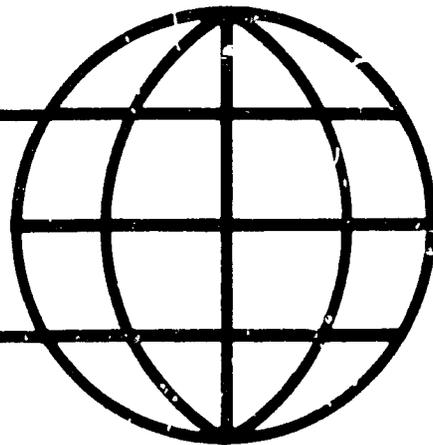


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**COOPERATIVE AGREEMENT ON HUMAN SETTLEMENTS
AND NATURAL RESOURCE SYSTEMS ANALYSIS**

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LAND TENURE, INSTITUTIONAL FACTORS
and
PRODUCER DECISIONS ON FRAGILE LANDS

by

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Social and Environmental Cycles on Fragile Lands

Recent years have witnessed the emergence of a highly charged debate over the appropriate use of fragile tropical lands. As one observer has commented, tropical soils have either been represented as "a chimerical vision, liable to disappear in a puff the first time a spade is set into them, or a super-exploitation zone that can be mined constantly with little or no negative consequence" (Stouffer 1984:6).

Understanding of the ecological issues related to fragile lands has increased sufficiently in the past decade, however, to allow us to move beyond such simple either/or propositions to an appreciation of the range of possibilities for land use. Experience has shown that, in some contexts, permanent land use or cropping systems have led to severe erosion and other types of soil deterioration while in others, stable and prosperous patterns of exploitation have been established. In examining the differences between these two types of experiences, it is important to distinguish between problems that are related to the innate characteristics of an ecological zone and those that are social and economic in nature (Johnson 1982:329) as well as to understand the interrelationships between social and ecological processes. As Hecht (1981) has said of the Brazilian Amazon: "...a variety of ecological factors...are linked to agricultural instability in the Amazon Basin. Nevertheless, to view them as the only causes of the ephemeral character of agricultural production...would be to ignore the catalysing effect of the economic structure of the region, and the social dynamics it creates (p. 97).

The discussion that follows focuses on social processes that lead to

environmental decline in fragile land areas. It emphasizes two problems --indebtedness and labor scarcity--that have been widely documented among smallholders in fragile land contexts. Both of these problems give rise to inappropriate patterns of land use that speed processes of environmental decline. The result is lowered production which exacerbates the conditions that gave rise to the inappropriate strategies. The end result is irremediable environmental damage, loss of land by small producers, or both.

The initial problems of indebtedness and labor scarcity, and producer decisions to engage in inappropriate patterns of land use in attempts to remedy them, are linked to a variety of structural variables, including: the amount and terms of credit available; the size and quality of landholdings; security of title; and government price policies and market conditions. These variables result from government policies toward the agricultural sector in general or toward fragile land areas in particular. They may reflect a desire to open new lands as an alternative to agrarian reform, to reduce population pressure and poverty in more favored rural areas, to increase production of certain export or food crops, or any combination of these goals.

Whatever their goals, such policies have frequently been based on an incomplete understanding of the ecological constraints and social pressures that characterize fragile environments. The discussion that follows will identify the kinds of research that can assist in formulation of policy. It will also specify those questions that can be approached in much the same way for fragile lands as for other regions, and those that require more specific understanding of the costs and returns to production on fragile lands, the special technologies and productive knowledge required, as well as the dynamics of social and ecological change that are generated.

Prerequisites for Fragile Land Development

Fragile lands are characterized by their tendency to deteriorate under a wide range of uses. They may be classified as fragile because of soil characteristics, degree of slope, excessive rainfall or any combination of these factors. While the present discussion is generalizable to most, if not all, of the easily degradable lands in Latin America, it focuses most explicitly on the steep slopes of the eastern Andes and on tropical forest regions. It does not consider the potentially fragile areas of South and Central America where sustainable production processes, using traditional technologies, have been maintained for centuries, but focuses on areas where newly-initiated and non-sustainable productive strategies create the potential for serious environmental degradation.

Decisions to promote development of fragile lands require that policymakers be able to answer the following questions:

- 1) What are the potential sustainable uses for a region?
- 2) What are the long-term costs of initiating appropriate uses in comparison with the costs of improving production in established agricultural regions?
- 3) How does the development of fragile lands contribute to the broader goals of agrarian policy?

The knowledge required to answer the first question is rapidly becoming available. Posner et al. (1982) have recently classified 68 land systems for Andean steplands, and have grouped these into nine land use categories. Protective management or reserve status was indicated for 55% of hill and highland areas. Appropriate uses for the remaining 45% of lands included several types of tropical annual and perennial

cropping systems, combinations of forestry and pasture, and range management systems. Effective policy for fragile lands rests on the ability to identify sustainable uses for particular regions (Goodland 1980). Even the best policy design and structuring of incentives will not be able to forestall environmental destruction if inappropriate uses are instituted.

The second question is more difficult to answer, given present knowledge, particularly when the long-term effects of a particular land use pattern are considered. The costs of sustainable production on fragile lands are high and productivity is frequently low. In new lands the additional costs of provision of infrastructure and of planned settlement programs must be considered. A failure to come to terms with this question, however, may lead to a situation in which smallholders are encouraged to undertake production in a region where the most appropriate management, given current technological and productive knowledge, will not yield returns sufficient to cover production costs.

The third question requires that policymakers think broadly about the impacts of fragile land use. Will it create labor scarcity in other regions? Will it increase or decrease food production? What will be the overall impact on the distribution of landholdings and on landlessness? What constituencies stand to gain or lose from the exploitation of fragile lands?

The ability to answer these three questions clears the way for fragile land development in areas where annual or perennial cropping systems or animal husbandry are indicated. Favorable answers do not guarantee success, but are prerequisites to any development effort. Once they have been answered, attention must shift to an identification of those

structural or institutional factors that promote ecological stability and long-term viability of land use systems and those which lead to destructive land uses. It is this question that will be addressed in the sections that follow.

Cycles of Indebtedness

One of the most striking aspects of the literature on smallholder production on fragile lands is the frequency with which one encounters descriptions of rights to land being lost. Land loss seems to occur regardless of whether or not producers have clear titles to their land. It is frequently associated with a pattern of accumulation of land by largeholders, most of whom seek to consolidate property for cattle ranching.

The major mechanisms by which small producers lose access to land in fragile areas are indebtedness and violence. Methods of violence require little explanation. They have been described most frequently for the Brazilian Amazon (Foweraker 1981, Hecht 1981, Wood and Schmink 1979), and are precipitated by the differential ability of large and small farmers to produce goods for which a strong market exists, such as cattle. This contributes to the relative weakness of the smallholder and the aggressiveness of the larger farmer in seeking expansion. In frontier regions, or other contexts where governments are willing to ignore such activities, violent dispossession occurs with relative frequency.

More common, but presenting problems of equal magnitude for smallholders are cycles of indebtedness which force them to sell or otherwise alienate their lands. Numerous examples of the dynamics of such a process have been provided. In the Upper Amazon of Ecuador,

loss of land has been associated with peasant indebtedness resulting from the initial costs of claiming a plot of land. While these costs can frequently be paid over relatively long periods of time, clear title cannot be obtained until the obligation is fully met. In order to repay the loan, small producers intensify their slash/mulch polycultural production beyond sustainable levels, so that yields drop every year. Indebtedness initiates a cycle of environmental decline which in turn increases indebtedness. At the end of a few years, many small producers sell their lands in discouragement. They do not receive full price, however, because they do not have permanent titles. Populations of colonists become differentiated into large landowners, wage laborers, and a few smallholders who have paid off their initial debt and established a foothold (Hiraoka and Yamamoto 1980).

A similar cycle has been described for the Brazilian Amazon. Along the Transamazon Highway, credit has been most easily available to small producers for rice production. This has created pressures for producers to devote relatively large percentages of their land to rice, mitigating against diversified, multi-cropping systems that may be more ecologically and economically tenable in the region (Moran 1981, Smith 1978, Schuurman 1979). As Hecht (1981) has indicated, the only trouble-free year for such an endeavour is the first one, after which declining soil properties and weed invasions lower yields.

While this is a serious problem for any small producer, it is exacerbated by indebtedness. Farmers who do not fully repay a loan at the end of a season are ineligible to receive credit for the next year and may be forced to abandon production. Alternatively, pressure to repay loans in a bad year may force intensification of production, speeding soil

erosion and environmental decline. Eventually, as in Ecuador, the land of smallholders is sold or abandoned to larger farmers or ranchers. Larger owners may also denounce small farmers for unsound ecological practices such as excessive burning of lands (Wood and Schmink 1979:89), leading to high fines which occasion property loss. As Hecht has emphasized, the instability of production in these areas reflects the land economics of the region as much as soil fertility, with indebtedness increasing the vulnerability of small farmers to larger holders (1981:79). Indebtedness, in this case resulting from poorly planned credit policies, increases that vulnerability, forcing producers to adopt strategies oriented toward short-term gain. This fuels processes of environmental deterioration and reduces future yields in a process which, unless reversed, leads to land loss within a few years.

These examples not only illustrate the complex interaction between ecological processes and the social dynamics of fragile land production, but they also raise several very specific questions with regard to the way in which social dynamics can be altered by changing structural and institutional factors that affect decisions made by small producers. In the settlement of new lands, ways must be sought to manage indebtedness related to titling so that incentives to production for short-term gain are not created. Credit programs can be organized to promote sustainable multi-cropping or agroforestry systems as easily as monocropping. Multi-year credit, or refinancing systems, could be examined as alternatives to seasonal credit which leads to land loss upon default or creates incentives to intensify production.

Finally, commitment to smallholder production requires examination of the dynamics of accumulation by large owners and a search for ways to

reduce the inequalities between large and small farm sectors. Current market conditions provide many incentives for ranching. Given the destructiveness of cattle in most fragile lands environments, policymakers may wish to consider whether market forces lead to allocations of land and other resources that are in the long-term best interests of the nation as a whole. Cattle ranching not only foments inequalities in agrarian structure on fragile lands, but it may also do irreparable environmental damage, removing them from sustainable production for generations to come (Toledo and Serrao 1981, Goodland and Irwin 1975).

Cycles of Labor Scarcity

Traditional development theories tell us that labor is abundant and capital is scarce for small producers in developing nations. Nelson's (1973) volume on the development of tropical lands begins with this proposition. In most contemporary rural settings, however, the opportunity cost of labor is not low. Studies have shown that families exploiting the steeplands of Mexico, Peru, and Bolivia acquire between 50 and 75% of their household income from off-farm employment (Deere and Wasserstrom 1980). When this practice is combined with appropriately-mixed cropping systems and small-scale animal husbandry, excessive demands on labor may result, particularly if critical activities overlap. Researchers have noted the limits this situation places on a farmer's ability to invest in soil conservation practices and productivity-improving technology (Posner and McPherson 1982, Posner et al. 1982).

An extreme example of this phenomenon, and an illustration of its dynamics is found in the Tambopata Valley of southern Peru. In this region, farmers producing coffee on the steep slopes of the upper valley face a variety of production and marketing constraints including lack of

credit, poor transportation, a government monopsony on the purchase of coffee and insecure titles to land. As a result of these structural factors, they are unable to obtain a sufficient return from coffee production to meet household needs on a year-round basis. To make ends meet, they maintain their highland subsistence plots. An initial attempt at colonization has become a prolonged pattern of long distance seasonal migration (Collins 1984).

Again, in this case, social cycles initiate cycles of environmental decline. While the producers in Tambopata have traditional techniques of soil management which are quite effective, and while they grow coffee alongside the archaeological remains of lowland terraces built by their ancestors, the seasonal nature of their use of the fragile steeplands of the valley has prevented them from expending labor on soil management and severe erosion has resulted.

Posner and McPherson (1982) have argued that

...farmers who are less poor have less need to "mine" their farm land by emphasizing present consumption over future consumption. Second, being less poor, farmers will also have more resources, including labor time, to adopt soil conservation practices and invest in productivity-improving technology. (P. 347)

In order to promote effective development of fragile lands, it is necessary to know what size landholding (or what combination of landholdings) is necessary to provide year-round subsistence for families under various farming and land use systems. The amount of labor required for the maintenance of sustainable production under various systems must also be considered. Policies directed toward small producers on fragile lands must recognize that labor is not unlimited and its opportunity costs are not as low as traditionally assumed. Technologies directed toward small producers should not count on unlimited supplies of labor for their

implementation (Posner et al. 1982, Collins 1984), but must consider overall productive strategies. It is possible that the provision of opportunities for on-farm diversification may be a more viable alternative in fragile land settings than current trends toward increasing participation in off-farm wage labor, raising the possibility of introduction of new crops or processing activities that would distribute labor requirements more evenly throughout the year.

Conclusions

The preceding examples illustrate the interrelationships between social and environmental processes in fragile land environments. They indicate clearly how structural factors can influence producer decisions and may lead to productive strategies that promote environmental decline.

Questions raised with regard to small holder production on fragile lands differ from those that might be raised in other contexts in three ways. Obviously, technology and productive knowledge are different from that required in more favored areas. Second, the dynamic of change is more rapid due to the way in which structural problems produce environmental consequences, feeding back on one another and speeding processes of decline. Thirdly, the consequences of poor planning and policy are severe and more frequently irreversible on fragile lands. Nevertheless, the fundamental problems of access to land, the implementation of sustainable farming systems and the structural factors that determine their success or failure are not different in nature from those encountered in other rural settings. An improved understanding of the ways in which credit, titling and factor and commodity markets affect the behavior of small producers in a variety of settings will provide insights into their dynamics on fragile lands. Such insights can then be incorporated into

models of the social and environmental cycles that have characterized these lands and into policies that seek to restructure the incentives to and constraints on producers to promote sustainable production in keeping with the overall goals of agrarian policy.

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