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An Analysis upon Agricultural Expansion in Forest Reserves in India

Laxmikanth

Research Scholar, Bundelkhand University, Jhansi, UP

Abstract – This study evaluates the relative controls of human induced land-cover change and natural factors on the chemical status of soils, stream waters, and sediments, mainly through a spatial sampling design. Soils of primary forests were found to be chemically similar to those of regenerated forests and agricultural land-covers (pastures and coffee plantations), and differences in chemical concentrations between streams draining areas to varying degrees covered by forest were assigned to natural variability. The farmers, however, perceived an overall increase in environmental degradation as well as a change towards drier and warmer climatic conditions. The climate change was reported to be the main factor responsible for a negative trend in life quality (rural livelihoods). The results may be used in the work of identifying priorities and key factors necessary for environmental and socioeconomic sustainability in India.

It is suggested that a holistic approach for valuation of forests is essential while examining the issue of compensation for expansion and maintenance of forest cover. There is need to identify the set of people/institutions that bear the cost vis-à-vis the beneficiaries in order to develop an appropriate incentive mechanism. Here, the involvement of local people is of paramount importance.

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INTRODUCTION

The pressures on the forest will not go away soon. Tropical forests are being converted to croplands and pastures. In the race between agricultural expansion and agricultural intensification, expansion is winning, and seems likely to maintain its lead over the next 30 to
50 years. Expansion is driven both by wealth and poverty. An immense rural population relies on low-productivity agriculture for its subsistence. A growing and increasing wealthy urban population demands commodities produced at the forest's edge: beef, palm oil, coffee, soybeans, chocolate. The FAO predicts a deceleration in the growth of demand, but still anticipates that cropland in the developing world will expand, on net, about 3.8 million hectares per year for the next] three decades (Bruinsma 2003). Gross expansion will be greater, because some farmland is abandoned. And these estimates do not include the expansion of pasture or of planted forests.

Forests are under pressure, too, from loggers. Logging thins and degrades forests, and helps to finance and provide access to farmers, ranchers, and plantation owners who slash and burn the remnant trees in order to establish agriculture.

The present paper looks at the various dimensions of contributions by forests in the context of the Indian economy. Based on a detailed review of literature on importance and valuation of forests, some policy implications on the issue of compensation to states undertaking afforestation programmes have been analyzed. Certain other unanswered issues have been flagged for wider consultation including the modus operandi for compensation to stakeholders to encourage expansion of forest cover in the country.

Expansion of industrialized agriculture into tropical moist forests (TMF) has increased dramatically over the last century, compromising the survival of Earth's most biodiversity-rich forests (Gibbs *et al*. 2010; Foley *et al*. 2011). TMF conversion also contributes 6–17% of global anthropogenic CO2 emissions. Despite the priorities assigned by biologists for biodiversity conservation, agricultural production goals tend to trump these considerations when expansion is planned (Foley *et al*. 2005).

Achieving concurrent goals of provisioning the planet's growing human population and maintaining biological diversity, including vital necessary ecosystem goods and services from those forests, requires an urgent paradigm shift. With this analysis, we provide one possible way to reconcile biodiversity conservation and agricultural expansion goals in the Pan tropical TMF belt. We identify areas of very low above ground biomass (carbon density) that are likely anthropogenic ally produced, some of which may be

assigned by local and federal governments for potential large-scale commodity crop expansion that will spare important biodiversity areas.

Our rationale is TMF that has already been stripped of high carbon cover (or biomass) will also support less important biodiversity than intact forests. Because such degraded TMF can take decades, or even centuries, to recover and fully mature, these lands will have less conservation value relative to intact forests that should be spared from agricultural development.

Agricultural expansion is widely believed to be the main reason for deforestation in developing countries (Barbier,2004). A study conducted by FAO (2001) of a stratified random sample of the world's tropical forests finds that 73% of the world's forests are being converted to non-forest land due to agriculture. 32% of the forest cover change can be attributed to large-scale agriculture and 26% to small-scale agriculture. Intensification of agriculture in shifting agriculture areas was the third largest cause and accounted for 10% of tropical deforestation. Expansion of shifting cultivation into undisturbed forest accounted for 5%. Barbier (2004) also reports that cultivated area in the developing world is expected to increase by more than 47% by 2050, with two-thirds of the new land coming from deforestation and wetland conversion These figures underscore the importance of examining agricultural land, and factors affecting agricultural decisions, especially in forested areas, such as protected areas and forest reserves. An understanding of the direction and magnitude of effects can help to inform forestry policy and help alleviate pressures on the f rest frontier.

FACTORS AFFECTING AGRICULTURAL EXPANSION IN FOREST AREAS

In examining agricultural practices in forest villages in Chiang Mai I focus on three factors that have been found to be important drivers of agricultural expansion and deforestation: population, transportation costs and the absence of property rights.

Population and Transportation: A seminal study examining the effect of population on tropical agriculture is one by Esther Boserup in 1965. In the study, Boserup asserted that the main effect of a change in population was on the intensity of cultivation, defined as the frequency of cropping. Specifically she asserted that the distinction between intensive and extensive cultivation could be explained by the frequency of cropping. She also argued that population increases lead to a shift from extensive to more intensive systems of land use.

The Boserup paradigm in which population is the main determinant of land use has been used subsequently by many studies, that assume population to be the main driver of agricultural production: many agricultural tropical communities are modeled as aiming to reach an exogenously determined consumption basket. In these subsistence communities, increases in population are the only reason for increases in agricultural production.

The impact of transportation costs on agricultural decisions was first examined by Von Thunen in 1965. Von Thunen suggested that differences in crop choice could be attributed to transport costs alone (he assumed homogeneous soil fertility). He showed that farther farmers are more likely to shift from growing perishable cash crops such as vegetables, to growing crops that are more hardy and storable, such as staples and legumes.

Subsequently, both variables - population and transportation costs - have been cited in the literature examining agricultural expansion although few studies examine their impact in India. Cropper, Griffiths and Mani (1999) and Panayatou (1991) are especially relevant since both examine the impacts of population and transportation costs in India. Cropper et al. (1999) use province-level data to estimate an equilibrium model of land clearing between 1976 and 1989. The}^ find that population density had a large impact on land clearing in North India. The elasticity of land clearing with respect to agricultural household density is found to be 0.41 in North India. Road density (measured as length of road network divided by provincial area) however had no statistically significant impact on cleared area.

An Agricultural household as the unit of Analysis: This limitation, that most studies using the pixel as the level of analysis are unable to explain the role of socio-economic characteristics in explaining deforestation, is alleviated, to some extent, by studies using the agricultural household as their main unit of analysis.

These studies use socio-economic variables to analyze the role of main determinants with respect to the household. Households are modeled differently depending on how well they are integrated with input or output markets, and integration with markets is usually measured by transportation costs.

RESERVED FOREST IN INDIA

Forest resources in India have been increasingly subjected to deforestation and degradation. The prevailing idea in the forest bureaucracy over the last fourteen decades has been that conservation is the sole prerogative of the state. This notion undermines the concern and the ability of the forest dependent communities to preserve their own natural resource and ecosystem. And the effective alienation of these communities from their life support systems has resulted in widespread forest degradation, at the same time placing the state forest departments in perpetual conflict with them.

The colonial rulers had established state property rights over the forests in the 1860s, prior to which there existed unrestricted use rights in them. The

forests continue to be under state property rights and therefore fall under the control of the Forest Department (FD). Ramachandra Guha (2003) has argued that before 1947, our forests served the strategic interests of British imperialism, and after independence, they served the needs of the mercantile and industrial bourgeoisie. However, many view the present arrangement of joint forest management (JFM) as a historic turnaround in Forest Policy. Although this is true to an extent, yet in reality, the present arrangement of JFM is nothing but a share cropping arrangement between the state and local villagers. Still, most forest departments continue to perceive JFM as a grudgingly accepted 'benefit' sharing arrangement to buy some peace with the local villagers. Both the content and process by which most state JFM resolutions have been framed reflect the inevitably unequal relationship between powerful state bureaucracies and the forest dependent communities. In fact, the forest departments reserve the right to unilaterally cancel the JFM agreement if the latter is perceived as violating any given condition (Sarin, 2006).

The economics of forests is characterized by inter-temporal choice, that is, the allocation of resources for consumption and production over time. Central to this theme is the question of determining the optimal rate at which the forests are to be harvested, or the question of 'sustainable harvesting'. Forests can be characterized as a renewable natural resource.

However, they also require certain investments that may help in the regeneration process. The extraction rate should be less than the rate at which a forest regenerates, or else the resource will get exhausted within a finite period of time; the depletion might even result in a state from which the resource is not able to regenerate at all. This is the issue of 'efficiency'.

Two pieces of legislation provide the backbone of modern, conservation-related forest legislation in India: The Forest Act of 1941 and the National Forest Reserve Act of 1964. The Forest Act of 1941 defined a forest as "land without any private rights following land laws". The Act made a break with the past, because it oriented forest legislation towards spatial conservation (Wataru, (2003)). The National Forest Reserve Act of 1964 converted forest area to National Forest Reserves (pa sanguanheang chat). It also laid out restrictions of use within Forest Reserves: Holding, possessing, clearing land, burning, collecting timber and gathering forest products were made illegal within Forest Reserve boundaries (Bugna and Rambaldi, (2001). Forestry legislation did not change significantly before 1989 when all commercial logging was banned and forest policy "shifted to the protection of national environment". It is important to point out that although there were commercial logging interests in this region before 1989, Forest Reserves did not coincide with logging areas.

Since 1964, the official procedure for establishing/altering Forest Reserves has been as follows (National Forest Reserve Act, 1964): New areas, boundary revisions and other changes require a geographic survey and a subsequent Ministerial Order. After approval, Reserve boundaries are marked by poles and signs, and a public announcement is made, directed mainly at district offices, offices of sub-district heads and all affected villages. A National Forest Reserve Committee is established for each forest. The Committee consists of one member each from RFD, the Department of Local Administration (DOLA), the Department of Land (DOL) and two members chosen by the Minister of Agriculture.

Importantly, all appeals disputing Reserve boundaries are passed to the National Forest Reserve Committee. Villagers who claim usufruct rights to land within the reserved area can appeal only after an area is designated a Forest Reserve.

This appeal is sent to the National Forest Reserve Committee and the Minister adjudicates. Since an appeal contesting boundaries must be made within 90 days of the area being designated a Forest Reserve, people living within boundaries of Forest Reserves are frequently deemed 'illegal encroachers' if an application is not presented within the mandated 90 day period. No distinction is made between older residents and newer occupants.

IMPORTANCE OF FOREST COVER

There has been increasing realization that forests provide numerous benefits to mankind including improvement of the quality of environment. Forests provide goods and services and maintain life support systems like timber, fuel wood, fodder, and a wide range of non-timber products. Further, forests are a source of natural habitat for biodiversity and repository of genetic wealth, provide means for recreation and opportunity for eco-tourism. In addition, forests help in watershed development, regulate water regime, conserve soil, and control floods. They contribute to process of carbon sequestration and act as carbon sink, which is important for reduction of greenhouse gases and global warming. In ecologically sensitive areas like mountains, as well as river catchments, forests play an important role for prevention of floods, etc. Degradation of forest resources has a detrimental effect on soil, water and climate, which in turn affects human and animal life. This has created global concern for protection and preservation of forests.

It is important to recognize that the benefits of natural forests are rather different than man-made forests. The ecological benefits of natural forests are difficult to replicate in a man-made forest. Functions like carbon-sequestration, would depend on topography, soil conditions, density of forests, etc. The functions of forests both for the natural system as well as the social dimensions can be briefly seen in the following statement. It may be mentioned that while natural forests provide for all these functions, only some of these benefits may arise from man-made forests.

PROPERTY RIGHTS WITHIN FOREST RESERVES

Before 1953, national forest policy in India was exclusionary: legislation did not recognize de facto use of land within Forest Areas and recognized no rights of residents within its boundaries. In 1953, authorities realized that such exclusion was not practical given the large population dependent on forest resources and their traditional uses. As forest authorities realized the needs of villagers, limited use of forest areas began to be permitted. RFD, along with the Ministry of Agriculture and relevant officers, began to provide limited sanctions for use of Forest Reserves.

Applications to secure sanctions/rights to use land within Forest Reserves and extracting forest products were accepted at the District forest offices and sent to the headquarters via provincial forest offices. The Director General of the Forest office made these decisions. In 1975, official forest villages were created, via a cabinet resolution. Landless peasants were allotted land within these settlements, which could be used, but not sold or used for collateral.

A review of the literature reveals that although usufruct rights were granted, usufruct rights within Forest Reserves were being continuously investigated and re-defined at least until the 1990s. This contributed to a great deal of uncertainty amongst Forest Reserve inhabitants. Thus for instance, in 1957, people occupying forest land at the time were given land titles called SK-1 (So-Ko 1) and NS-3 (No-So 3). (SK-ls were claim certificates that were granted if residents successfully established possession before 1957. Land with an SK-1 certificate could not be used as collateral. NS-3s were granted for land that could be traded and used as collateral.) Then in 1976, the cabinet authorized the Department of Land and Ministry of Interior to issue NS-3K (No-So-Ko-3) land titles. (These were secure land titles but ownership could be challenged if land remained fallow for more than five years.)

In 1990 according to TDRI, more than 20% of the country's 56,000 villages were located within Forest Reserves. An increased frequency of
conflicts between encroaching villagers and forest authorities is an indicator of the tension between forest preservation and rural livelihoods.

METHODOLOGY

This paper describes characteristics of the 670 study villages used in this dissertation. The data for the study are provided by Thammasat University, which has been regularly collecting biennial data on rural villages in India since 1986. The data are collected for the National Economic and Social Development Board (NESDB).

This is followed by explaining how I constructed the data set for 670 Reserved Forest villages from a data set consisting of all villages in the province. One feature of the survey is that village headmen provide responses to questions and the survey records modal values of variables. Data are collected via questions such as: "What is the mode of transport most (popularly) used by households in the village?" or, "What is the method of sale for most households?"

The study dataset is a subset of a larger dataset collected by Thammasat University for the province of Chiang Mai.[20] The villages included in the study dataset all responded that they lay within Forest Reserves at least once. All villages in the dataset are registered villages i.e. villages have to be registered with the Village Directory of the Department of Local Administration (DOLA). However all villages do not always respond that they lie within Forest Reserves for all the years that they are surveyed.

CONCLUSION

The problems relating to use and conservation of natural resources in developing countries like India are qualitatively of a different nature than those of developed countries. Whereas in developed countries the primary issue is protection of what remains in nature, in India the preservation of natural resources must necessarily consider the competing claims of humans on these resources for their sustenance and livelihood. And this includes a huge population that is completely dependent on the forests and is among the poorest as forests form life support systems for them. Recognizing the real relationship between the forest resource and the people surviving on them, any legal and administrative regime must aim to judiciously utilise these resources for addressing the concerns of livelihood while ensuring sustainability of their use.

Agricultural area also grew by 1.8% during the period. To the extent that both these occurred concomitantly, and that upland rice cannot be grown on land devoted to other crops, the study suggests that it may be important to do a more detailed analysis of the factors affecting rice cultivation is detrimental to the environment.

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