SOIL RESOURCES OF NAUGACHIA SUB- DIVISION , BHAGALPUR DISTRICT

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ABSTRACT

In Bihar, huge area (approx. 2.4 lakh hectare) locally known as Diara land comes under active flood prone zone of the most important river the ganga. The land features present a riverine landscape with unstable land surfaces annually subject of flooding, erosion , re-deposition with assortment of sediments depending upon the velocity of the existing flood.
The Important fetures of the form of land surfaces are alluvial plain, alluvial cone, alluvial terraces, braided stream, channel bar, flood plain scroll, interfluve, levees and meander scroll and many other land forms related to riverine landscape. The geomorphic process active in the regions are annual rejuvenation, of deposition of fresh water minerals varying from very coarse to very fine. Subsequent to flood of varying velocity there occurs annual supply of fresh nutrients, primary and secondary minerals with stratification, alternately occurring oxidizing and reducing situations, river terrace formation right from the river bed to natural levees and wide varations in age of the various deposits. These processes also influence the quality of life and social aspects of human existance because most of the population has to shift to safer places during rains causing great hardships and unstability in their habits.
In view of the cryinf needs, the present investigation has been undertaken to study the various soil features including morphological, physical, physio-chemical and mineralogical properties under existinf pedagogical and hydrological enviroments, Such study seems to be nodal for the land form locally known as Diara land both of the Ganga and the kosi.

INTRODUCTION

Like many other words, the word soil has various meanings and may be used in various ways. As a verb it means “to make dirty” as in the case of soiled dishes or clothing. The noun soil is derived from the Latin word Solum, which means floor or ground. A soil scientist calls it soil, a geologist may call fragmented rock, an engineer may call earth and an economist may call land.

Generally soil refers to the loose surface of the earth as identified from the original rocks and minerals from which it is derived through weathering processes. According to Dokuchaev, “Soils are applied solely to those superficial or nearly superficial horizons of rocks that have been more or less modified naturally by the interaction of water, air and various kinds of organisms, either living or dead, this reflected in a certain manner in composition, structure and colour of such formations. Where these conditions are absent, there are no natural soils but either artificial mixtures or rocks.”

According to Joffe and Marbut, “Soil is a natural body developed by natural forces acting on natural materials. It is usually differentiated into horizons from mineral and organic constituents of variable depth which differ from the parent material below in morphology, physical properties and constituents, chemical properties and composition and biological characteristics.

Accoriding to Hilgard, “Soil is the more or less loose and crumbly part of the outer earth crust in which by means of their roots, plants may or do find foot hold and nourishment as well as other conditions essential for their growth.”

According to Buckman and Brady soil may be defined as a "A dynamic natural body on the surface of the earth in which plants grow, composed of minerals and organic materials and living forms."

In a generalised form soil may be defined as an accumulation of natural bodies which has been synthesized in profile form from a diversified mixture of disintegrated and weathered minerals and decaying organic matter which covers the surface of the earth and which supplies, when optimum amount of air and water, mechanical support and sustenance for plants.

COMPONENTS OF SOIL

Soils consist of four major components (i) mineral matter, (ii) organic matter, (iii) water and (iv) air.

All these components cannot be separated with much satisfaction because they are present very intimately mixed with each other. The mineral matter forms the bulk of soil solids and a very small amount of the soil solids is occupied by organic matter.

Physically, the soil consists of stones, large pebbles, dead plant twigs, roots, leaves, other parts of the plants, fine sand, silt, clay and humus (derived from the below proposition of organic matter).

In the organic portion of the soil, about half of the total organic matter is comprised of the dead remains of the soil life in all stages of decomposition and the remaining half of the organic matter in soil is alive.

The living part of the organic matter consists of plant roots, bacteria, earthworms, algae, fungi, nematodes, actinomycetes and many other living organisms.

As far as the volume composition of soil is concerned the optimum condition for crop growth is explained in Fig. 1

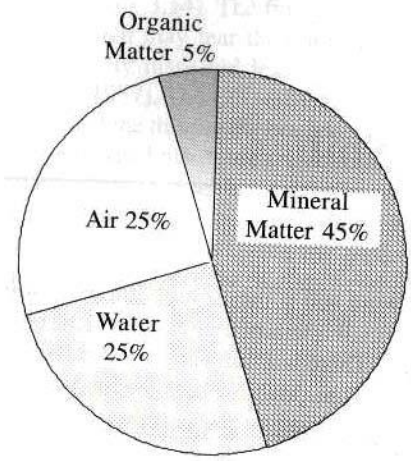

Fig.-1 The Soil Components

The size and composition of mineral matter in soil is variable due to nature of parent rock from which it has been derived. It is generally composed of very fine broken rock fragments and minerals either dominated by inorganic constituents or dominated by distict minerals like quartz and felspar.

Soil organic matter exists as partly decayed and partially synthesized plant and animal residues. These organic residues are continually being broken as a result of microbial activity in the soil and due to constant change. It must be replenished to maintain soil productivity.

Soil water plays a very significant role in soil plant growth relationship. Water is held within the soil pores with varying degrees of forces depending on the amount of water present. It also presents along with dissolve salts and makes up the soil solution.

Air spaces or pore spaces (voids) in a soil consists of that portion of the soil volume not occupied by the soil solids, either mineral or organic. Under field conditions pore spaces are occupied at all times by air and water. The more the water, the less the room of air and vice-versa. A summary of soil forming process is given in Fig 2

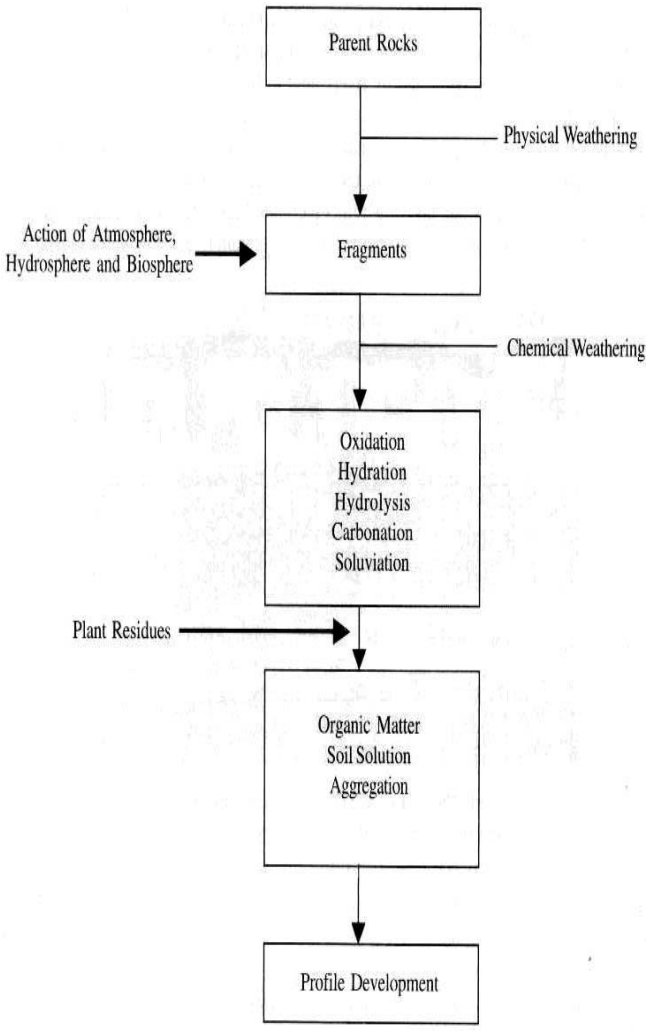

Fig.-2 Summary of soil-forming processes

SOIL PROFILE

The soil profile may be defined as a vertical section through a soil. It represents sequence of horizons or layers differentiated from one another but genetically related and included to the parent material from which the soil profile is developed. The soil profile is divided into four horizons – organic horizons (O), A, B and C horizons. Practically the soil profile is an important tool for soil classification which is applicable for thorough understanding of soil.

If a pit or trench is dug into soil, especially deep soils, we can see characteristic layers or horizons differing in colour, texture, structure, thickness, chemical composition and biological properties. These superimposed layers or horizons of soil are collectively designated as soil profile

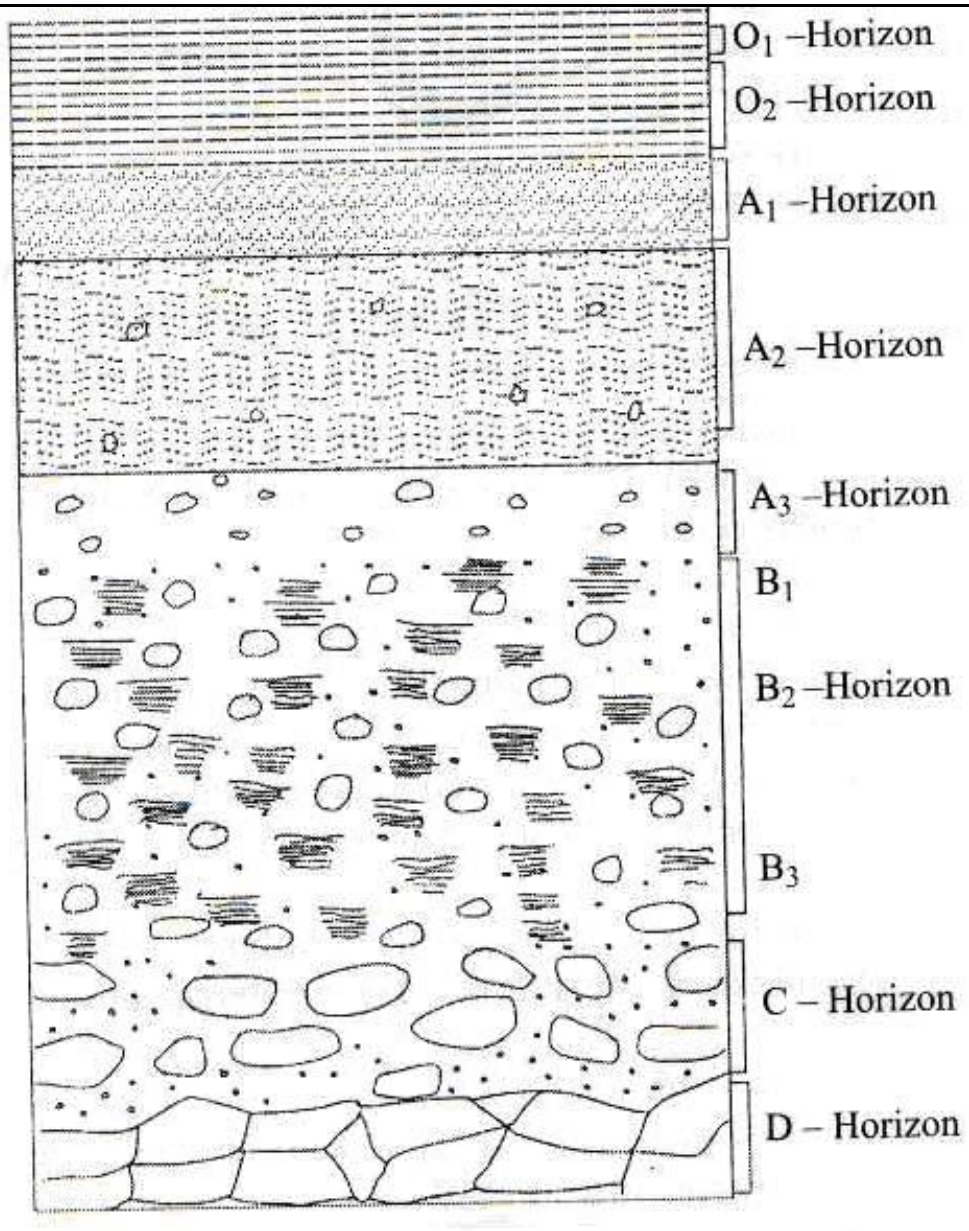

Fig-3 Diagrammatic representation of a soil profile (vertical section of the soil) showing soil horizons 01:undecomposed organic debris (leaves, etc.), O_2: Partly decomposed organic debris, A_1: Zone of maximum humus accumulation (usually dark coloured), A_2: Zone of maximum leaching (usually light coloured), A_3: Portion of A horizon transitional to B horizon, B_1: Portion of B horizon transitional to A,B_2: Zone of maximum deposits (clay, iron, aluminium and/or humus), B_3: Portion of B horizon transitional to C horizon, C: Mineral horizon usually unconsolidated but sometimes reconsolidated (below the principal root zone), D: Consolidated bedrock.

The differentiation of horizons is brought about largely through the action of rain water, which leaches materials from surface layers and deposits them at different depths. A typical soil consistes of the following horizons:

O horizon consists of plant litter on the mineral soil surface. It is divisible into O_1, having recently fallen litter (fresh litter) with little decomposition and O_2, having partly decomposed organic debris, derived from litter (particles having lost identities matted together).

A horizon is the eluviation or extraction zone of leaching, which indicates downward movement of materials. It is represented by mineral material that contains most of humus in the profile. This horizon easily loses soluble salts, clay, Fe, Al and organic colloids by leaching but is enriched by silica. Its subdivisions are:

A1 = Zone that has maximum humus with dark colour and granular structure.

A2 = Zone of maximum eluviation, light colour and structureless due to the loss of clay, Fe, Al and organic colloids.

A3 = Transitional zone to B horizon, but more like A than B horizon.

B horizon is commonly called the subsoil and represents the zone of illuviation or deposition. This layer receives and accumulates the soluble salts, clay minerals and oxides of aluminium and iron carried by percolation waters from the A horizon. The intense colour is due to sesquioxide coating of mineral grains. This zone is of heavy texture, greater density and higher clay content than A horizon. In the B horizon, a hard pan might form in some soils.

C horizon is the mineral horizon below the B layer but excluding true bed rock; this is formed under conditions little affected by pedogenic processes. The A and B horizons may or may not have been formed from the material of C horizon. Frequently, however, the C horizon contains parent material weathered to some degree.

D horizon consists of unweathered bedrock and may not be the material from which A, B and C layers are formed.

It may or may not be the same as the parent material from which the sodium is formed**.**

LOCATION AND EXTENT OF STUDY AREA

The study area is Naugachia sub-division of Bhagalpur district. It is located in the eastern part of the Middle Ganga Plain in Eastern Bihar. It forms the northern part of the Bhagalpur district. The Ganga river has separated it from the southern part of the district. On the northern part of the sub-division the river Kosi flows which has separated it from Madhepura district. To the east lies Purnia and Katihar Districts of Purnia Division.

Naugachia sub-division is situated between the 25°15′ N to 25°30°N latitudes and 86°50′-87°15′E longitudes and has an altitude of 61 m above the sea level. Its length is 36 km from east to west and width is 27 km from south to north. The total area of the Sub-Division is 891.40 sq.km. which is 35.05% of the District of the Bhagalpur.

As per 2001 census the population is 5,91,199 persons which is 24.3% of the district. The maximum and minimum temperature is 43.6°C and 8°C respectively. The annual rainfall is 142 cm. The population of the sub-division is having the people of Hindu and Muslim religions.

The chief crop of the area is Maize, Banana, Wheat, Kalai, Mustard etc.

The State Govt. declared Naugachia as sub-division is 1973 and as police district in 1992.

The area is notified Backward area by planning commission.

The complete jurisdiction of the sub-division is affected by floods of Ganga and Kosi.

Table -1

The Characteristics of Naugachia subdivision

S.No.	Name of Blocks	Area (in sq. k.m.)	Population (2001)	NSA (sq. k.m.) Average of (2006 – 09)	Major Crops Grown
1.	Naugachia	114.03 (4.48)	122750 (5.05)	70.57 (6.37)	Maize, Wheat
2.	Kharik	138.48 (5.44)	102873 (4.23)	61..60 (4.69)	Maize, Wheat, Banana
3.	Bihpur	182.40 (7.17)	96955 (3.99)	65.13 (4.96)	Maize, Wheat
4.	Narayanpur	117.42 (4.62)	81947 (3.37)	26.56 (2.02)	Maize, Wheat, Barley
5.	Gopalpur	86.63 (3.41)	76434 (3.14)	56.86 (4.33)	Maize, Wheat, Urad
6.	Ismailpur	117.86 (4.63)	37629 (1.55)	52.97 (4.03)	Maize, Wheat, Urad
7.	Rangra Chowk	134.65 (5.30)	72611 (2.98)	63.78 (4.85)	Maize, Wheat, Urad

N.B. Figures in bracket indicate percentage share of the district.

Source : District Statistics Office, Bhagalpur (2007

PHYSICAL CHARACTERISTICS

Relief – The region is a flat alluvial plain. The slope of the land is from north west to south east. The general slope is 10 metres in 1 kilometer. The plain has been formed by the alluvium brought by the rivers like the Ganga and Kosi and their tributaries. Many abandoned courses of rivers or 'Chharan' are found near the Ganga. In this part many 'Diaras' or large newly formed islands have developed in the bed of the Ganga. Example of such Diara are Chauvaneya, Shankarpur and others. The saucer shaped depressions which are long semi circular and filled with water during the rainy season are known as 'Chaurs'. Thus Diaras, Chharan, Chaurs and embankments are the important features of this alluvial plain. The general elevation is 50-60 metres above main sea level. In this north west the altitude is 63 metres while is in the east it is 53 metres above mean sea lived.

Drainage –The river Ganga is the main river which separates this northern part of Bhagalpur from the southern part. The Ganga touches the district at Tulsipur forming boundary with Parbatta block of Khagaria district and enters the district opposite Sultanganj on the southern bank. The northern part of the sub-division is drained by the Kosi which joins the Ganga at Kursela in Katihar district just a few kilometers of the eastern boundary of this area. Among the left bank tribularies of river Ganga are Ghungri and its tributaines Shirkhandi, Tilinga etc. which meet the Kosi near Dhodia village. The areas experiences flood from the Ganga and the Kosi every year.

Climate – The areas experiences hot and moist climate just like West Bengal and the adjoining Purnia division. The average summer temperature is 42^0C while the minimum winter temperature is about 8^0C. Sometimes temperature goes up to 45^0C in summer and as low as 2^0C in winter. This part of Bhagalpur district receives more rainfall than the southern part. The average annual rainfall is 130-140 cm. The eastern side of this sub-division gets more rainfall than the western part.

There are five seasons in this area. They are as follows:

1. **Winter season** : During Winter Season the temperature of the area comes down to 15^0C during day hours but the nights record is 5^0C less whereas 10^0C is the average temperature. Sometimes during cold waves, temperature goes down to 4^0C as in January 2011. This is the period of very lesser amount of rainfall (5 cm to 10 cm) from western disturbances which comes from the Mediterranean sea.
2. **Spring season** : During Spring Season the temperature starts rising. Around 15th of February the normal temperature is 20^0C during the daytime but it increases up to 40^0C in the first week of June. About 3 to 4 storms in the forms of dust storms are common which visit the area each and every year. They come as hailstorm which is very harmful for standing tobacco and Annar crops but helpful for Sugarcane and vegetables.
3. **Summer season** : During Summer Season temperature goes up to 45^0C in the area specially during the daytime. The entire day looks dusty with the blowing of speedy westerly wind followed by high temperature. The formulation of baby-cyclone is quite common specially in the Ganga diara and urban areas. Local hot winds 'Loo' is often fatal for babies and old persons.
4. **Rainy season** : Rainy Season starts with the onset of South West Monsoon in the middle of June. The temperature goes down to 30^0C in the last week of June. The area receives rainfall from Bay of Bengal branch of Monsoon. The rainfall received during this period is as much as 140 cm. The highest amount of rainfall is received during the month of July-August. Along the embankment of the Ganga, the flood havoc is a common feature.
5. **Autumn season** : It is also known as the Season of Retreating Mansoon from 15th September to 15th November. The south-west monsoon starts receding from northern plains of India. During this season this part of the district of Bhagalpur enjoys about 10 to 20 cm of rainfall in Hathia Nakshata and the rest period is rainless. The temperature also comes down to 25^0C which is very helpful for Kharif and Rabi crops. The ground if full of moisture and sunny days are quite harmful for people.

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