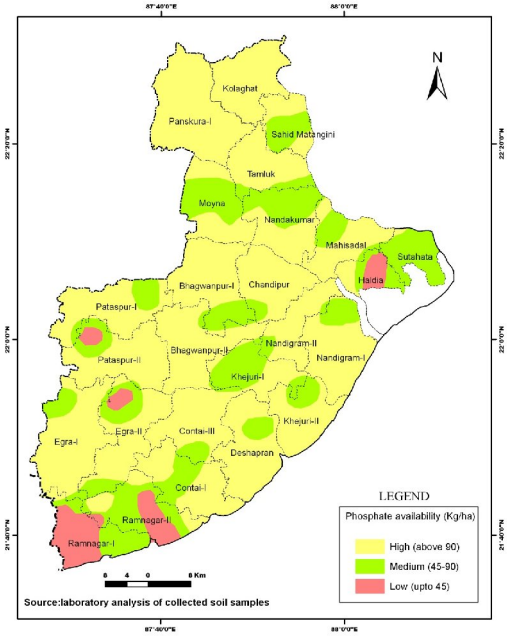

Fig. 6 Spatial variability of available phosphate

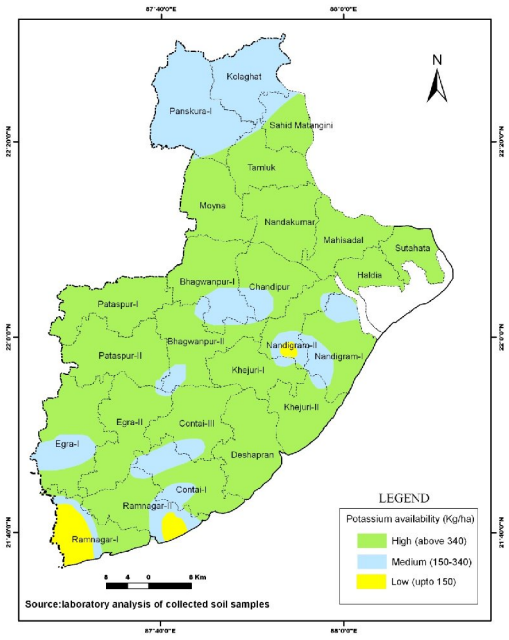

Fig. 7 Spatial variability of available potassium

of embankment. So the high yielding paddy of Kharif season, Rabi and summer crop can be easily cultivated with the pond water. Fish and duck can also be reared in the pond. Vegetables and various fruits on the pond bank can be grown in the above lands which can help the farmer to earn more.

5. Acknowledgement

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