

Research Article

## Social Ecology and Social Exclusion: Lessons from Kosi Command Area

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### ABSTRACT

There is a close relationship between social ecology and social exclusion, although not rigorously examined by social scientists. The proposed article attempts in establishing a relationship between ecological conditions of the Kosi Command Area adversely affecting various social classes in the region under investigation and exclusion from the benefits resulted from state initiatives. Kosi is one of most notorious rivers in India. It is known for changing its course frequently. Changing course of the river has resulted into millions of hectares of land being degraded, resulting into uncultivable for agricultural purposes. The proposed article examines various agrarian classes adversely affected by degradation of land due to change of the course of the Kosi river. Besides, it also highlights unprecedented floods due to overflow of water from Nepal for which Government of India has no control. These floods have devastated millions of people and billions of rupees in terms of inundation of houses and other assets and damages to crops in the fields. A large chunk of cultivators coming from lower socio-economic background as well as low castes are excluded from benefitting from the little resources available at their disposal. *Grihasts* as well as petty cultivators are excluded from optimising their major resources at their disposal due to fragile ecological conditions intensified by natural calamities like floods. Social Scientists must learn from these devastations from the perspectives of the disaster management for empowerment of the marginalised sections of the society.

**Keywords:** Social Ecology, Exclusion, Development, Kosi Command Area, Grihast, Tenant Cultivator, Landless Labourer

## INTRODUCTION

Bihar is one of the most flood prone states of India. North Bihar is interspersed with eight major river basins namely, the Ghagra, the Gandak, the Burhi Gandak, the Bagmati, the Adhawara group of rivers, the Kamala, the Kosi and the Mahananda. These rivers erode the soil very easily and transport it to the plains. As these rivers descend down to the plains, the velocity decreases considerably which results into the deposition of the sediments and the formation of the delta. The deposited sediments act as an impediment to the river flow and the rivers cut across these deposits and carve a new path for themselves and meander. Mishra describes that the Kosi river has a catchment area of about 74,500 sq. km of which 85% is located in Nepal and the remaining portion lies in India. The river has a total length of 468 km of which 248 km is in the Indian territory. The maximum observed peak flow in the river is reported to be 25,880 cumecs at Barakhshetra in Nepal and the annual average run-off is to the tune of 68,282 million cubic metres. The river carries a silt load of 9495 hectare meters annually. The average rainfall in the Indian portion of the Kosi catchment area is 1276 mm (Mishra.).

The Kosi moves into the plains near Chatra in the Saptari district of Nepal and enters Bihar near Bhimnagar in the Supaul district. Notorious for its unpredictable changes the river joins the Ganga near Kursela in Katihar district of Bihar. The floods of the river Kosi are most devastating as compared to the other rivers of Bihar. The river has shifted westward in the past 200 years by 160 km.

The river Kosi has always upset the ecological conditions of the area. This river is well known for its notorious character and devastating impact on the socio-economic structure of the district. When it enters the flat plains, the current slows down and the heavy load of sand and silt gets deposited in the riverbed. This relentless process of riverine activity lays waste several thousand square miles of territory by depositing large quantities of sand over once fertile agricultural land. The dreaded annual floods brought in death, disease and devastation. The Kosi is aptly dubbed, 'Bihar's River of Sorrow'. However, the deadly Kosi was a great leveller. It struck with blind fury and with equal harshness the rich and the poor, the landowners, the land poor and the landless. For several months in the flood seasons, all had to depend on relief doles. Thus, before its taming, the Kosi inflicted infinite but indiscriminating suffering on all the inhabitants of the Kosi area. Considering the unstable ecological conditions due to the river Kosi, government undertook the gigantic Kosi Project to bring about some ecological balance in the region and this has ushered in a new era of agricultural prosperity for this backward region.

This article is based on the field study of the village Bathipur which is located in Kursa block in the present district of Katihar in north Bihar. Being near the bank of the river, this village is prone to the ecological upsets brought about by erratic behaviour of the Kosi.

Kosi project is one of the important projects of Bihar especially as it has played a major role in saving the state from catastrophic floods annually and has contributed considerably to the development of its economy. The command area of the project lies in the erstwhile districts of Saharsa and Purnea which have since been regrouped into six districts viz. Saharsa, Supaul, Madhepura, Purnea, Araria and Katihar in Bihar. These districts now comprise the command area. The plains of north Bihar, specially the command area of Kosi project, of the eastern Kosi canal system including the Rajpur canal system used to be replenished by silt brought from Himalayas by various rivers, including Kosi, which flooded annually and devastatingly. The Kosi project, which was primarily intended to be a flood protection scheme, later was converted into a multipurpose project providing irrigation benefits also in the flood-protected area.

The Kosi irrigation project was executed between 1958 and 1968. The Kosi area development authority was constituted by the Government of Bihar in October 1973 and started functioning in January 1974. The jurisdiction of the authority was not confined to the command area of the Kosi canal system but extended to all development activities connected with agriculture. The Kosi area development authority was converted in 1974 into a corporate body by a notification issued under an ordinance of October 1974 and renamed as Kosi Area Development Agency (Pant, 1981a, b). The agency functions under the chairmanship of the Kosi area development commissioner. The canal system in the Kosi Project is as follows:

- a) Chatra canal system
- b) Eastern Kosi Canal system
- c) Rajpur canal system
- d) Western Kosi canal system

Nepal is served by the Chatra canal system and partly by the Western Kosi Canal system while Bihar is served by the Eastern Kosi canal system, the Rajpur canal system and partly by the Western Kosi Canal system (Final Report on Evaluation Study of Kosi CAD Project in Bihar, 1996, Command Area Development, Ministry of Water Resource, Government of India).

The total geographical area of the districts in which Kosi command area lies is 14,695 ha. and the cultivable command area is 67.41% thereof, i.e., 9,83,960 ha. Kosi command area covers 973 villages in 36 blocks (Final Report on Evaluation Study of Kosi CAD Project in Bihar, 1996, op. cit., p. 8, ch.1). The salient features of Kosi project of relevance to Bihar are: Barrage and Headworks, Embankments, Eastern Kosi canal system, Hydel power station, Rajpur branch canal system and Western Kosi canal system (Ibid.).

The irrigation potential and its CCA has been a contentious issue since water was first released in the Kosi main canal in 1964. Even with a drastic reduction in

the ultimate irrigation potential the utilisation did not exceed 48% at any stage between 1964–1965 and 1990–1991. The average discharge in the eastern Kosi main canal as well as the number of days of the canal's operation also presented a grim picture (Ibid.).

The flood control benefits of the Kosi project have been accruing to the entire area right from 1958 to 1959 and there is spectacular improvement in the entire protected area in various social spheres such a social, environmental, economic, climatic etc. In the first week of October 1968, highest ever flood discharge passed through the river Kosi but the entire protected area remained safe with the river between the two embankments flowing to the brim.

The problem of shifting of the river, however, has been raising its head year after year, as the other components of the original Kosi project aimed at improving river morphology by discharge regulation, improving sediment carrying capacity of the river and soil conservation measures in the upper water shed were not taken up. Year after year the river's banks are still shifting at one place or the other making it difficult at times to contain the same within the embankments. The level of ground within the embankments has risen due to heavy siltation, creating difficulty in drainage of countryside land through original sluices into the river (Status of Progress of Project, 1998, KCADA, Saharsa).

In the Kosi region Small Farmer's Development Agency (SFDA) was a major state interventionist strategy directed towards the poor farmers. It was based on the assumption that a farmer with 3 or 3.5 acres is viable if he has an assured water supply and the necessary inputs to go with it. Thus, SFDA scheme was started in 1969, aimed at enabling potentially viable farmers to participate in development and share in the benefits. The scheme provides special credit, advising and other services to cultivators who own and cultivate between 2.5 and 5 acres. However, it has been found that the role of cooperatives and commercial banks in providing finances to small and marginal farmers has not been up to the expectations (Ibid).

The problems of the small farmers have not escaped the attention of various researchers who have studied the Kosi region. Many of them view that the tenure conditions prevailing in that region are responsible for the worsening plight of small farmers. Fragmentation of holdings, insecurity of tenure, inadequate and untimely supply of inputs, inadequate and untimely irrigation, unsuitability of land, lack of credit facilities and other factors like storage, marketing, etc are the handicaps of the small farmers. Kosi revolution programme started in five blocks of Purnea district had aimed at effective and speedy implementation of land reform by combining the power of the people with that of the state and it was based on the premise that the tenurial conditions existing in the Kosi area were responsible for the backwardness of the region (Pant, 1981a, b).

## Social Ecology

The term 'ecology' seems to have almost as many meanings as there are ecologists. *Ecology* is a very simple term, a science that studies the interdependent, mutually reactive and inter-connected relationships between the organism and the environment on the one hand and among the organisms on the other hand. The concept of ecology was originally formulated in 1869 by the German Zoologist Ernst Haeckel to emphasise the relationship of living things. However, in this century, it was first adapted by Barker and Wright as early as in 1954 to understand the role of environmental factors on human development. In the field of social sciences, it was adapted by geographers, economists, sociologists, anthropologists and demographers. On realising the importance of environmental variations, problems created by them and their impact on human settlement, quality of life, developmental problems, changes in fertility, mortality and morbidity, this concept acquired great importance during the 1980s. Ecology is the science of the mutual relationship of organisms to their environment, hence, ecological region. Human cultural environment stresses the mutual relationship of 'people and place' (as defined by geographers), of 'people and people' (as defined by sociologists). Without any qualification, the term environment is botanical in concept (Monkhouse, 1972).

'The word Ecology may be used as interchangeable with geographic environment and consequently ecological studies are often limited to the study of the direct effect of environment on the material culture of the people with simple technologies. Social ecology is likewise concerned not only with direct response to environment where technology is unsophisticated, but also with the distribution and composition of groups necessary for the exploitation of natural resources, the indirect relationships which spring from these groupings and general conceptualisation of the cosmos associated with the specific habitats' (Mitchell, 1969). 'Ecology is a study of the morphology of collective life in both its static and its dynamic aspects' (Hawley, 1950). Hawley has further elaborated and said that it is a study of the form and the development of the community in human population. However, from the ecological point of view, he went on to say that life is not an individual but an aggregate phenomenon. 'Human ecology deals with the spatial aspects of the symbiotic relations of human beings and human institution' (McKenzie, 1950).

The ecological problem is a multi-factorial phenomenon. It is not only the result of relationships between nature and public production but also the result of influence of different circumstances of a 'super-structural' character such as politics, culture and a number of other factors with a degree of dialectical inter-relationships between these factors changing due to precise natural and historical conditions. First of all, even natural factors could not be taken as a passive element in the said

interrelations. From the very beginning, nature was endowed with an ability of self-regulation, a capacity to put up some kind of resistance to negative influence on the part of man. Besides, nature on its own part can actively influence social development, this influence being more perceptible – the weaker becomes the productive forces of a society. So, the condition of agriculture depends on the quality of the soil, availability of irrigation sources, the climatic peculiarities, the condition of industry and partly on the lack or availability of particular mineral resources. Sometimes the influence of nature or of geographical conditions may be extremely negative (Guzevaty, 1992). Matin (1977) has pointed out the possible connection between ecology and agrarian structure in the Purnea district especially gutchbandi relations of production because of constant degradation of the quality of land. He has further strengthened this point in his later study (Matin, 1989). Keeping in view the multi-faceted problems, the state started taking deeper interest in controlling the ecological degradation.

### **Social Exclusion**

Social exclusion has been defined by the Department of International Development (DFID) as ‘a process by which certain groups are systematically disadvantaged because they are discriminated against on the basis of their ethnicity, race, religion, sexual orientation, caste, descent, gender, age, disability, HIV status, migrant status or where they live. Discrimination occurs in public institutions, such as the legal system or education and health services, as well as social institutions like the household’ (DFID 2005, Reducing Poverty by Tackling Social Exclusion: A DFID Policy Paper).

Whilst the concept arose in response to dissatisfaction with approaches to poverty that focused on income alone, it remains contested and there is no agreed definition. Most commonly, social exclusion is seen to apply to groups, involving the exclusion of individuals due to their membership of particular groups that suffer discrimination, i.e., according to racial, ethnic, gender, geographic or age characteristics. However, there are various understandings of social exclusion which emphasise different aspects: the groups at risk of being excluded; what people are excluded from, employment, education, citizenship, respect; the problems associated with the impact of social exclusion, i.e., low income, poor housing; the processes driving exclusion and the agents and actors involved.

There is agreement, however, that social exclusion is multidimensional – it encompasses social, political, cultural, economic and ecological dimensions and operates at different social levels. It is also dynamic, in that it impacts people in various ways and to differing degrees over time. It is relational – it is the product of social interactions which are characterised by unequal power relations, and it can produce ruptures in relationships between people and society which result in a lack of social participation, social protection, social integration and power.

The concept of social exclusion having ecological dimension is particularly useful as this also focuses on process and relations of agrarian classes. Thus, it complements the concept of inequality which focuses more on disparities between different categories of people. In development practice, the term 'exclusion' has become popular with non-economic social scientists because it focuses on societal institutions, actors, relationships and processes, of which measured disparity in income or lack of access to social services may be both an indicator and outcome.

### **Kosi Command Area and Its Impact**

The British after their occupation of India tried to tame the Damodar, the 'Sorrow of Bengal' as they had termed it, in the middle of the 19th century with the help of embankments and failed miserably in controlling the river. Despite many proposals put forward from time to time, the British did not touch the Kosi and wanted it to be left to its own devices and their legacy continued till 1953 when it was decided to embank the Kosi after a debate of about 100 years against embanking of the river. Considering the great loss which floods had continually been effecting in terms of large-scale inundation and crop destruction, breakdown of communication system and other human sufferings, the Government of India introduced since 1954 a series of measures like construction of new embankments, drainage improvements in the water logged areas etc ([www.datakosisicomandarea](http://www.datakosisicomandarea)).

The investments in the flood control sector in the state are doing more harm than good. It is not proper to put all the blame on to the embankments along the Bihar rivers. The construction of village roads under programmes without any regards to the drainage aspect to it has also contributed towards drainage congestion leading to enhanced floods and prolonged waterlogging. The canals of the Kosi project have also done their bit in aggravating the situation by cutting the drainage lines and seepage. The prestigious Kosi embankments have breached many times and their notable failures were seen in 1968, 1981, 1984 and 1987. The breach of 1984 and 2008 was most serious of these accidents which had wiped out many villages and inundated million people homeless. The area that is being irrigated by the eastern main canal of the Kosi Project is just the same which the people were irrigating through their own traditional sources in the command area of the canal. It suggests that the investment in the irrigation sector in this part of the country has not only gone to waste but it has also rendered a sizable amount of land into a swamp.

When an officer of the irrigation department of Katihar was asked to comment on the Kosi project, he told:

'This irrigation project had experienced shortage of finances for completing the project, leading to delays and, in turn, the cost escalations which aggravated the situation. The project had taken as long as 15 to 20 years with costs rising as high



as 400% of the original estimates. Quite apart from this direct rise in costs is the indirect cost in terms of the direct and indirect benefits foregone, which would have resulted from early fructification of the investment. Further, due to the financial stringency, very often economy is attempted through foregoing the construction of some “optional” structures or supportive investments like the lining of canals, or in the case of drainage systems, the link drains are not constructed and are left to be constructed by the beneficiaries on their own initiative. The absence of lining leads to increased seepage losses to a higher probability of water logging, requiring additional expenditure on subsequent soil reclamation. Similarly, ignoring link drains in fact aggravates drainage problems since the beneficiaries do not perform the expected tasks of maintaining the water outlet. The piecemeal construction has adversely affected the returns on the entire investment. Problems of cost escalation, delays, bad planning of the works and waste appear to be associated with this project. Note should be taken of the specific problems that arise not only in the construction of the asset but also its maintenance and delivery system.

A critical factor affecting the utilisation of irrigation through canal was the need for proper maintenance of the entire system. Poor compliance with maintenance requirements affected the ultimate discharging capacity of the canal. Also, the poor maintenance of the main canal network, i.e. from the head works to the outlet, aggravates the variability in water discharge. The problems of sedimentation, weed clearance and breaches of canal banks – accidental or deliberate – presented major problems. The condition of canal was far from satisfactory. The proper maintenance had not been accorded due importance by the state administrative body in charge of financial disbursement. The lack of maintenance of watercourses at the terminal level further aggravated the erratic nature of supply. Canal network delivered water to a group of private individuals whose fields were watered by the particular outlet.

Beyond this point, it was they who were supposed to organise the water sharing, i.e. the sequence of respective turns, laying out of the field channels, their maintenance etc. The organisation of the maintenance was characterised by operational aspects which adversely affected the discharge. Firstly, it was done manually. Being a clumsy process, repeated manual clearance upset the level of the waterbed in the course. Secondly, maintenance was the joint responsibility of all the shareholders of the outlet. For the flow to be maintained to the end, it was necessary for all the shareholders to contribute to the cleaning operation. If some of the shareholders did not participate in this arrangement, it led to a low level of or even abandonment of use of canals by the remaining shareholders due to the consequent reduction in discharge’ (Kumar, 2003).

In Kosi area, about 85% of farmers are small and marginal farmers are having ~0.70 ha holding per family. They also possess land scattered throughout the



village and on an average they have lands in three–four different places. The consolidation of holdings under the revenue act was started in early 1960s but the progress has been slow. The study shows that until 1993–1994, there did not appear to exist any effective system of equitable distribution of irrigation water. The farmers in the upper reaches, who had no fear of water logging or that of additional submergence and consequent loss of crop, is said to have gone on to take water far in excess to their requirement which, on account of the sandy nature of soil and steep gradient in the upper reaches of the command area, compared to that in the lower reaches reappeared as a source of additional submergence in the lower commands, depressions and ‘Chours’.

In line with the policy of water resources department, Kosi Command Area Development Agency (KCADA) was set up for optimising irrigation from the project. But it can be said that the irrigation component has not clicked despite setting up of KCADA. It is estimated that hardly 20% or so of Kosi’s CCA is irrigated by Kosi canals. The silt load has not only drastically reduced the carrying capacities of the canals, distributaries, minors and sub-minors but also obliterated most of the ‘kuchcha’ channels making it difficult to carry water to the cultivator’s fields.

It can be said here that if the government is not able to meet its targets, it can pass on the responsibility for construction and maintenance of field channels and water courses to the farmers and Kisan Samitis. This is sure to have some positive outcome. According to officials, Kisan Samitis are reported to be operative and participating in warabandi programme in Kosi command area. But interviews with farmers reveal that though such samitis exists in pockets, they are hardly active. Farmers complain that officials hardly consult them on policy matters.

It is also learnt that sometimes there is lack of coordination between the irrigation and agricultural staff of KCADA in planning and execution of the work related to the construction of field channels. This is evident from the fact that some of the field channels have been constructed at places where no irrigation water has ever reached.

Until recently it is revealed that there did not appear to exist any effective system of equitable distribution of water. The farmers in the upper reaches, who had no fear of waterlogging or that of additional submergence and consequent loss of crop, went on taking water far in excess of their requirement (which, on account of the sandy nature of soil and steep gradient in the upper reaches of the command area, compared to that in the lower reaches, reappeared as a source of additional submergence in the lower commands, depressions and ‘chours’).

Most of the beneficiaries feel that the attitude of the irrigation bureaucracy is at times non-cooperative and that, they point out, officials do not always pay heed

to their complaints. It is believed by farmers at all reaches that if the officials paid even the slightest attention to their problems, things would improve considerably. At times, they say, lot of water gets wasted because of small leakages but the officials do nothing in spite of reminders. With regard to canal maintenance, it is pointed out by farmers that every year vast amount was spent on the repair of canals but they remained as before. They get the feeling that overseers and engineers were not much interested in the canal's upkeep. The beneficiaries also complain of wrong assessment of irrigated land. They point out that even the fields which did not receive water were assessed as irrigated. It can be said that lack of farmer's confidence in the system is an important reason for low utilisation of potential created. The farmers in KCADA have little confidence in either timely supply or adequacy of canal water for irrigation and are thus generally reluctant to invest money in seed, labour, fertilisers, etc. Most of the farmers in head, tail and middle reach say that they do not get timely or adequate supply of water and are also not satisfied with CAD work. They complain of channels running for short period only. Almost all the farmers in the head reach reported that the first watering is received by them in the last week of December or January. The total number of waterings in all the cases was reported to be two. Most of the farmers in all reaches reported that they do not take water for irrigation of pulses, oilseeds or any other crop other than wheat during Rabi. However, other modes of irrigation in KCADA are pumps, well etc. Farmers use water from both canal and pump/well etc. Farmers who do get canal water complain of inadequate and short supply of water in the canals, low level of water, late supply of water and also of channels running for short period only.

A common complaint was the problem of siltation and drainage in the command. Another problem was of uneven and unlevelled surface of land. It was learnt that irrespective of crops, irrigation by flooding is also common. This method of irrigation is responsible for huge wastage of canal water apart from depriving farmers of lower reaches from getting their share of water. Hundred percent of farmers in all the reaches felt that they were capable of taking decisions for their own benefit and that the government should transfer water management rights to the farmer's organisation after establishing them and empowering them with right powers. The tail end farmers felt hopeful of getting canal water if farmers were vested with distribution of canal water. Farmers in all reaches responded positively to participatory irrigation management when explained to them saying that it would definitely help them in solving their problems and help in resolution of conflicts amongst themselves. Respondents say that though Kisan Samitis do exist in certain areas but they have no rights over water management. Though the officials agree that there is a gap between potential created and utilised in KCADA, they say that they try their best to be cordial with the farmers and help in solving their problems. Though the officials did agree with the concept of participatory

irrigation management, some were not so sure of its success in KCADA. They were mostly apprehensive about the collection of revenue in time (Fatmi, 2004).

The causes of under utilisation can broadly be classified as follows: those that locate the malfunctioning of irrigation systems in technical factors; those that explain it by the absence of suitable infrastructure and institutions and finally, those which view the utilisation problems as a part of the totality of production conditions that confront different socio-economic categories of cultivators. It is maintained that the main causes for reducing the level of utilisation of canals are to be found in the incomplete construction of irrigation works, particularly of watercourses below the outlet, poor maintenance of the main canal network (which often leads to silt deposit or weed growth) and improper maintenance of the watercourses. Apart from the denial of access to water sources, another factor influencing utilisation is the geographical location of the field from the source. Greater physical distance from the source makes the source inefficient for the user, hence the often discussed tail-enders' problem of water scarcity and irregularity. Causes of under utilisation are mainly perceived as poor infrastructural facilities, poor organisation of the delivery system, lack of credit and marketing facilities etc, which led to the CAD approach with its emphasis on farm development and related works. Poor reliability of the irrigation supply during critical periods of production forces the cultivator to look for alternative sources.

### **Kosi Command Beneficiaries**

Though the Kosi Project has resulted into complete transformation of the area and has ushered in a new era of agricultural prosperity for this backward region, the benefits have been enjoyed by different classes differentially and have further widened the gap between the land owners and the landless.

The four principal classes in Bathipur have been categorised as 'grihast', 'tenant cultivator', 'petty cultivator' and 'landless labourer'.

*Grihasts* belong to upper and middle castes and are independent operators of land. They use hired labour for agricultural operations. They derive social power by maintaining contacts with the local officials. A small proportion of the land operated by *grihasts* can be leased in but this does not substantially alter their image as independent operators of land, using the labour power of others. It is important to stress that this feature encapsulates all *grihasts*, irrespective of the castes to which they belong or their position in the scale of landholding. *Grihast* women do not work in the fields. There is a striking difference between the wives of a Yadav *grihast* and that of a Yadav petty cultivator. The latter, like most other women of her class, works for wages, whereas the former does not. *Grihasts* are divided by their heterogeneous caste membership. While they exploit their labourers economically, they lack the capacity to dominate the community socially.

Tenant cultivators mostly belong to the middle castes. They occupy a minor position in the class structure of Bathipur. They own a little land and most of the land they operate is leased in. They hire in labour for the cultivation of their small holding. They never hire themselves out to others as labour. Several tenant cultivators referred to themselves as *bataidars* and some said that they were *grihasts*. Unlike typical *bataidars*, most tenant cultivators also have independent control over small tracts of land.

Mainly Dalits constitute the petty cultivators. They held a marginal position in the structure of land control. As the amount of land is inadequate for subsistence, they hire themselves out as agricultural labourers. This class also includes those who do not own any land. Many members of this class simply describe themselves as *jan* (labourers). The members of this class straddle several systems of production relations. Majority are unable to lease in any land. All of them perform cultivation by and large through labour drawn from the household. Significantly, since the land operated is inadequate for subsistence, the able-bodied members, men as well as women are constrained to sell their labour power to others. The precarious position of petty cultivators as operators of land in Bathipur is a consequence of the changing times. Before the 1970s, many such persons were likely to have been *bataidars*.

Landless labourers depend entirely on the sale of their labour power for subsistence. The members of this class are the principal producers in contemporary agriculture. A substantial number of the households in the village belong to this class. They are drawn from a range of castes. An overwhelming majority of the households constituting *Musahar*, *Markande*, *Dom*, *Dusadh*, *Chamar*, *Pasi* and others castes belong to this class.

The classes outlined above can be viewed as categories occupying specific positions in the agrarian economy of the village. They do not explicitly convey the notion of conflict groups. There has been discriminating impact of the irrigation schemes on these different socio-economic classes of users who do not enjoy equal access to the irrigation sources and are not able to own private means of irrigation or adopt the more efficient mode of irrigation. Those who enjoy considerable social and economic power have easy access to and control over the irrigation resources.

As majority of population draws its livelihood from agriculture, controlled and adequate water supply holds the key to agricultural performance. Discrimination in the access to control over irrigation supplies is an important ground as well as a consequence of economic differentiation among users.

It can be argued that the adoption of the new technology and state initiatives on irrigation schemes benefited mainly the upper stratum of agrarian society and led to more inequalities. The technological intervention through canal irrigation

and tractorisation has benefited the large land owners and tends to worsen the situation for tenants and petty cultivators. The polarised class situation in this Kosi region can be regarded as symptomatic of a wider social reality. Kosi tamed in the absence of essential structural changes has turned out to be an instrument of inequality generation and perpetuation.

The benefits accruing from the Kosi Project are twofold: first, those resulting from flood protection and secondly, those from irrigation. Some of the benefits resulting from the flood protection work, such as freedom from physical discomfort or suffering and improved health conditions, have been shared by all sections of the population. Flood protection has also led to assured returns from agriculture and to spectacular appreciation in land values. The size-class distribution of holdings being much skewed, the newfound agricultural prosperity has been shared unequally and majority of the members of the underclass have remained excluded from being benefited.

The result has been widespread agrarian disputes in the area, particularly in some parts of the district. The landowners have generally succeeded in ousting sharecroppers belonging to the scheduled castes from the land they had been cultivating for generations. Considering that prices have been steadily rising year after year, the economic conditions of the agricultural labourers in the Kosi area have perhaps deteriorated in recent years. At any rate, there has been no improvement. Thus, briefly stated, the benefits of the project have been shared in the following manner: substantial landowners have benefited substantially, small landowner have made small gains but their position has become vulnerable, sharecroppers have suffered greatly, and landless labourers survive in more or less the same conditions of abject poverty in which they have always lived (Appu, 1973).

The emphasis upon large-scale irrigation projects has evoked a number of controversies. In planning these projects sufficient attention is not paid to the possibility of the emergence of problems of water logging, salinity, declining water table etc. The problem is particularly acute in the command areas of Kosi canal systems. Irrigation investment must be so planned as to take adequate note of problems of maintenance and utilisation. The ecological and technological externalities as well as those affecting the economic utilisation of irrigation need to be anticipated. The story of such projects has been one of delays, cost escalation, financial bottlenecks, social and human costs. It is important to draw attention to the fact that the extant economic differentiation among the users produces undesirable discriminatory influences, which need to be taken account of in policies.

The gap is all the more prominent as far as irrigation potential created and utilities are concerned. Thus, according to experts, one way of reducing this gap is to effectively bring farmers at the stage of taking up management of canal water below the outlet. Transfer of rights and control over water-related resources with

the implied expectation that they have to live with the consequences of their management appears to be the key to making users effectively manage their resources. It must be mentioned besides facilitating community involvement and ensuring democratic decision making with regard to the management of water resources.

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