

**CONTEMPORARY DYNAMICS OF AMAZONIAN DEVELOPMENT
REANALYZING COLONIST ATTRITION**

I. INTRODUCTION

To the countries of the Amazon, the importance of Amazonian territory has surged during the last decade. Geopolitical concerns questions of internal hegemony, economic integration, the displacement of social pressures to Amazon zones via colonization are but a few of the agenda underlying expansion into the region. The economic role of the Amazon basin in national economies ranges from major foreign exchange generators in agricultural commodities such as coca to cacao, to revenues from mineral finds of gold and petroleum. Amazon countries have launched large public programs in infrastructure, rural credits and regional development approaches ranging from colonization to industrial growth poles. These programs; stimulated in-migration of settlers. Currently the Amazon as a whole is characterized by:

1) Rapid, but uneven rates of deforestation. The deforestation process has a diversity of causes including road development, colonization policies, stimulation of spontaneous settlement, credit and fiscal incentive policies in the livestock and agricultural sectors, the coca boom, predatory timber extraction, export incentive policies, mineral exploration (especially for small scale gold extraction), large scale mineral extraction and its related infrastructure development, threats of agrarian reform, and general insecurity of land titling.

2) Extremely rapid rises in the population of Amazonia during the last 15 years. As Table 1 shows, Brazilian Amazon population increased by some 54% in the decade 1970-1980, and a similar pattern exists in Ecuador where an increase of some 76% is

noted in the national census data. The Guaviare region of Colombia experienced an increase of some 65% in the same decade, while the Alta Huallaga areas of Peru registered a demographic surge of some 45%. Those who have worked with these census materials generally think that Amazonian populations are under-represented in them because of the dynamic nature of current migration, and because census activities are difficult to carry out in the region. Clearly these percentages are in part an artifact of the relatively low populations recorded in earlier decades, but there is certainly no question that populations have increased dramatically in the Amazon basin and probably now approach some 20 million inhabitants.

3) Explosive urbanization. On the average at about 50% of Amazonian inhabitants live in mushrooming boomtowns and cities. The Brazilian data is classic in this regard, (See Table 2) but the phenomenon is repeated throughout the region. While most of the focus on Amazonian issues has concentrated on rural problems, the urban environmental and social-economic crisis are equally as severe.

One theme that constantly emerges in the analyses of Amazonian settlement is that of high rates of peasant "failure," lot abandonment, out-migration etc. What is clear is that colonists are differentiated when they arrive at the frontier (Moran 1982, Blanes 1987, Coy 1987) and that they are often in competition more capitalized enterprises such as timber extractors, and livestock ranches for access to land, labor, credits, and physical and social infrastructure. Several studies have been devoted to analyzing why peasants succeed or fail on the Amazon frontier (cf Painter 1986, Gill, 1986, Collins 1986, Aramburu 1987, Moran 1982, Smith 1982, Coy, 1987, Hiraoka and Tokomata 1980, Maxwell 1982, Fearnside 1986) but general comparative analyses that deal with theoretical as well as the specific characteristics of a given frontier situation are frequently lacking. This paper explores the dynamics of colonist attrition first focusing on the magnitude, of this process and then evaluating the

major models of explanation to explain it. By reanalyzing some of the central features of Amazonia peasant economies, some of the implications of colonist attrition for deforestation and urbanization will be discussed.

While this paper focuses on the dynamics of small scale settlers, I emphasize that large scale activities, such as cattle ranching, plantations, charcoal production and speculation and the economic dynamics that surround them are probably more important in absolute terms in driving deforestation (cf Hecht 1985, 1986, Fearnside 1986). Still, colonist attrition is a major concern because of the social as well as environmental costs inherent in one of the largest migrations of this century.

II. ATTRITION IN AMAZONIAN SETTLEMENT

The factors linked to attrition/failure are complex because they are in part determined by specific regional dynamics in particular countries. However, there are sufficient common themes to warrant a comparison between colonist settlement throughout the Amazon. Such an analysis is valuable because of 1) the role of colonists or colonists in interaction with other regional actors in the deforestation and other processes of environmental degradation; 2) the costs of peasant settlement and failure in financial and human terms; 3) the policy implications a different approach might engender. Many well intentioned regional development programs have remained fundamentally misguided because they have not understood the basic features of the rural economy, and/or the policies are powerless in the face of larger macro-economic forces.

Whether land occupation is spontaneous, semi-directed or directed, and whether the projects are public or private, the attrition rates in Amazonian settlements are troublesome. Table 1 outlines the rates of attrition for Amazonian rural settlements where data are available. The methodologies for ascertaining these percentages are

variable, but can involve re-censusing colonized areas over time, and estimation techniques based on urban or rural migration studies. What is quite clear is first that the data show fairly large ranges in attrition, ranging from 15% to 85%, but in general about two thirds of the colonists fail.¹ This table shows that high levels of attrition are general throughout the region, and not a peculiar outcome of one particular region.

1. Land abandonment as failure? Speculation and Violence

A. Speculation

First, does leaving one's land always constitute failure? The answer here is clearly no. There are two driving factors which operate very differently: land speculation and violence. Both can include a strategy of accelerated deforestation as a means of expanding or certifying land claim. Land speculation has been noted in many colonization/settlement areas, and has been an important force in large scale clearing for pasture. Documented areas of settler speculation include Santa Cruz/San Julian/Chapare in the Bolivian Amazon (Painter 1987, Gill 1986, Stearman 1984) the Araguaia, Rondonia, Acre, TransAmazon, Mato Grosso, Western Maranhao of the Brazilian Amazon (Fearnside, 1986, Hecht 1982 1985, Moran 1982, Schminck 1982, FAO report 1986, Coy, 1987, Allegretti and Schwartzman 1988, May 1986), the Guaviare and Caqueta zones of the Colombian Amazon (Ortiz 1982, Molano 1987, Dominguez 1982, 1987, Hecht 1986b). Generalized land markets are relatively new to the region, since much of the land was considered state land, or under non-capitalist usufruct tenure systems until quite recently. In the Brazilian Amazon, for example, some 50 million ha. were transferred from state to private ownership in the last 20 years. While the scale is less dramatic in other parts of the Amazon, the process is similar. Adjudicated transfers from public to private ownership represent a major one time

subsidy from the state, and titled land is often a pre-requisite for access to credit in Peru, Bolivia, Ecuador, Brazil and Colombia. Thus, although land is not physically scarce, it may become "institutionally" scarce through the patterns of adjudication (Hecht 1985, 1986a). Moreover, much of the current value of land reflects its potential for institutional rents (credit, proximity to roads), its importance as a reserve of value (Mahar 1979) potential land resources such as timber or minerals, its physical or spatial characteristics, as well as factors important to production such as soil fertility. In addition, the lack of other safe regional investment opportunities and investment barriers outside the region can tend to inflate land prices, particularly in zones of super profits, as in some coca, or gold regions. The returns to labor by becoming a small scale land speculator can exceed those of other agricultural activities (FAO 1987, Fearnside 1986). Indeed, cleared land, usually for pasture has a greater value than forested land (see Fig 1). Extending this speculative process is one means of accumulation for small scale entrepreneurs who may continue either to the forest frontier, to repeat the land clearing dynamic or migrate to urban areas.

B. Violence

The role of violence in land abandonment is difficult to assess. In general three main forms of violence can be identified in Amazonia: that linked to narcotraffic, guerilla activities, or land or resource conflict. Many people migrate to the Amazon frontier to escape violent interludes in other areas and it often represents a final arena for those who have been marginalized elsewhere. Classic in this regard was the "Colonizacion Armada" into the Guaviare of Colombia in the 1950s (Molano 1987), where the violencia in the highlands triggered the first major Colombian post war migratory shift into the Amazon territories. In Colombia violence continues today

linked to the narcotraffic, and political conflict between the FARC (Forces Armadas Revolucionario Colombianos) and the military. The primary source of mortality for men under forty in Guaviare is gunshot wounds. The Cocaine trade with its high profits and illegal nature may very well be increasing the prevalence of rural violence in the Amazonian coca producer zones.

The struggle for land, rather than explicitly political or drug related violence is a central dynamic in land abandonment. Aragon (1978) has documented that practically a third of the of the migrants he analyzed in the Eastern Amazon left their place of origin because of rural violence. In the eastern Amazon, according to the documents of the Catholic church, some 13,700 families are involved in some form of lands conflict in dispute over 1,473,122 ha in the greater Carajas region. In all of Brazilian legal Amazonia, 497 deaths last year were a result of land conflict (CPT 1987).

In the Brazilian case, the issue of land conflict is addressed through the use of direct intimidation, such as assassination threats, burning of houses, etc. means of avoiding conflict for large land owners is through rapidly clearing large areas and converting them to pasture, rather than running the risk of squatter settlements in forest areas on lands of potentially contestable title. Both large and small holders may be tempted to clear as much land as they can in order to maximize the area under "effective use" because agencies that guarantee title or compensate expropriation do so on the basis of improved area as a percentage of the total holding. In the case of INCRA, this index is 1:5 --- the area cleared times five is the holding size; INTERPA, the land institute of Para state in Brazil uses an index of 1:12. The threat of agrarian reform has also increased the rate of deforestation as large owners try to show effective use through forest conversion.

What is clear is that leaving one's plot can signify one of the few means of capital accumulation available for peasants, or a survival strategy in the light of increasing violence of both political and economic natures. Both strategies imply clearing with limited productive use, and, in the case of land conflicts, rewards directly correlated to larger cleared areas.

Violence and land speculation generate colonist attrition in numerous areas in Amazonia. In terms of environmental issues, both are likely to generate careless land use. The first, in the climate of insecurity produces minimal investment in perennials and careful management since one can be dispossessed of the products of one's labor. In the case of speculation, the exchange value enormously supercedes the use value so investments in production per se are minimal and short term. Moreover, pasture land which is much less labor intensive, can command or exceed the price of agricultural land. In this light, the "pecuarization" linked to land speculation at the small scale is an important source of revenues.

2. Factors of Failure

While not all land abandonment necessarily reflects agricultural failure, a great deal of the attrition in rural areas is due to the inability of rural households to maintain themselves from season to season or year to year. This "reproductive squeeze" has been the focus of several forms of explanation which will be outlined in the next paragraphs. What has been systematically overlooked is the degree of participation in wage labor markets, gender issues in household income formation and the "subsidy from nature" (by which I mean small scale extraction both for household reproduction and sale. See Hecht et al. 1988). To understand the processes of peasant attrition it is necessary to analyze the main models that explain peasant failure, and to review them in light of the processes of settlement. Most studies tend to privilege

environmental/agronomic, macro or micro economic, or infrastructure or institutional features. These are clearly relevant issues, but they neglect the fundamental feature of rural economies: household income formation, which can illuminate factors that have been overlooked in other analyses.

Environmental and Agronomic Models.

This group of explanations basically focuses on either environmental determinist, and/or technical deterministic perspectives that focus on the features of the environment itself, or inappropriate agricultural technologies. Typically, plant diseases, pest outbreaks particularly those associated with perennials, human diseases such as malaria, and last but not least, soils are viewed as the central optic for explaining attrition. Human disease issues are seen as being amenable to improvement through the provisioning health services, and so is not seen as a permanent factor of failure, in spite of the reputation of the "insalubrious tropics", and the unfortunate timing of malaria peaks with rice harvesting and planting seasons. More complex, is the long history of environmental determinism linked to soil properties in the tropics (See Meggers, 1954). This perception pervades the analyses of colonist failure, and has been central in setting regional and international research agendas for Amazon zones.

i. Soils

Colonist failure is often linked to soil fertility questions (cf Moran 1982, 1986, FAO 1987, Sanchez et al. 1982, Maxwell 1982) as numerous studies have now shown that the productivity of annual crops under continuous cultivation eventually collapses if no fertilizers etc. are applied (Sanchez and Benites 1987). Most of the soils in the Amazon have at least one soil or physical constraint, and often several

(See Table 2). Because of the characteristics of biogeochemical cycling in the lowland tropics, soil fertility for short cycle agriculture on virtually all Amazonian soils involves nutrient inputs whether from the ashes of burned forest, mulches or purchased inputs. Even on the relatively fertile "Terra Roxas" -- Alfisols --- in the upland zones, the soil fertility parameters are over rated when compared with the fertility on many productive temperate zones soils used for annual cropping systems. This logic underlies current discussions of agroecological zoning and carrying capacity. A problem with this perspective is that, as several authors have shown, soil fertility of colonist lots does not predict colonist success or failure (Moran 1982, Fearnside 1986, Leite and Furley 1984, Maxwell 1982), and it is not even clear that under frontier conditions that initial soil fertility alone adequately predicts colonists yields anywhere in the Amazon.

Fearnside's results show that even though semi-proletarianized peasants (or laborer farmers using Moran's definition) planted smaller areas, had less diversified agricultural production strategies based largely on monocultures, and focusing mainly on a risky, low value crop (upland rice), generally on poorer soils, their probability of failure was not significantly higher than independent farmers (middle peasanton better soils with a diversity of production systems) at all densities simulated. A central issue in rural societies is that: household reproduction is not uniquely determined at the agricultural field. It depends on local regional and international economies commodity markets, and on labor markets, and often on access to some extractive resources.

The issue is not really that of adequate production of calories and proteins because pure subsistence production among Amazonian settlers is virtually non-existent. They are linked to markets for purchase of numerous items from the beginning. The central question is what does it take for colonists to survive, and

then the relative role of off-farm wages in household income formation. Labor allocation to farm and off-farm activities has important implications for land management and survival strategies, both in terms of the environmental questions, and the features of the regional labor and commodity markets.

The portion of gross income derived from wages is often quite high. Data from the TransAm show that between 62% and 82% of colonist gross income are derived from waged work (Moran 1982), in western Maranhao the figure is 33% (May 1986, Hecht et al 1988a), and Bolivian figures are 64% (Gill 1987). In general, the returns to agricultural activities hover at about 1 dollar per man day (and are actually declining in some areas such as Bolivia and Ecuador -- cf Painter 1987], roughly half the going wage rate at the minimum salary. Small farmers may thus be less interested in agricultural work on their own lots as a central income source, and view agriculture as a subsistence supplement to their wages.

Variability in crop yields is a function of management, and management can be expressed quantitatively in terms of time allocated to agriculture. Given the returns to labor, both speculation and sale of labor exceed the returns/man day in agriculture (cf FAO 1987, Browder 1988). Alternate employment can reduce labor availability for soil conservation and productivity improving technology (cf Collins 1982, Deere and Wasserstrom 1981). Moreover, the relative returns to improved technology may not translate into significant economic gains for peasants given the size of their holdings and the relative value of the crops they grow. Labor has a very real opportunity cost; a "rational" peasant may reduce labor allocation in agriculture through labor saving choices or choices which maximize the return to labor. These can lead to land degradation (Collins 1988). Such strategies would include planting pasture, casual land management, monocultural production and of course, expanding primary forest cutting because with the higher productivity, and

less demand for weeding of new lands, the returns to labor are substantially higher than in older plots.

ii. Agricultural Technologies

While this space is too small to summarize debate about agricultural technologies in the humid tropics, the technology and production issues have been the subject of wide ranging, and occasionally rancorous disagreements. The form of debate follows two main lines: technical adjustment arguments and the larger critique of the entire monocropping production systems. In the first case, the features of the production system are viewed as infinitely malleable, and colonist failure linked to agriculture as an unfortunate agronomic episode, but one easily improved upon. The classic example is the TransAmazon upland rice debacle. Rice delivered to colonists was an improved variety unadapted to the exigencies of the Amazonian uplands and performed very poorly. While supplied with credit to plant the rice, colonists were often unable to repay loans, and were ultimately forced to abandon their lots (Smith 1982, Fearnside 1986, Moran 1982). There are several examples of such misapplied technical recommendations from Colombia, Ecuador, and Peru. These kinds of specific foul-ups do have a simple technical fix, but ignore the larger constraints of annual cropping systems in Amazonia, both biotic and economic.

The next line of criticism revolves around agricultural intensification models (the so called "Yurimaguas" technology developed in Yurimaguas in the Peruvian Amazon by the North Carolina State research group) that consists primarily of fertilization and biocide applications on short cycle crops. The arguments pit intensified monocultures versus more "indigenous" agricultural models based on multicropping systems with a high proportion of perennials. The main problems with

the intensification model at the level of the farming system that can enhance peasant failure are:

- 1) erratic availability of inputs of fertilizer etc;
- 2) application difficulties and timing problems in the use of inputs;
- 3) riskiness in the face of secondary pest or nutrient imbalances;
- 4) low profitability even when the yields are adequate because of the kinds of products produced;
- 5) indebtedness;
- 6) labor availability;

The larger question of the sustainability of this model without subsidized credit also remains open to question even if larger structural constraints are ignored.

Others argue that tropical lowland development models should be based on land management models that developed there and that are more closely integrated into the dynamics of tropical systems (Altieri 1987). These generally include large numbers of diverse agroforestry systems, but settler versions of these tend to focus on a few specific cash crops. In the settler context, such agricultural models that incorporate perennials are also problematic and can threaten colonist livelihoods due to:

- 1) length of time to production;
- 2) pest and soil problems;
- 3) difficulties obtaining the proper planting material;
- 4) problems with labor requirements;
- 5) indebtedness;
- 6) problems with extension;
- 7) market volatility.

Both short cycle and agroforestry systems are relatively weak solutions for settlers who have little capital, but short cycle crops at least assure a fairly rapid income. It is thus not surprising that perennial crop production in Amazonian

settlement zones falls far below initial targets. In the Guaviare, perennial production is roughly 10% of projected (Corporacion Araracuara 1986) in the Polonoreste project, (FAO, 1987) about 42% (although this seems to be highly overestimated, and is not borne out in the census materials) and about 25% of target in Peru. Ecuador, in contrast indicates that about 73% of the area in the agricultural census is in fact in tree crops, of which coffee dominates: it covers 43% of the area in agriculture. Another 18% are in large scale African oil Palm plantations.

Privileging the agricultural system in the analysis still focuses the issue of colonist success or failure at the level of farm production. Even if production is good or adequate there are still a number of factors that can impinge on the returns, since price determination for agricultural commodities in Amazonia is not necessarily a function of local supply (cf Crouch and de Janvry 1980, Goodman 1985, Homen de Melo 1986, de Janvry and Dethier 1985, Lipton and Longhurst 1985). Several exogenous factors and economic factors at the macro and micro level influence the returns on production.

2. Macro Economic Factors

A. International Markets.

The macro economic issues that influence settler prices fall into two categories: those that operate at the level of the international markets, and those that respond to the national macroeconomic context. The first set is expressed mainly in the role of international markets for tropical agricultural commodities which can fluctuate enormously. This fluctuation can be further compounded through the influence of marketing boards that may purchase at well below the international rate, or, national producers in other parts of the country may insist on segmented pricing patterns with Amazonian products receiving a lower price. In Brazil, Rondonian cacao was

priced at 2/3 that of Bahian cacao, in spite of the higher risk, and greater distance to market experienced by Amazonian producers, and a similar phenomena exists in Colombia. Because Amazonian commodities of cacao, coffee and rubber are produced in tropical zones throughout the world, prices are volatile, and in many cases show a downward trend. This is especially the case for cacao, the main legal export crop of the Amazon. In each case, the price projection shows a decline for most Amazonian commodities, thus one should be quite cautious about the potential gains to perennial crops linked to international markets.

B. National Pricing Policies.

There has been a long history of strong government intervention in the formation of domestic prices for agricultural goods, but this intervention has been highly uneven across regions and crops. In an attempt to keep urban food prices low, price ceilings for many basic food items exist in all the Amazon countries. These ceilings tend to reflect average costs of production in privileged areas with relative ease of access to infrastructure and markets, and are often subsidized with substantial levels of credit (Graham et al 1987). In addition, agricultural commodity prices tend to be constrained relative to many of industrial products or agricultural inputs due to several import substitution policies. While the terms of trade move against agriculture generally in Latin America, these effects are particularly pronounced in Amazonian contexts, where the quality of the agricultural products is generally considered inferior, and where the costs of transport and monopsonistic control of inputs drastically increases the costs. The surplus extraction through unequal exchange can be a major means of decapitalizing peasants, even if their yields for cash crops or food crops are good (cf Bunker 1985, Gill 1987, Painter 1986, Redclift 1986).

C. Credit Policies

In all the Amazon countries, the 1970s was a period of enormous credit expansion into agriculture, although Amazonian credit lines generally represent less than 5% of agricultural credits except in Bolivia where the Santa Cruz zone is the major agricultural producing region, and receives two thirds of the Bolivian commercial agricultural credit. In the Amazon, credit is very unevenly distributed across crops and farms. The number of settlers who are served with any form of state assistance in Amazonia varies at less than 20% for all the Amazon countries. For the Brazilian Amazon where state intervention is more perfected than in other Amazonian context is only about 10% of potential users receive credit, although in a survey of livestock producers on holdings above 500 Ha, 85% had access to credit (Homma et al 1984). Access to credit in general in Amazonia depends on formal title, a major limiting factor for credit worthiness for many spontaneous migrants.

Selected commodities have been favored with special credit lines, particularly those destined to the luxury or export markets (i.e. cacao, coffee, beef cattle, oil palm, cotton, soy) which are usually produced on larger holdings. This focus of credit reflected the strategic role of export expansion and substitution policies of the Amazon country governments, and the political economy of credit in these countries (de Janvry 1981, Hecht 1986a Hecht 1985, Crouch and de Janvry, 1980, Lipton and Longhurst 1985). In specific colonization projects, such as Polonoreste, more credits were made available to smaller producers.

The rates of interest charged to agriculture were systematically negative in real terms and often remained unchanged during the 1970's period of credit expansion, in spite of inflation rates that vastly exceeded the interest rate on loans (bank rates in agriculture hovered at about 12% while inflation in all the Amazon countries exceeded these levels). With negative real interest rates, excess demand for credit

induced the banks to seek loans that minimized transaction costs. This resulted in most of the loans being captured by large and medium size farmers, while small producers were often left to the usury of local credit brokers. Several credit distortions were thus at play creating competitive disadvantages for settlers that reinforced unfavorable market conditions for them. Credit can also be used as a direct income supplement by low income farmers. In these cases, when credit dries up, their situation becomes very unstable.

3. Local Economic Issues

In the local economy several factors emerge that further exacerbate the insecurity of pricing and the problems of surplus extraction from peasantries. The concrete costs of obtaining credit, monopolistic commercialization, informal credit markets, crop mortgaging, relatively high labor costs, and astronomical transport are powerful forms of profit taking on small producer production.

The combination of macroeconomic policies and the local merchandizing configuration place Amazonian peasants at an enormous disadvantage in national markets. In the marketing of perishable food crops, goods are heterogeneous, transportation expensive, storage facilities vastly insufficient or poorly located, post harvest losses are huge, and marketing margins enormous. Not surprisingly, several studies of Amazonian peasant agricultural returns show that the costs of production and marketing are in fact often negative, or only slightly positive (Moran 1982, Gill 1986, Corporacion Araracuara 1986, FAO 1987, Browder 1988). Given the returns to production, and the accentuated forms of surplus extraction, even a good producer can find himself in a precarious situation.

There are mechanisms to address this situation at the level of the household, one of which is wage labor. In terms of land use strategies, peasants tend to try and procure credit for those activities that receive subsidies (cacao, rice, beef, for the most part), although there are a number of structural reasons from land titling, illiteracy, class biases etc., to the cost of obtaining credit (which can exceed the value of the credit itself cf Bunker 1979, Moran 1982, Blanes 1987) that interfere with this strategy. In addition, settlers can attempt to increase the total amount of agricultural products offered at market. Because labor is often the most limiting factor, forest clearing for agriculture with its relatively high yields early on remains an important strategy, with pasture grasses planted into the former agricultural plots. This permits the renting of pasture if the household has no large animals, and makes the land attractive for resale with very limited labor costs. Continued clearing for higher yielding annual crops and for grassland development are melded into the economic pressures that often undermine colonist agricultural stability at the frontier. This dynamic in part explains the continuous expansion of pasture even in small farm settlements.

4. Infrastructure and Institutions

The problems outlined in earlier sections are also compounded by issues of infrastructure, and some institutional factors like titling. The infrastructure issues are obvious, because if one cannot move one's produce to market there are difficulties in realizing its profit in sale. The problems with infrastructure make highly exploitive transport operations feasible. Storage facilities (or their location) are also often problematic.

7. Institutions

Land titling remains a critical issue throughout the region because of the diversity of overlapping legislations, ranging from pre-capitalist usufruct laws, squatter rights, illegal land markets, and official land titles, all of which can lay claim to the same piece of land. Under existing legislation in all the Amazonian countries, land can be claimed in frontier zones by using it. This increases the incentive to incorporate as much area by clearing to secure one's claim. The problems of labor scarcity at the small farm level, induce further conversion of as much land as possible, which once again leads to the use of pasture as a means of physically occupying space. While annual clearing rates may be erratic (Fearnside 1986) conversion clearing rates are between two and four hectares per year per household according to data from Peru, Bolivia, Brazil and Colombia (Aramburu, 1987, Painter 1986, Fearnside 1986, Hecht 1986b).

Showing actual use is one way to claim squatters rights, but in fact these rights are often not recognized by the state or by other regional actors. The conflictual nature of much Amazonian occupation, and the tenuous legal hold that the powerless have over land resources means that settlers often choose a strategy that reduces their losses should they be expropriated. This strategy includes : 1) minimal investment in perennial crop agriculture, under most conditions, except near the house; 2) low labor intensity land uses such as pasture, 3) minimal soil conservation practices; 4) strategies that maximize return to labor such as continued land clearing as long as this is institutionally possible. Thus, a combination of low intensity land use and minimal management translate into an accelerating deforestation front.

The frontier structure of difficult ecologies, economies and social contexts is the reality which Amazon colonists face and includes numerous factors well beyond their control. Analyses that focus on the sources of colonist success or failure as

primarily related to agricultural production ignore the central problematic of peasants, which is how does one get access to cash? The two main "conventional" strategies involve wage labor and petty extraction. Peasant success or failure in Amazonian frontiers involves how successfully the portfolio strategy of agricultural production, wage labor, entry into marketing circuits and small scale extraction functions. The central optic becomes of that household income formation. The structure of Amazonian labor markets, and access to extractive resources thus can become crucial issues for explaining colonist success or failure, and probably should be given the same analytic weight as agricultural policy in regional development. Finally, there are other strategies that also need to be taken into account: engaging in the coca economy in the Andean Amazon, small scale mining, and cyclic urban migration as part of the larger regional survival strategies.

AMAZONIAN PEASANT ECONOMIES: THE ROLE OF EXTRACTION AND WAGES

A great deal of recent research in Latin America has pointed to the importance of the wage supplement to rural incomes, but, with very few exceptions, analyses of the Amazonian frontier have not paid much analytical attention to this issue. Far less widely studied is small scale extraction. These systems of extraction can involve managed or semi-managed forests for timber, rubber, resins, fibers, oils, fruits, and medicinals, hunting, and appear to be a central feature of relatively stable Amazonian populations. Studies of the rural economies of the Maranhao frontier zone, the riverine populations of Iquitos and Belem and studies of Caboclos all point to a complex strategy of income formation including several extractive products, waged or commercial activities and agriculture (Hecht et al 1988, Anderson & Anderson 1983, May 1986, Anderson et al 1987, Padoch et al 1986). The social relations that define these systems are quite complex and range from debt peonage, sharecropping, corvee,

exchanges in kind to wage labor, often on a single enterprise. While technical landlessness abounds, access to resources is highly negotiable, although the human exploitation inherent in many of arrangements can be quite onerous (Schwartzman and Alligretti 1988, Weinstein 1982). Rural survival without access to such extractive resources is, however, unimaginable. Household income derived from extraction often exceeds 30% of cash received (Hecht et al 1988, May 1986). The extractive resources appear, for the most part to be managed on a sustainable basis, and the populations involved with these commodities have been producing them for decades.

Data from colonization studies often tends to underestimate the importance of these non-agricultural income earning activities, but full time farmers are a minority, with anywhere from 35% to 100% of farmers involved in off farm activities. The lowest areas of semiproletarianization tend to be those linked to the coca economy, which sustains a full time proletarianized landless labor market and pays a princely return to even small scale land owners.

1. Extraction in Colonization Zones

Extraction activities clearly occur in new settlement zones, and have been documented by Sharif for Peru (1982), Hiraoka (1985), Brazil (Butler 1986, Smith 1982, Moran 1982, Hecht et al 1988, Schminck 1985, Miller 1985, Bunker 1979 Wesche 1985, Allegretti and Schwartzman 1988), Colombia (Hecht 1986), Bolivia (Gill, 1987, Stearman 1984). While extraction is often viewed as a decadent residual from previous booms, the volume of extraction and its economic value (see Table 3) suggest that extractive activities are dynamic parts of the Amazonian economies. Table 3 really only indicates the importance of exports which overlooks one of the major markets for extractive goods which are local and regional (cf Padoch et al. 1984, Anderson et al. 1987). The significance of extraction products for households is often routinely

underemphasized, but is significant everywhere this aspect has been analyzed in Amazonia (cf Hecht et al. 1988, Hecht and Schwartzman 1988, Anderson and Anderson, 1983, May 1986, Anderson et al. 1987).

Extraction at the frontier can take several forms. These include the interfacing of an existing extraction economy with a colonization front where some colonists may begin to incorporate existing extraction forms into their activities, or existing populations may participate in colonist services, such as rural credit. In Rondonia and Acre, some colonists began to tap rubber trees and collect Brazil nuts (Schwartzman, pers. comm. Millikan, pers. comm). In various areas in the eastern Amazon where colonization programs have impinged on existing Caboclo cultures, participation in credit programs and extension has been documented (Wesche 1985, Miller 1985). Another, far more widespread model however is destructive exploitation. The classic example is the extraction of valuable timber species as part of the colonization process and is ubiquitous in Amazonian settlement. Indeed, it is often a critical subsidy to colonists fortunate enough to find valuable trees on their lots. Browder (1988) reports that the returns from timber are essential to making the internal rates of return positive for colonists. Extraction in this context may represent an explosion of pre-existing, though small scale timber industry, or the entrance of a completely new extractive economy with infrastructure development.

A final model is that represented by the Babassu economy in the eastern most Amazon, where, as cleared areas are taken over by Babassu, the economy based on petty extraction of Babassu nuts follows the clearing front.

It is possible to have several types of extractive economies overlapping with agricultural economies, so called "layered economies" operating simultaneously, but a central issue is whether the extraction itself is sustainable or not. This depends on a combination of accumulation, market and survival strategies involving:

- 1) Whether large scale operators subsidize their enterprises with wood sale;
- 2) Whether large operators exclude access to extractive resources on their holdings;
- 3) Whether larger operators completely convert forested areas into other land uses, such as pasture which usually precludes regeneration of forest resources;
- 4) Whether small scale settlers use timber to subsidize their holdings;
- 5) Stability of access to forest and riparian resources;
- 6) Intensity of market pressures for over-exploitation (esp. for fauna extraction, and high quality timber);
- 7) Whether regional populations who know how to manage local forest resources can persist.

While extraction is widespread, and important, it is generally not sustainable under most frontier conditions. Large holders, interested in accumulation attempt to cut out valuable timber as quickly as possible, and depending on the context, transform areas that have been cut into other uses often pasture. Settlers subsisting in precarious circumstances are desperate for cash. In Rondonia, roughly 60% of colonist households sold timber, in Tucuma in the South of Para, 30% of households engaged in the timber trade, Smith (1982) reports a great deal of use of wild game by initial colonists, and some sale of timber and shows the use of a large number of forest products by settlers. The central issue here is that the strategies of both large and small scale actors are under pressures for either accumulation or subsistence. The small scale settler may be able to stabilize himself on the basis of the one time subsidy from the sale of particularly valuable resources, but under the frontier extraction pressures, it is a one time event. Moreover, extraction of use value items (fish, game, fruits, etc.) may also progressively deteriorate through over use, and access rights are often vulnerable to change. For settlers, extraction is an important economic contribution at the initial phases of the frontier occupation, but this source of income is ephemeral under intense conversion pressures.

In "layered" economies, where the colonist frontier contacts existing and viable extractive economies, the transformation of access rights, and/or forest conversion can clearly destabilize a sustainable extractive economy. The Brazilian information is by far the most complete in this regard with data from Maranhao (Hecht et al, May 1986, Anderson & Anderson 1983), Itaituba (Miller 1985), Southern Para (Schmink 1985), Medio Amazonas (Bunker 1982) and Acre (Hecht and Schwartzman 1988).

The ephemeral nature of non-sustainable extractive economies under frontier conditions implies progressive destabilization of this source of income for colonists if agricultural activities remain as difficult on the frontier in later phases as they are in the beginning.

2. Frontier Labor Markets

The structure of rural Amazonian labor markets is linked to several main activities:

- 1) Deforestation for large projects (plantations, ranches);
- 2) Deforestation labor for settler plots;
- 3) Temporary agricultural labor;
- 4) Timber extraction and processing;
- 5) Road building and civil construction;
- 6) The informal economy in both urban and rural forms;

What is characteristic of the labor markets is their temporary nature, both seasonally and over project life. In the case of timber cutting, deforestation, and civil construction, labor demand may be high but temporary, and maintenance labor requirements may be far lower and more erratic. Moreover, the generalized process of either expansion of livestock production, or in some cases, the expansion of highly mechanized agriculture (such as Sta. Cruz Bolivia and Altamira and Mato

Grosso in Brazil), further constricts the rural labor markets. With the exception of the Coca economy, rural labor markets in colonist zones tend to diminish over time if no new activity such as mining, comes in.

The need for off farm income, suggests that the as the settlement project continues, the ability for buffering the uncertainty in agriculture declines. As farmers are increasingly thrown onto the vicissitudes of agriculture and accumulation at the frontier, the forces of attrition become sharper for those without substantial capital. This helps explain the phenomena noted by Scudder (1983) that tropical colonization programs have the highest rates of failure not in the earliest years, as a "sink or swim" perspective might suggest, but in the "consolidation" phase, when populations should have adapted, when the infrastructure and marketing systems are somewhat better. Thus, the phenomena so widely noted throughout the Amazon: human rural density often declines with time in settler areas through processes of land concentration which are related not only to the difficulties in the agricultural system but also in the declines alternate sources of rural income.

The peasant response to this "reproduction crisis" can take several forms depending on local context:

- 1) urban migration in order to be closer to urban labor markets, and also to be close to zones where more family members can be employed, hence the rates of urban migration that are among the highest in Latin America in the area where there is the most land;
- 2) migration to the next frontier using the capital from the land sale (and possibly sale of timber etc) when reproduction of the household becomes impossible. This leads to a continuing cycle of frontier deforestation;
- 3) in Andean zones, entrance into the Coca economy if possible;
- 4) entrance into gold fields or other mining activities as in Rondonia, Eastern Amazonia, Madre de Dios zone of Peru.

This analysis suggests that those involved in settlement policy or its implementation in Amazonia need to carefully address the issue of the labor markets

in the region. It is clearly a neglected issue, and, I believe one of the central features in peasant attrition in Amazonia. Participation in off farm wage activities has important implications for land resource management strategies by peasants, and may be far more important in the adoption (or lack of adoption) of new technologies, particularly those involving perennials than other factors, particularly in the labor intensive establishment phase (cf Collins 1985). In concrete terms this involves much more careful analysis of the regional economy and the structure of regional labor markets, and looking at projects in areas that already have developed labor markets, and consolidating investment in such zones. The explosive urbanization in the region reflects perceived urban wage opportunities in many cases and the untenable nature of much contemporary settlement. Urban solutions are often questionable in the more remote areas, since the economic base is extremely weak (Hecht and Schwartzman 1988).

CONCLUSIONS

The overall dynamic of these processes is suggested in Figure 2. The returns from extraction are highest in the earliest phases, labor markets are most robust, and the colonist agriculture is often most productive. With time, depletion of extractive resources, contraction of labor markets and the normal vicissitudes of agriculture make colonist persistence more difficult. When violence and speculative forces are added to this mix the question is not why do colonists fail, but why do any succeed at all. Those who do succeed are those best able to buffer the decline and to take advantage of the increasing economic instability of their cohorts. High initial levels of capital, ability to enter commercialization or transport networks, large amounts of family labor, locational advantages (i.e. proximities to roads), are some of the features of successful colonists (see for example Moran 1982, Gill 1986).

While extraction and wages can buffer the processes of peasant differentiation in the initial phases of settlement, if no stable regional economy emerges, the subsequent costs in colonist "shake-out" will engender the ironic feature of Amazonian development: "the empty frontier" -- as the waves of accumulation and subsistence wash over the landscape, leaving mainly degraded pastures in their wake.

The discourse of settler attrition has focused on the farmer's field as the major determinant of failure, whether through ecological factors, or some lack of entrepreneurial spirit, or even all inclusive terms like misfortune (Scudder 1986). National and International research investment poured into agronomic, pasture and soil amendment research while the structure and dynamics of Amazonian rural economies remain largely ciphers to Amazonian planning agencies. These are far more powerful at explaining colonist attrition than soil pH. Agronomic research alone has not and will not be able to counter the dynamics of deforestation and explosive

urbanization because peasant attrition or success is not uniquely determined in the agricultural field. Far more research effort and analysis needs to focus on the dynamics of extractive economies, regional economies and labor markets, factors that, in the end can generate stable rural employment. Without attention to these issues, we can expect only more deforestation, more urbanization, more violence and the destruction of tropical forests -- the basis of a sustainable regional economy.

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ATTRITION RATES IN AMAZON SETTLEMENT

Country	% Attrition	% Pop in Wage Labor	Extraction	Speculation
BRAZIL				
Rondonia	23%/yr (1) 63 (2)	49.7	Yes	Yes
TransAm.	38 (3) 13%/yr (4) 67 (5)	75-100 (3) 71 (4) n.d.	Yes	Yes
BOLIVIA				
Alto Beni	50 (6)		Yes	
Nuevo Mundo	68 (6)	65 (6)	n.d.	Yes
Sta. Cruz	32 (7)	35 (7)	Yes	Yes
Yacapani	47 (8)	66 (9)	n.d.	n.d.
San Julian				
PERU				
Uchiza/ Nuevo Horizonte	80 (10)			
Peru Oriental	30 (10)			
Alta Huallaga	40 (10)			
Tingo Maria	80 (11)			
Jennaro Herrera	57 (12)	100(12)	Yes	Yes
COLOMBIA				
Guaviare	15 (13) 28 (15)	68% (14) 40 (15)	Yes	Yes
Caqueta	32 (16)	24 (17)	Yes	Yes