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Agricultural Expansion And Its Impact On Environment: A Geographical Analysis In Kanksa C.D. Block In Barddhaman District, West Bengal

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Abstract:
Rapid population growth and economic development (mainly in terms of agricultural expansion) in country are threatening the environment through expansion and intensification of agriculture, uncontrolled growth of urbanization and industrialization, and destruction of natural habitats. The growing population put immense pressure on land extensification at cost of forests and grazing lands because the demand of food could not increase substantially to population. Thus, horizontal extension of land has fewer scopes and relies mostly on vertical improvement that is supported by technical development in the field of agriculture i.e. HYV seeds, Fertilizers, Pesticides, Herbicides, and agricultural implements. All these practices are causing degradation and depletion of environment with multiplying ratio. The present paper is an attempt to study the agricultural expansion in terms of increasing net sown area change and its impacts on surrounding environment in Kanksa C.D. Block in Ajay-Damodar interfluves in Barddhaman District. High level of deforestation to fulfil the food-demand of population and increased intensity of irrigation mainly in term of ground water extraction are the main causes of environmental degradation. The data have been analyzed from various secondary sources. An analysis of changes in net sown area over last thirty years has been conducted. These changes may aggravate the soil erosion and ground water depletion and declining fertility of soil which affecting productive resource base of the economy. Finally some suggestions have been made to reclamation of wasteland in productive purposes and find some alternative sources of irrigation to save ground water resources.

Key words*: Agricultural Expansion, Net Sown Area, Environmental Degradation, Wasteland Reclamation*

1.Introduction

There is a strong relationship between land use and environment. As different land use practices require different sets of environmental conditions, the scale and magnitude of land use practices affect the natural environment. At the global level agriculture is the biggest land use in terms of, area and it is the most significant land use in terms of environmental impact. Modern agricultural practices have undoubtedly given a fresh lease to agricultural land use but at the cost of environmental consequences (Mather, 1986). To feed the increasing population especially in the developing countries, it is felt extremely urgent to have the horizontal as well as vertical expansion of land i.e., net sown area of any region, which invited imported advanced agricultural technologies. Since the mid-sixties of the present century the traditional agricultural practices have undergone considerable changes with the adoption of technological innovations. Although these innovations have initially strengthened the nation's economic foothold yet such impositions have adversely affected the total environmental system.

2.Objectives

The main objectives of the present study are:

a) To find out the change in net sown area that have experienced between 1971 and 2001 and their probable causes.

b) To identify the environmental problems associated with the change in agricultural activity and agricultural land uses in the study area

c) To suggest some remedial measures and alternative avenues to mitigate such environmental problems

3.Study Area

The study area represents a small tract of west-central Barddhaman District, comprising the Kanksa C.D. Block. This area is extended from 23°25'N to 23°40'N latitudes and 87°20'E to 87°35'E longitudes. The area is physically bounded by Ajay River in the North and Damodar River in the South. Administratively Kanksa block bounded by Birbhum District in the North, Bankura District in the South , Faridpur-Durgapur Block in the west and Aushgram II Block in the east of Barddhaman District (Fig. No.1). Total area covers by this district is 278.4 sq.km which is 3.96% of the total Barddhaman district. Total population is 120480 (census, 2001) excluding urban units and population density is 452 per sq.km. In 30 years time span (1971-2001) there is 55.2% of population increase is the whole block. The study area is predominantly agricultural with 47.12% of its population (Census, 2001) is engaged in agriculture and allied activities and 51.2% of its total are represent net sown area. The study area has experienced significant spatio-temporal change in net sown area during the time period from 1971-2001.

4.Methods and Database

The present study is a comparative study aimed to analyze the change in net sown area over a time span of 30 years (1971-2001). This period has seen a number of developmental programmes in terms of agriculture including the land reforms particularly in terms of the share croppers. This study includes the usage of statistical techniques in terms of tabulation, data analysis and mapping. This whole work has been prepared based on mainly secondary sources e.g., District Census Handbooks (1971 and 2001), various literatures and SOI Topographical map (73 M/6, 73M/7 and 73M/10). Although field verification also be conducted in this purposes.

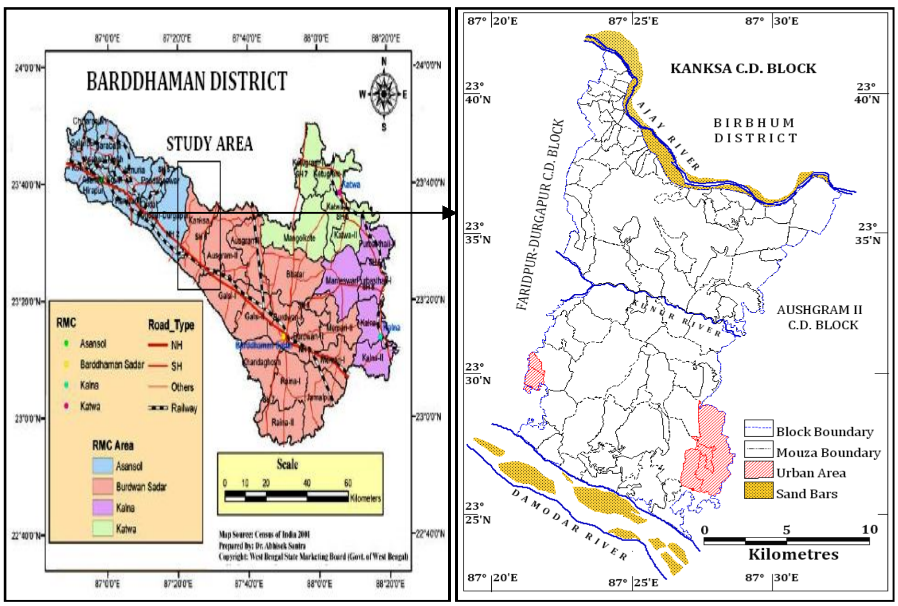

Figure1: Location of the Study Area

5.Analysis And Major Findings

5.1 Changing Landuse Pattern

Changing physico-cultural settings over the years has been causing significant spatio-temporal variation in net sown area in the study area. The proportion of net sown area in this block increased from 47.7% (13286.36 hec.) in 1971 to 51.2% (13634.2 hec.) in 2001, amounting 3.5% increase of land in this category. Over 30 years of time span there is a net increase of 347.84 hec of net sown area in the study area. For geographical analysis of change in net sown area (1971-2001), the study area may be divided into three broad regions (Table: 1 & Fig. No.4)

Areas	**Name (JL) of Mouza**	**Total Number of Mouza**	**Percentages**
Areas experiencing Increase in NSA			
<30%	2, 5, 6, 7, 12, 13, 21, 22, 24, 25, 26, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 39, 40, 41, 42, 44, 45, 47, 48, 50, 51, 52, 53, 58, 61, 62, 63, 65, 66, 67, 68, 69, 71, 73, 74, 75, 76, 79, 81, 85, 90, 92, 93, 94	54	63%
30-60%	1, 27, 38	3	4%
>60%	3, 4, 46, 84	4	5%
Area experiencing Decrease in NSA			
<30%	8, 10, 11, 15, 18, 19, 20, 23, 49, 54, 64, 70, 72, 77, 78, 80, 82, 83, 89, 91	20	22%
Area experiencing No Change in NSA			
No Change	14, 17, 25, 43, 55	5	**6%**

Table 1: Spatio-temporal Variation in Net Sown Area in Kanksa C.D. Block (1971-2001)
Source: District Census Handbooks, 1971 & 2001

From the analysis salient features are as follows:

- Within 30 years of time span (1971-2000) there is a wide range of change in NSA in Kanksa block. The magnitude of change ranges between 0.01- >95% increase and 0.01- 30% decrease of NSA. Such wide range of change implies that the pace of development is not uniform rather it is highly variable in the study area.
- During this 30 years there is a net increase in NSA 347.84 hec which overcome the decrease on NSA by urban encroachment in six rural mouzas i.e., JL No. 59, 60 under Faridpur-Durgapur block and JL No. 86, 87, 88 as Census Town category in Kanksa block. Out of 86 mouzas (excluding 5 urban units) 54 mouzas (63%) have experienced below 30% increased in NSA where as 20 mouzas have

very slight increase i.e., under 5%. Only seven mouzas (9%) have more than 30% increases in NSA. JL No. 3, 4 and 46 have more than 80% increase in the NSA.

- Negative change is not uniform in all parts of the study area. Out of 86 mouzas 20 mouzas have experiencing upto 30% decrease in NSA. Among them only 8 mouzas have more than 5% decreases in NSA. These are JL No. 49, 54, 64, 70, 78, 83, 89, and 91. Rest of the Mouzas have very minor decrease (i.e., <5%) in NSA.

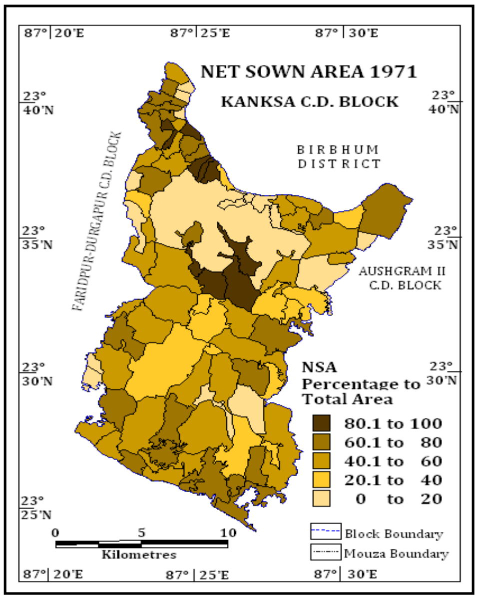

Figure 2 : Percentages of Net Sown Area in Kanksa C.D. Block (1971)

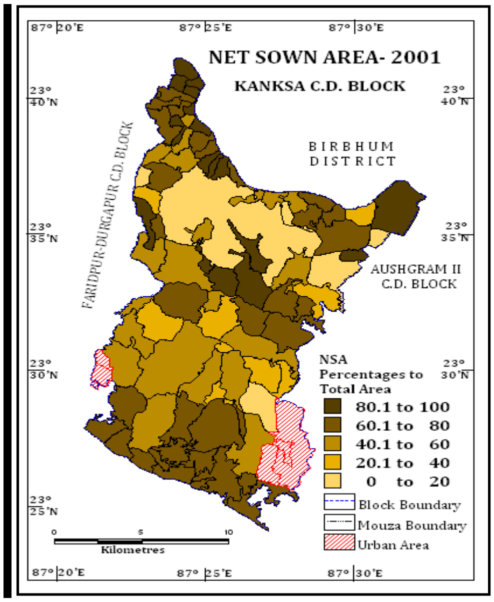

Figure 3: Percentages of Net Sown Area in Kanksa C.D. Block (2001)

5.2 Areas Experiencing Increase In Net Sown Area

From 1971-2001, 54 mouzas out of 86 experienced less than 30% increase in net sown area. Very minute increase (<5%) of net sown area has been associated with 22 mouzas mainly concentrated along the Ajay-Kunur interfluves area. These all mouzas faced increased irrigation from Ajay and Kunur River mainly. Favorable alluvial soil and potential of high level irrigation influences the increase in agricultural area in these mouzas. Only three mouzas i.e., JL No. 1, 27, 38 have an increase in NSA about 30-60%. Rest of the four mouzas have abrupt increase in NSA (>60%) due to the direct irrigation impact from Ajay river (JL. No. 3, 4 and 9). As for example in Talbahari (JL. No. 4), irrigated area increased 36.89% and NSA also increased with same pace as

95.14% (Fig No.4 & 5). So overall trend is the increase of net sown area all over the block though there are some exceptions.

5.3.Areas Experiencing Decrease In Net Sown Area

As against the general trend, 20 mouzas (22% of total number of mouzas) in the study area experienced negative change in net sown area. Area affected by decreased NSA is more in the lower part adjoining to Damodar watershed than in the upper part adjoining to Ajay watershed in the study area. Major cause of decrease of agricultural land is the decrease in irrigation facility. As for example in Rupganj (JL. No.54), Jatgaria (JL. No. 19), Rajkusum (JL. No. 72), decrease in irrigated area influences the agricultural land (Fig.No.4). As a result NSA decreases 10.49%, 0.1% and 4.38% respectively. In rest of the suffering mouzas have either population increase with urban spread in terms of construction of road and railway or increased area of wasteland due to low fertility of land.

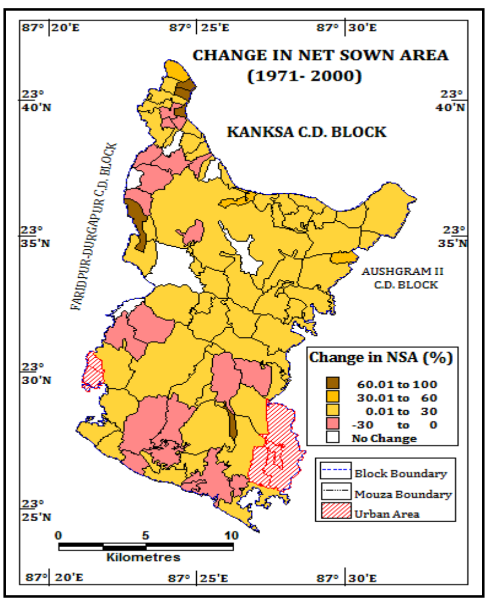

Figure 4: Changes in Net Sown Area (1971-2001) in Kanksa Block

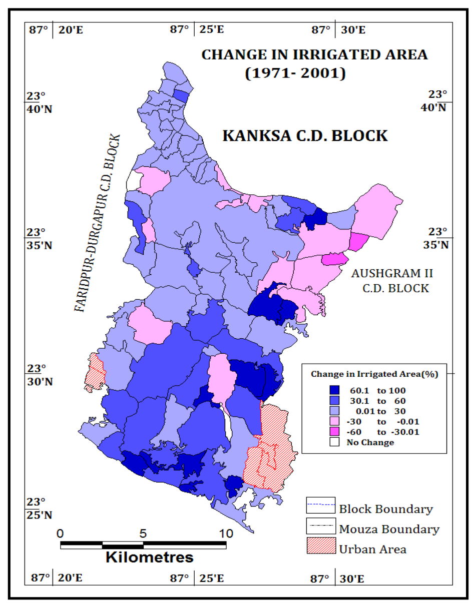

Figure 5: Changes in Irrigated Area (1971-2001) in Kanksa Block

5.4.Problems Associated With The Change In Nsa

<u>5.4.1.Deforestation and Soil Erosion</u>

Morphologically the northern, south-western part of the study area characterized by rugged terrain. During the time period of 30 years agricultural land is increased at cost of deforestation. About 1.9% (313.27 hec.) forest cover have been destructed during this time period. The deforested bare upland mainly in the northern part of the block severely affected by gully erosion. The top soil of the region gradually washing away and the soil becoming highly acidic. Soil erosion due to naturally active processes occurs in the area in the form of sheet flow, rill and gully erosion and bank erosion. Sheet flow is prevalent particularly in the laterite upland like north of G.T.Road where latosol is loamy in nature especially around Gopalpur, Rajkusum and Garadah. Gully and rill erosion is prevalent on both banks of the tributary nala of Kunur extending from Tilakdanga to Dhoadanga where the tributary joins Kunur. A long stretch from Bankati in the east to Jagannathpur in the west in the northern extremities of the area is affected by multiple erosional processes like sheet, rill, gully etc. In the central part of the area similar type of erosional activity is noticed on either bank of Kunur extending from north of Sundiara to Dhoadanga. This erosional process is caused by the gushing of surface water flow during monsoon. At places the gully formation is accentuated by headward erosion during bankful discharge of Kunur and tributary nalas of Kunur and Tumuni. With the increase of agricultural land soil nutrient decreases because this area is mainly composed of laterite soil though some part is covered by alluvial deposit of Ajay and Kunur River but the areal extent is limited in the southern part. This ecological constrain in terms of soil nutrient loss become more active in the gully prone area of the study area.

5.4.2.Bank Failure And Flooding

Bank failure is common phenomenon within parts of river courses of the study area. In the northernmost part the Ajay River exhibits bank failure at many places particularly in its left bank in the area around Bankati. Among two main tributaries of Ajay namely Tumuni and Kunur the Tumuni shows extensive valley erosion at 0.5km east of forest office at Bistupur. The areas around 0.5km NE of Bistupur, SE of Chandardanga and NE of Srikrishnapur show extensive bank erosion. Besides the tributaries of Tumuni River around Majhidanga, Kherobari and the areas from Gopdanga in the east to Kendula in the west show extensive gully erosion to due to which a vast bad land area is produced.

Along Kunur nadi bank failure is recorded at several places like east of Hirja, south of Malandighi, NE of Kuldiha, NE of Bhaluk kunda, N of Domra and near Baulbani. This type of failure occurs during monsoon when huge volumes of surface run off flows through the river channel. Similar type of bank failure occurs almost in all the tributary nala of Kunur between Tilak-Chandrapur and Dhoadanga. In case of Damodar River, bank failures are observed in the south of Silampur, Keten and Napara and SE of Babnabera. It is aggravated when discharge of water is augmented from Durgapur barrage during flash flood.

5.4.3.Ground Water Exploitation

Irrigated area increased about 20.7% during this 30 years time span in whole block mainly by hand of canal irrigation and groundwater extraction by deep tube wells. Excessive canal irrigation with improper drainage system has resulted in destabilization of water balance, mainly in the southern part of the study area. Loss of ground water recharge in a high rate is take place in these mouzas. Field investigation regarding ground water exploitation for domestic and agricultural use reveals that in the Lalgarh formation area exploitable ground water is available beyond 50 metre bgl. While in the alluvial tract groundwater for domestic and agricultural use is available at shallower depth, between 10 to 30m bgl. Field inventory of dug wells reveals that most of the dug wells in the laterite country become almost dry during summer (GSI, 2005). It is also recorded that in the laterite country particularly along the watershed like Gopalpur and north of Panagarh many of the existing tube wells yield little or insufficient water during summer time (GSI,2005). As a result in Gopalpur and north of Panagarh, groundwater is drawn by PHE from deeper level (90 – 120 m bgl.).

6.Conclusion

Over 30 years of time span the study area has experienced a wide range of change in NSA. It is true the number of mouzas (61 mouzas) experiencing positive change is comparatively higher than that of mouzas (20 mouzas) experiencing negative change, but in terms of actual areal coverage only 347.84 hec areas under NSA is increased. But there is enough provision for further extension of cultivation in the study area mainly in terms of wasteland reclamation. Because 54% mouzas have experienced increase in NSA only upto 30% and at present about 15.28% of total cultivated land in the study area belongs to cultivable wasteland. Development of wasteland requires a package of treatment which includes soil erosion control measures, erection of ground water recharge structure and suitable crop production system (Prasad & Ghosh, 2011). Soil erosion control measures are very much essential because huge amount of fertile top soil have been eroded away every year through rill and gully erosion mainly in the forestendowed upper part of the study area. To decrease sole dependency on ground water as a source of irrigation, use of surface water bodies may be effective. Rain water harvesting in terms of dug well, tank and ponds are essential tools to mitigate this problem. To promote sustainable agriculture various methods should be applied. These are polycultures in terms of fallow rotation, use of residues, rotation with legumes, bio-manuring, alley cropping, contour planting, etc (Santra, 2010). Social forestry programmes may be effective in this context, because it may increase the green cover in fallow land so that already deforested area can be used for agricultural purposes. Besides this social forestry programmes may bring alternative sources of fuel, timber and more specifically income, so that pressure on agricultural land decreases and environment may achieve its sustainable level.

7.Acknowledgement

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