

# TECHNOLOGICAL CHANGE, ENVIRONMENT AND POOR WOMEN, ESPECIALLY TRIBAL WOMEN, IN INDIA\*

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## 1. Introduction

Technological change, a vital component of the overall process of development, tends to produce differential impacts on different groups of people in human societies. Technological change in agriculture refers to technical innovations that affect directly the way a specific task is carried out. However such innovations are deeply intertwined with social relations. Hence any change in production technique is bound to affect the structure of a society. The adoption of 'green revolution' technology in Indian agriculture led to its adoption in other countries in South Asia. Rise in demand for food and raw materials stemming from unchecked population growth and India's industrialisation programme since the early 1950s led to the growth of market forces in traditional rural India. While technological change increased agricultural productivity, total output, and greatly improved the economic condition of medium and large farmers, it also, in combination with the growth of population and market forces, produced profound effects on the environment and thereby on the poor, particularly the tribals. Within this group, it is the women who have suffered most. This paper analyses the impact of technological change on the environment and on landless and land poor women with particular reference to tribals in India.

## 2. The Importance of Natural Resources to the Poor

The ability of women, who are often the primary bread winners in poor families, to provide subsistence for their families depends on their direct access to natural resources, control over technology and on their own labour. Due to their limited access to private property resources, poor women in the past obtained from common property resources (CPR) of villages and forests such essential items as food, fuel, fodder, fibre, small timber, manure, bamboo, medicinal herbs, oils, fish, roofing and thatching materials, meat, honey etc. for personal use and sale. Agarwal (1989) notes that in Madhya Pradesh, out of 165 trees, shrubs and climbers, 19 provide roots and timbers, 63 provide fruits, 17 yield juices, in addition to nuts, figs, honey and 35 supply petals and leaves to the tribals. Many of these products are the principal source of food in periods of acute food scarcity, drought and in slack seasons. Of the total income of tribals, between 14 and 38 per-

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cent in Madhya Pradesh, between 10 and 55 percent in Andhra Pradesh and about 35 percent in Gujarat are derived from minor forest produce (MFP) (Government of India 1982, CSE 1985-86). Jodha (1986), drawing on data from 21 villages in dry-land areas of 12 districts in 7 states between 1982 and 1985, found that while all rural households use common property resources to some degree, for the landless and land poor families, CPRs account for as much as 20 percent or more of their total income in 7 of the 12 districts and 9-18 percent in the remaining 5. By contrast the contribution of CPRs to the total income of the non-poor in the same 21 villages ranges from 1 to 4 percent. Among the various items (CPRs) collected by the poor of these villages, fuel and fodder appear to be the most important and account for 91 to 100 percent of firewood used, 66 to 84 percent of the total domestic fuel utilized and 69 to 84 percent of the grazing needs of the poor along with 8 to 9 percent of their food intake (Ryan 1984). It is estimated that minor forest produce (MFP) supplies a substantial proportion of the livelihood of an estimated 30 million tribal people in India. In the central Himalayan region, both farming and landless labouring families depend greatly on the forest for timber, wood for fuel, pulpwood, resin, animal fodder etc. Forests and common lands supply fertilizer to the hill agriculture directly in the form of leaf mould and indirectly via manure from livestock. Much of cooking fuel which comes mostly from firewood and building timber are obtained from forests (Joshi 1987). Jackson's study (1985) revealed that in a number of villages in Almora district about 57 percent (by weight) of the fodder needs of livestock were met from common land and forests. The rural life of hills, just as in the Madhya Pradesh plains, is very closely bound up with forests. However, the responsibility for collecting in these forests rests with women who also perform most other agricultural household tasks in both plains and hills.

### **1. Traditional Forest Use and Management and Commercial Use of Forests**

Traditional practices relating to natural resource use — the gathering of firewood and fodder or shifting agriculture were not typically destructive of nature. Firewood for domestic use in tribal households is mostly collected from fallen branches which does not destroy trees. Between 75 and 100 percent of firewood used as domestic fuel in north India is collected in this way. The traditional practice of obtaining tree fodder by careful lopping does, in fact, enhance the prospect of greater availability of fodder (Bandopadhyay, J. and Moench, M. 1985). Jhum cultivation practised in the late nineteenth and early twentieth century in north-east India allowed about 7 to 10 years for soil

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regeneration (Playfair, M. 1939). The shortening of jhum cycles which is causing soil erosion, has resulted from the pressure of a growing population being forced to subsist on a declining and deteriorating land base. In the UP Himalayas, before the British conquest of Kumaon and Garhwal in 1815, the forests were used and managed by the peasantry.

In the nineteenth century due to the very low density of population in the early years of British rule, the British did not impose any restrictions on the use by villagers of forests for grazing, lopping and collecting of other produce.

Since forests and pastures were an important component of the village economy's natural resource base, villagers erected boundaries between villages to regulate their use. Forests within the boundaries were considered common property and villagers had the responsibility to evolve a mutually acceptable and environmentally sustainable pattern of forest use. To prevent exhaustion of forests within and outside village boundaries, annual winter migration of village communities with their livestock from the plains to the jungles below the foothills of the Himalayas and summer migration of menfolk with their livestock to high level oak forests known as transhumance were practised (Moench 1986). With extensive forests, absence of both government controls and commercial felling of trees and no easy access to markets in which surpluses could be sold, the villagers were able to keep their forests in a reasonably good condition through loose controls over their norms of behaviour.

However growing demands from European and Indian private operators for commercial exploitation of forests and the demand from the railways for sleepers and fuel led the colonial government to derecognise traditional notions of community ownership, to declare all non-private land to be state property and to impose restrictions on the rights of villagers to collect forest produce. Large tracts were assigned to favoured individuals for the establishment of tea and coffee plantations and land clearing for cultivation was encouraged to augment public revenue.

With the large scale exploitation of forests by the state, the hill people completely lost their rights of control over forests and their user rights were also greatly restricted. In the post independence period, the clearing of forest continued for agricultural expansion, river valley projects, mining and stone quarrying and for providing building logs, industrial raw materials and fuel for small scale and cottage industries.

The state's control over forest lands has allowed politicians and bureaucrats to act in collusion with businessmen to exploit forests for short-term private gain with the result

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that forests have been over-exploited. At the same time, the loss of local community control and restriction of use of forests by local people have weakened villagers' incentives and ability to use forests sustainably. All these factors have gained added strength since the onset of 'green revolution' in India. Thus while population pressure appears to be a contributory factor to deforestation, deforestation may not occur even with a high population density provided an appropriate system of community control exists. It is clear that reform of property rights in the forests is needed if ecological deterioration in the U.P. Himalayas is to be contained. In the Meghalaya regions in north eastern India, it is suggested that containing the growth of demand for forest produce in order to maintain ecological balance at viable level may require an appropriate pricing policy which by raising the price of normal and inferior goods significantly would discourage their consumption by low income people (Choudhury and Parekh 1990).

#### **4. Impact of Development Activities on Environment and the Poor**

Deforestation and ecological degradation are the results of forests being converted to agricultural land, encroachment by roads and unsustainable use of forests due to excessive felling and lopping of trees and over-grazing. As a result, dense full canopy forests are becoming sparse or barren.

The government of India's national forest policy enunciated in 1952 required the respective state governments to maintain forest cover over 60 percent of the total geographical area of hilly regions such as Meghalaya. But in 1990, only 37.96 percent of the total area of Meghalaya remained under forests. This loss of forest cover has led to (i) an increase in the average level of temperature and a decrease in the average rainfall in the state; (ii) a decrease in average fertility of the soil; (iii) a decrease in the atmospheric level of oxygen and (iv) increased danger to the genetic resources of animals and plants in Meghalaya, many of which face extinction. It is also estimated that the forest cover could further be reduced to 34.09 percent of the total area in 5 years if the current rate of deforestation continues (Choudhury and Parekh 1990).

In dry land plains, with the disappearance of trees, local tanks silt up, the village well dries up and the perennial stream get reduced to a seasonal one. Uneven and uncertain monsoons causes destruction of vegetation which accentuates drought and water scarcity in the dry season (CSE 1986). Overall, it is estimated that between 100 and 150 million hectares of India's land area is rapidly becoming barren and 1 million hec-



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tares of crop lands and grazing lands are badly affected. On an average every hectare loses 20 tonnes of topsoil a year. 4 million hectares have been swallowed up by ravines and in the famous Chambal Valley more than 10 percent of villages are completely depopulated (Jain 1988).

The disappearance of forests and degradation of environment are after-effects of development activities undertaken to improve the level of living of the people. In the process, however, large sections of the population have lost their means of living and have been uprooted from their traditional homeland. More than 50 percent of mining activities in India are concentrated in 40 adjoining districts in central and eastern India which form India's tribal heartland. As a result hundreds of villages in this region have been depopulated (Jain 1988). Similar problems have appeared in the World Bank funded Sardar Sarobar Project (SSP) (a water impoundment project) in the Narmada Valley with an estimated cost of \$US450 million. Although the construction of the project threatens to submerge 249 villages and 90,000 population in three states - Madhya Pradesh, Maharashtra and Gujarat, the funding was approved even in absence of a comprehensive plan for re-settlement of 90,000 people. The funding agreement for the project was signed even before the project had been granted an environmental and forest clearance by the Government of India and even by the end of 1991, the issue of land availability and identification of re-settlement land remained largely unresolved in all three states. In terms of economic benefits, the prospect of the project earning net economic returns after its completion appears to be slim (Kane 1991).

Massive displacement of people due to such large irrigation works as noted above has implications for women. Rehabilitation usually takes care (even in a limited way) of the interests of the larger landowning groups in terms of an allotment of alternative plots but not those of landless. Women cannot recreate easily the nexus of kin support they had built-up in the villages and from which they could draw support during a crisis. They cannot also obtain easy access to alternative community sources of fuel and fodder etc. Such problems have also appeared in other countries of Asia and in Africa (Hanger and Moris 1973). Fertilizer and pesticide used in the green revolution technology to increase agricultural output has caused soil to lose vast quantities of plant nutrients as has been found in Ludhiana district in Punjab.

The use of chemical fertilizer and pesticides in agriculture has also contributed to water pollution which has now affected about 70 percent of all available water in India (Jain 1988).

The group of people worst affected by the environmental crisis is tribal women of landless

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and land poor families. As tribal belts are mostly located in dry land and hill areas, tribal women rely more heavily than others on forests and common property resources to sustain their families. However, development strategies implemented in India have been destructive rather than conserving of nature. Population growth and improvements in transport and communication have brought market forces deep into the tribal heartland with the result that on the one hand forests are disappearing and on the other, the quantity of forest produce available to tribal women is rapidly declining. On the one hand, technological change presented the villagers with the opportunity to grow more food and on the other, population pressure increased the need for more food. As a result large areas of forests, fallows and common property resources have been privatised and converted to cultivable land both legally and illegally. Hence the scope for obtaining food and other necessities from these sources has declined to an alarmingly low level. Non-market goods were also available, although in small quantities from private property resources. However technological change and population growth have raised quite considerably the market value of these goods with the result that this source of supply of free good from CPRs has now been completely eliminated.

As the main gatherers of fuel, fodder and water, tribal women now are forced to spend considerably longer time in collecting these items. While the time spent is becoming longer, the amount collected is becoming smaller. It has been estimated that in the mid-1970s, a significant quantity of firewood for domestic consumption and sale per day could have been collected within a distance of 1 to 2 kilometres of ones' home. Now the collection of the same quantity requires a daily trekking of 8 to 10 kilometres from home. In the Gujarat plains, women and children collect firewood once in every 4 days in undepleted forests, once in 2 days in depleted forests and 4 to 5 hours every day in severely depleted forests (Nagbrahman and Sambrani 1983). In Madhya Pradesh Plains, they spend 1 to 2 times a week and travel 5 kilometres for firewood collection (Chand and Bezboruah 1980). In Gujarat hills they spend 5 hours a day and travel 10 kilometres for collecting firewood (Agarwal 1983).

Bhaduri and Surin's study (1980) reveals that in Bihar plains women and children trek 8 to 10 kilometres a day for obtaining firewood.

In 1992 in the course of the fieldwork (by Dr K. Roy) in Belpahari, a major tribal belt in West Bengal, found that with the same time spent women collect significantly less quantity of firewood per week now than they used to 5 to 10 years. As a result, larger quantity of firewood than before has to be purchased from the market.

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## 5. Nature of Green Revolution Technology and Cultural Set Up and their Impact on Tribal Women

Green Revolution technology was implemented in India in two phases. The first phase of green revolution lasted for about 10 years from 1967. During this period, the new technology consisted of HYV seeds, chemical fertilizers and adequate provision of water through deep tube wells.

The second phase lasted for approximately another 10 years from 1977-78. During this period, the new technology consisted of increasing use of labour saving mechanical devices in agriculture.

Thus during the first phase of green revolution, due to the application of labour intensive technology in agriculture, the overall demand for labour increased in the country. But during the second phase, increased mechanisation of agriculture lowered the overall demand for labour. This pattern follows that for the typical Ishikawa curve (Ishikawa 1978). But it differs from the observed relationship in Bangladesh (Tisdell and Alauddin 1992) and in much of Southeast Asia (Jayasuriya and Shand 1986) where green revolution technologies appear to have been labour displacing or almost so even in the first stage of their use.

The case of tribal women should be analysed within the context of the overall impact of the technology on landless and land poor women. While the adverse effects of technological change spread to the dry land plains and hill areas where the majority of tribals live, its favourable effects did not spread to these regions due mainly to lack of adequate provision of water. As a result, in tribal belts in West Bengal, Orissa, Bihar and Madhya Pradesh, HYV seeds had a limited application and land was used mainly for single cropping of paddy. In India, the rural poverty is lower in regions where the level of agricultural output per head is higher and highest in regions where the output per capita is lower. The incidence of poverty appears to be much higher among the socially and economically disadvantaged people such as scheduled castes and tribes than among the rest of the population.

Tribal areas are chiefly hilly and tribals depend for the most part on rainfed agriculture rather than irrigation. Following the green revolution the real prices of a number of agricultural crops such as rice have fallen. To the extent that tribals grow rainfed rice in the wet season and other crops which have benefited from the green revolution, they have suffered a fall in cash income or its equivalent because these technologies have had little impact on crops grown under rainfed conditions and such areas have not been

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able to benefit from increased multiple cropping made possible by irrigation in conjunction with the new agricultural technologies. Thus technological change may have reduced rather than increased the income of this group. That the socio-economic situation of the tribals and scheduled classes has deteriorated relative to the Indian population on the whole is supported by independent evidence from D'Souza (1990).

The rate of reduction of poverty also appears to be much slower among these people than among the general population. The tribal belts in the eastern region in India recorded slow or negative growth in agricultural output implying that tribal agriculture is characterised by slow growth in productivity and higher poverty. The studies by Rao (1991), Agarwal (1989) and Sen (1987) noted that in hill or tribal regions, which are low productivity coarse grain-growing areas, there is a low demand for either male or female agricultural labourers. It should also be noted that coarse grains are an inferior substitute for rice (and in some cases wheat). With lower rice and wheat prices, it may be harder for these coarse grains to find a market for human consumption. Thus the cultivation of coarse grain would do very little to reduce the level of poverty in hills and tribal belts.

In these regions, women more often than men are found in the residual category of wage labour rather than in categories with more favourable security or tenurial arrangements. Women, therefore, generally face greater unemployment rates than men.

In hill and tribal belts, although female labour force participation rates are relatively high, most of these female workers are family farm labour, not wage labour. As male labourers tend to migrate from hill areas, women are required to work in the field and manage farms. The major constraint faced by those women seeking wage employment in the hills is, therefore, the overall scarcity of wage employment.

Similar patterns of migration take place in Pakistan from those rural areas relatively disadvantaged by the green revolution as a result of not significantly sharing in its productivity enhancing benefits (Longmire 1992). Longmire (1992) however argues that even these areas have benefited in Pakistan because of the increase in employment of farm labour as a result of the green revolution and higher real wages. But there is little evidence that this is so in the tribal areas of India, particularly given continuing discrimination against tribals in employment. While some migration of males for employment from such areas has been common even in the past, it has now become a necessity and more widespread, with adverse impact on the functioning of families as social units. The social cohesion of families and tribal groups is being reduced because of changing economic factors largely brought about by technological changes, a powerful force

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altering the social structure of society (Tisdell 1988).

The major problems faced by land poor women in hill and tribal belts are those associated with marginal and dry land agriculture: poor supply of infrastructure and inputs such as inadequate sources of fertilizer, seed, credit and agricultural extension; poor irrigation and water management; low yields etc. Such problems appear to be more acute in tribal belts than in hill areas due to environmental degradation at a faster rate; lack of legal ownership rights; encroachment on tribal land by non-tribal immigrants; almost near absence of agricultural extension and credit etc. Tribals are also often over exploited by local money lenders who extend loans at very high interest rates (Chen 1989). Apart from these the time spent in collecting fuel, fodder and water is becoming longer (CSE 1985).

Temporary migration of tribal women with their families to rainfed agricultural regions in planting and harvesting season for a period of 4 to 6 months a year was a common phenomenon before the onset of 'green revolution'. But population growth, market forces and political factors forced the farming families to gradually replace tribal male and female labourers by family male labour and local scheduled caste male labour.

Technological change also took away the control that landless and land poor women had over their technology. The task of mixing fertilizer with soil and spraying pesticide is now performed by men and machine.

In planting, harvesting and processing tasks men have displaced women. In post-harvesting and other agricultural works also men have displaced women (Chen 1989). This process of displacement of female labour in various agricultural tasks also contributed to the marked slow down in temporary migration of tribal labour families to irrigated agricultural regions. Due to lack of cottage industries, non-farm activities which can absorb a certain proportion of this labour force has not expanded in rain-fed areas, hills and tribal belts.

Apart from these, social and institutional barriers which can be termed "cultural constraints", also prevent tribal women from acquiring gainful employment. Although the ideology of seclusion which confines the movement of women within the boundaries of their homes does not apply to tribal societies and there is a less marked hierarchy in these social structures, tribal societies are not different from non-tribal societies in the matter of accepting and implementing women's right to land. Even when women's right to land is recognised, customary access to land is largely kept confined to male members of the household (Agarwal 1989). While Hindu law gives recognition to women's

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rights to inheritance, in other communities women do not even possess this right of inheritance (Duvvury 1989). Although women's right of inheritance was accepted in a limited way among the hill-tribes of north-eastern India, such right seems to be disappearing now due to changes in the mode of cultivation from shifting cultivation to settled agriculture under which new technology and land privatization have led to marginalisation of female labour.

The institutional biases against women are strengthened by cultural prejudices which make society view men as the primary bread winner. A woman is regarded as a worker only to the extent that the output of her tasks enters the exchange network, despite the facts that women spend longer hours than men in a variety of activities including cooking, patchwork, grass cutting, cattle grazing, milking (Jain and Chand 1985); tending animals, transplanting, weeding and harvesting; and collecting fuel, fodder and vegetables etc. (Jain 1985). Social prejudices, customs, lack of assets limit their access to credit from financial institutions and male bias in extension services quite often limit their access to information on and inputs of the new technology.

Although the adverse impact of technological change, population growth, denudation of forests and other natural resources and of common property resources, have been felt by landless and land poor women in general, women of scheduled tribes are far more disadvantaged than women of other communities due to the facts that (i) tribal families are economically the most vulnerable group in the Indian society, (ii) acute scarcity of water restricts the application of new technology in agriculture in hill and tribal belts and that (iii) consequently tribal women's reliance on forests, natural resources and common property resources for sustaining their families is far greater than women of other communities.

## **6. Social Alienation and Survival of Rural Communities**

Within the tribal groups, widowed, aged and infirm suffer most as they have neither physical nor material resources to fall back on and as tribal social values of sharing with and caring for others have been fast disappearing. These have created a sense of helplessness and alienation among the poor in tribal communities (Fernandes and Menon 1987). Agarwal (1989) notes that indeed for tribals, the destruction of forest and growing restrictions on what remains has eroded a whole way of life. Despite legal, social and economic constraints under which landless and land poor women live, they still

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play a vital role in the survival of rural communities. In a recent study (Roy, Tisdell and Alauddin 1992) it is noted that the absence of alternative sources of income for female members and the deterioration in families' economic condition in villages were the primary reasons for the migration of landless poor families (including adult female members and children) from rainfed paddy growing regions of West Bengal and Bangladesh to Calcutta slums. This study with its emphasis on the lack of female employment as the main factor in the migration decision and on the aspect of family migration in the migration process tends to suggest that technological change also contributed to the undermining of the survival of rural communities.

#### **7. Fieldwork in Belpahari, West Bengal, India**

Belpahari is situated at a distance of about 300 kilometres south-west of Calcutta in the district of Midnapur adjoining the neighbouring states of Bihar and Orissa. The tribal belt extends into the Bihar and Orissa side of the border and accommodates many tribal families. This is a hilly and dry land area. Green revolution technology has not spread to the region due to the acute scarcity of water. As the water table goes down to a very low level in the summer months (March to June), very little water is available to these families for drinking, cooking, washing and bathing. Due to lack of water, the productivity of land is low and only one rice crop is grown in a year. A part of this meagre produce may go to the village money lender for principal and interest payment on previous year's loan if the family had borrowed money. The remainder can provide food for a near landless tribal family only for a few months in a year. Due almost to the total absence of agro-based and cottage industries in this region, the prospect for non-farm employment for landless tribals is almost nil. In this situation, the dependence of tribal women on forests, natural resources and common property resources for obtaining food, fodder, fuel and water etc. has greatly increased in this tribal belt. But technological change and growth of markets led to a phenomenal growth in demand for timber, bamboo and other forest products. The consequent improvement in transport and communication connected this tribal region to major commercial centres. The granting of leases of parts of forests to private operators for commercial exploitation and illegal felling of trees by private operators by bribing the forest guards during the last three decades led to the disappearance of vast areas of forest in this region. With the growth in commercial exploitation, and the growth in competition among tribal families for a share of what is left of the forest produce, tribal women's access to government owned

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forest became increasingly limited and the supply of minor forest produce to each family also declined. However, before forests were opened to commercial exploitation, tribals treated the forest as a common property. Their use of forest for fuel, fodder and some food was in no way destructive of nature. Each family used to collect fuel and fodder according to its needs and took care to preserve the forest.

Social cohesion which was an important feature of tribal communities appears to be disappearing. In the absence of social safety nets the aged and infirm suffer most in tribal communities. Although they are not left entirely to themselves, they nevertheless are neglected. Aged female members are more neglected than aged male members.

The failure of development programmes to improve the lot of the tribals led to the emergence, more than a decade ago, of Jharkand Morcha Dal, a highly militant political group demanding a separate tribal homeland state covering tribal belts in the adjoining border regions of West Bengal, Bihar, Orissa and Andhra Pradesh. Violent conflicts between various tribal groups, between tribals and non-tribal immigrants, between Jharkand and CPM supporters resulting in beatings and murders are a common occurrence. As a result, the political situation in this region is emotionally charged, highly volatile and dangerous.

The India situation is far from unique in Asia as far as conflict between tribals and ruling lowlander groups are concerned. Historically the lowlanders are often descendants of first invaders and conquerors who took the most productive spoils first, at the time usually the richer lowland agricultural land. In earlier times, the lowlanders did not find it worthwhile to penetrate into the hills because at that time the economic reward was little and military operations more costly and dangerous. So existing hill tribes had a relatively safe haven and were joined by escaping lowland refugees belonging to the indigenous culture. With consolidation of the new ruling regime indigenous people became increasingly marginalised. Lowlanders kept encroaching on their territory by a process of creeping economic expansion.

This process of encroachment is continuing today but it is becoming economically unbearable for many tribals. Hence they resort to arms. Population increases amongst lowlanders and the difficulty of many in eking out an existence is increasingly forcing them to encroach onto tribal lands to extend agriculture. Usually such extension has disastrous environmental impacts. The lowlanders attempt to use the type of agriculture in hilly areas which they used on the plains. The result usually is severe soil erosion and loss of soil fertility in a short period of time. Very often the areas concerned become

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barren and revert to economically unproductive weeds and scrubland.

This encroachment on tribal lands means that the tribals must cater for their existing population on even smaller land areas. This is putting their already low levels of per capita income under greater strain. At the same time, the rate of population increase of tribals tend to be above the national average. This is partially a result of their lack of social security.

Because of the alienation of tribal lands and rising tribal populations, tribals have been forced to reduce the length of their jhum cycle. As a result it is becoming increasingly difficult to maintain the productivity of land used by tribals for agriculture (Ramakrishnan 1992).

In addition, they have lost lands to state forestry bodies controlled in the main by lowlanders who tend to provide economic opportunities in the forests to lowlanders. Furthermore, in recent times mining has become concentrated in India in tribal lands (Ramakrishnan 1992) with little or no benefit to indigenous tribes. Mining tends to be capital-intensive and the damage to tribal lands usually exceeds the economic benefit received by tribals from mining. Moreover, as already mentioned areas occupied by tribals are often flooded to make way for dams to supply irrigation and potable water to lowlanders. The case of the Sardar Sarobar Project in India has already been mentioned. Another unfortunate case is Kapita Lake (caused by water impoundment) in the Chittagong Hill Tracts of Bangladesh. Tribal people have been displaced without adequate compensation and several of the tribes are in armed conflict with the Bangladeshi army which is dominated by Bengalis.

As a result of environmental changes principally brought about by lowlanders, tribals are suffering the loss of natural resources traditionally used by them for a livelihood. This is impoverishing many and as observed earlier, tribal women in particular are being disadvantaged. The environmental degradation occurring in these areas is especially disadvantageous to women. While lowlanders tend to blame tribals and vice versa, it is clear that all are caught in a vicious cycle of poverty, population growth with attempts at economic growth exacerbating the problem and leading to unsustainable 'development' because of environmental degradation. If sustainable development is to be achieved in tribal areas and the economic and social position of tribal women protected, much greater attention must be given to the environmental and cultural impact of economic growth strategies.

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**Abstract**

*In India, as in several other less developed countries, the poor and especially women within poor households are particularly dependent on common-property resources (CPRs) for their livelihood. The relative importance of common-property resources as a contributor to the overall income of the households of tribals and scheduled castes, the groups with the lowest socio-economic status in Indian society, is high and their womenfolk are especially reliant on such resources to enable them to contribute to the economic welfare of their households. However, due to economic growth and 'development', CPRs are being lost at a rapid rate in tribal and 'marginal' areas. This is strikingly so for forested and wooded areas which make a substantial contribution to the subsistence income of tribals. Partly these changes are a result of the environmental effects of new technologies such as Green Revolution technologies, but have also been accentuated by population growth putting greater pressures on CPRs, and the appropriation of many of these resources by lowlanders - (that is directly or indirectly in many cases to the benefit of the urban elite). This thesis is supported by the secondary data for India and by the results of fieldwork in the Belpahari tribal area in the Mindapur District of West Bengal.*



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## CHANGEMENTS TECHNOLOGIQUES, ENVIRONNEMENT ET FEMMES DU NIVEAU SOCIO-ECONOMIQUE LE PLUS BAS EN INDE

### RESUME

*En Inde, comme dans plusieurs pays en voie de développement, les pauvres, et surtout les femmes dans les ménages pauvres, sont particulièrement dépendentes des ressources naturelles communes pour survivre. L'importance relative des ressources naturelles communes comme contribution au revenu global des ménages des tribus et des castes, qui forment les classes du rang social-économique le plus bas dans la société indienne, est grande. Ces femmes ont notamment besoin de telles ressources pour pouvoir contribuer à la prospérité économique. Cependant, à cause de la croissance économique et du développement, des ressources naturelles communes disparaissent rapidement dans les régions tribales et périphériques. C'est surtout le cas dans les régions boisées et les forêts qui contribuent considérablement au revenu minimal des tribus. Ces changements sont dûs en partie aux effets sur l'environnement des nouvelles technologies telles que les technologies de la 'Green Revolution', mais ils sont également renforcés par la croissance démographique qui exerce davantage des pressions sur les ressources naturelles communes, et par l'appropriation de ces ressources par les habitants — (c'est-à-dire directement ou indirectement dans beaucoup de cas en faveur de l'élite urbaine). Cette thèse est soutenue par des données secondaires sur l'Inde et par les résultats du travail sur le terrain dans la région de la tribu Belpahari dans le district Mindapur du West Bengal.*

