

Poverty and Natural Resources: Understanding the Dynamics in Context of Dry Land Regions in Western India

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1. Introduction

The interface between environment and poverty is a complex phenomenon. Poverty reduction needs will be enabled if the poor are allowed access to natural capital, such as land, water, forest and minerals in order to produce economic goods and marine resources. Without this, the poor may continue to co-exist with resource-rich environment especially in the rural settings. In the absence of properly calibrated distribution and use of natural resources population growth may further aggravate the situation. Out-migration and dependence on the alternative activities outside the primary sector may also have a negative impact on the environment, both directly through the processes of production and indirectly through neglect of land as well as other natural resources in the rural areas (Bilsborrow 1991). It is therefore, imperative to work out strategies through which people can find

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employment and income from a combination of activities without creating negative externalities on the environment.

Since the poor depend more critically on natural resources-based activities in agriculture and allied sectors, they are often seen as causes as well as victims of environmental degradation. This monolithic view of a 'vicious circle' of poverty and resource degradation has been contested in the recent literature seeking empirical evidence on the interface between poverty and environment (Markandya undated; Duriappah 1998; Nadal *et.al.* 1998). Alternatively it has been argued that the real life situation is often diverse, indicating plurality of interface between the two (Nadkarni 2000). For instance there is ample evidence that poor do not always damage the environment. Similarly, there are a large number of situations where the non-poor are the major cause of environmental degradation. A priori, the following typology can be identified for depicting the multi-patterned relationship between the environment and the poor in the Indian context (Duriappah 1998).

1. Exogenous poverty causes environmental degradation
2. Power, wealth and greed causes the degradation
3. Institutional failure primary cause for the degradation
4. Market failure causes degradation
5. Environmental degradation causes poverty
6. Endogenous poverty causes the degradation

It is of course, difficult to discern the dominant pattern of interface between environment and poverty because of the changing nature of the use of natural resources under varying demographic, institutional and technological situations across time and space. Thus, by and large the view that obtains in the context of developing economies is that "poor do not initially or indirectly degrade environment, the interface is contingent upon the other groups not degrading the environment and also on absence of market or institutional failures" (Duriappah 1998). Unfortunately, the empirical evidence for the actual interface between poverty and environment is fairly sketchy and somewhat inaccurate. Nevertheless studies based on a large number of situations in developing as well as developed countries lend support to the two basic propositions: first, poverty *per se*, does not damage the environment and second, environmental degradation does hurt the poor (Markandya undated).

Given the above perspectives, the burden of environmental degradation in predominantly agrarian economies, is placed on the policies that have been used for promoting agricultural growth. These policies have led to the increased degradation that has been caused by rural poor communities (Lopez 1992). The proximate causes of environmental degradation by the poor in agrarian societies, as found in the case of Central America are: (i) soil erosion by small holders as a rational strategy for survival; (ii) semi-proletarianisation of the rural population and a collapse of local institutions; and (iii) deforestation as a result of migrants seeking land (De Janvery and Garcia 1998).

A similar situation is likely to prevail in several other developing economies. It is thus, ironical that agricultural growth, one of the most important strategies for poverty reduction, is found to have contributed (at least partly) to environmental degradation in a number of developing economies, including India. Consequently the growth policies in many of the agrarian economies have faced severe criticism not only on account of their poor record on poverty reduction but also on environmental sustainability. In fact, what is being challenged is the nature of agricultural growth, especially on the lines of 'Green Revolution', rather than questioning the criticality of agricultural growth *per se*. A plethora of literature exists in India critiquing the 'Green Revolution' strategy especially for its impact on equity, and of late, on environmental sustainability. The most important criticism stems from the fact that on the one hand the strategy has by-passed dryland farming and on the other it has promoted non-sustainable use of resources, especially water, due to distorted price structure. As a result dry land regions have lagged behind in terms of agricultural growth and continued to suffer weather-induced vulnerability. Over exploitation of ground water resources thus becomes the most handy mechanism for the poor to survive and for the non-poor to maintain the status-quo with respect to their economic well-being.

Strangely, the poverty scenario in Indian states does not confirm the expected pattern across dryland and rainfed-forest regions. In fact contrary to expectations, states with predominance of dryland areas are found to have relatively lower incidence of poverty vis-à-vis the forest based states. This is partly explained by high incidence of out-migration from dryland states. Apart from this, some structural factors seem to have exerted significant influence on the pattern of poverty and its interface with agricultural growth across space. These factors are: agrarian relations; entitlement to natural resources, especially forests;

and economic diversification particularly, the industrial sector taking a lead in the state's economy. One observes a log-jam of all the three factors working adversely in the major states constituting the 'poverty square' in India. These include most of the central-eastern states comprising Rajasthan, Madhya Pradesh (undivided), Uttar Pradesh (eastern), Orissa, West Bengal, Assam, and the north-east (Mehta and Shah 2003). To a large extent, these states (except for Rajasthan) constitute a major part of the forest-based economies in the country.

The diverse pattern of poverty among dryland and forest-based regions has been aptly summarized in a recent report on India's rural development. The report notes that 'drier states (in west) harbour lesser poverty proportions than the wetter ones (in east). In general the states, which were under the Zamindari regime of the yesteryears and have experienced relatively ineffective agrarian and land reforms and thereafter green revolution, have been the losers, while those in the west, have been gainers. Within these contours if the monsoon fails, all suffer and vice versa' (NIRD 2000).

The four states in western India viz., Gujarat Maharashtra, Madhya Pradesh and Rajasthan represent predominantly dryland situations though, Madhya Pradesh (including Chhatisgarh) faces a double disadvantage of having vast tracts of dry land as well as forest based economies. In fact a large part of the forest areas especially in west and south-west Madhya Pradesh experience conditions of resource degradation that are similar to dryland regions, but without the other advantages such as large landholdings, and developed market economies etc. The four states however, differ significantly in terms of levels of economic growth as well as poverty. Broadly the states in the western region could be grouped into two categories - Gujarat and Maharashtra with predominantly Ryotwari agrarian system, with higher level of industrial growth and development, and Rajasthan and Madhya Pradesh with feudal agrarian relations, and relatively lower level of development. There is however, significant variation in the incidence of poverty across regions/districts within these four states. What is the extent of incidence of poverty and how far does it vary within the four states in the western region? What explains variations in poverty and how far are dryland conditions responsible for that? What are the policy implications for amelioration of poverty on a sustained basis? These issues have been examined in the light of the four major states in Western India.

The paper is divided into five sections including the introduction. The next section presents a brief overview of the role of agricultural

growth in poverty reduction in India. Section 3 examines incidence of poverty across regions and discusses the dynamics of poverty under dry land conditions among the four states in Western India. This is followed in section 4 by an analysis of the correlates of poverty at two levels viz., region as well as district within these states. The last section summarizes the discussion and draws policy implications.

2. Agriculture-Environment-Poverty Interface in India: Some Evidence

Empirical evidence provides overwhelming support to the argument that the agricultural sector has played a crucial role in reduction of poverty in India (Sen 1996; Ravallion 2000; Bhalla and Singh 1997; Desai and Namboodiri 1997). This is despite the fact that agriculture and the allied activities contribute a relatively smaller proportion i.e. 30 per cent of the Gross Domestic Product in India. Notwithstanding this, the sector is of critical importance in so far as it ensures aggregate supply of foodgrains, employs a large majority of workers and thereby provides wage goods which enhance demand for consumer goods and services, and supplies raw material for several important industries, including those which are export oriented. A recent analysis suggests that the primary sector, besides making direct contribution to the national economy, continues to have a significant association with overall economic growth in India (Gandhi 1997).

The growth in agriculture sector has been achieved through adoption of bio-chemical inputs like seed-fertilizer-irrigation, known as the Green Revolution technology. Of late, use of these external inputs has started exerting a negative impact on the environment (Marothia 1997). Nevertheless, such impact, at least till now, is neither widespread nor irreversible (Shah 2000). In fact the dominant view in this context is that “on balance the land saving technological change represented by Green Revolution was the single most important factor contributing to the (environmental) sustainability” (Rao 2001; p. 4). This is mainly because it has reduced the pressure on marginal lands and thereby resulted into a rise in area under fallow land (Ray 1992).

But Green Revolution technology, if used in an indiscriminate manner and without proper measures to overcome the environmental damages, may become counter productive. For, as widely observed, “environmental degradation in India has tremendous human cost. It hits the poor most-and directly too” (Nadkarni 2000). Hence, regeneration and sustainable use of natural resources, rather than conservation *per se*,

becomes endemic to poverty alleviation given the fact that over 60 per cent of the country's working population directly depends on the primary sector - the main user of these resources. This has been amply demonstrated by the experiences during the nineties growth, that had brought a dampening impact on poverty reduction at macro level owing mainly to sub-normal rainfall situations (Ravallion 2000).

Of late the slowing down of agricultural growth has led to questioning the future potential of the Green Technology indicating that the sector has reached a plateau in terms of providing additional income to its work force, a significant part of which is under-employed in terms of time and/or income criteria (Bhalla 2000). Accordingly it is argued that poverty reduction in future will have to go beyond the primary sector. The recent evidence however, does not entirely support the view that agricultural sector in India has reached near saturation in terms of employment generation and poverty reduction. The empirical evidence for mid-nineties, by and large, suggests a negative association between the levels of labour productivity in agriculture and poverty across major states in India. This is evident from the low levels of agricultural productivity in states like Bihar, Orissa, Assam, Uttar Pradesh, all of which have higher incidence of poverty as compared with Haryana, Punjab, Kerala, and Karnataka (see Table 1). Endorsing this perspective, the policy approach in the Tenth Five Year Plan lays specific emphasis on sustaining a higher rate of growth in agriculture (i.e. 3.5 per cent). According to Radhakrishna (2002), attaining the higher rate of growth is essential and also feasible if the right policies are in place. Thus, agricultural sector has come to the centre stage of the strategy of poverty reduction. This is particularly important for the western region which is predominantly characterized by dryland conditions and poor agricultural growth due to frequent failure of rainfall in the recent past (see Table 2).

3. Poverty among Regions in Western India: Understanding the Dynamics

This section examines the incidence of poverty in the four major states in Western India and tries to understand its dynamics with special reference to dryland regions in these states.

Table 1: Agricultural Productivity and Poverty among Major States in India

States with Lower Level of Agricultural Productivity	Rural Head Count Poverty Ratio ^a			Index of Male ^b Agricultural Productivity (1992-95)
	87-88	93-94	% Change	
Assam	48.4	57.0	18.0	89
Bihar	66.5	65.6	-1.3	33
Orissa	63.2	56.6	-10.4	70
West Bengal	57.9	52.4	-9.5	87
Uttar Pradesh	49.2	41.3	-16.0	87
Madhya Pradesh	52.0	36.2	-30.4	95
States with Higher Levels of Agri. Productivity				
Haryana	21.9	28.0	27.8	244
Punjab	22.0	15.4	-30.0	301
Gujarat	42.8	30.7	-28.3	121
Kerala	46.5	33.4	-28.2	188
Rajasthan	44.4	26.2	-41.0	101
Andhra Pradesh	34.4	29.9	13.1	104
Karnataka	44.4	37.0	-16.4	123
Maharashtra	53.3	51.1	-3.9	108
Tamil Nadu	53.4	42.8	-19.8	122
All India	49.4	42.7	-13.6	100

Source: (a) Mehta and Shah (2002); (b) Bhalla (2002)

Table 2: Growth of Agriculture among States in Western India

States	Growth Rate Value of Net State Domestic Product in Agriculture	
	1980-81 to 1990-91	1990-91 to 1995-96
Gujarat	1.0	0.3
Maharashtra	4.6	1.9
Rajasthan	6.0	2.0
Madhya Pradesh	5.6	1.0
All India	3.5	2.3

Source: Estimates of State Domestic Products, EPW Research Foundation, Mumbai

3.1 Profile of the NSSO-Regions in Western India

Table 3 provides estimates of poverty across regions in the four states of western India. It is observed that the incidence of poverty varies significantly across and within regions in the states. Maharashtra had the highest incidence of poverty (44.5 per cent) in 1993-94 followed by Madhya Pradesh (38.7 per cent), Gujarat (30.3 per cent) and lastly by Rajasthan (27.8 per cent). Higher incidence of poverty in relatively more industrially developed states like Maharashtra and Gujarat compared to less industrially developed states like Rajasthan reflects out-migration from less to a more developed state. Madhya Pradesh however remains an outlier in this regard with a higher incidence of poverty unlike Rajasthan. This may suggest a lower rate of out-migration from Madhya Pradesh as compared to Rajasthan. Another striking feature is that whereas rural poverty is higher than urban poverty in Maharashtra and Gujarat, a reverse pattern occurs in the case of Rajasthan and Madhya Pradesh in 1993-94.

Table 3: Incidence of Poverty (HCR)

	1987-88			1993-94		
	Rural	Urban	Total	Rural	Urban	Total
Gujarat State	42.8	40.3	42.1	30.7	29.4	30.3
Dry land (Arid)	60.5	53.9	59.3	37.4	27.0	35.6
Saurashtra	34.8	54.4	40.0	19.4	34.2	24.8
Plains Northern	37.9	34.7	36.7	30.9	30.1	30.6
Eastern	51.5	39.3	50.8	31.8	34.3	32.1
Plain Southern	35.1	30.9	33.5	39.5	21.0	32.0
Maharashtra State	53.3	37.1	47.9	51.1	33.2	44.5
Inland Western	45.3	40.8	44.1	37.5	38.7	37.9
Inland Northern	56.6	52.8	55.8	61.8	55.8	60.2
Inland Central	59.7	62.9	60.3	61.5	59.3	61.0
Coastal	42.8	16.5	26.1	24.5	11.3	15.3
Eastern	56.0	53.9	55.7	64.7	48.8	62.4
Inland Eastern	61.9	54.7	59.5	66.1	56.7	62.8
Rajasthan State	44.4	38.8	43.3	26.2	33.1	27.8
Western	40.8	39.2	40.5	25.4	25.4	25.4
Northern Eastern	38.7	42.5	39.6	17.8	35.8	22.6
Southern	73.0	33.4	69.9	46.0	26.8	43.9
South Eastern	41.4	25.0	38.1	33.0	45.1	35.7
Madhya Pradesh State	52.0	47.0	51.1	36.2	46.5	38.7
Vindhya	47.0	64.6	49.1	32.0	48.6	34.4
South	59.6	38.7	54.5	42.6	49.2	44.5
Central	52.7	59.4	54.4	44.5	51.4	46.6
South Western	61.0	66.5	62.0	64.6	55.5	63.0
Malwa	46.2	45.5	46.1	22.7	44.0	29.8
Chhatisgadhd	58.5	35.4	55.3	38.2	42.2	38.9
Northern	32.5	41.5	34.6	15.0	43.2	22.1

Source: Dubey, A. and Gangopadhyaya, S. (1998); Tables S -3.4; 3.5; 3.6

Incidence of poverty in rural areas is more than 60 per cent in 5 out of 22 regions in these states in 1993-94. Of these, 4 districts are in Maharashtra and 1 in Madhya Pradesh. Poverty levels in the urban areas of 4 of these 5 districts are somewhat lower i.e. in the range of 50-59 per cent. High incidence of rural poverty in these 5 regions might be due to the forest-based economies facing multiple disadvantages of degradation and smaller land holdings on the one hand, and physical remoteness and social marginalisation on the other (Shah and Guru 1993). Incidentally, the four regions in Maharashtra where rural poverty is greater than 60 per cent comprise districts having higher proportion of tribal population. It may be noted that the poverty ratio has increased in all the five regions whereas it has declined and at times substantially so, in the rest of the regions in the four states. The only exception is plain southern region in Gujarat, which incidentally is a destination of large number of migrants for both farm, as well as non-farm, employment. A similar situation is also observed in forest based areas in the eastern parts of Gujarat and southern parts of Rajasthan where degraded forest combined with higher proportion of tribal population have resulted in low social capabilities. The forest-based areas also suffer due to severe degradation and frequent droughts.

3.2 Incidence of Poverty among Drought Prone Areas: Hidden vs. Explicit

There is no official delineation of dryland regions in India except for the one adopted for identifying districts to be covered under the Drought Prone Area Programme (DPAP). Nevertheless, attempts have been made to define dryland regions under specific situations (ICRISAT-ICAR 1999; Fan *et. al.* 2000). Recognising the critical importance of agronomic potential in determining poverty, Shah *et. al.* (1998) tried to identify dry lands by focusing primarily on moisture deficiency by considering three sets of factors: (i) areas located in agro-climatic regions 1 to 12; (ii) length of the growing period (LGP) < 180 days; and (iii) proportion of gross irrigated area between 40 and 50 per cent. Accordingly, 42 per cent of the districts covering 56 per cent of the total geographical area in the country have been identified as dryland. This proportion is significantly higher in the four states in Western India (see Table 4).

However, it is difficult to estimate poverty in dryland regions as the official statistics do not provide separate estimates for such areas. Nevertheless, a recent study using state level estimates indicated that

Table 4: Dryland Area in Western India: 1989-90

States	% of Dryland	
	Districts	Area
Gujarat	74	88
Maharashtra	77	81
Rajasthan	93	92
Madhya Pradesh	89	81
All India	42	56

Source: Shah, Mihir et.al. (2000), pp. 121

incidence of poverty was lower among drought prone (DP) vis-à-vis non-drought prone (NDP) states (Conroy *et. al.* 2001). In 1993-94, the proportion of poor in DP states was 29 per cent vis-à-vis 37 per cent in NDP states. These findings have also been further substantiated by Kelley and Rao (1995). The study noted that there were significantly fewer absolutely poor people residing in the more marginal rural environment i.e. districts with productivity less than Rs. 500 per hectare. In terms of severity of poverty there was no significant association with the marginal lands. This implied that incidence of rural poverty is relatively higher in the areas with better land productivity within the Semi Arid Tropic (SAT) regions. This may suggest significant out-migration and the resultant low density of population in the relatively low productivity (or marginal) areas within SAT regions.

The above observations further substantiate another interesting observation by Conroy *et.al.* (2001) that lower incidence of rural poverty in dryland areas is generally accompanied by higher incidence of urban poverty. To a large extent this is due to the fact that a larger proportion of rural workforce has to depend on non-farm employment within or outside the rural areas. Moreover, a large part of poverty in dryland regions is likely to be transitory in nature (Sagar 1997). This has been corroborated by a detailed analysis based on the panel data collected by ICRISAT. According to a study by Singh and Binswanger (1993) covering three SAT regions, poverty was clearly not a permanent characteristic of the households. It was further noted that out of the 218 households, 131 (i.e. 60 per cent) were initially poor. After nine years 48 (i.e. 37 per cent) of these households had moved above the poverty line, and another nine (i.e. 10 per cent) of the initial 87 non-poor households became poor despite considerable growth in average income of the sample households. While a large part of the poverty reduction is likely

to be due to increased access to irrigation, a substantial part of the income growth among poor is likely to be due to the state interventions in the form of drought relief measures or employment guarantee scheme, especially in Maharashtra. Both the measures appear to be unsustainable in the long run.

3.3 Low Agronomic Potential: Instability of Yield

An important feature of the dryland region however, is low agronomic potential, not so much in terms of levels of yield, but more in terms of uncertainty and fluctuations in yield. As a result land productivity is found to be fairly low and also varying. According to the estimates provided by Fan and Hazell (2000), average land productivity in India during 1981 to 1994 was Rs. 8,485, Rs. 6,464, and Rs. 3,291 in areas categorized as irrigated, high potential rain-fed, and low potential regions (consisting mainly of dryland regions) respectively. It is important to note that low potential regions registered a decline in land productivity compared to previous year, in 6 out of 14 years; for irrigated and high potential rain-fed regions the decline was observed in 3 years and 1 year respectively.

The above observation is further substantiated by the estimates of incidence of instability in cereal production in some of the dryland states. These include three out of the four major states in western India viz., Gujarat (58 per cent); Rajasthan (39 per cent); Maharashtra (29 per cent). Incidentally, Madhya Pradesh with relatively low level of instability is treated as part of the high potential regions (WFP 2001). The phenomenon of higher uncertainty has been considered the most distinguishing aspect of dry land agriculture in semi-arid tropics (Walker and Ryan 1990). It has been noted that higher rainfall uncertainty in the planting stage induces area variability, which often looms larger in conditioning crop income volatility than fluctuation in yield. This makes poverty in dryland region, a transitory rather than a long duration phenomenon, which eventually leads to low incidence of poverty in these regions. What is of greater concern as observed by the study, is that 'rainfall induced uncertainties in crop income may also have serious ramifications on devising a sustainable crop insurance or credit scheme'. Non-existence of an effective credit system for a long time, might have a deepening impact on poverty with the result that many of the transient poor might end up being chronic poor in the long run; or else, they might out-migrate.

3.4 Coping Mechanism

Four sets of coping mechanisms help overcome the basic constraints of low agronomic potential in the region. First, dryland regions have relatively low population density and hence have larger land holdings. But, this feature is likely to disappear along with increasing population. Second refers to the increasing coverage of the various efforts for drought relief measures undertaken by the state. Third is specialization in high valued commercial crops like oil seeds, spices, and horticulture, etc. Fourth, and perhaps the most important is out-migration. Since the first two are exogenously determined, the effective strategies refer to the latter two. These strategies are discussed briefly.

(a) Diversified Farming System and Predominance of High Valued Crops

According to the estimates prepared by (Shah *et.al.* 1998), drylands in India constitute 45 per cent of the total area under cereal production; 66 per cent of the area under oil seeds; and 68 per cent of the area under non-food crops. A number of studies have examined the impact of commercialization on Indian agriculture. Among these, is a seminal work by Nadkarni (1985), which provides a vivid account of how the strategy works in a dryland vis-à-vis wet regions Karnataka, Tamil Nadu and Andhra Pradesh. The study observed that, to a large extent, commercialization of agriculture in dryland regions has helped increase income among cultivating households across different categories of land holdings. It is however noted that commercialization has been facilitated by substantial contribution of labour from the landless households, which also tend to gain in terms of employment as well as higher wage rates. Therefore, commercialization seems to have a poverty reducing impact, though it increases inequality within the village. The important feature of commercialization is that it tends to work more effectively in areas where commercial crops are grown on large scale rather than in isolated and less commercialized regions. Remoteness thus, plays an important role in determining the lack of poverty reducing impact.

Table 5 presents estimates of area under non-food crops, thereby representing level of commercialization in the four states. It is observed that area under non-food crops is higher than the all-India average in Gujarat, Maharashtra and Rajasthan. Madhya Pradesh has relatively lower level of commercialization of agriculture. Among the four states, Gujarat has the highest proportion of area (i.e. 61.6 per cent) under non-

food crops followed by Maharashtra (39.4 per cent), Rajasthan (38.4 per cent) and Madhya Pradesh (31.5 per cent) in 1997-98. It may however be noted that Madhya Pradesh is catching-up fast with a significant jump in the proportion of area under non-food crops from about 13.6 per cent in 1980 to 31.5 per cent in 1997-98. To a large extent, this is due to spread of oilseeds, especially soyabean in large parts of central, south and western Madhya Pradesh.

Table 5: Commercialisation of Agriculture and Migration in the Four States in Western India

States	A		B		C	
	Area Under Commercial Crops*		No. of Cow & Buffalo ('000)*		% of out-migration**	Net Inter-state Migrants*** per 1000 persons
	1980	1997-98	1982	1992	1999-00	1991-01
Gujarat	50.0	61.6	11437	12072	0.6	19
Maharashtra	27.4	39.4	25134	22894	0.8	44
Rajasthan	22.3	38.4	19548	19371	1.5	07
Madhya Pradesh	13.6	31.5	33552	36660	0.6	10
All India	22.6	35.1	262237	288755	1.2	27

Source: *CMIE, *Agriculture Sector, Various Volumes, Centre for Monitoring Indian Economy, Mumbai*

Notes: ** Based on Table 6 in Kundu (2003)

*** Based on Table 3 in Kundu (2003)

Fortunately, predominance of cash crops like oil seeds is a part of the agronomic features, which needs to be tapped by right kind of technology and policy support. But, as is fairly well recognised, agricultural research and development (R & D) in India has been heavily tilted towards irrigated farming (Jodha 1990) with the result that farmers in dryland regions are forced to grow more of irrigated crops. The result is often quite disastrous. For instance, this kind of crop choice leads to over depletion of ground water resources, the sustainability of which is being increasingly threatened. Worse is the temptation of ensuring a requisite level of income which may lead many farmers to go for a highly risky investment. This, given the uncertain rainfall conditions, may result in crop failure and bankruptcy. The increasing incidence of

suicidal cases among cotton growers from different parts of dryland regions is partly a manifestation of lopsided R & D and price structures that distort the crop choice, and hamper long term sustainability of dryland farming in different parts of the country.

Besides growing high-valued crops, dryland regions also have natural advantages in terms of adopting a more diversified farming system, especially with livestock producing milk, wool, and meat. The recent categorization of zones in India's SAT takes into consideration this aspect. Accordingly, 5 out of the 15 dryland zones (excluding irrigated rice in zone 1) have livestock as an important activity (ICRISAT 1999). Given the fact that livestock economy is losing ground in most of the dryland regions, and that dairying is increasingly dependent on availability of irrigation, sustainability of livestock as a coping mechanism is increasingly getting reduced. Frequent droughts in large parts of western India seem to have exerted a significant negative impact on the livestock economy in the region (see Table 5).

(b) Migration

Given the initially low agronomic potential and the limited technological support, migration turns out to be an important coping strategy especially among the landless and the poor (NIRD 2000; Bilsborrow 1992). The phenomenon, though difficult to establish at macro level, has been substantiated by a number of micro level studies from various dryland regions in the country (Haan 1999; Shah 2001; Mosse *et. al.* 2002; Lipton 1980; Reddy 2002; Deshingkar and Start 2003).

Apart from low and uncertain returns from agriculture, declining size as well as quality of common property resources (CPRs) have also led to deepening of poverty in dryland regions for e.g. in Rajasthan (Jodha 1986). This in turn, has led to a significant increase in out-migration, especially among the landless and the poor (Chopra and Gulati 2001). Following the seminal study by Jodha (1986), a number of studies have tried to examine dependence of the poor on CPRs. The evidence of late, however, deviates from the earlier finding regarding the significant dependence of the poor on CPRs. Strangely the recent studies suggest only limited dependence on CPRs among the poor (Iyengar and Shukla 1999) possibly because of the severe depletion of these resources. The poor from dry land regions thus, seem to be increasingly dependent on migratory income. Table 5 provides estimates of out-migration in Gujarat, Maharashtra, Rajasthan and Madhya

Pradesh. It is observed that out-migration during 1991-2001 is very high in the case of Rajasthan but not so in the case of Madhya Pradesh even though it represents a relatively less developed state. Conversely, Maharashtra and Gujarat have higher incidence of in-migration during the same period.

The emerging perspective thus, recognizes migration as an integral part of the livelihood strategy rather than an aberration or a transitory phenomenon. In terms of impact, there seems to be some consensus that migration tends to contribute much to the host economy and that it leads to higher rates of labour force participation. For instance, a recent study in south Rajasthan revealed that nearly two thirds of the households reported migration, which was the most important source accounting for 46 per cent of the household income in the study area (Sudrak 2003). Similarly, a study in two villages of Badwani district in south-west Madhya Pradesh describe the criticality of migration as a coping mechanism, especially for the poor (Shah and Sah 2003). An important feature emerging from the study is that migration is the least preferred option mainly because of the non-conducive working as well as living conditions at the place of destination. Hence, there is little evidence that migration reduces inequality between areas of origin and destination (Haan and Rogaly 2002).

A number of studies have enquired into the conditions of migrants at the place of destination. Most of the studies suggest that these migrants, especially from the marginalized areas, have to face a hostile environment in terms of employment, exploitative institutions such as contract-labour, living conditions, loss of identity, etc. at the place of destination. While most of these features are fairly common, particularly in the case of distress migration, one of the important aspects specific to migrants from dryland regions could be long duration and/or permanent migration of a large number of households to the regions with better agronomic conditions and/or better opportunities for diversification. The long history of out-migration from dryland regions might have helped to build up strong social capital, thereby inducing a chain of long duration migrants from the region. This has been amply demonstrated by a recent study on land degradation and migration from Saurashtra region in Gujarat (Shah 2003).

Another implication of sustained out-migration from dryland regions could be higher wage rates. This could be further supported by relatively higher importance of livestock economy which absorbs a major part of household labour on the one hand, and high valued cash

crops on the other. Increased development of ground water resources might further push the wage rate of local labour. While there is no systematic evidence on wage rate differential across dryland and other regions, the issue needs detailed probing so as to be able to understand the dynamics of local labour markets and out-migration from the region.

The evidence discussed above suggests that the hitherto low incidence of poverty, together with predominance of transient poor, in dryland regions is based on the two sets of mechanisms, which appear quite fragile at least at this point of time. These are (i) commercialization of agriculture; and (ii) out-migration. The non-sustainability of both these mechanisms emanate from the fact that on the one hand out-migration is increasingly constrained by overcrowding of surplus labour force pushed out of rural areas in urban centers (Bhalla 2000), while on the other hand, ground water levels have also reached the danger mark, implying that future availability of water will be less than present levels in the absence of requisite measures for recharge. The combined effect of both these might lead to worsening of poverty in dryland regions leading to a larger proportion of people getting trapped in long duration poverty.

3.5 Depletion of Ground Water: The Issue of Sustainability

Ironically, development of ground water is both a short term remedy and at the same time, a likely cause for chronic poverty in the long run. The problem of depleting ground water seems to have worsened since the late eighties, the period which has been marked by (a) diffusion of high yielding varieties; and (b) frequent occurrences of drought.

Recent evidence on ground water depletion in Indian states reveals that the states with very high level of ground water exploitation like Rajasthan, Gujarat, Maharashtra, Karnataka, and Tamil Nadu have exploited more than 30 per cent of the available ground water resources (WFP 2001). What is however of more concern is that, a large part of the ground water exploitation is through tube wells, which are fast becoming the single largest source of irrigation in the country (Shah *et.al.* 1998). The growth of tube wells has been particularly alarming since the eighties. Between 1977-79 and 1988-90, the area irrigated by tube wells had increased by more than 300 per cent. The situation seems to have been aggravated further during the nineties as reflected by a large number of areas, especially in dryland regions getting classified as dark zones where further depletion of ground water is banned. Similarly, the

number of wells getting defunct is also increasing at a rapid rate. All these together suggest non-sustainability of ground water resources for containing poverty in dryland areas in western region. A part of this phenomenon is reflected in the fact that the impact of droughts (given the level of precipitation), has increased during the last few decades. The impact of drought is felt more in terms of scarcity of drinking water and fodder that are essential for supporting life systems - human as well as livestock (Shah 2001). A large proportion of people are faced with frequent shocks in terms of insecurity of the basic sources of survival viz., employment and income, asset base (i.e.livestock), food and drinking water. The extent to which this could be recouped through the state's support for relief measures would, to a large extent, determine the poverty outcome.

4. Correlates of Poverty: A Disaggregated Analysis

This section tries to examine correlates of poverty within the four states at region and district levels. Ideally, the analysis should be carried out at regional level for which poverty estimates are available. But this is difficult because of the absence of regional level data on a number of important variables. Fortunately, such information is readily available for rural areas at regional level. Hence we have confined our analysis to rural areas in 22 regions of the four states in western India (see Table 3). Subsequently, a district level analysis has been carried out by using estimates of households below poverty line (BPL) as proxy for poverty estimates. It may be noted that the two sets of estimates are not comparable. Also there are methodological problems with respect to the manner in which BPL surveys have been conducted (Sundaram 2003). Nevertheless, in the absence of a better alternative, we have used the BPL estimate as an indicator of income poverty. The analysis is carried out by estimating correlation coefficients for 14 and 21 variables at region and district levels respectively for all the states taken together. The district level exercise is conducted for all the states taken together, and also separately for each of the four states. The main results from empirical exercise have been discussed as follows.

4.1 Regional Level Analysis

Table 6 depicts the variables having significant association with rural poverty among 22 regions in western India. It is observed that rural poverty is significantly influenced by five out of the 14 variables used for the analysis. Of these, four variables seem to have a poverty reducing impact as indicated by the negative sign of correlation coefficients. These

include important factors like rural wages, labour productivity, proportion of wasteland to total geographical area, and household size which perhaps, reflects size of landholdings. Similarly, the negative association between poverty and wasteland might indicate permanent out-migration and low population density in semi-arid regions as noted earlier by the study on SAT. This is perhaps why rural poverty is found to be positively associated with urban poverty in the same region.

Table 6: Correlates of Rural Poverty Among Regions in Four Western States in India: 1993-94

Variables#	Value of correlation Co-efficients
Urban poverty 1993-94	.581**
Rural wage	-.460*
Wasteland	-.458*
Labour productivity	-.539*
Household size	-.581**

Source: NIRD (2000); Dubey, A. and Gangopadhyaya, S. (1998)

Notes: # The 14 variables used for the correlation exercise are:

1. Rural Head Count Ratio, 1993-94
2. Urban Head Count Ratio 1993-94
3. Population Growth Rate
4. Female Literacy
5. Land Productivity
6. Rural Wage
7. Village Electrified
8. Rural Non-Farm Workers
9. Wasteland
10. Safe Drinking Water
11. Labour Productivity in Agriculture
12. Gross Irrigated Areas as a % of GCA
13. Child Mortality
14. Household Size

* 5% Level of Significance

** 1 % Level of Significance

Surprisingly, the extent of irrigation does not turn out to be a significant variable associated with rural poverty. This of course, does not imply absence of poverty alleviation impact of irrigation, which has

been amply demonstrated by a number of studies in the past (Bhattarai and Narayanmoorthy 2003). Instead the result suggests intra-regional movement of people from areas with low to high irrigation. This is particularly true for dryland areas in Madhya Pradesh and Maharashtra where areas on the river-sides are irrigated whereas areas away from the river bank in the same districts constitute core area of dryland regions in the state. Such movements however may not help to lift the households out of poverty as noted by Haan and Rogaly (2002). The ‘migration + remittance’ mediated scenario of poverty across regions with varying levels of irrigation captures two types of migratory movements. First is permanent shifting of population to regions with higher level of irrigation, and impact of remittance on the households who stay back in the relatively less irrigated regions. The second is seasonal out-migration to different rural as well as urban locations, especially from the forest-based regions. While the former may help reduce poverty at the place of origin, it may not be true in the case of the latter. The latter may instead lead to increase in poverty at the place of destination without necessarily reducing the same at the place of origin. This phenomenon seems to have been taking place in large parts of regions in Maharashtra and Madhya Pradesh having very high incidence of rural as well as urban poverty. Thus, the overall regional scenario of poverty appears fairly complex as it gets intermediated by migration of different types and with different outcomes. It is often difficult to gauge the impact of the various kinds of migratory movements due to non-availability of data on migration and some of the other important variables at regional level. To that extent, the analysis could be treated as partial.

4.2 District Level Analysis

A more disaggregated analysis at the district level could help overcoming some of the data limitations. Table 7 presents the results of a correlation exercise at the district level using 21 variables. The results indicate significant association of most of the variables (except rural sex ratio, proportion of wasteland, and land productivity) with proportion of BPL households in respective districts.

The variables having significant association with BPL estimates include demographic and social development indicators such as population growth and infant mortality (having a ‘+’ association), and population density and female literacy (having a ‘-’ association). Other variables like urbanization and infrastructural development index also have significant negative association with BPL estimates.

Table 7: Correlates of Poverty Among Districts in the Four Western States in India: 1995

Variables	Value of Correlation Co-efficients				
	All four states	Gujarat	Maharashtra	Madhya Pradesh	Rajasthan
Population growth rate	.185*	-	-	-	-
Population density	-.191*	-	-.393*	-.470**	-
Infant mortality rate	.354**	-	.591*	-	-
Female literacy	-.474**	-.494*	-.647**	-	-.551**
ST	.781**	.874**	.685**	.607**	.856**
Urban population	-.573**	-.581**	-.426*	-.607**	-.741**
Forest area	.401**	.713**	-	.461**	.430*
Female work participation	.443**	.774**	.520**	.567**	.566**
Irrigated area	-.456***	-	-	-.420**	-
Non-farm workers	-.275*	-	-	-	-
Non-farm in emp.	-.582**	-.613**	-.600**	-.564**	-.633**
Composite infra. Index	-.352**	-	-.416*	-.301*	-
GCA as % of total area	-.264**	-.569*	-	-.387**	-
Rural sex ratio	-	-	-.470*	.351*	-
Wasteland	-	-	-	-.295*	-

Source: CMIE, District Profiles (Various Issues)

*Notes : * 5 % Level of Significance*

*** 1 % Level of Significance*

It is important to note that among the three variables viz., irrigation, land productivity and proportion of wasteland, only irrigation turns out to be a significant variable influencing poverty reduction at district level. Data on rural wages were not available.

Forest area and tribal population have significant positive association with rural poverty. This reinstates our earlier observation with respect to high incidence of poverty in forest-based regions and the tribal communities residing there. Essentially, these observations support the assertion about double disadvantages experienced by people in the forest-based region having to face dryland like conditions along with the other constraints viz., physical remoteness and social marginalisation.

Similarly, rural non-farm employment is found to be negatively associated with the BPL estimates. This is also in close conformity with the pattern observed at macro-level, by several studies in the past (Ravallion 2002).

Inter-State Variations

We tried to examine whether the pattern of poverty and its correlates vary across states in western India. Table 7 provides the value of correlation coefficients separately for the four states. Apparently, the results do not show any striking features across the two sets of states viz., Gujarat-Maharashtra and Rajasthan-Madhya Pradesh. Nevertheless, the following observations are worth noting:

- (i) Population growth is not found to be significantly associated with poverty at individual state level.
- (ii) Variables like proportion of ST population, female workforce participation and non-farm employment are the common variables having significant association with poverty in all the four states. It is pertinent that female workforce participation is positively linked with poverty, suggesting that higher female work participation is more an outcome of poverty.
- (iii) A positive association with forest area is found in three states except Maharashtra. Similarly, female literacy is found to be negatively associated with poverty in all the three states except Madhya Pradesh.
- (iv) Surprisingly significant association with irrigation is found only in Madhya Pradesh, where proportion of out-migration is lower, given its low level of development.

- (v) Finally, whereas Maharashtra and Madhya Pradesh show significant association between rural sex ratio and poverty, the direction of association is found to be opposite in the two states. In Maharashtra, the correlation is negative, thereby suggesting a positive impact of male out-migration on poverty reduction. In Madhya Pradesh the association is found to be positive. This might suggest that although large scale migration takes place among tribal population in these regions, the outcome in terms of poverty reduction may not be significant unlike that in relatively more industrialised states like Maharashtra. Sex ratio does not have significant relationship with poverty among districts in Gujarat and Rajasthan.

This kind of differentiated outcome of migration, in turn, substantiates multi-patterned interface between natural resources and poverty, especially when it is mediated by important structural factors like agrarian relation, access to forest resources and diversification of the state economy. It is therefore, important to understand the dynamics of these inter-relationships by examining the situation at a more disaggregated levels. The analysis presented here provides only a broad pattern of similarities in association between poverty and the identified factors. What is also important is to probe further into the dissimilarities that obtain across states and regions by looking into the initial situations as well as the process that brings differential outcomes. In turn, this should form the agenda for future research that could inform policy formulation for poverty reduction in the western region.

5. Summary and Implications for Policy Formulation

The foregoing analysis presented a multi-patterned interface between natural resources and poverty in the Indian context. Given the critical importance of agricultural growth for poverty reduction, a two-fold categorisation of states and regions, having differential pattern of poverty-natural resource interface, was identified. In doing so, it reinstated the mediating role of the three structural factors viz., agrarian relations, entitlement to forest resources, and economic diversification of the state-economy.

It is demonstrated that dryland areas generally have lower incidence of poverty vis-à-vis forest-based regions, largely due to over exploitation of natural resources, especially ground water. However, this is not

sustainable in the long run. Contrary to the above situation, forest-based areas suffer largely because of resource degradation as well as social marginalisation.

Therefore in both the situations, poverty reduction by way of promoting sustainable use of natural resources is inherently rooted in the property rights regime. Thus, the central issue is effective access and control of rural households over the critical resources viz., ground water and forests. The future policies should therefore address these issues in a holistic manner, and not treat regeneration of ground water in isolation from forest and/or vegetation in the region. This is particularly important because a large part of forest-based areas in the western states also face problems of resource degradation that are fairly similar to dryland areas.

The disaggregated analysis indicated a positive association between poverty and the proportion of forest areas as well as tribal population. While this confirms what is already known as macro reality, the finding has a specific relevance to the western region. A large part of the forests in the contiguous areas of the four states represent hard core poverty in the western zone. Hence, it calls for an area based approach for development of the region, consisting of southern Rajasthan, eastern-tribal belt of Gujarat, western and south-west Madhya Pradesh and inland Maharashtra. The region is not only geographically contiguous, it is also agro-climatically as well as culturally homogenous.

Evolving an area based approach however, would call for a close collaboration among the four states in the western region. This in turn involves exploring avenues for regional co-operation within the overall framework of federal finance in the country. In the absence of these, the poor may keep circulating across regions and states with little improvement in their well-being status.

The analysis of correlates of poverty at region and district levels brought out certain additional insights besides confirming some of the broadly shared understanding on the theme. One of the important observations emerging from the analysis is that whereas agricultural labour productivity is an important poverty reducing factor at regional level, irrigation is not found to have significant impact on poverty reduction. Contrary to this, the district level analysis suggests a significant negative association between extent of irrigation and poverty. This suggests that irrigation has a fairly localized impact on poverty reduction perhaps. This may be because coverage of irrigation is

unevenly spread across talukas/blocks, and among farmers within that. As a result, one comes across isolated green patches of fields even in the midst of severe dryness or aridity within a district. While this selective spread of irrigation may increase the proportion of irrigated to cultivated area, the impact on poverty reduction may be insignificant because of the limited coverage of households benefiting from irrigation. Also, impact on poverty reduction is contingent upon quality (i.e. adequacy and certainty) of irrigation received by different households talukas/blocks within the district. It is difficult to ascertain this phenomenon in the absence of detailed information on households having access to quality and certain irrigation.

One of the important implications of such an approach is planning for a more sustainable use of irrigation for providing livelihood support to a large number of households within the region. Ideally the area or region based approach should work towards the goal of providing minimum water for all' (Shah *et. al.* 1998). This will not only check distress migration and thereby reduce the pressure on natural resources at destination, but it will also help regenerate land and water resources at the place of origin. Eventually, the strategy would turn out to be environmentally more sustainable.

We also tried to look into the differentiated pattern of correlates of poverty across the four states. The disaggregated analysis however, did not bring out significant dissimilarities across the two sets of states viz., Gujarat and Maharashtra on the one hand, and Rajasthan and Madhya Pradesh on the other. This can be attributed to non-availability of data as well as improper specification of some of the variables such as migration, extent (rather than intensity) of irrigation, and poverty.

It is likely that the impact of relatively higher economic development, especially of the industrial sector in Gujarat and Maharashtra, is reflected more in severity and duration, rather than incidence of poverty, which is already influenced by in-migration from various places within and outside the state. A detailed understanding of the intensity as well as chronicity of poverty may help in understanding the dynamics at the regional and sub-regional levels. Given the data limitations, special efforts should be made to understand the poverty dynamics in some of the high poverty areas in the region. Such an exercise should involve a fairly large coverage of villages and households, for it to be representative of the district or sub-region.

Participatory poverty appraisal, carried out recently in Gujarat and Madhya Pradesh may provide useful lessons. The need however, is to simultaneously examine the functional aspects of some of the critical factors in poverty reduction such as status of natural resources, access to these resources among poor households, nature and impact of migration, scope for improving efficiency in the use of natural resources, and institutional mechanisms that could help achieve the goal of 'water for all', especially in dryland areas in the region.

Future policies should therefore, be based on a detailed understanding of the interface between poverty and natural resources within the region. The poverty analysis thus should step out of the existing bi-polar situation of generalization at macro-level, and microscopic details of a few location specific situations at the micro-level. A detailed enquiry into not only the status of poverty and natural resources, but also the processes leading to poverty, should then be fed into the area-based approach suggested above. While there exists a rich experience of decentralized planning in some states like Gujarat, the need is to shift away from administrative boundaries and adopt a new system, where regions are defined by the boundaries of natural resources. This, in turn, would help in evolving a regional perspective for development and poverty reduction in western India.

References

- Bhalla, G.S. and Singh, Gurmail 1997. 'Recent Developments in Indian Agriculture: A State Level Analysis', *Economic and Political Weekly*, 32(13).
- Bhalla, Sheila 2000. 'Behind Poverty: The Qualitative Deterioration of Employment Prospects for Rural Indians', Paper presented at the Third Asian Conference of Agricultural Economists (ASAE), IDS, Jaipur, October 18-20.
- Bhattarai, M. and Narayanamoorthy, A. 2002. *Impact of Irrigation on Agricultural Growth and Poverty Alleviation: Macro Level Analyses in India*, IWMI-Tata Water Policy Programme 12, Vallabh Vidyanagar, Gujarat.
- Bilsborrow, Richard E. 1992. 'Rural Poverty, Migration, and the Environment in Developing Countries: The Case Studies', Policy Research Working Paper 1017, The World Bank.
- Chopra, Kanchan and Gulati, S. C. 2001. *Migration, Common Property Resources and Environmental Degradation: Interlinkages in India's Arid and Semi-arid Regions*. New Delhi: Sage Publication.
- Conroy, C., Iyengar, S., Lobo, V. and Rao, B. 2001. *Household Livelihood and Coping Strategies in Semi-arid India: Adapting to Long Term Changes*, Research Report for SPWD, Gujarat Institute of Development Research, Ahmedabad.

- Deshingar, P. and Start, D. 2003. 'Seasonal Migration for Livelihood in India: Coping, Accumulation and Exclusion', Draft Working Paper 220, Overseas Development Institute, London.
- De Janvry, A. and Gracia, R. 1988. 'Rural Poverty and Environmental Degradation in Latin America: Causes, Effects and Alternative Solutions', S 88/1/L3/Rev.2, IFAD, Rome.
- Desai, B. M. and Namboodiri, N. V. 1997. 'Developing Agriculture in Gujarat: A Strategic Perspective for Ninth Plan', Economic and Political Weekly, 32(13).
- Dubey, A. and Gangopadhyaya, S. 1998. 'Counting the Poor: Where are the Poor in India', Sarvekshna, Analytical Report 1.
- Duriappah, Anantha, K. 1998. Poverty and Environmental Degradation: A Review and Analysis of the Nexus, World Development, 26(12).
- Fan, Shenggan and Hazell, Peter 2000. 'Should Developing Countries Invest More in Less-Favoured Areas? An Empirical Analysis of Rural India', Economic and Political Weekly, 35(17).
- Haan, Arjan De and Rogaly, Ben 2002. 'Introduction: Migrant Workers and their role in Rural Change', The Journal of Development Studies, 38(5).
- Haan, Arjan De 1999. 'Livelihoods and Poverty: The Role of Migration – A Critical Review of the Migration Literature', Journal of Development Studies, 36(2), December.
- ICRISAT & ICAR. 1999. Typology Construction and Economic Policy Analysis for Sustainable Rainfed Agriculture, Patancheru, Andhra Pradesh.
- Iyengar, S. and Shukla, N. 1999. 'Regeneration and Management of Common Property Land Resources (CPLRs) in India: A Review', Working Paper 110, Gujarat Institute of Development Research, Gota, Ahmedabad.
- Jodha, N. S. 1986. 'Common Property Resources and Rural Poor in Dry Regions of India', Economic and Political Weekly, 30(27), July 5.
- Jodha, N. S. 1990. 'Drought Management: The Farmer's Strategies and Their Policy Implications', International Institute for Environment and Development, Paper 21, September.
- Kelley, T.G. and Partharashathi Rao, P. 1995. 'Marginal Environment and the Poor-evidence from India', Economic and Political Weekly, 30(40).
- Kundu, Amitabh 2003. 'Globalisation, Inequality and Mobility of Population in India', Paper presented in seminar on Labour Mobility in a Globalising World: Conceptual and Empirical Issues.
- Lipton, Michael 1980. 'Migration from Rural Areas of Poor Countries: The Impact of Rural Productivity and Income Distribution', World Development, 8.
- Lopez, R. 1997. 'Where Development Can or Cannot Go: The Role of Poverty-Environment Linkages', Proceedings of Annual Bank Conference on Development Economics, The World Bank, Washington D.C.
- Markandya, A. (undated), 'Poverty Alleviation and Sustainable Development: Implications for the Management of Natural Capital', University of Bath, U.K.

- Marothia, D. 1997. 'Agricultural Technology and Environmental Quality: An Institutional Perspective', *Indian Journal of Agricultural Economics*, 52(3), July - September.
- Mehta, Aasha Kapur and Shah, Amita 2003. 'Chronic Poverty in India: Incidence, Causes and Policies', *World Development*, 31(3), March.
- Nadal, A. 1998. *Maize in Mexico: Some Environmental Implications of the North America Free Trade Agreement (NAFTA)*, Commission for Environmental Cooperation, Montreal, Canada.
- Nadkarni, M. V. 2000. 'Poverty, Environment, Development: A Many Patterned Nexus', *Economic and Political Weekly*, 35 (14).
- Nadkarni, M. V. 1985. *Socio-Economic Conditions in Drought Prone Areas*. New Delhi: Concept Publishing Company.
- NIRD 2000. *India: Rural Development Report: Regional Disparities in Development and Poverty*, National Institute of Rural Development, Hyderabad.
- Radhakrishna, R. 2002. 'Agricultural Growth, Employment and Poverty: A Policy Perspective', *Economic and Political Weekly*, 37(3).
- Rao, C.H.H. 2001. 'Sustainable Development of Agriculture', in K.Chopra, C. Perrings, U. Rao, K. Parigh and C.H.H. Rao (ed.), *Ecological Economics for Sustainable Development*, New Delhi: Academic Foundation.
- Ravallion, Martin 2000. 'What is Needed for a More Pro-Poor Growth Process in India?', *Economic and Political Weekly*, 35(13).
- Ray, Sumit 1992. 'Development of irrigation and its impact on Pattern of Land Use, Output Growth and Employment Generation', *Journal of Political Economy*, 4(4).
- Sagar, V. 1995. 'Public Intervention for Poverty Alleviation in Harsh Agro-Climatic Environment: Case of Rajasthan', *Economic and Political Weekly*, 30(41).
- Sen, Abhijit 1996. 'Economic Reforms, Employment and Poverty: Trends and Options', *Economic and Political Weekly*, 31(35).
- Shah, Amita 2003. *Land Degradation and Migration in a Dryland Region in India: Understanding the Dynamics* (Unpublished Report), Gujarat Institute of Development Research, Ahmedabad.
- Shah, Amita 2001. 'Drought-proofing: Exploring Wide Options', in M. D. Asthana et.al. (ed.) *Towards Hunger Free India: Agenda and Imperatives*. World Food Program, New Delhi: Manohar Publication.
- Shah, Amita 2000. 'Food Security and Environment: Issues and Evidences', Working Paper 116, Gujarat Institute of Development Research, Ahmedabad.
- Shah, Amita and Sah, D. C. 2004. 'Chronic Poverty in a Remote Rural District in South West Madhya Pradesh: A Multi-dimensional Analysis of its Extent and Causes', CPRC-IIPA Working Paper 5, IIPA, New Delhi.
- Shah, Mihir; Banerji, Debashish; Vijayshankar, P. S. and Ambasta, Pramathesh 1998. *India's Drylands*. New Delhi: Oxford University Press.

Singh R. P. and Binswanger, Hans 1993. 'Income Growth in Poor Dryland Areas in India's Semi-arid Tropics', *Indian Journal of Agriculture Economics*, 48 (1).

Sudrak 2003. *Ajeevika Study* (unpublished), Udaipur.

Sundaram, K. 2003. 'On Identification of Households Below Poverty Line in BPL Census 2002: Some Comments on the Proposed Methodology', *Economic and Political Weekly*, 38(9), March 1.

Walker, Thomas S. and Ryan, James G. 1990. *Village and Household Economies in India's Semi-arid Tropics*. Baltimore and London: The John Hopkins University Press.

World Food Programme 2001. *Food Insecurity Atlas of Rural India*, M.S. Swaminathan Research Foundation, Chennai.