

# **Environmental Impact of Land Use in the Chalan Beel Area: A Study of Some selected Villages in Kalam union\***

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## **Abstract**

Poverty with the rapid population growth and their consequent needs compel men to over-exploit natural resources like land. Given the nature of agricultural technologies and practices, land is losing its potentialities gradually. It is observed that the extensive monopoly of HYVs rice cultivation has already replaced other crops in the Chalan beel area, which were friendly to environment and were important sources of nutrition. The intensification of land use and its associate externalities and spillovers have produced environmental imbalances in the study area to a level which is not serious enough in the present context but symptoms are very much apparent in the degradation of resources like land with its concomitant evils. These are very critical in view of necessity to ensure food security for growing population of the country during the next twenty years. The present knowledge about present status of the land degradation process and its level of impact on national development and rural livelihood system is inadequate and requires further investigation and research. Researches with full effort to find out appropriate preventive measures and their certain implementations are also urgently needed to check further deterioration.

## **1.1 Introduction**

Population pressure and development activities have great impact on environment. To meet the immediate needs men attempt to change his physical environment. But in doing so, they are increasingly disturbing or even destroying

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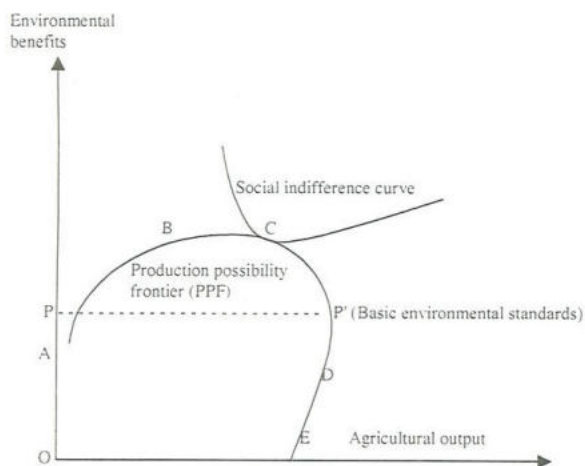
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the biotic components of the environment. Unplanned development, the large size of population and its high rate of growth, poverty and inappropriate policies have all continued to decline in the quality of the environment and a depletion of the natural resources in Bangladesh.

Land and water are two important natural resources, which have direct and indirect linkage with human being in every sense such as production system, economic activities and Socio-cultural activities. Land degradation caused by nature is often balanced by formation of new lands. Deterioration of soil quality and land loss due to human intervention may not always be reversible. Therefore, survival in future depends on finding a balance between man and nature in a world of limited resources. This does not mean that man should revert to nature, but it means that he would need to go back to some of the good common senses and human concern to one's neighbour. The knowledge of environment is much more needed now than ever before for creating and maintaining human civilization.

## 1.2 Relationship Between Agricultural Output and Environmental Benefits

The key sectors of human activities, which have a direct impact on environment, are agricultural, industrial, and human settlements. These sectors are closely linked to each other and to environment such that development in one affects the other sectors directly and they are in turn promoted by the large population size, its growth, distribution and movement.



Conventional agricultural policies which support commodity prices and income support can insulate farmers from market signals. These encouraged the intensive use of land and have introduced excessive use of chemicals. It is observed that, there exists an inverse relationship between agricultural output (HYVs cultivation) and the environmental benefits. (Lactacz\_Lohmann 2000, Kown and Kim, 2000). Fig- I shows the relationship between agricultural output and environmental benefits.

The dotted line PP' represents basic environmental standards (e.g. fertilizer and pesticides application standards). The segment AB on the production possibility frontier (PPF) indicates that at a low market level of agricultural production, an expansion of output would yield environmental benefits, such as enhancing the landscape. This complementary relationship between the two outputs has been interpreted as a positive externality of agriculture or simply the results of a 'multifunctionality' of agriculture. Segment BD represents a competitive relationship between the level of output and the level of environmental quality. Environmental quality declines with the increase in agricultural output. Environmental degradation takes place in the form of soil erosion, water and air pollution, habitat and bio-diversity loss etc. These have been impacted as a negative externality. Segment DE is the stage of 'inefficient choice of technology'. The slope of PPF is positive at this stage. It does mean that the inefficient use of technology results in severe environmental disruption. The social optimum point (point C) lies on the segment BD. It means that the use of HYVs technology beyond this point may disrupt the environment balances.

## **2.1 Objective and Sources of data**

This study limits its discussions on the impact of agricultural activities of the people on the environment and focuses specially on the impact concerning HYVs cultivation on land in Kalam union of Chalan Beel area of Bangladesh.

Both primary and secondary data were used in the study. Sources of secondary data were mentioned in the relevant places. Primary data were collected through questionnaire survey, personal observations and participatory appraisal. 61 farmers from five villages of Kalam Union were interviewed.

## **2.2 Socio- Demographic and Geographical background of the study area**

The area of our study is a part of the famous Chalan Beel region under Singra thana of Natore district and located about 6km to the north-east of thana headquarter. The total population of the union is 31,775 of which 75% are

engaged in agriculture as their principle occupation (Thana Statistical Office, 2003). The area is free from flood hazards because of flood control measures taken by the government in 1973. Within the time span of 30 years, there has been a noticeable change in cropping pattern taken place in the area. Presently, it is an area of HYVs rice monoculture.

### **3.1 Land utilization**

Land is the key element of crop production and a scarce and limited resource. A very unfavorable land-man ratio is existing in Bangladesh. The ratio is declining rapidly due to the high rate of population growth. In the study area the land-man (net cultivable land) ratio is only 0.19 acre. Poverty with rapid population growth compel the people to over-exploit natural resources like land, which forms a major focus for human economic activities. Degradation of soil quality in Kalam union is mainly attributed to improper use of chemical fertilizers and pesticides to boost agricultural production. In this area siltation does not contribute much in degradation of land due to flood and sediments accumulated from riverbank erosion.

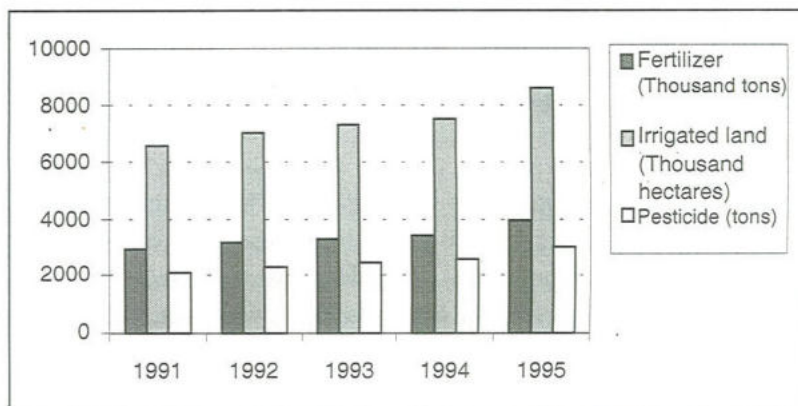
### **3.2 Impact of irrigation**

The tremendous increase is made in the installation of shallow tubewells (STWs) and Deep Tubewells (DTWs) for ground water in the Chalan Beel area during the last 30 years. In these area the cropping pattern is mostly transplanted HYVs Boro/ Aus followed by the rain-fed transplanted Aman. As a result the land remains inundated in most of the seasons (about 6 to 8 months), which keeps adverse effects on soils because of continued oxygen deprivation in the sub-soils. Chemical changes of soil material forming toxic components for plants and constant percolation loss of essential nutrient elements including micro nutrients and organic matter.

### **3.3 Impact of fertilizer and pesticide use**

The use of chemical fertilizers and pesticides has directly linked with farming in irrigated lands. Three types of fertilizers such as Urea, Triple Super Phosphate (TSP) and Murate of potash (MP) and four types of pesticides are commonly used in Bangladesh, which are insecticides, herbicides, fungicides and rodenticides.

The trends of irrigated land and use of chemical fertilizers and pesticides from 1991 to 1995 in Bangladesh are presented in fig-2. In 1991, the use of nitrogenous fertilizer along accounted for about 67% of total fertilizer use, which rose to 88% in 1995.

**Fig. 1 Trends of irrigated land, pesticides and fertilizer use**

Source: Bangladesh Bureau of Statistics, Various issues.

Per hectare use of urea for HYVs rice cultivation in the study area is shown in table –1. It is found that more than 90% of the farmers use 298 to 334 kg of urea per hectare, which is much below the average use of urea for HYVs rice cultivation at national level (457 kg per hectare).

**Table 1: Use of urea for HYVs rice cultivation**

Urea per hectare in kg	Frequency	Percentage	Cumulative percentage
298-334	55	90.2	90.2
335-375	6	9.8	100

There has been no significant increase of total chemical fertilizer use at national level. But, significant increase in pesticide use has been observed which has serious implications to land and ecosystem.

Research findings show that pesticides applied at the rate of about one kilogram per hectare contaminates the topsoil to a depth of about 30 cm (UNEP, 2001, pp.2-3). Pesticides do not only destroy harmful insects but also destroy useful topsoil microbes, which eventually reduce the biological nutrient replenishment of the

soil. Application of pesticides in the study area still remains much below the national average (0.35 kg per hectare).

The local people of the study area claimed that fallow and grazing lands were turned into the lands of rice monoculture and thereby adversely affect the production of green cattle feed. In addition, they also mentioned that, the domestic animals eating pesticides affected grasses also suffer from health problems (Table-2).

With the increased production of paddy there would be concomitant increase in paddy straw. But the palatability and digestibility of the straw has declined due to excessive use of chemical pesticides. The deep-water aman cultivation was a valuable source of supply of fresh cattle fodder. Moreover, farmers spraying pesticides suffer from heart and skin diseases because of ignorance.

**Table 2: Opinion of the farmers about the problem rearing livestock**

Nature of problem	Frequency	Percentage	Cumulative percentage
Crisis of cattle food	31	50.8	50.8
Absence of grazing land	18	29.5	80.3
Increased price of cattle food	6	9.8	90.2
Disease	3	4.9	95.1
Others	3	4.9	100

About 21.3% of the farmers claimed that HYVs rice monoculture and use of chemical fertilizers and pesticides as one of the major causes of loss of land fertility (Table-3). More than 39% of farmers identified the absence of flood water as the major cause of declining land fertility.

**Table 3: Causes of declining soil fertility as mentioned by the farmer.**

Causes	Frequency	Percentage	Cumulative percentage
Absence of flood water	24	39.3	39.3
Rice mono culture	17	27.9	67.2
Chemical fertilizers and pesticides use	13	21.3	88.5
Siltation	1	1.6	90.2
Use of ground water	6	9.8	100

Extensive monopoly of HYVs rice cultivation is removing other crops needed for nutritional welfare of the people. Such monoculture is depleting some specific soil nutrients very rapidly. Deficiency of different micro and macro elements is prevalent in the farming soils. With such complicated adversities, grain yield may be reduced. About 28% of the farmers blamed on the HYVs rice monoculture for the loss of soil fertility of the area. Khan. A and Keong C. H (1993 ) in their study claimed that up to 40% of the fertilizer used are leached to low-lying areas where weeds proliferate, and an unknown amount of pesticides end up in the irrigation and drainage system. It is also encourages a proliferation of weeds and algae growth which depletes the oxygen content of the water. They also claimed that, in the water of Chalan Beel, the contention of oxygen is only 3mg/L in the dry season and this is not enough to sustain aquatic life, which needs a minimum of 5mg/L. This may promote the formation of poisonous nitrates in the water. These conditions are responsible for the reduction in the fish population. There are frequent complaints from the Department of Fisheries about the agrochemical toxicity to the fishes. The high level of pesticides leached to the water courses has also been blamed for causing regular outbreaks of epidemic diseases in fishes and is said to have decimated the fish population in certain areas ( Zia Uddin et al., 1991) . There is, however, no detailed and specific studies on the effects of pesticides on fisheries or on wildlife.

Most of the people (37.7%) of the study area claimed the excessive use of fertilizers and pesticides as the major cause of decline in fish population (Table-4).

**Table 4: Farmers opinion about the causes of decline in the fish population**

Nature of the causes	Frequency	Percentage	Cumulative percentage
Bushes which could act as fish shelter have been wiped out	12	19.7	19.7
Over harvesting by current jal	5	8.2	27.9
Wetland converted into rice monoculture	13	21.3	49.2
Use of chemical fertilizers and pesticides	23	37.7	86.9
More frequent epidemics of fish	8	13.1	100

13.1 % people blamed to the leaching of high level pesticides, as a cause of epidemic diseases in fishes. The loss of flood plain wetlands and wiped out of bushes were also identified as important causes of reduction of fish population.

### **Conclusion and Recommendation**

This paper does not attempt to provide an extensive analysis of complex balance of environment and the interaction between the population growth and the use of land resource. Part of the reason is the difficulty in covering such a wide topic and dimension of the problems, as well as the inadequacy and range of data available that can facilitate critical analysis. However, it is found that the intensification of land use and its associated externalities and spillover have produce environmental problems to a certain level in the area under study. The major types of environmental problems are as follows :

- 1) Degradation of Soil quality due to the inundation of land in most of the seasons round the year;
- 2) Decline of soil quality due to increasing incidence of unscientific HYVs rice monoculture and unbalanced use of chemical fertilizer;
- 3) Increased pesticide use particularly of insecticides with adverse environmental consequences;
- 4) Increased health problems due to unbalance use of pesticides ;
- 5) Substantial reduction in the supply of cattle fodder due to over harvesting ;
- 6) Substantial reductions in the stock of inland fish due to use of pesticides;
- 7) Increased deforestation due to extension of crop production and human interventions;

The environmental impacts of land use in Chalan beel area may not be considered serious enough in the present context. Balanced and timely application of chemical fertilizers and pesticides will be helpful to improve the environmental quality at this stage. Application of strict regulative measures and creation of farmer's awareness should be considered as top priority in this respect. Integrated pest management and use of traditional knowledge (TKs) which are considered environmentally suitable may also reduce the use of chemical pesticides. To minimize soil nutrient depletion, monoculture of rice needs to be discouraged.

All the above measures may be effective for the present context of the area concerned. But the situation is not easy in the national concept. Bangladesh will have to ensure the supply of food for an additional 40-50 million people during the next twenty years. To meet the increased demand, it is essential that foodgrain output will have to expand 90 to 100% during the period. In order to meet the challenge the country may face serious environmental hazards in near future. The present knowledge about the process of land degradation because of unplanned



efforts of production maximization is inadequate. The potentiality of preventing further degradation in future is also uncertain as the country suffers from lack of innovative technology friendly to environment, a low level of education and social awareness and limited enforcement of laws and regulations. Therefore, in order to combat land degradation and to attain sustainable land management and development, it is very urgent to build institutional arrangement to conduct field level research and apply the result through extension programs along with enabling policy makers to take necessary decisions and to undertake appropriate mitigation measures.

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