Proceedings of the Annual Conference of NEEA held at Dibrugarh, Assam in February 2004.

POVERTY AND ENVIRONMENTAL DEGRADATION IN RURAL INDIA: A NEXUS

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Abstract

Inspired by the worldwide debate on the issue, the present paper is a humble attempt to test the nexus between poverty and environmental degradation in rural India based on secondary sources of data. Though the study does not reveal any definite pattern of linkage in the context of rural India it examines the probable causes of failure in the link, highlights the status of poverty and environmental degradation across States and over time and concludes by highlighting the urgent need for undertaking micro level studies in the North Eastern States based on primary survey for policy intervention.

Introduction

According to the Brundtland Report, poverty is a major cause and effect of global environmental problems (World Commission on Environment and Development 1987). The poor are the victims of environmental degradation and too are the agents, the perpetrators of the degradation. They are basically short-run maximisers; they try to meet the needs of the present at the cost of the future. Poor and hungry often destroy their immediate environment for their survival. They cut down forests; their livestock overgraze grasslands; they overuse marginal lands; and they crowd into congested cities in growing numbers. The cumulative effect of these changes is so far-reaching as to make poverty itself a major global scourge. It is in this context that the first report on Human Development mentions, “Poverty is one of the greatest threats to the environment” (UNDP 1990).

Review of Literature

The link between poverty and environment has often been mentioned in the 'sustainable development' debate and is seldom systematically explored (Lele 1991). The literature that treats the link usually focuses on the 'vicious circle' between poverty and environmental degradation; the circle is Malthusian in inspiration where farmers pushed by population increase and poverty extend cropping onto fragile marginal lands and degrade them. As a result the yield is reduced and this further impoverishes farmers (Dasgupta and Maler 1994, Pearce and Warford 1993 and Mink 1993). A new dimension to the link between poverty and environmental degradation was brought out in 1995 when Reardon and Vosti introduced the concept of 'investment poverty' and related the same to other measures of poverty (Reardon and Vosti 1995). The notion of poverty was examined by them in the context of categories of assets held and categories of environment change with particular focus on farm household income generation and investment strategies as determinants of the links. According to them the strength and direction of the poverty-environment links in rural areas are to differ (even invert) depending on the composition of the assets held by the rural poor and the types of environmental problems they face. One of the major findings of their study is that the level of poverty conditions the links. People having incomes above an established welfare poverty line still be too poor in key assets and thus overall cash and human resources to be able to make critical investments on soil conservation or follow key land use practices to maintain or enhance their natural resource base. They might thus be better off than the 'welfare poor' but still be 'investment poor'. Finally they opined that the links between poverty and environment in a given setting depend on the level, distribution and type of poverty and environmental problems.

A major work was undertaken to study the relationship among population, poverty and environmental degradation in China in 1997 (Rozelle et al 1997). The authors examined the impact that each had on the China's land, water, forest and pasture resources. They found the government policy to be ineffective in controlling rural resource degradation primarily because of its limited resource and poorly trained personnel. According to the report of Government of China, Ministry of Agriculture, rapidly expanding township and village enterprise sector have been the major sources of water pollution in China (G.O.C 1991). Next to industrial effluents,

agricultural chemical runoff and leaching are also causing serious water pollution (Mei, F 1992). Housing investments, a major user of wood products, has been rapidly growing and causing widespread deforestation (World Bank 1992). All these environmental effects on the health and livelihood of the poor are directly or indirectly being felt. Some studies reveal that due to deforestation, agricultural expansion and overgrazing of livestock there has been widespread destruction of grasslands causing environmental problems (Lieu et al 1991). Soil erosion is also taking place due to deforestation and overgrazing. Mountainous lands, hilly regions and plateaus are most vulnerable to soil erosion. Poorly constructed irrigation system has led to salinity of land in some environments, either from inadequate application of water or from sub-standard drainage. Salinity of farmland has caused significant decline in farm productivity and has induced the producers to remove land from production (Huang et al 1994). The net result is the reduction in income earning capability of the farmers and thus has an indirect impact on their health and future investments in agricultural activities.

The above discussion on the various studies conducted worldwide reveal that there is a two-way linkage between poverty and environmental degradation. Degradation of environment caused either by the poor or the rich has both direct and indirect impacts not only on the cost of production but also on the productivity of crops and thus on the income of the people. Poor get more affected than the rich and become poorer due to environmental degradation manifested through destruction of forest for fuel wood, timber, *jhum* cultivation; degradation of land water through the use of chemical fertilizer, pesticide, etc in modern farming; and pollution of air due to consumption of biomass fuel. Thus a vicious link is established between poverty and environmental degradation. Each becomes the cause and effect of the other. The present paper in this regard is a humble attempt to quantify the magnitude of both poverty and environmental degradation over time and across States and verify empirically the link between them. Though estimates are available on poverty for both rural and urban areas of the country and the nature of environmental degradation varies from rural to urban, the present study is confined to rural areas only.

Data and Methodology

In the context of India, poverty line was defined by the Planning Commission at the per capita monthly expenditure of Rs.49/- for rural areas and Rs.57/- for urban areas at the 1973-74

price level. These figures corresponded to a norm of per capita intake of 2400 calories per day in rural areas and 2100 calories per day in urban areas. The present study has made use of the Planning Commission's definition of poverty line for its analysis. Due to non-availability of poverty data for the States of Arunachal Pradesh, Meghalaya, Mizoram and Nagaland the data for Assam has been taken as the representative one. Although many factors are responsible for environmental degradation, due to non-availability of data, only two factors such as percentage of area under forest and normal rainfall are taken into account in the present study. Normal rainfall has been defined as the average annual rainfall by taking a period of 30 years (Agarwal 1997). It is assumed that the higher the rainfall and higher the forest cover, the lower the environmental vulnerability. Secondary data on poverty and environmental indicators for the period 1971 and 1991 are used in the present study to construct the corresponding indices. To make a meaningful comparison of different States of India in terms of indicators of poverty, forest cover and rainfall, the following formulae are used to arrive at the degradation index of the indicator variables as mentioned against each:

$$(PINDEX)_{ij} = \frac{Max(X_{ij}) - X_{ij})}{Max(X_{ij}) - Min(X_{ij})}$$

$$(FINDEX)_{ij} = 1 - \frac{Max(X_{ij}) - X_{ij})}{Max(X_{ij}) - Min(X_{ij})}$$

$$(RINDEX)_{ij} = \frac{Max(X_{ij}) - X_{ij})}{Max(X_{ij}) - Min(X_{ij})}$$

where PINDEX, FINDEX and RINDEX respectively represent poverty, forest cover and rainfall degradation indices of the j^{th} State of the i^{th} variable. Then environmental degradation index EINDEX is constructed by taking an arithmetic average of the individual index of forest cover and normal rainfall as follows:

$$EINDEX = \frac{1}{2}(FINDEX + RINDEX)$$

Lastly an average composite index (PEINDEX) is constructed using both poverty and environment indices for the purpose of comparison across States and over time as follows:

$$PEINDEX = \frac{1}{2}(PINDEX + EINDEX)$$

Magnitude of Rural Poverty in India

Analysis of data on poverty in India revealed that on an average 57 per cent of rural people were below poverty line in 1971 (Table-1). Due to various policy initiatives of the government it was reduced to 45 per cent in 1991. When West Bengal having highest incidence of poverty (76.7%) in 1971 could reduce its poverty level to only 57.2 per cent in 1991 Manipur in spite of having high incidence of poverty (72.3%) in 1971 could achieve a tremendous progress by being the best State in 1991 with a poverty level of 20.2 per cent. Assam and the eastern States such as Bihar and Orissa were observed to have failed in the poverty eradication programme even after 20 years of policy initiatives. Among the other States with reasonable progress in this regard were Haryana, Kerala, Tripura and Andhra Pradesh.

Magnitude of Forest Cover and Rainfall

Data on area under forest cover revealed that it witnessed a marginal increase in the period from 1971 to 1991 (Table-1). It was only the north eastern region (seven sister States) which was having highest forest cover in 1971 could retain its status quo even in 1991. However, there were uneven progresses made in these sister States. When Tripura witnessed a decline in forest cover from 60 per cent to 51 per cent, all other N.E. States made progress in bringing more area under forest cover. Nagaland in this regard was the best example which could be able to increase its forest cover from 50 per cent to 86 per cent as against Assam where it could increase by less than 6 per cent. Mizoram took the first position in this regard in 1991 followed by Nagaland, Arunachal Pradesh and Manipur. Among the States which witnessed decline in forest cover in the non-N.E. Region were Himachal Pradesh, Jammu and Kashmir and Orissa.

Average annual rainfall was maximum (4323mm) in Arunachal Pradesh and minimum (531mm) in Rajasthan in the year 1971. The situations remain unchanged even after 20 years. However, many of the States in India like Assam, Bihar, Gujarat, Haryana, Himachal Pradesh, Madhya Pradesh, Meghalaya, Orissa and Uttar Pradesh experienced reduced rainfall year after year. Some of the States which experienced moderate increase in rainfall were Karnataka, Kerala, Punjab, Jammu & Kashmir, Manipur, Mizoram, Nagaland and Tripura.

Indices of Poverty and Environmental Degradation

Poverty and environmental vulnerability indices were measured in 0-1 scale and presented in table 2. Higher the values of poverty index the higher the poverty level; whereas higher the values of forest cover and rainfall indices lower the forest cover and rainfall and thus higher the vulnerability of environment on account of these indicators. Analysis of these indices revealed that there was State-wise variation of the incidence of poverty, forest area and rainfall (Table-2). These individual indices also changed by their magnitude over time from 1971 to 1991. Particularly incidence of poverty index changed to a large extent in comparison to other two indices. But one of the striking features about these indices was that there was mixed findings of various indicators in different States. Table 3 revealed that some States like Bihar and Orissa with high incidence poverty were having low forest cover and low level of rainfall. Some other States such as Manipur and Tripura with low incidence of poverty were accompanied with high level of forest cover and high rainfall. In contrast to these some other States such as Punjab, Haryana, Himachal Pradesh and Andhra Pradesh witnessed low incidences of poverty with low forest cover and low rainfall. Thus it became too difficult on our part to draw any definite conclusion regarding the nexus between poverty and environmental degradation. One important reason could be that we depended on cross section data from secondary sources across the States which were not always natural geographical regions. Another reason lied in the fact of externality or spillover effect of improvement or deterioration of environment of one State on another.

Composite Index of Poverty and Environmental Degradation

Composite index of poverty and environmental degradation revealed that the States which were hardest hit in 1971(PEINDEX $\geq$ 0.7) were West Bengal, Bihar, Tamil Nadu, Orissa, Rajasthan, Gujarat, Madhya Pradesh, Kerala and Maharashtra. The least affected States (PEINDEX < 0.5) were Arunachal Pradesh, Himachal Pradesh, Meghalaya, Mizoram, Jammu & Kashmir, Nagaland and Tripura. The rest of the States were moderately hit (0.5 $\leq$ PEINDEX < 0.7). After a period of 20 years the situations, of course, changed in many respects. The States such as Bihar, Maharashtra and Orissa which were in the worst affected category States in 1971 further deteriorated in 1991. Excepting Tripura all other least affected States during

1971 also deteriorated in 1991. Excepting Manipur and Tripura the commonly known better off N.E. States also deteriorated. The problem became more serious in case of Assam among the N.E States. The States which made good progress during the period were Tripura, Andhra Pradesh, Haryana, West Bengal, Gujarat, Kerala, Rajasthan and Tamil Nadu. Manipur in that regard made an exemplarily achievement and it changed its position from 11^{th} position in 1971 to 1^{st} position in 1991. In general it can be said that the extent of progress made in the reduction of poverty and countering environmental degradation across the States in India was asymmetrical. But rural India as a whole did not witness any progress as regards composite index of environmental degradation was concerned. The overall index value remained unchanged at 0.601 even after 20 years of gap from 1971 to 1991. Moreover, the relative position of different States according to composite index did not change significantly as was evident from the high correlation coefficient ($r = 0.7$) between the composite indices of environmental degradation for both the years.

Conclusion

The rural India as a whole witnessed a significant progress in poverty reduction. However, the progress made was uneven across the States. States like Bihar, Maharashtra and Orissa were neither able to reduce their poverty level nor able to stop environmental degradation. Instead these states continuously degraded their environment. The only Achiever State was Manipur which was not only successful in poverty reduction but also in protecting her environment. The analysis of secondary data did not yield any definite pattern in poverty-environment linkage in rural India. But this should not be construed as lack of relationship between the two without conducting further studies based on primary data. We should not also deviate from the policy of making a joint attack on poverty and environmental degradation. Since poorest of the poor eke out their precarious living from natural resources like forest, river, lakes etc environmental degradation would undoubtedly have its effects on them. Similarly increase in incidence of poverty would surely increase the desperate onslaught on Nature. This is amply borne out by the case of the N.E. Region where shifting cultivation on the hill slopes has established a vicious circle of poverty of the hill men and denudation of forests leading to environmental degradation.

Table 1

RURAL POVERTY AND ENVIRONMENTAL INDICATORS

STATE	Reference Year					
	1991			1971		
	Poor People (%)	Forest Cover (%)	Rainfall (mm)	Poor People (%)	Forest Cover (%)	Rainfall (mm)
Andhra P.	31.56	17.40	0897.3	51.57	17.70	0863.2
Arunachal P.	53.08	81.80	4334.0	50.36	61.50	4323.0
Assam	53.08	33.10	2365.7	50.36	26.87	2417.8
Bihar	66.26	15.50	1254.3	68.79	13.05	1308.2
Gujarat	41.57	05.90	0834.2	57.76	04.85	0893.4
Haryana	23.17	01.27	0722.9	40.02	01.81	0816.2
Himachal P.	24.75	24.00	1664.2	28.73	27.12	1708.2
J. & K.	33.11	09.20	1179.1	27.67	10.03	1098.7
Karnataka	42.29	16.80	1783.6	52.82	15.38	1636.6
Kerala	44.02	26.11	2718.6	69.03	22.12	2674.7
Madhya P.	49.83	30.03	1195.0	62.40	24.52	1233.4
Maharashtra	54.17	14.32	1190.3	55.75	13.22	1189.8
Manipur	20.24	80.10	2026.3	72.87	67.53	1950.8
Meghalaya	53.08	70.98	2365.7	50.36	64.03	2417.8
Mizoram	53.08	89.47	2026.3	50.36	65.91	1950.8
Nagaland	53.08	86.12	2026.3	50.36	49.61	1950.8
Orissa	65.64	30.26	1456.3	74.61	31.07	1543.9
Punjab	21.02	02.32	0768.5	28.65	02.18	0640.2
Rajasthan	41.59	03.80	0529.2	54.74	03.30	0531.0
Tamil Nadu	51.30	13.62	1000.6	66.45	12.84	0952.7
Tripura	24.22	50.78	2026.3	54.54	60.11	1950.8
Uttar Pradesh	47.70	11.49	1217.6	51.36	08.80	1312.7
West Bengal	57.19	09.46	2123.8	76.67	09.45	2151.4
INDIA	**44.88**	**19.49**	**1639.4**	**57.33**	**16.89**	**1631.1**

Table 2

INDICES OF RURAL POVERTY AND ENVIRONMENTAL DEGRADATION

STATE	Reference Year							
	1991					1971		
	PINDEX	FINDEX	RINDEX*	EINDEX	PEINDEX	PINDEX	EINDEX	PEINDEX
Andhra P.	0.246	0.817	0.903	0.860	0.553	0.488	0.835	0.662
Arunachal P.	0.714	0.087	0.000	0.043	0.378	0.463	0.046	0.254
Assam	0.714	0.639	0.517	0.578	0.646	0.463	0.561	0.512
Bihar	1.000	0.839	0.809	0.824	0.912	0.839	0.812	0.826
Gujarat	0.463	0.947	0.920	0.934	0.699	0.614	0.929	0.722
Haryana	0.064	1.000	0.949	0.975	0.519	0.252	0.962	0.607
Himachal P.	0.098	0.742	0.702	0.722	0.410	0.022	0.652	0.337
J. & K.	0.280	0.910	0.829	0.870	0.575	0.000	0.863	0.431
Karnataka	0.479	0.824	0.670	0.747	0.613	0.513	0.751	0.632
Kerala	0.517	0.718	0.424	0.571	0.644	0.844	0.563	0.703
Madhya P.	0.643	0.674	0.825	0.749	0.696	0.709	0.735	0.722
Maharashtra	0.737	0.852	0.826	0.839	0.788	0.573	0.826	0.700
Manipur	0.000	0.106	0.606	0.356	0.178	0.922	0.313	0.618
Meghalaya	0.714	0.210	0.517	0.363	0.538	0.463	0.278	0.370
Mizoram	0.714	0.000	0.606	0.303	0.508	0.463	0.325	0.394
Nagaland	0.714	0.038	0.606	0.322	0.518	0.463	0.449	0.456
Orissa	0.986	0.671	0.756	0.714	0.850	0.958	0.644	0.801
Punjab	0.017	0.988	0.937	0.963	0.490	0.020	0.983	0.501
Rajasthan	0.464	0.971	1.000	0.986	0.725	0.552	0.989	0.771
Tamil Nadu	0.675	0.860	0.876	0.868	0.771	0.791	0.860	0.826
Tripura	0.086	0.439	0.606	0.523	0.305	0.548	0.369	0.459
Uttar P.	0.597	0.884	0.819	0.852	0.724	0.483	0.844	0.664
West Bengal	0.803	0.907	0.581	0.744	0.773	1.000	0.728	0.864
INDIA	**0.510**	**0.657**	**0.708**	**0.683**	**0.601**	**0.541**	**0.666**	**0.601**

* Reference years for rainfall index (RINDEX) are from 1961 to 1991 (average of 30 years).

Note: PINDEX, FINDEX, RINDEX, EINDEX and PEINDEX respectively refer to poverty, forest cover, rainfall, environment and composite indices (poverty & environment).

Table 3

INDEX-WISE GROUPINGS OF STATES

VUNERABILITY INDEX	**MAGNITUDE**	**STATES**
POVERTY VULNERABILITY	HIGH (PINDEX ≥ 0.7)	Bihar, Orissa, West Bengal, Maharashtra, Nagaland, Mizoram, Meghalaya, Assam and Arunachal Pradesh
	MODERATE (0.5 ≤ PINDEX < 0.7)	Tamil Nadu, Madhya Pradesh, Uttar Pradesh and Kerala
	LOW (PINDEX < 0.5)	Karnataka, Rajasthan, Rajasthan, Jammu & Kashmir, Andhra Pradesh,Himachal Pradesh,Tripura,Haryana,Punjab and Manipur
FOREST COVER VULNERABILITY	HIGH (FINDEX ≥ 0.7)	Haryana, Punjab, Rajasthan, Gujarat, Jammu & Kashmir, West Bengal, Uttar Pradesh, Tamil Nadu, Maharashtra, Bihar, Karnataka, Andhra Pradesh, Himachal Pradesh and Kerala
	MODERATE (0.5 ≤ FINDEX < 0.7)	Madhya Pradesh, Orissa and Assam
	LOW (FINDEX < 0.5)	Tripura, Meghalaya, Manipur, Arunachal Pradesh, Nagaland and Mizoram
RAINFALL VULNERABILITY	HIGH (RINDEX ≥ 0.7)	Rajasthan, Haryana, Punjab, Gujarat, Andhra Pradesh, Tamil Nadu, Jammu & Kashmir, Maharashtra, Madhya Pradesh, Uttar Pradesh, Bihar, Orissa and Himachal Pradesh
	MODERATE (0.5 ≤ RINDEX < 0.7)	Karnataka, Tripura, Nagaland, Mizoram Manipur, West Bengal, Meghalaya and Assam
	LOW (RINDEX < 0.5)	Kerala and Arunachal Pradesh

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