

Conservation Measures to Check Soil Erosion In Chopra Block , Uttar Dinajpur , West Bengal, India

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ABSTRACT

Erosion is a comprehensive natural process of detachment and removal of loosened rock materials and soils by exogenetic process such as running water,ground water,sea waves,wind,glacier.In fact the damage and degradation caused to the soil due to compactness,smearing,excessive working etc.through human activities is called "Soil Degradation".

CHOPRA block of Uttar Dinajpur is densely populated agricultural area.It is situated in high rainfall zone including many rivers following from north to south direction.All the rivers have their origin from the Darjeeling Himalayas.Thus water volume and velocity of the rivers became high during rainy season.So in this study area stream erosion in the main cause of soil erosion.This study shows the present status of denuded soil of Chopra block and discusses the factors which are responsible for this erosion and also focuses on the the efficient and scientific conservation measures which are applied to that area to check soil erosion for further improvement in soil fertility of of Chopra block.

KEY WORDS: TOPOGRAPHY, LAND, SOIL PROPERTIES, FACTORS OF SOIL EROSION, SOIL CONSERVATION MEASURES, SUGGESTED REMEDIAL MEASURES.

OBJECTIVES

The main objectives of this study is-

- To analyses the present condition of denuded soil
- To find out the main factors which are responsible for erosion of that area.
- To check soil erosion and further improvement in soil fertility in different parts of the area.

METHODOLOGY

The whole information and data have been collected from Chopra Block Development Office, Chopra Agriculture Office and District Census Handbook(2001), secondary data collected from irrigation and agri-irrigation office of Islampur and Agriculture office of Chopra block. Few books have been studied for preparation of paper.

STUDY AREA

Chopra block is the middle area between Uttar Dinajpur District. It is the most important block of Islampur sub-division. It is situated in between 26°24'N to 26°40'N latitudinal extension and 88°18'E to 88°30'E longitudinal extension. The northern part is formed by Darjeeling District, the eastern and north-eastern part is Bangladesh, the western part is Islampur.

Chopra block covers an area of 378.40sq.km. It has 8 gram panchayats, 119 mouzas and 47 villages. River Mahananda, Kartoa, Nagor is situated in the northern boundary, eastern boundary and southern boundary respectively.

Chopra has surprising boundaries. It is bounded by Darjeeling in the north, Kishanganj district of Bihar in the west, Islampur block in the south and panchgara district of Bangladesh in the east.

INTRODUCTION

Erosion is the process by which soil and rock are removed from the earth's surface by exogenetic process. While erosion is a natural process, human activities have increased by 10-40 times the rate at which erosion is occurring globally.

Soil erosion has resulted into the loss of fertile soils and thus degradation of agriculture lands, rill and gully erosion augmented by extensive use of natural resources has rendered millions of hectares of land into waste lands, since efforts are immediately required to halt accelerated rate of soil erosion caused by rill and gully erosion and to protect the cultivated farms from poisoning through rain splash and sheet erosion. Natural condition and human action caused soil erosion which in turn affects agriculture very seriously. Once a huge portion of fertile soil is lost, it is very difficult to replace it. Soil conservation means efficient and scientific management of soil in order to ensure permanent and large production of crops. Conservation methods help to protect the surface from rain drop impact, increase in the infiltration of rain water, maintain species of trees and vegetable cover.

TOPOGRAPHY

This area is flat with a medium slope. Some areas are low and must be inundated by rivers during the rainy season. There are no mountain peaks within this area. It is a monotonous cultivated land and many portions of area covered with trees, forest and tea gardens.

LAND

In this area most of the land is cultivated and either irrigated or not. Chopra has 22,207 hectares cultivated land and 8307 hectares non-cultivated land. Chopra block has 14620 hectares high land, 7296 hectares medium land and 344 hectares low land, barren land - 410 hectares, area under orchard - 107.80 hectares, permanent pasture - 205 hectares.

Table No.1

G.P WISE TOTAL LAND OF CHOPRA BLOCK

SL No	Name of G.P	Land (in hectare)
1	Haptiagach	2932.33
2	Sonapur	6629.88
3	Chopra	4075.77
4	Chukiapor	4330.66
5	Lakhipur	2209.65
6	Ghirnigaon	5095.14
7	Daspara	4948.14
8	Majhiali	7343.19

Source-Agriculture office, Chopra.

SOIL PROPERTIES OF CHOPRA BLOCK

The study area is young and active. The soil of Chopra block is alluvial of very recent formation. It is sandy loam and the colour is grayish and in the marshy area the colour of the soil is black. The surface is sandy loam. Below the following tables shows some soil properties of Chopra Block.

Table No.2

SOIL TEXTURE

Soil Texture	Parent Material	Area(in hectare)
Sandy	Alluvial	13360
Sandy Loam	Alluvial	8160
Loam	Alluvial	400
Clayey Loam	Alluvial	400
Clay	Alluvial	Nil

Source-Agriculture Office, Chopra

FACTORS OF SOIL EROSION IN CHOPRA BLOCK

Chopra block of Uttar Dinajpur is a densely populated agriculture area. It is situated in high rainfall zone including many rivers following through this block, followed by havoc erosion of soil which is a general problem of this block.

In this block there are many rivers following north to south direction. Such as Dauk, Mahanand, Kartoa, Nagar. The main rivers are Dauk and Berang rises in the Darjeeling Himalayas and flows through the centre part of Chopra. Dauk river flows through some areas of Bhagabati, Dakshin Damorgach, Narayanpur, Besarbari, Berang flows Uttar and Dakshin Damorgach. In North-Western part of Dakshin Damorgach Berang river joints with Dauk river.

Mahananda flows within Borobilla, Chitalghata. The rivers are perennial but in the monsoon time the river carries huge amount of water. The bank of the river are abrupt and the beds sandy. These sandy beds shift at the time of wet years, then the rivers water over flow their banks, thus causing flood and destroy crops as well as home land also. The soil through which the river flow being alluvium of very recent origin and largely mixed with sand is easily cut by the water and deposited on the side on which the velocity is less. By the end of summer season the water come down considerably.

Table no-3

SOIL ORGANIC STATUS OF CHOPRA BLOCK

Sl.No	Village	% of organic carbon	Sl.No	Village	% of organic carbon
1	Dalua	.51	19	Jhumari	.60
2	Chopra	.09	20	Singha	.48
3	Goabari	.15	21	Bherberi	.83
4	Chandanidanga	.24	22	Bazargach	.83
5	Lakhipur	.37	23	Bimlabari	.20
6	Bholagach	.67	24	Kinabari	.23
7	Madhobita	.27	25	Khunia	.42
8	Baragach	.57	26	Sadhuramgach	.42
9	Molani	.22	27	Majhiali	.47
10	Bishali	.39	28	Banargach	.63
11	Arali	.90	29	Chugari	.76
12	Koimari	.39	30	Mithapukur	.93
13	Kumartola	.98	31	Mohangach	.97
14	kajigach	.54	32	Binnaguri	.55

15	Dhumdangi	.50	33	Jhajri	.35
16	Aramati	1.01	34	Fetehabad	.64
17	Kalagach	.98	35	Chufargach	.97
18	Debigach	.38	36	Balarampur	.50

Source-Agriculture Office, Islampur

Table no-4

PH OF SOIL IN DIFFERENT VILLAGES IN ISLAMPUR

Sl. No	Village	PH Value	Sl.No	Village	PH Value
1	Dalua	5.5	17	Jhamari	5.5
2	Chopra	5.3	18	Singha	5.0
3	Goabari	5.6	19	Bherberi	5.5
4	Chandanidanga	5.2	20	Bazargach	5.5
5	Lakhipur	5.2	21	Chadargach	5.3
6	Bholagachh	5.2	22	Bimalbari	5.7
7	Madhobita	5.4	23	Kinabari	5.7
8	Baragach	5.0	24	Khunia	5.4
9	Maloni	5.0	25	Sadhuramgach	5.0
10	Bishali	5.0	26	Majhiali	5.4
11	Arali	5.2	27	Banargach	5.4
12	Koimari	5.7	28	Chugari	5.5
13	Kumartola	5.5	29	Mithapukur	
14	Kajigach	5.6	30	Mohangach	
15	Dhumdangi	5.5			
16	Aramati	5.3			

Source-Agriculture Office, Islampur.

Table No-5

N.P.K STATUS OF CHOPRA BLOCK

O.C%	AV P ₂ O ₅ (Kg/ha)	AV K ₂ O ₅ (Kg/ha)	PH	EC(m.m ho/cm)
0.10-0.6	8-94	32-200	4.6-5.8	0.80-0.10

Source-Census report 2001

Table No-6

RIVERS NAME

Name of river	Gauge sta.	D.L	E.D.L	H.F.L
1.Mahananda	Sonapur Ghat	75.771M	76.771M	76.480(28.7.72)
2.Dauk	Chopra	69.460M	70.0700M	70.000M(1969)

Source-Agri culture Office Chopra

VARIOUS CAUSES OF SOIL EROSION HAD BEEN FOUND IN THIS AREA:-

1) **SOIL EROSION BY RUNNING WATER**:-The greatest erosive agent is the running water or stream. A heavy shower on the earth surface loosens the soil particles which are carried on by small rivers. It results in the havoc landslides. This

type of soil erosion in the sloper land catchment are make heavy loss to cultivated area and there is no terraces for checking the soil removal particles.

The bank erosion by the river water changes the course of the river. It erodes huge amount of soil around the area. In this area sheet erosion, rill erosion, gully erosion are notable erosion by running water.

- **SHEET EROSION**-Watching of surface soil by sheet from arable land is called sheet erosion. This type of erosion is occurred on the earth only. In the study area, it is found here and there in small patches.
- **RILL EROSION**- Rill erosion is the erosion of soil through the small water ways. It is very common in this area and almost covers the whole area of the block. In the south and northern part of the area it is very common.
- **GULLY EROSION**-Gullies are relatively permanent sleep sided water causes. This type of erosion is very common in this block. It can be found in the western part of "DALUA" along the dauk river.

2)SOIL EROSION DUE TO OVER GRAZING OF ANIMALS:-The area is mostly covered with alluvial soil. So movement of cattle here and there causes the soil layer become loosen and due to rainy season the soil eroded easily.

3)EROSION BY CULTIVATION :-Year after year the cultivation on the same land make the area poor fertility. In rainy season huge amount of soil eroded from agricultural land.

4)EROSION BY RAINFALL:-The area situated in high rainfall zone. When the rain drop fall on the land, the loose material are missed with rain drop and washed away.

Table No.-7

FLOOD AFFECTED AREA OF CHOPRA

SL.No	Vulnerable villages	Name of G.P	Approx Population likely to be affected
1	Kumartol	Chopra	1000
2	Sitpara	Chopra	400
3	Suvasnagar collony	Chopra	500
4	Murijhapi	Chopra	300
5	Nainital collony	Chopra	300
6	Rangagach	Chopra	1000
7	Bherbheri(uttar & dakshin)	Chopra	500
8	Dhamargach	Chopra	500
9	Haskhari-I,II,III	Majhiali	500
10	Chitalghata	Sonapur	1000
11	Sitpara	Sonapur	400
12	Adraguri	Sonapur	500
13	Rabindra Nagar	Sonapur	400
14	Shidhu- kanhoo Char	Haptiagach	500
15	Kalikapur	Chutiakhore	1500

Source-Block Development Office, Chopra

5)DEFORESTATION:-Most mouza of this block are remote villages. The poor villagers cutting the trees to use them as a fuel and also sell them in the market to earn some money. In this way deforestation increasing day by day.

CONSERVATION MEASURES TAKEN TO CHECK SOIL EROSION:-To check soil erosion and to attain further improvement in soil fertility various methods to be practiced in different parts of the study area like agronomic

measures, rotation of crops, strip farming, mulching, creation of protective surface, cultivating of soil binding crops, control of grazing on land, mechanical method etc. All mechanical methods should be employed in conjunction with agronomic measures. The following are the most important mechanical methods which may be applied in the study area to protect the soil against erosion. They are-

(I) Earthen Bandh of about 300mts wide to 2 mts height has been made parallel on the both side of the river. This kind of bandh we can find on the left bank of the river and just downstream of Chopra bridge on Dauk at Rabindra Nagar Colony and right side of Sonapur ghat to left bank of Mahananda towards upstream. At Barabilla the bandh protection length is above 400 mts which is upstream side Chitalghata embankment.

Earthen Bandh is helpful to protect sand deposited on the agriculture field and after flood when water comes down into the river it is more effective as soil erosion protection Bandh.

(II) Land field bandh is made for level field cultivation when more deposition of sand along the river bank is very high. This type of bandhs are found in Rangagach and Dalua at the left side of river Dauk.

(III) Chopra is in high rainfall zone (average rainfall 300 mts). Rain water runs off land and firstly occurs sheet erosion then rill and gully erosion. To protect gully erosion there have been made many bandhs made up of cement, boulder and earth material across the gully. In Chopra block gully erosion protection bandhs have been made at Haptiagach, Lakhipur, Dalua and Rangagach.

THE BANK PROTECTION MEASURES:-

In this study area we can find much bank protection work along both sides of DAUK river. Bolder protection work for the protection river bank erosion has been done. Approximate length on the upstream is about 700 meters and nearly about 82 meters on the downstream side. The bank protection work has been done on the left bank of Mahananda river. Another bank protection work has been found in Haptiagach B.O.P camp. It has been done from the upstream to Barabilla side of length around 220 meters (approximately) on the left bank river Dauk and at Dalua for protection of renowned Lord Shiva Temple. About 200 meter length protecting work has been done here.

TABLE NO-8

LIST OF BANK PROTECTION

SL. NO	Location	River Bank	Name of the bank protection work	Length in meters
1	Haptiagach	Right bank of Mahananda	Borabilla protection	750
2	Upstream side to the Chital Ghata embankment	Mahananda	Borabilla protection	400
3	Both side of Chopra Bridge on the upstream	Right bank of Dauk	Rangagach Protection	700
4	Both side of Chopra bridge on the downstream	Right bank of Dauk	Protection of Lakhipur	820
5	Dalua	Left bank of Dauk	Protection of Lord Shiva Temple	200

Source:-Irrigation Office, Islampur

EMBANKMENTS-

It is also a bandh. Many kinds of embankment are found like-

a) Earthen Embankment

b)Boulder Embankment**c)Pitching Embankmentand****d)Cementing Embankment**

A)EARTHEN EMBANKMENT:-Rabindra Nagar colony embankment left bank of river Dauk and just down stream of Chopra bridge on river Dauk are the earthen embankment .It is mainly made by earth or soil and for protection of Rabindra Nagar colony.The importance of this embankment found during enormous flood.Another embankment is Chitalghata embankment situated right side of Sonapur ghat to left bank of Mahananda river towards upstream.It has length of 6 km approximately.

B)BOULDER EMBANKMENT:-It is made of earth and boulder river bandh for erosion from flood and sand deposited the left bank protection of Mahananda river has been done by boulder on the sloped surface of river Dauk.The boulder which is used for bank protection and making spur is available atDudhia quarry of river Balasan which is commonly known as a North Bengal variety .Both side of Chopra bridge and right bank of Dauk, boulder protection work has been done.Nagar river following basically through the boulder line of Indo-Banladesh and also east side of Chopra section.Boulder protection has been done at the Marabari B.O.P camp.

C)PITCHING EMKMENBANT:-It is made of earth,boulder and pitch,along the river bank protecting gully erosion.It is found on the right bank of Dauk river,boulder pitching on the slope bank.The pitching or revetment of the river bank is done by cutting the river bed to a slope of 2:1 and spreading the filter material on this slope bed and finally setting the boulder on the filter material.

D)CEMENTING EMBANKMENT:-It is made of boulder,iron,cement along the river bank.It is found in Dalua to protect the temple of Lord Shiva.Besides the cementing embankments the sausage construction is also found.

TABLE NO-9

LIST OF EMBANKMENT

SL.NO	Location	River Bank	Name of the Embankment
(1)	Rabindra Nagar and Rangagach	Left and right bank of river Dauk	Boulder embankment
(2)	Rabindra Nagar colony	Left bank of Dauk	Earthen embankment
(3)	Chitalghata	Left bank of Mahananda	Boulder embankment
(4)	Sonapurghat	Left bank of Mahananda	Earthen embankment
(5)	Morabati B.O.P Camp	Nagar	Boulder embankment
(6)	Dalua	Right bank of Dauk	Cementing embankment
(7)	Barabilla	Right bank of Dauk	Pitching embankment

Source-Agri-Irrigation Office,Islampur

SPUR AND SAUSAGE CONSTRUCTION

The spur is the most important construction to protect embankment.It is come down from embankment or bank through the water or down the stream,across the embankment in bank.It is found in Dalua,Rangagach.

BED BAR

On the up stream of Chopra bridge and left of river Dauk there are 15 no of bed bar for protecting Nainital Colony adjacent to this protection. In Mahananda the bed bar is 6 no. spur.

TOE-WALL SAUSAGE

The toe-wall is done by making wire-netting which is known as sausage toe-wall. Both side of Dauk river protection work has been done by making the toe-wall at the toe of the sloped bank.

GEOTEXTILES

A Geotextile is any permeable textile material used with foundation of soil, rock, earth or any geotechnical engineering related material. It can be in the form of a mat, sheet, grid or web or either natural fibre such as jute or coir or artificial fibre such as nylon. The fibre are buried and designed to give permanent protection to a slope by rain forcing the soil. Once a vegetation cover is established and the plant roots and the mixture of Mahananda and Tista's water artificially carried out by the help of aqua duct. In south eastern where the Baurigach is located there has been made an artificial eaterfall with the help of this water which is the biggest waterfall in Asia, its depth is 7.15mts. Again by the help of this water a biggest Dam has been built.

TABLE NO-10

EFFECTIVENESS OF GEOTEXTILE MATERIALS IN CONTROLLING WATER EROSION ON A SANDY LOAM SOIL

Material	Moisture Absortion	Soil detachment by raindrop impact % of control	Sediment removal by run off % of control	Soil loss by rain and run off combined % of control
Jute based net	570	14	13	22
Coir based net	250	30	49	---
Mulch	320	25	67	32
Polymide net	120	130	n/d	72

Source-Irrigation Office, Islampur

The Geotextile construction is found only in some places like Rabindra Nagar COLONY, Rangagach and Dalua. But this protection work was not lasting at all.

SUGGESTED REMEDIAL MEASURES

To control the soil erosion of this block area need to built dam to stop yhe flow of canal's water where there is some probability to damage the dam, there need forestation. Overall local people should be carefull about deforestation and husbandary.

CONCLUSION

Now a days it is clear that the whole world understanding the importance of soil conservation. Since erosion is a natural process, it cannot be prevented but it can be reduced to a maximum acceptable rate. That's why different types of measures have been taken. The protection work has been taken where there is some signs of destroy. Among all conservation measures, agronomic measures are applied several times. Tultimate success of conservation schemes depends on how well the erosion problem has been identified and how the measures are implemented. Dauk is the main river in this region. But in rainy season it acts as a disastrous. Soil is the mother of all

resource. So we should take care to conserve soil as our natural asset. Public awareness will be grown for conservation of soil.

REFERENCES

1. Singh Savindra (2009) - Environmental Geography. Prayag Pustak Bhawan. Allahabad.
2. Morgan, R.P.C - Soil Erosion and Conservation, 3rd edition, Blackwell Publishing Oxford, 2005.
3. Das Kumar Dilip (2004) - Introductory soil science, Published by Kalyani Publishers, ISBN 10:8176631280. ISBN 13:9788176631280
4. Dr. Daji J.A Revised by Dr. Kadam J. R and Dr. Patil N.D (1996)—A Text Book of Soil Science, Media Promoters of Publishers Pvt. Ltd.
5. Biswas. T.D & Mukherjee - Text Book Soil Science, McGraw Hill Education (INDIA) Private Limited. P-340
6. Soil Science - An Introduction - Indian Society of Soil Science .P-217
7. Comprehensive District Agriculture Plan for Uttar Dinajpur District - Agriculture Finance Corporation Ltd. Eastern Regional Office. Kolkata.
8. Census of India (2011)—series-20 part xii-B, District Census Handbook, Uttar Dinajpur. Directorate of Census Operation, West Bengal.

