Nobody's Child: The Economic and Institutional Aspects of Soil Conservation in India

REGIONAL REPORT

India

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The paper addresses problems caused by encroachments into forests by the rural poor for the purpose of cultivation in hill areas. While some encroachments were regularized in the past, there remain many encroached-upon lands for which title deeds have not been given so as to discourage further encroachment. Though soil conservation is of critical importance, farmers do not invest in lands under their possession for which they have no title deeds. This paper analyzes the institutional and ecological factors which influence investment in soil conservation and the economic returns from such investment. Analyses have been conducted by ecological zones and age of farms. The results will show that costs are high and returns are low in uphill areas and on newer farms. Thus, cultivation on deforested lands in uphill areas is not economical, particularly if it does not involve soil conservation measures. It is not the lack of awareness of the problems of land degradation, but the institutional and economic constraints that getin the way of proper soil conservation measures. These observations are illustrated on the basis of an area in Iduki district in Kerala, South India, an area which was earlier under forests but subsequently brought under cultivation.

Introduction

The cultivation of natural forests has been one of the most common ways of settling a large number of landless rural poor in developing countries, including India. According to an estimate from India's Forest Department, of the 4.328 million hectares of forest diverted to other uses in India between 1950 and 1980, 2.623 million hectares, or, 60.6 percent, were accounted for by agriculture alone. The balance of 1.705 million hectares of forest was lost to hydroelectric and irrigation projects, industries, townships, electric transmission lines, roads and other factors. In the meantime, some of the waste lands have been

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brought under the Forest Department for forestation and development, and as such, the proportion of area under forests has remained more or less constant over the years.

Both processes—diversion of forests to other uses, especially agriculture and pastures, and conversion of wastelands into forest—have been going on simultaneously. But the latter does not necessarily compensate for the former in qualitative terms, because the forest lands converted to other uses are often very rich. Not only is biodiversity lost, but such converted lands are also subject to a considerable degree of soil erosion. It is not rare to find cultivation even on slopes exceeding 20 degrees. Unless proper soil conservation measures are undertaken, the lands erode quickly and agriculture, particularly under annual crops, can become economically nonviable. The lands can also ultimately become wastelands, which are difficult to reforest later.

The forest lands in India are by and large owned by the government. The process of conversion of forests into agricultural lands has been taking place over a long period of time. This is so in Kerala, which is our region of study, but we will not go into the history of this process, as it has been done elsewhere in detail for Kerala.[1] It suffices to note here that the official policy has changed from open encouragement of forest conversion up to about the 1950s, to offering resistance to encroachment thereafter. As a result of the change in policy, not only were the encroached lands not regularized, thus denying ownership titles to farmers on encroached lands, but also long-term leases of forest land for growing cardamom were not renewed. Thus, we have two types of unowned lands in the operational holdings of farmers in the region—encroached and lease expired, the former being more common. This is mentioned to clarify that although these lands are in the farmer's possession, they are actually owned by the government.

Socially, forest conversion created more equity since castes and communities who previously had no land of their own became landholders, which increased their social and economic status. When natural forests began to dwindle too fast, however, the state government started discouraging forest conversion. Meanwhile, socioeconomic problems were being addressed through land reforms. Encroachment into forests no longer guaranteed automatic official entitlement to land, even though the farmers concerned took possession of the land and cultivated it. There was fear in official quarters that a policy of easy entitlement to encroachers would only encourage further encroachment. As a result, the process of forest conversion has considerably slowed down now compared to the state of affairs before the 1960s.

But the problem created by conversion of forests into cultivated lands in Kerala has remained. Most of these forests were on hill slopes

in the Western Ghats and cultivation made them prone to erosion and degradation. Since rainfall is heavy in the state, land is particularly sensitive to water erosion unless protected duly. In a 1984 report, the High Level Committee on Lands and Water Resources of the Government of Kerala stated that out of the state's total geographical area of 3.886 million hectares, 1.5 million hectares are susceptible to erosion hazards. Hence, soil and water conservation measures were initiated as early as 1955. Since the earlier attempts at conservation were on a piecemeal basis and were found to be inadequate, integrated measures were initiated in the early 1980s, taking watersheds as units for planning and implementing soil conservation. The state government has been investing in soil conservation measures to a limited extent, but mostly in state-owned lands, excluding those in the possession of private farmers. The government also helps farmers in carrying out soil conservation in the form of subsidies or loans in the case of lands to which the farmers have ownership titles. But unowned land in the possession of farmers is nobody's child and is left unprotected by conservation measures.

On the basis of field work in a typical village, Kalkoonthal in the Idukki district of Kerala, which represents the situation posed above, this paper tries to answer the following questions: Is it economically viable for farmers to undertake soil conservation measures on their fields? What are the economic, institutional and ecological limits to undertaking soil conservation measures by farmers? What are the policy implications of our findings?

The Sample Village, Households and Ecological Zones

Though Kalkoonthal is a typical village from the point of view of the land situation described above, it is unusually large—the second largest in Kerala. Unlike the situation in most other states in India, villages in Kerala consist of scattered households spread over a large area, with each farm household situated amidst its own field. There are no nuclear villages with most households together in one settlement. Because of its large size, the village was split into three for the purpose of revenue administration and planning in 1991, one of them continuing to have the old name. The earlier composite Kalkoonthal was spread over an area of 184 square kilometers and the new Kalkoonthal has 62 square kilometers. For our study, we had to take the erstwhile composite village, as earlier records and statistics relate to the composite village as a whole. The composite village had a population of 103,614 in 1991.

Some 36 percent of the working population in Kalkoonthal are cultivators (those dependent mostly on the cultivation of self-owned or leased farms), and 48 percent are agricultural laborers (those dependent on working for wages on farms held by others). The average size of an operational holding, which was 3.24 acres in 1975-76, declined to 2.52 acres in 1985-86. Most of the farm holdings (which increased from 4,812 to 6,157 between the same years) are small. The number of holdings of 10 acres and higher declined from 5.1 percent to only 1.6 percent between 1975-76 and 1985-86, with their share in total area declining from 34.7 percent to 13.6 percent during the same period.[2]

The village has an average rainfall of 2,897 millimeters per annum, and the altitude varies from 692 to 1500 meters above mean sea level (MSL). Soils are mainly forest loam and laterite, and major crops grown are pepper, cardamom, tapioca (cassava) and mixed crops. The proportion of net sown area as a percent of the geographical area has increased in the village even in recent decades from 63 percent in 1971-72 to 73 percent in 1989-90, and that of forest has declined from 23 percent to 19 percent during the same period. Pastures and grazing lands, which were 4 and odd percent in 1971-72, dropped to nil by 1989-90, with the remaining forests serving as grazing lands. A significant part of the cultivated area is erosion-prone in the form of rills and gullies. Rill erosion is a process in which numerous small channels of several centimeters in depth are formed, and usually occurs in cultivated lands. Such rills were frequently seen in the study village in pepper and mixed gardens. Rills gradually get converted to gullies, taking soils downstream. The problem, however, did not affect all fields or areas in the village, and depended on how well-managed the farm was and to what extent soil conservation measures were adopted. It also depended on the slope. Steeper slopes are particularly prone to significant erosion, which becomes less and less a problem down the hill and into declining slopes. Silts from the top also get deposited on lower lands, offsetting erosion to some extent in downhill areas. But excessive deposits of silt and pebbles can also become a problem downhill, sometimes even burying the crops. Conservation measures uphill are very important for survival of crops even downhill.

Because of the importance of ecological zones, we have chosen sample households that are representative of each ecological zone—uphill (over 1050 meters above MSL), midhill (between 1050 and 800 meters above MSL) and downhill (below 800 meters above MSL).

According to the 1991 Census, there were 16,036 households in the study area, which was too large a number for our sample. We randomly selected 130 farm households, not all of whose main activity was necessarily agricultural, since those cultivating tiny holdings below 2

1/2 acres (1 hectare) depended also on other activities like agricultural labor. Sample households were selected so that we could get a sufficient representation of different altitudes. Of the 130 sample households, 34 were from uphill, 61 from midhill and 35 from downhill. This broadly reflected the distribution of cultivated land between the three types of areas.[3] On average, each sample household in the uphill area had 2.1 acres; in the midhill areas 6.3 acres, and downhill, 9.8 acres. The overall average, including all the zones, was 6.1 acres per household. This includes unowned lands.

Unowned Lands and Problems Caused by Them

Table 1 below presents the percent share of unowned land in the total area held by cultivators, both according to the three ecological zones and the size of the holdings.

Table 1

PERCENT SHARE OF UNOWNED LAND (ENCROACHED AND LEASE EXPIRED) IN THE TOTAL AREA HELD BY CULTIVATORS

Size of Holding (in acres)	Uphill	Midhill	Downhill	Weighted Average
Less than 2.5 acres	79.2	71.6	57.1	74.1
2.5 to 4.99 acres	73.9	68.2	48.1	65.9
5 to 9.99 acres	71.0	73.2	51.8	67.2
10 acres & more	80.9	83.7	77.8	81.0
Total	73.1	74.8	59.9	70.6

It can be seen from the table that 71 percent of the land is unowned, having been either encroached upon or with its lease expired. The proportion is higher both in the smallest and the biggest categories. The landless encroach because they otherwise have no or very little land. They thus acquire small operational holdings. The relatively big landholders encroach because they are powerful enough to do so. The variation across size categories is not significant.[4] However, while uphill and downhill holdings are composed of over 73 percent unowned land, those downhill are less than 60 percent unowned. There is less encroachment downhill because a good part of the land downhill and in the valleys was brought under cultivation long ago and regularized. But even here, it is noteworthy that more than half of the area has been encroached upon. Interestingly, as we have noted above, the size of the holding begins to decline as we move uphill. The landless poor find it easier to encroach on the less productive uphill areas, leaving the middle and downhill portions to the already landed households.

The significance of the unowned lands lies in the fact that farmers rarely undertake soil conservation works for them, though they do so on their own lands with support from government subsidies. The institutional factors which explain this have two dimensions. First, since the benefits of conservation take effect over a period of time and the recovery of money spent on conservation also takes time, farmers do not undertake conservation measures unless they are reasonably certain that they will be able to enjoy the tenure of these lands for a long time or that they will get titles to their ownership. But this is discouraged by the government so that there is no incentive for further encroachment into the forests. The net result is that farmers do not invest in soil conservation on unowned lands. Secondly, farmers are unable to raise loans from financial institutions for financing conservation works on lands for which they have neither ownership title nor legal tenure. This also discourages investment in soil conservation on unowned lands.

These factors affect not only soil conservation but also crop patterns. Farmers tend to grow short-term or annual crops like tapioca, which create more soil erosion, on unowned lands. The digging involved in the harvesting of tapioca makes the land even more erosion prone. Planting trees and other long-term crops which can arrest erosion requires security of tenure or some certainty that ownership rights can be acquired in due course.

Apart from these institutional factors discouraging soil conservation in unowned lands, there are others which discourage it even in owned lands. The small size of holdings is a particularly important

factor. Apart from the fact that poor households do not have their own resources (which can be supplemented by loans from financial institutions), small holdings cannot serve as ideal units for planning soil conservation works. Attempts are made to meet this problem through group cooperation among farmers, but this is not as prevalent as it should be. Despite this, even small farmers undertook some soil conservation measures on their own land.

The Economic Viability of Soil Conservation

Institutional factors apart, is it at least economically viable for farmers to undertake soil conservation measures in their cultivated lands? This question must be answered in the context of diversity of ecological zones. Specifically, our interest is in finding out whether it is worthwhile to bring uphill lands under cultivation, even with soil conservation measures.

As a first step, we will analyze the cost of soil conservation per acre of protected land. As noted above, farmers do undertake conservation measures on their own lands. We have taken note of the costs incurred by farmers on an annualized basis which includes investment costs as well as maintenance costs. If soil conservation works are repaired and maintained every year, they can last up to 25 years. Assuming 25 years as the total life span, depreciation each year would be 4 percent. So we have taken depreciation at 4 percent *plus* interest at 5 percent per annum for annualization. Subsidies are not deducted from the costs, so that the costs reflect actual expenditures. We have taken into account the implied costs of family labor also, although money as such was not actually spent on it.

Differences in the periods when farms were started can be a complicating factor in analysis that affects comparability between farms. Converting cash flows to constant prices for a given base period solves this problem only partially. Since labor constitutes the main item of expenditure on soil conservation, we have expressed cash flows at constant 1989-1990 prices on the basis of an index of agricultural wage rates for unskilled labor instead of commodity prices. Despite converting cash flows at constant prices, other differences occur over a period of time, mainly on account of the increasing real costs of soil conservation. Fortunately for us, we found that among the sample farms as many as 63 were started around 1973 and 29 farms were started around 1983. The 92 farms were spread across the three ecological zones. We have therefore used only these farms in our economic analysis, and grouped them separately in order to make the comparison of constant price cash flows meaningful.

Pepper was very popular with the farmers because of high yield and high value. It was grown mostly as a pure garden crop in all the three zones. Pepper is a vine which needs the support of a thorny softwood tree (*Erythrina indica*). Because of these trees, erosion is checked to some extent, but the gardens still need extra conservation measures. Pepper vines have a gestation period of three years and a life span of 26 years. There are also farms with mixed crops, interspersed with several trees, which are less erosion prone than pepper gardens.

Table 2

SOIL CONSERVATION COST IN RS. PER ACRE
(ANNUALIZED AT 1989-90 PRICES)

Ecological	Farms Started Circa 1973 (63 farms)		Farms Started Circa 1983 (29 farms)	
	Pepper gardens	Mixed crops	Pepper gardens	Mixed crops
Uphill	1014	820	1881	1000
Midhill	900	655	1345	760
Downhill	838	500	1142	600

Table 2 presents the cost of soil conservation measures in rupees per acre of protected land, annualized and at constant 1989-1990 prices. Farms started around 1973 and those started around 1983 are separated, as are pepper gardens and mixed crops, and the three ecological zones.

It is interesting to see from Table 2 that as we move uphill, the costs of soil conservation increase. This trend is consistent in all four columns. This is understandable because, as we move up, soil becomes less shallow and more erosion prone, requiring more costly conservation measures. Later, we shall examine whether the higher costs combined with lower productivity are an economic factor seriously discouraging investment in soil conservation.

It is also noteworthy that soil conservation costs are higher for pepper gardens raised as mono crops than for mixed crops. This is so despite the protective role played by the trees required to support pepper vines. Mixed crop farms often have trees strategically placed to check erosion. The root system of mixed crops is fairly effective in

giving protection and reducing soil conservation costs. It may be noted that this difference is consistent in all ecological zones and also among earlier and more recent farms.

Taking the third dimension, the time period when farms were started, it is interesting to observe that here again there are consistent differences between older farms and recent farms. The recent farms have higher costs in each zone and also in each type of farm, pepper gardens as well as mixed crops. It may be recalled that this is so despite our adjustment of costs to identical base year prices using the index of agricultural wages. Cost differences arise not because of the rise in agricultural wages between 1973 and 1983, but due to other factors. Over the years, gullies became deeper, forcing more recent farms to spend more. Unlike earlier embankments, more recent ones had to be constructed on firm foundations. Stone bunds are more prevalent now than in the past. Greater availability of institutional loans for the purpose of constructing stone bunds also facilitated a higher level of expenditure. The disturbing point, however, is that soil conservation costs are increasing in real terms because erosion problems are cumulative. In some cases they may well be irreversible or reversible only at extremely high costs.

We may now see how far investment in soil conservation is viable, taking into account net income after deducting costs for two alternative situations—*with* and *without* soil conservation measures. Since there were no "control" cases of pepper gardens *without* soil conservation, the differences in yields between the two situations are estimated on the basis of experience of farmers and agricultural scientists in the region. The results of our analysis are presented in Table 3, in terms of net present value (NPV), benefit-cost ratios (BCR), and internal rates of return (IRR). The net present value from the pepper gardens is accumulated during their 26-year life span. A discount rate of 5 percent is applied to derive present values. A higher rate is not applied, because cash flows are in real terms, adjusted for inflation, and 5 percent is taken as a reasonable real social rate of discount.

The table shows that investment in soil conservation is more profitable from the point of view of farmers. This is reflected in higher net present value, benefit-cost ratios and internal rates of return in a situation *with* soil conservation as compared to one *without*. This is consistently so in all three ecological zones. The higher costs incurred due to soil conservation are more than compensated for by higher benefits. In the uphill areas, it is not even economically worthwhile to bring land under cultivation without soil conservation, as seen from negative NPV and IRR, and the BCR of less than one.

Table 3

A Benefit-Cost Analysis of Soil Conservation

	A: With Soil Conservation				B: Without Soil Conservation	
	Uphill		Midhill		Downhill	
	A	B	A	B	A	B
NPV per Acre (in 000 Rs.)						
1973 gardens	42.9	9.8	78.0	41.2	99.2	49.5
1983 gardens	35.1	-3.0	60.4	11.6	75.2	34.6
Benefit-Cost Ratios						
1973 gardens	2.15	1.35	3.42	2.74	4.28	3.03
1983 gardens	1.52	0.93	2.62	1.35	2.69	2.06
Internal Rates of Return (%)						
1973 gardens	24.8	17.3	35.5	26.8	45.8	37.6
1983 gardens	15.4	-18.9	29.1	21.6	34.6	33.2

Note: Present values are derived by using a 5 percent discount rate. A higher discount rate is not used because the cash flows are in real terms (at constant prices).

If so, why are farmers bringing unowned lands under cultivation without conservation in the uphill regions? They do not grow pepper there, but mostly short-term crops requiring little or no long-term investment. Besides, in our economic analysis above we have included implied costs of family labor as costs. Since these are not actually incurred in monetary terms, there is a net profit after actual paid-out costs even in uphill lands without soil conservation. This profit is wiped out if the implied costs of family labor are deducted.

Even the positive NPV for pepper gardens obtained after deducting implied costs of family labor is wiped out and becomes negative in uphill farms if the opportunity cost of bringing forest lands under cultivation is included. This is so despite the adoption of soil conservation measures in these areas. These opportunity costs are in the form of benefits which farmers could have derived from forests by grazing cattle, collecting firewood and green manure, or gathering minor forest produce.[5] From this point of view, even converting uphill forests into pepper plantations is not worthwhile from the point of view of society. And it is not worthwhile even from the individual farmers' point of view if soil conservation is not undertaken.

Conclusion

Lands previously in state-owned forests and subsequently brought under cultivation but unowned by the concerned farmers have became nobody's child. They are left unprotected, without soil conservation measures. The proportion of unowned lands increases as we go from downhill to uphill areas, and so does the need for conservation measures. On the other hand, the cost of conservation also increases, and productivity of land declines, from downhill to uphill. The cost of soil conservation in real terms has also been going up over time, because stronger measures are needed as soil erosion increases. Despite this, investment in soil conservation is economically worthwhile from the viewpoint of the individual farmers, as it is more than recovered by the increase in yields, even in uphill areas. It is clear, therefore, that it is the institutional factors in the form of absence of property rights, rather than economic factors, that come in the way of soil conservation.

But then the government is also caught in a policy dilemma. Granting property rights to private farmers on lands brought under cultivation by encroachment on state-owned forests only encourages further encroachment. From the viewpoint of the society and even the collective interests of the farmers themselves, it is not desirable to convert uphill forests into privately cultivated lands.

It is difficult to resolve this dilemma, but not impossible. It is not politically feasible to dispossess private farmers of the unowned forest lands brought under cultivation. Nor is it necessary. Even if proprietary rights are not granted on these lands, the government could itself undertake soil conservation measures on the condition that farmers grow tree crops, interspersed with other crops consistent with soil conservation. To discourage further encroachment, positive measures could be undertaken, such as organizing local people in joint forest management in such a way that the utility of forests to local people is enhanced and forests are managed in a sustainable way.

Group action is necessary for soil conservation, since there are significant positive externalities involving the problem of sharing the costs and benefits in an equitable way. There are already some moves in this direction initiated by Kerala Sastra Sahitya Parishad, a prominent voluntary agency working in the area. But such group action has yet to become more prevalent.

Though this paper is based on the study of a specific state in India, the conclusion and policy implications have relevance to similar areas in any regions where there is a problem of encroachment into forests in hilly terrain for the purpose of cultivation. It is possible that the situation may be worse in other regions where annual crops are cultivated in hilly terrains instead of plantation crops and horticulture.

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Endnotes

1. V. Govindaru, "Policy Environment of Deforestation : Kerala's Experience," paper presented at the seminar on *Greening India's Wastelands*, December 11-13, 1991, at the Institute for Social and Economic Change, Bangalore (Mimeo).

2. This is as per the Census of Agricultural Holdings, where an operational holding is defined as owned area *plus* area leased in *minus* area leased out; the unowned lands under cultivation which are not leased in are excluded. For the purpose of our paper, however, we have included unowned lands under possession as part of the operational holdings.

3. Information collected from the Taluk Office, Land Survey Section, indicated that out of 21,500 acres of cultivated land in the village in 1989, 30 percent was located uphill, 45 percent midhill, and 25 percent downhill. Corresponding figures for the number of farm households were not available. On the other hand, the shares of these ecological zones in the total geographical area were 25, 55 and 20 percent respectively, reflecting a higher proportion of cultivated area downhill.

4. Another study in the Western Ghats in Karnataka State showed that the biggest holdings accounted for the highest share of encroached lands (Nadkarni et al., 1989, Part II).

5. V. Govindaru, "Impact of Conversion of Natural Forests to Agriculture and Plantation Crops on Local Economy and Environment: Kerala," thesis submitted to Bangalore University for Ph.D. degree, Bangalore, 1994.