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COPING WITH A NEW ENVIRONMENT

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I. Introduction

Rapid population growth, plus efforts to improve living standards, has led a number of nations throughout the world to exploit heretofore undeveloped areas of their national territories. Brazil is among those nations which still possess such vast and untouched natural resources. Both its population and its economic activities have been concentrated along the Atlantic coast for most of the nation's history.[1] Only in the 1950's, beginning with the construction of Brasilia, did the Western states begin to develop. It was not until the 1970's that the Federal government initiated a vigorous program of economic development in its most tropical region--the Amazon Basin (Smith, 1972; Wagley, 1971, 1974).

The area affected by this Amazon development scheme was not wholly unpopulated. There was already present a sparse population whose adaptation to life in the tropical rain forest has been noted(Lathrap, 1968; Moran, 1974).[2] Government efforts to develop the Amazon and to bring farmers to the land encouraged a second, and more heterogeneous, population to migrate from all other cultural areas of Brazil. Both groups found themselves colonizing the lands transected by the Transamazon Highway(see figure 1)[3]. The presence of both migrants and local people, makes this an exceptional area in which to study cultural adaptation in the tropics.

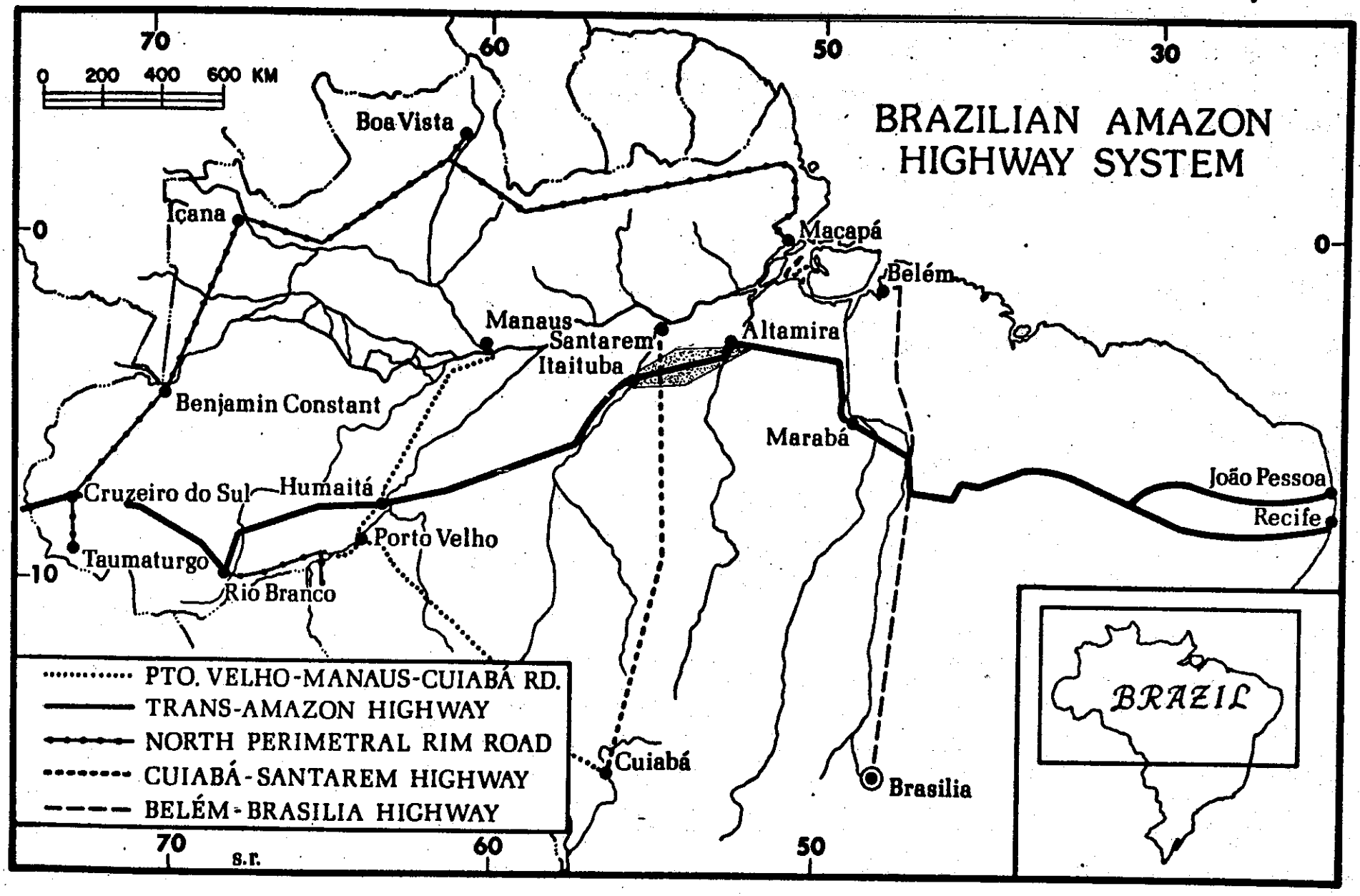

Figure 1. Brazilian Amazon Highway System (Wagley, 1974:292)

The Transamazon colonization project, begun in 1971, has been planned and financed by the Brazilian Federal Government, and had been in operation three years at the time this study was conducted.[4] Some 6,000 landless farmers from all parts of Brazil have received 100 hectares (250 acres) of virgin land[5], credit assistance, and other supportive services as colonists. Some have succeeded as farmers in this new physical, social, and institutional setting, while many others have not. This differentiation raises questions as to why some succeed where others fail. Both farming success and the use or non-use of available forest products will be noted in evaluating the performance of farmers. This paper will compare the ways in which local and migrant groups use available resources in order to determine which economic and ecological strategies are most successful in coping with the Amazon tropical rain forest.

Unlike traditional homogeneous populations such as those studied by Nietschmann(1973), Rappaport(1967), and Waddell (1972), that of the Transamazon does not yet have a singular or universally accepted cultural response to its physical environment.[6] The immigrants have brought to this tropical area a stripped-down version of the cultural blueprint that once fitted their respective regions of origin.[7] While all Brazilians share in a national culture to one degree or other, regional subcultures also exist and are made up of specific responses to the physical and social features of various geographical regions(Wagley, 1948:457-464).

One such regional subculture has developed as a particular response to the tropical forest-riverine environment now crossed by the Transamazon Highway. This is the culture held by the Amazonian caboclo[8] (Wagley, 1952; Moran, 1974). The caboclo population uses a set of strategies adapted to both the physical environment of the tropics and to the traditional social isolation of a region with precarious transportation facilities.

Adaptation to the physical environment of a rain forest, the social environment of planned villages,[9] and to the institutional environment created by the colonization agencies has led to a variety of coping strategies among the colonists. To best deal with these various behaviors, a typology will be used to group similar strategies. This typology is derived both from the various backgrounds of the colonists and their current performance in the Trans-Amazon. While every aspect of a farmer's background is not indicative of his farming potential, certain elements of his employment history have visibly affected his farm management strategies and, consequently, his success or failure as a farmer. Of these, previous ownership of land and frequency of migration will be shown to be particularly useful in predicting cultural adaptiveness and farming success.

Transamazon farmers can first be divided into two major groupings: brokers and clients. This two-fold division describes the most basic social and economic relationships

present in the area. Brokers consist of those homesteaders who through their managerial skills can generate their own capital, and re-invest a major portion of this capital back into their enterprises. The clients are those who depend on the brokers or on outside institutions to provide them with a steady cash income in order to survive. The latter group employs most of their capital resources for consumption items rather than farm investment. Secondly, brokers tend to be more stable geographically than clients. Brokers, at one time or other have owned land or durable goods such as trucks and machinery. Their managerial expertise has come from learning to exploit the physical and financial resources of an area, and investing heavily in their use. The clients, on the other hand, are basically a labor force; they go where there is a demand for their labor. Their constant mobility, in turn, has kept them from acquiring the managerial acumen necessary to run their own commercial or agricultural enterprises. In short, we have distinguished between rural managers and rural proletarians.

These two major groupings, however, are too broad to be operationally useful. If one is to adequately account for the various adaptive strategies observed among the Transamazon farmers a more precise typology must be employed. Within each of the two broad categories, two sub-types may be defined. Brokers can be sub-divided into entrepreneurs and independent farmers; clients, in turn, into artisan-farmers and laborer-farmers.[10]

The client category is essentially made up of two forms of rural proletarians. The first, laborer-farmers, have come from largely rural, sharecropping or migrant labor backgrounds, and are characterized by a high degree of mobility and possession of few durable goods. Figure 2 compares previous migrations among the various types of farmers. The high level of migration of laborer-farmers would suggest that these are persons who customarily work for others. They have many years in low-skill agricultural work but little experience in farm management, and have repeatedly failed to do well economically. They are traditionally tied to the landowner-patrons by symbiotic bonds which provide them with security, yet effectively keep them in their low economic position(Johnson, 1971). Patrons deal with them paternalistically and, in bad times, may provide a minimum subsistence. The patron gains by this arrangement by paying low wages, expecting hard work, and charging high prices in the fazenda-run store where credit is available to laborers. Since laborers tend to repay their patron in farm produce and deal with the local store on a debit-credit basis, they have gained little experience in managing cash resources.

Nelson(1973:288) points out that this type of farmer is found less frequently in areas of spontaneous colonization than in government-directed schemes. This situation is probably associated with the lack of personal initiative of those accustomed to the dependency-breeding fazenda environ-

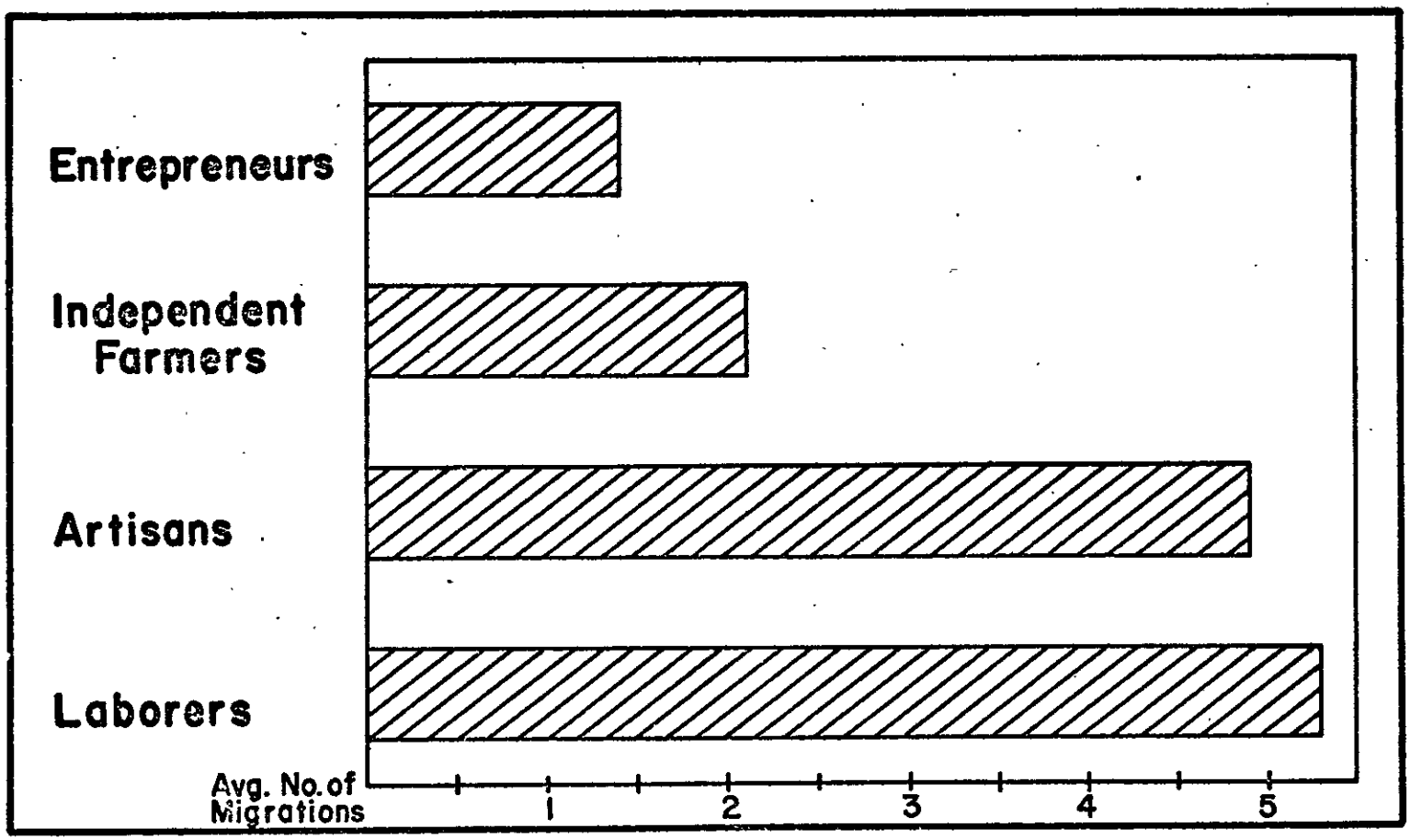

Figure 2. Number of Previous Migrations among the Four Types of Colonists

ment(Diégues Júnior, 1973). Many laborer-farmers are attracted to the Transamazon Project due to the numerous services and opportunities promised by the Federal government. They expect the colonization agency to be a far more benevolent patron than those they had, heretofore, known.

The second client group, the artisan-farmers, are also characterized by a high degree of mobility(see figure 2). A major difference between this group and the laborer-farmers is the former's urban experience which has led them to acquire craft skills or more education. In turn, this qualifies them for better-paying jobs. While their various skills might be considered second-rate in most urban areas, and would not merit substantial remuneration, such skills are in great demand in rural areas undergoing rapid development. Thus, in the Transamazon, artisans have sought and found well-paying jobs with the government agencies as carpenters, stone-masons, construction foremen, and professional chauffeurs. Since the artisans have come to depend on these jobs for their livelihood, rather than on their farm production or their managerial talents, they are classified as clients rather than brokers.

In the broker category two major subgroups may be distinguished. First, the independent farmers are a group of largely rural persons who previously have been the owners of small landholdings or managers on landed estates. Unlike clients, they have lived in the same place for most of their

lives(see figure 2). Independent farmers of the Transamazon are, in a way, like the European mixed farmer in that both emphasize self-sufficiency.[11] They plant a wide variety of crops, for both home use and market sale. Cattle raising is commonly practiced but only the few colonists of German descent employ draft oxen and use cattle manure as fertilizer. In general, all independent farmers who own cattle process milk into curds(coalhada) and home-made cheese(requeijão), some of which is sold. Canning and preserving are not practiced in the Amazon but other cottage industries more adapted to the tropical environment are utilized. Broadly speaking, the strategies of the Transamazon independent farmers and the European mixed farmer are similar, although their specific practices may differ. The differences in their strategies result from their adaptation to particular environmental demands. Most of their day-to-day needs are met through diversified production, and the cash profits from their agricultural production are returned to the farm in the form of livestock, payment for new clearings, replacement of farm equipment, and a few consumer goods. The independent farmers and their families supply most of their own labor needs in farming and in cottage industries. Therefore, with relatively few farm expenditures and constant re-investment of farm profits, independent farmers show ever greater agricultural production.

The second group of brokers, the entrepreneurs, is one of limited membership. The Altamira region, where colonization began,[12] abounds with adventurous entrepreneurs but most of these are engaged in the town's commercial sector, rather than in the farm sector, any new area needs such a group to organize people and resources into a profitable flow of goods, services, and capital. Active entrepreneurs in the area, like the independent farmers, are characterized by previous land ownership or farm administration experience, and by a low degree of previous migration. They differ from the independent farmers, however, in having more urban experience and higher capital assets on arrival to the Amazon. While the majority of farmers indicated that they had very little money when they arrived, entrepreneurs came with an average of US$500. This small, but nevertheless significant, amount of capital allowed them to proceed quickly with land preparation and other capital-generating activities without having to depend on the release of government-subsidized loans. Local dry goods stores and vehicles were often acquired with this capital and now generate a substantial income for this small group.

Besides general stores and motor vehicles, the entrepreneurs' main interest has been to invest their profits in pasture development and cattle. Their previous management experience and exposure to urban financial institutions have given them a facility in dealing with banks, bureaucracies

and clients. They even may serve as middlemen between the government and the other colonists in both economic and social transactions.[13]

Each of the categories in the aforementioned typology includes persons native to the Amazon region. Transamazon caboclo colonists largely come from a riverine environment where they planted small intercropped fields, and fished or hunted for their protein. Some of them have spent time panning for gold in the Tapajós River region, or tapping rubber in Acre or Xingú River areas. In the 1950's the county of Altamira made some municipal lands available and attracted prospectors, rubber gatherers and subsistence farmers to the area. In these pre-highway years their activities differed little from those of caboclos elsewhere. Some of the caboclos' parents or grandparents had come during the Rubber Era(1880-1920) and had stayed on after it was over. Rubber collecting continued along the nearby Iriri River, for instance, until 1967. With the coming of the highways, this local population sought guaranteed land titles and close proximity to the main highway artery. Caboclo independent farmers were among the first to occupy the Altamira Project lands.

This presence needs to be explicitly mentioned since the colonization scheme neglected to take the local people into consideration or to employ their knowledge of the region. Many colonization officials assumed caboclos to be uneducated

and uninterested in modern farming techniques. The caboclo population, however, became an important source of information to newcomers, particularly in exploiting the forest resources. Since this paper deals primarily with the emergence of coping strategies, special attention will be paid to the caboclo independent farmers and their contribution to the adaptations made by the other colonists.

II. Traditional Uses of Amazonian Resources

In terms of long-term survival, not only must resources be recognized but adequate strategies must be developed to insure the preservation of these resources while exploiting them. Traditional populations, whose lives have not been seriously disrupted by modernization, show a remarkable balance between their exploitation and conservation of local resources. For example, Rappaport(1967) has described the elaborate homeostasis regulatory mechanism built into the culture of the Tsembaga Maring which indicates the proper times to go to war, and engage in conspicuous consumption of taro-yams and pigs. Reichel-Dolmatoff(1971) found an elaborate cosmology among the Tukano Indians of the Northwest Amazon. This cosmology links the reproductive energies of people and animals to such an extent that cultural restrictions limit both the size of families and the intensity of hunting and fishing. As a result, the population remains stable and has an adequate and easily obtainable supply of protein. The Hanunóo, studied by

Conklin(1957), possess what he has called an "integral approach" to shifting agriculture. This is a complex system which gives ample fallow time, provides good soil cover through the use of intercropping, and utilizes hundreds of cultigens and wild plants which diversify the food resources of the population.

Like these traditional groups, the Amazonian caboclo population is familiar with its tropical environment. The various resources of the forest are utilized in ways which closely replicate aboriginal adaptations. Hunting and gathering activities provide protein, vitamin, and mineral-rich food sources, while a fail-safe horticulture, based on manioc provides the bulk of needed calories. Their crops are planted in small horticultural patches prepared by slash-and-burn methods. The relative isolation of the Amazon area led to a self-sufficient lifestyle which has been linked to an extractive economy based on the collection of rubber, wood, or pelts. It is this historical antecedent that largely explains the caboclos' presumed neglect of horticulture. Rubber, Brazilnuts, and timber bring good prices, while surplus agricultural production yields comparatively lower cash profits, and is much harder to market(Wagley, 1964; Moran, 1974).

With the coming of the highway, government funds poured into the Amazon in the form of minimum salaries, credit, jobs, and larger potential markets for agricultural produce.

The caboclos did not wholly change their subsistence mode but adapted it to these changing conditions. They first began by choosing fertile areas marked by thin-trunked liana forest growth(paus finos). Soils associated with such forest growth have good organic content, low exchangeable aluminum levels, adequate potassium and phosphorus, and a pH of 6.0 or better.[14] Many of the newcomers are confused by the lush vegetation and simply assume that the maxim they use in their home areas also applies in the tropical rain forest. As so many of us are likely to do, they equate areas with the larger trees with having the greatest farming potential. In the Transamazon, however, such criteria leads to a choice of infertile land, with very little potential for intensive agriculture.

Few, if any, of the newcomers utilized the full range of the caboclos' knowledge of plant-soil associations since caboclos were reputed to be more interested in hunting than in agriculture. Ironically enough, it was during their hunting and rubber collecting that caboclos came to recognize those species of vegetation which are indicative of both agriculturally productive and infertile soils. Table 1 lists the vegetational criteria used by caboclos to judge soil potential in the Altamira region. Vegetation indicators are, most lilely, different in other Amazon micro-environments. Soils samples taken in the Altamira region confirm the accuracy of these folk agronomic indicators. Elsewhere I have noted

TABLE 1

PLANT-SOIL ASSOCIATIONS

Good Agricultural Land		Poor Agricultural Soils	
Cover term:	"paus finos"		"paus grossos"
Local Term	Scientific name	Local term	Scientific name
Açaí	Euterpe oleracea Mart.	Acapú	Vouacapoua americana Aubl.
Babaçú	Orbignya martiana	Cajú-Açú	Anacardium giganteum Engl.
Faveira	Piptadenia spp.	Jarana	Holopyxidium jarana Ducke
Maxarimbé	Emmotum spp.	Massaranduba	Manilkara huberi or Mimusops h.
Mororó	Bauhinia spp.	Melancieira	Alexa grandiflora Ducke
Purple pau d'arco	Tabebuia vilaceae Hub.	Piquí	Caryocar spp.
Yellow pau d'arco	Tabebuia serratifolia D.	Sapucaia	Lecythis paraensis Linn.
Pinheiro Preto	Unidentified	Sumaúma	Ceiba pentandra Gaertn.

(Moran, 1975a:82, 85, and 176-193) that fertile soils are present in many areas of the Amazon, and that poor agricultural production is more often a result of uninformed choice of farm land, rather than of the absence of fertile soils per se in the area.

The land along the Transamazon highway is parceled out in rectangular 100 hectare holdings, as illustrated in figure 3. Colonists either live on the land, or in nucleated village settlements(agrovilas). Caboclos prefer to live on their own land and show a marked preference for lots facing the main highway. This is probably a logical response to their long-experienced isolation and a recognition of the serious constraints presented by poor access to local trade centers. Newcomers often opt for residence in the nucleated villages which provide educational and health services. By living in villages, however, their farms may be situated 3 to 20 kilometers away. In figure 3 the lots of farmers residing in one village, marked in the map as Vila Roxa, are indicated. This great distance differential is repeated in other villages as well. Most lots face sideroads which transect the main highway. Farmers soon find, however, that sideroads are not given high construction or maintenance priority, and that the rainy season makes them practically impassable. Farmers located at more than 10 kilometers from their village residence engage in a less intense approach to farming than they might otherwise.

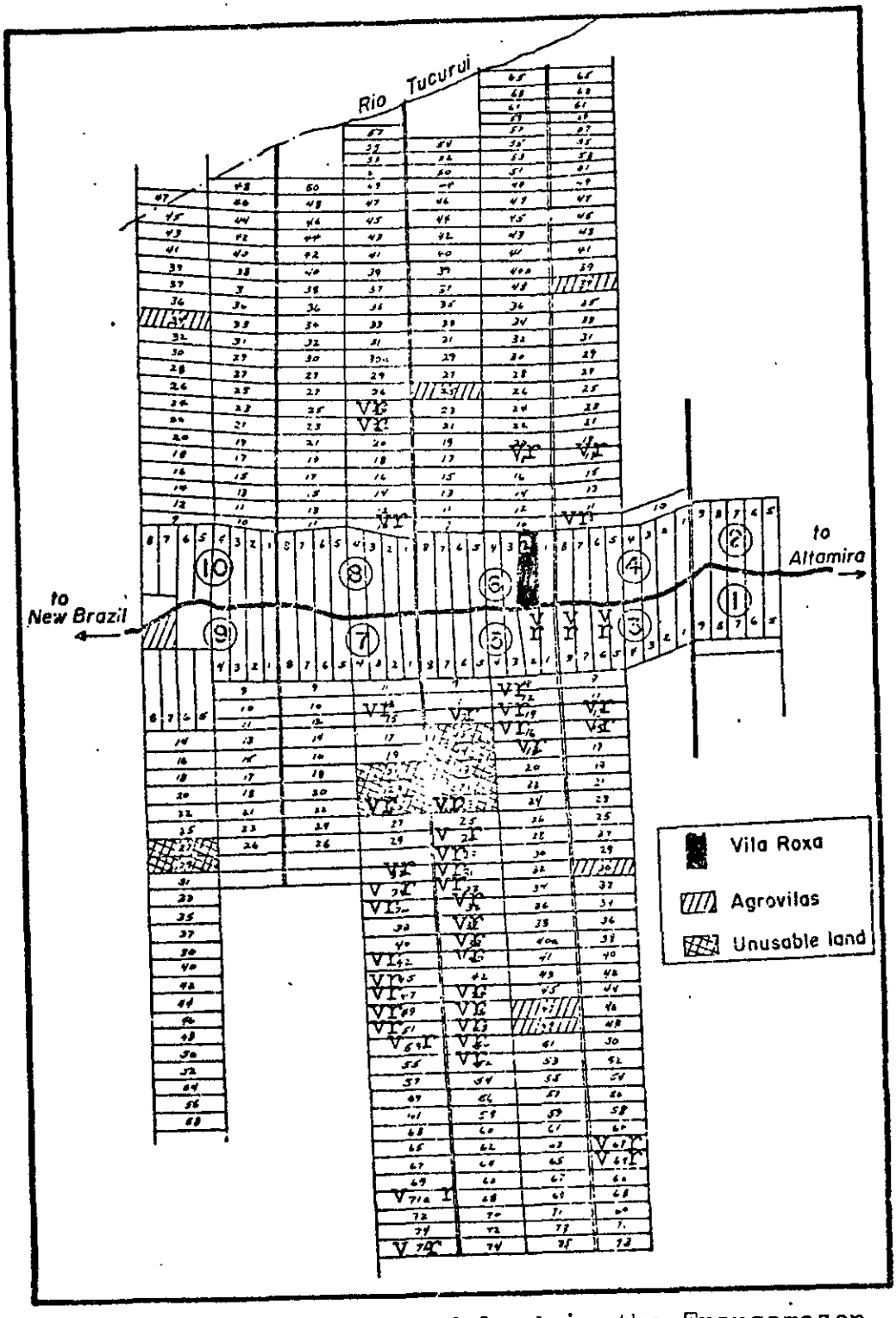

Figure 3. Distribution of land in the Transamazon

*Residents of one planned village are marked vr

Technical assistants and buyers are, therefore, unable to reach farmers located in sideroads too deep to be easily maintained by construction crews. In short, many newcomers are limited by both distances from the main highway, and by uninformed selection of infertile soils.

In addition to felicitous land choice, caboclos adapted to the new conditions by enlarging their previously small subsistence plots to meet the expanded local market for basic foodstuffs. But, unlike newcomers, they plant a wide variety of plants rather than highly seasonal cash crops encouraged by the government(rice, corn, and beans). While other farmers await their income to be derived from the sale of these three crops, caboclos have a steady year-round production of manioc flour to supply their own needs as well as local market demands. Manioc, the Amazon's traditional staple, grows abundantly ahd has relatively few natural enemies. It is also well-adapted to poorer and depleted soils and provides a solution to problems of storage in the tropics by its capacity to stay in the ground for periods of one year or more. It is, therefore, an ideal crop for the small farmer in the tropics. Unlike seasonal cereals, manioc provides a steady source of food year-round and can be converted,with a minimum of technology, into a dry, storable form that is eminently marketable since it is a traditional staple throughout Brazil. Manioc production does not compete with other activities of the farmer since it can be harvested anytime after six months of growth(cf. Moran, 1975b, 1976).

Other sources of ready cash that have traditionally been used by caboclos include poultry, pigs, and tobacco. Poultry and pigs require little attention as they are left to forage for themselves. Manioc peelings, surplus fruit, and food scraps are sometimes provided--both to increase their weight and to keep the house surroundings clean. Unlike cattle, poultry and pigs require little initial capital and do not demand the expensive development of pastures. Yet, they provide eggs, lard and meat for family consumption and are well-adapted to pioneering conditions. Tobacco is also well-suited to the tropics and brings in a good price at the local marketplaces. Caboclos know from experience that a combination of agricultural and livestock products are both easier to raise on a small farm, and minimize risk of losses in case any one item is lost through pests or disease.

Caboclos also exploit the environment through fishing and hunting, whereas newcomers do so only infrequently. Although the small streams that cut through the caboclos' lots do not carry the larger fish species of Amazon rivers (cf. Honda, 1972; Veríssimo, 1970), the use of a simple hook-and-line is rewarded with catches of "traíra"(Hoplias malabaricus Block), some of which weigh four kilograms. Neither have caboclos forgotten the use of fishing spears, and a type of aboriginal fish trap, the cacuri.[15] Fish in the area are not usually sold by colonists but,rather, used mainly for family consumption and distribution among friends.

Much more important in terms of securing high-quality protein on a regular basis is the hunting of wild game. Before the highway came, wild game was much more prevalent in the area. Caboclos recall killing large tapirs(Tapirus terrestris Linn.) a few meters from their secluded huts. Now the situation is quite different. While hunting is not universally practiced among colonists, their use of the forest for agriculture has driven the game further back into untouched areas. Tapir and other large game, such as capybaras, jaguars and giant armadillos, are hard to come by. Among the larger species, the hunting of white-lipped and white-collared peccary(Tayassu pecari Link. and Tayassu tacaju Linn. respectively) is still rewarding but requires time-consuming pursuit and several hunters.

After three years of intensive settlement, the region near Altamira yields mainly small game: "paca"(Agouti paca Linn.), agouti or "cutia"(Dasyprocta prymnolopha Wagler), armadillos(esp. Dasypus novemcinctus Linn.), deer(Mazama americana Erx.), land turtles(Testudo spp.), and monkeys of various species.[16] Only caboclos unhesitatingly eat monkey meat, although some newcomers have been known to eat it in time of need. There are numerous other forest animals, but they are not culturally acceptable as food.[17] For example, thin-spined porcupine(Chaetomys subspinosus Oefer), anteaters (Myrmecophaga tridactyla Linn. and Tamandua tetradactyla Linn.), rabbits(Sylvilagus brasiliensis), and sloths(Bradypus infuscatus marmoratus and Choloepus didactylus Linn.) are rarely hunted.

Caboclos are conservation minded when it comes to hunting. The belief in "lucky days"[18] and social[19] and legal[20] proscriptions diminish the amount of hunting which takes place. Game is not hunted for profit by Transamazon caboclos but only for their own consumption or sharing with neighbors. Newcomers, on the other hand, hunt any day, do not believe in "bad luck"(panema), and in several cases, sell game meat to supplement their incomes.

In the area studied most hunting goes on during the late evening and at night. The only exception to this rule is the hunting of the diurnally-active peccary. Since these travel in bands of twenty or more, the prospect of an exciting and high-yielding chase engages a number of men on a single hunt. Otherwise, hunters generally leave their agricultural pursuits in the late afternoon and walk to a "waiting point"(espera) by the time dusk has fallen. This is usually a spot near a flowering or fruit-bearing plant which is known to be attractive to game animals. Table 2 lists the species of trees most commonly mentioned by hunters who relied on the espera-method. Hunters tie their hammocks about three meters above the ground and wait for the arrival of the game. Conversation is practically absent. All wait to hear the distinct footsteps of various nocturnal animals. When an animal is nearly under their hammock and begins to eat the flowers or fruit, it is blinded by a flashlight and shot. On occasion, a hunter will pass up a chance to kill say, a "paca", because his wife has

TABLE 2

TREES USED IN WAITING FOR GAME IN NIGHT HUNTING*

Tree (local name)	(scientific name)
Açaí	Euterpe oleraceae Mart.
Babaçú**	Orbignya martiana
Bacaba	Oenocarpus bacaba Mart.
Castanha do Pará***	Bertholetia excelsis
Cupuaçú****	Theobroma grandiflorum Spring
Frutão	Lucuma spp. and Pouteria spp.
Jaracatiá	Unidentified
Jarana	Eschweilera jarana Ducke
Matamatá	Eschweilera spp.
Ninharé	Unidentified
Piquizeiro	Caryocar spp.
Sapucaia*****	Lecythis paraensis Hub.
Tamburí	Enterolobium maximum Ducke
Toarí	Couratari spp.

* The above list is a composite list with all trees mentioned by hunters interviewed. None of them included all of the above, but all regular hunters had a minimum of ten trees they used to seek a point of waiting. It is important to move each night, especially if a hunter has killed an animal at a given spot.

** Only deer and pacas eat the fruit after agoutis open the hard shell.

*** Only agoutis eat the fruit of the Brazilnut.

**** Only deer, paca and tapir eat the fruit

***** Flower and fruit consumed by most species except armadillos and birds.

asked him to bring home a deer. Shooting the first available animal scares others from coming to the spot. Yet, such requests are rare; usually hunters kill whatever they can on nightly hunts.

While conservation beliefs and practices are not held by the newcomers, it is well worth noting that food preferences act to restrain the impact of human occupation on the forest game species. Furthermore, in cases of illness and during the states of pregnancy, the post-partum period, and lactation, game meats are not consumed because they are considered too dangerous(remoso). Indirectly, food tabus act to lessen hunting intensity and makes game available for a longer period as a protein source.

The use of wild plants also differs between caboclos and the new settlers. The latter use only the fruit of the "cupuaçú"(Theobroma grandiflorum Spring), wild cocoa(Theobroma spp.), and Brazilnut(Bertholletia excelsis), and even the use of these is rare. Wild plants are viewed as more dangerous and unknown than game. Fruits in general tend to be considered "acid" and are especially avoided during periods of disease and physical weakness. Caboclos follow the same food proscriptions during illness and crisis periods, but more commonly they use a wide variety of seasonally available forest fruits. Caboclos use the fruits and edible cores of various palms, such as "açaí"(Euterpe oleracea), "bacaba"(Oenocarpus bacaba Mart.) and "babaçú"(Orbignya martiana). The fruits of "piquí"

(Caryocar spp.), "sapucaia"(Lecythis spp.), "cupuaçú", "tapereba" or "caja"(Spondias lutea), cocoa(Theobroma spp.) and passion fruit(Passiflora edulis Sims.).[21]

More often than not, use of these wild fruits demands a certain degree of processing. Their pulp is commonly mashed and mixed with water and sugar to make a juice(vinho). Children can rerely wait for juice to be made and most frequently consume fruits in their natural state. Some of the exotic fruits are unusually rich sources of vitamins. The nuts of babaçú, sapucaia and Brazilnut are rich sources of oil. Though few tropical fruits have been adequately analyzed for nutritional content, those which have would combat vitamin and other dietary deficiencies. For example, tapereba provides a great deal of vitamin C; Brazilnuts is rich in the amino acid methionine [22], açaí is rich in vitamin A and fats[23](Castro, 1967:51-52; Pechnick and Chaves, 1945); and "pupunha"(Guilielma speciosa Mart.), "buriti"(Mauritia vinifera), and "tucumã" are richer in vitamin A than carrots.[24]

Unlike other colonists, the caboclo does not view the forest as an enemy that must be beaten back. He sees it, rather, as providing a great variety of animal and plant foods, as well as being a source of raw materials for household needs: vine for rope, bark for basket-weaving, palm leaves for roof thatch, vine sap for potable water when away from streams, dried straw for brooms, medicinal plants[25], and many other materials of daily use. Such knowledge is being acquired by newcomers at different rates. These

differences in the rate of adoption can be explained by the general characteristics and needs of each group of farmers.

III. Strategies of Newcomers

The pioneers who came to farm the Transamazon at first recognized neither the resources of the forest nor the alternative ways of exploiting them. Their first impulse was to clear the forest and push it as far back as possible. This is especially evident around the houses, where not a blade of grass or natural vegetation is allowed to grow. The few vegetable gardens which are started by some are planted at least three meters away from the dwelling. Some fear having even domesticated plants near their houses. They envision snakes, scorpions, spiders,and other disagreeable forest dwellers lurking among the plants. Newcomers do not distinguish between the types of forest vegetation and forest fruits and animals are not prized as food sources, except for deer meat.

Independent farmers were the first colonists to overcome fear of the natural milieu. In their aim for self-sufficiency they are relatively quick to ask caboclos about the location of fertile land, the climatic conditions of the area, and crops which are amenable to local conditions. In the latter case, manioc is certainly foremost among the diverse number of crops grown by independent farmers. Tobacco, cowpeas (*Vigna sinensis*), corn, and local varieties of pigs and poultry are also raised for home and market use.

In addition to these diverse local products, independent farmers also plant small vegetable gardens, utilize an increasing variety of wild plant and game resources, grow the government subsidized crops, and invest in a few head of cattle. They are involved in "cottage industries" such as the making of manioc flour and curing of tobacco, both of which involve the participation of children and adults.[26] Wives and children of independent farmers work at producing farm surplus for sale, rather than leaving home to earn wages. Newcomers have often adopted the Amazonian method of soaking bitter manioc to remove its prussic acid. This process demands less labor, and results in a yellower, coarser meal known as farinha puba. Such manioc flour sells well on the local market and is produced year-round to supplement farmers' cash income. Independent farmers have become suppliers of many staple goods for both the marketplace and for retailing to neighbors. Diverse utilization of resources, both domestic and wild, is a strategy that is paying off(Moran, 1975a:145-154).

Independent farmers began with a relatively low amount of capital(see table 3), but set up profitable production units through judicious use of bank loans, family labor, and farm diversification. Their accumulated liquid assets, in the form of animals and farm equipment, is particularly notable, as is their high yield per hectare. Bank credit is used to acquire those assets that are likely to increase farm income, such as griddles for toasting manioc flour, cattle, horses, and powersaws. Such investments reflect both a

TABLE 3

ECONOMIC PERFORMANCE

Owners or managers previously	BROKERS (40%) yes		CLIENTS (60%) no	
frequent previous migrations	no		yes	
	Entrepreneurs (8%)	Independent Farmers (32%)	Artisan-Farmers (24%)	Laborer-Farmers (36%)
# of prev. migrations	1.5	2.1	4.8	5.3
Beginning capital in Transamazon*	4,000	678	1,700	140
Yield/ha. (1973-74) in kgs./ha.	pasture	804.7	503.3	283.3
Salaried income/yr*	48,000	5,603	18,269	4,500
Farm income per yr.*	5,000	8,798	3,752	2,666
Gross income per yr.*	53,000**	14,401	22,021***	7,166
Net income per yr.*	29,000	6,301	12,831	-902****
Debt to bank and INCRA*	37,740	12,498	6,462	5,247
Liquid Assets after 3 yrs.*	50,500	8,000	370	440

*Figures are averages in 1974 cruzeiros(1 cruzeiro=0.18 U.S.) based on a 50% sample of a planned village made up of 50 families.

**Largely a function of store and livestock profits.

***Largely a function of wages from skilled jobs

****A minus net income suggests that laborers are using credit obtained from bank and individuals to supply the balance. It also indicates inability to keep consumption within the limits of their capacity to earn. Net income is figured by substracting expenses from gross income.

commitment to the farm as a main generator of income, and the farm's successful management.

Entrepreneurs in the Transamazon utilize a combination of farm production, cattle raising, general stores, and transportation services. Their strategy is seldom based on agriculture alone. Their main goal in the first few years is to plant the government-subsidized cash crops in order to pay back outstanding bank loans. Then they buy cattle and/or fencing to get a cattle ranch underway. In the meantime, while most of the agricultural work is done by hired laborers, entrepreneurs are busy providing transportation for people and produce, and operating stores in local villages and along the highway. One harsh reality of the physical environment is the general lack of navigable streams in the colonization area that can be used to transport produce to nearby markets. Some entrepreneurs exploit the situation by investing in trucks to haul farm produce and people to marketplaces. They also establish general stores near concentrations of farmers. The trucks are fully utilized as they leave the villages for town loaded with farmers' produce, and return with supplies for the truck owner's store.

Entrepreneurs vary in managerial capacity, but most show sensitivity to seasonal fluctuations in demand. For example, they are busy during the weeks preceding the harvest attem-

pting to convince the farmers to sell their whole harvest at a fairly low price. This is often successful as the farmers tend to be low in cash just preceding the harvest. This is especially true among the laborer-farmers. The entrepreneur is able, then, to resell the produce at a better price in town or hold on to it for a few months until the market is less flooded and the prices are higher.[27]

The artisans have also used the colonization project to their own advantage and have overcome the problem of their deficient farming experience by hiring others to work for them. This is a highly effective adaptation, particularly for these urban persons coming into a tropical forest region. By working for high wages, artisans simply pay others to prepare their land. Whenever the artisans are free, they take time to learn about farming techniques from their workers. Over time they gain experience and may opt to become competent independent farmers. In the meantime, a minimal amount of their income is invested in farm equipment and livestock(see table 3). Their urban tastes have created a demand for various food, clothing, and household items which are expensive in the markets of the Transamazon frontier.

The entrepreneur and the artisan-farmer alike are essentially skilled businessmen who are using the opportunity of a pioneer zone to expand their holdings. Both spend relatively little time actually farming on their own land, and hire others to do this work for them. Thus they are relatively unfamiliar with their physical surroundings. Their

non-farm pursuits leave them little time for hunting and gathering, and their emphasis on cash earnings rather than self-sufficiency leads them to purchase both staples and luxury goods in the marketplace. Both, on the other hand, are keenly aware of the social and economic situation of the area and its inhabitants. The artisans are particularly sensitive to the labor market, and the entrepreneurs to the produce market and to the various farm surplus producers. However, one is not likely to see any creative strategies for exploiting the physical environment coming from these two groups, except perhaps in the development of pastures and use of various cattle breeds among the entrepreneurs.

Finally, a sizable proportion of pioneers belong to the laborer-farmer category. Accustomed to sharecropping and/or wage labor arrangements, the ownership of a 100 hectare farmstead has brought them landowner status, but not the necessary financial expertise to run it. Laborer-farmers seek credit from the bank to carry out ambitious cash cropping schemes for rice, corn, and beans--all of which agronomic and storage problems in a humid tropical environment. Such schemes often are beyond their managment capacity, and the limitations of the local transportational facilities. For example, the areas cleared by laborer-farmers are often too large for their capital resources, which generally consist solely of what the bank can provide in loans (US $55/hectare). Since such credit seldom is provided "on time" and since laborer-farmers lack personal savings,

they are unable to carry out the operations of underclearing, tree felling, and burning in accordance with the schedule set by tropical weather conditions(cf. Moran, 1975a:105-125). Many augment their cash income by doing odd jobs. However, as they do not have artisan skills they take on low-paying manual labor(see table 3). They have come to depend on the brokers and on government agencies for such employment. To help out, their wives also perform low skill jobs such as washing clothes for neighbors, gardening, and selling eggs.[28]

The laborer-farmers' emphasis on cash crops leads to neglect of basic subsistence crops and of forest resources. Household gardens are not planted in their planned village homes because they are never quite sure when they will move again(see figure 2). Low initial capital and mismanagement of bank credit and farm operations leads to debt and loss of bank solvency(see table 3). As the vicious circle of indebtedness closes in, some begin to sell their land as a way of paying off the debts, while others become full-time wage earners in the area. As a further requirement of subsistence, laborer-farmers turn to hunting to provide needed protein for their families, and in some cases as a source of ready cash. Laborer-farmers are slow to learn from others, but hunting information is one type of knowledge that they have gleaned from their caboclo neighbors. Their consumption of 22 kilograms of game meat per month is only second to the 36 kilograms utilized by independent

farmers, and greatly exceeds the 11 and 0 kilograms, respectively, consumed by artisans and entrepreneurs.

The four types of farmers vary greatly in their farm management strategies. The independent farmers produce most of their needed foodstuffs. This gives them the highest total yields per hectare(see table 3). They raise or hunt their protein, and make their own household tools and items of prime necessity. Entrepreneurs provice transportation services, operate stores with basic inventories, run small cattle concerns, and serve as spokesmen for others with government officials.[29] Their agricultural goals aim at quick returns on cash cropping and subsequent pasture development. Artisan-farmers and laborer-farmers spend a considerable amount of time earning wages outside their farms, and thus their agricultural yields tend to be much lower than those who invest both time and effort in farm management. Figure 4 illustrates how farmers who spent a minimum amount of time earning salaries also reached the highest yields per hectare(1,000 and up).

Laborer-farmers try to carry out the government directions as they understand them. They plant relatively large areas in cash crops and neglect subsistence activities. Meanwhile, they rely on bank loans to pay for the day to day needs of their large families. Artisans would be in the same predicament had they lacked the skills which have allowed them to obtain well-paying jobs. Both the independent farmers and the entrepreneurs serve as brokers to the other two groups in our

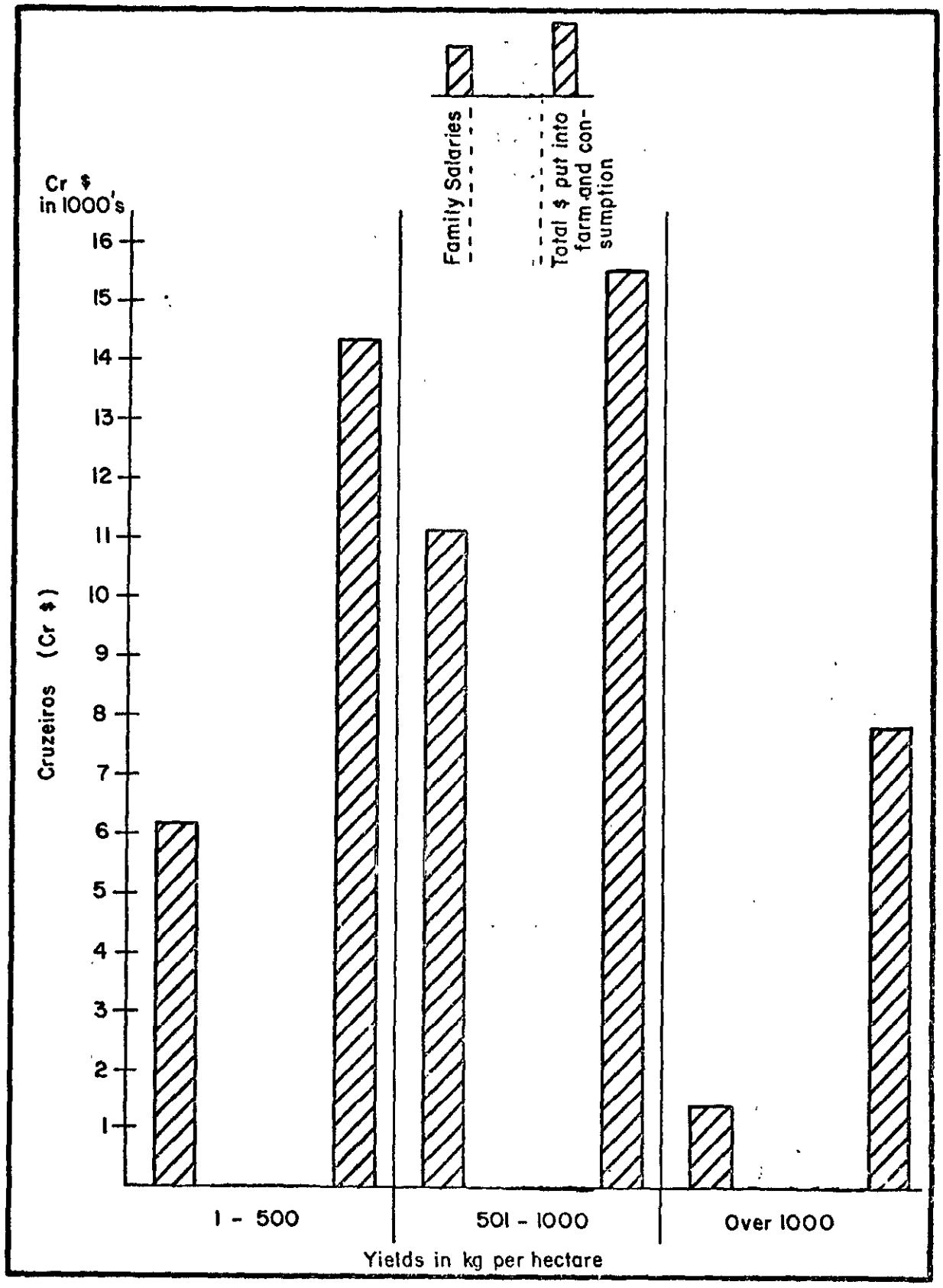

Figure 4. Relationship Between Non-Farm Sources of Income and Farm Productivity

typology. Entrepreneurs provide credit and services of various kinds.[30] Independent farmers serve as a source of basic food items, information about the land, and wages when seasonal labor is required. The survival of the clients is dependent on the success of these brokers who provide a market for both skilled and unskilled work.

IV. Conclusions

The physical environment, whether the natural forest or cultivated fields, offers a wide variety of economic possibilities. Newcomers to a tropical rain forest are dazzled and confused by the lushness and mystery of the environment. The decisions they make in the early adjustment period are often crucial to their economic and physical well-being. However, without information inputs from experienced local inhabitants, the immigrants' choice of land, crops, and farming strategies may be erroneous. This paper has tried to explore why some newcomers adjust better than others.

Sahlins(1968) has noted that adaptation to one's physical surroundings is never perfect. Adaptation is a process subject to modification from both physical and social requirements. In the case study presented here, both the "adapted" caboclos, and the incoming migrants have made adjustments to the complex physical, economic, and institutional setting presented by the Transamazon colonization project. Ideally, one might envision a group of immigrants who could forget all their past experiences and habits, and readily accept

a tropical lifestyle from the local people. But adaptation is always a compromise between past cultural experience and the requirements to adjust to changing situations. All migrants bring their "cultural baggage" to a new area. This past experience colors their perceptions, use of, and thus their adaptation to, their new environment.

From a variety of cultural experiences emerged a multiplicity of individual economic strategies in the first few years of tropical settlement. This study has shown that the adaptive strategy chosen by the colonists reflects the past managerial experience of each individual farmer. The nature of this expertise, in turn, determines the nature and quantity of environmental information that is sought from the local population.

The most successful colonists, in terms of agricultural production and financial stability, are those who combine previous farm management experience, residential stability, and use of the caboclos' knowledge about the environment. These are the colonists classified as brokers and they have taken full advantage of the opportunities offered in the Amazon frontier. By virtue of their management backgrounds, they recognize the need for site-specific information, information which only the local inhabitants can provide. They ask about soil, climate, location, and crops so that their farming and business efforts may succeed. They, therefore, create the conditions for making greater adjustments

in their strategies and coping with the tropical environment. But in making such adjustments, the basic goals of self-sufficiency for the independent farmer, and of commercial activity for the entrepreneur, continue to be met.

The least successful colonists are the clients, especially those of migratory sharecropping backgrounds. They have never manipulated production factors as farm operators and are not attuned to the need for a broad range of information about the local environment. Accustomed to doing wage labor and following orders, clients were not sufficiently aware of their unfamiliarity with local resources and their need to consult caboclos about resources. The single area of cultural exchange was hunting, an alternative chosen out of a necessity to feed their families following their poor results in farming. In time, many clients may be forced through indebtedness to give up their landholdings and will become a labor force in the area.

To conclude, then, neither past strategies nor present trial-and-error alone makes for rapid or successful adaptation to a new environment. For both short and long-term success, immigrants with broker backgrounds have two important advantages: they have past experience in mixing production factors and are attuned to asking for information from knowledgable inhabitants. While the Amazonian caboclo may not be familiar with modern agricultural techniques, his familiarity with the region's resources provides the baseline information needed in any effort to settle and utilize the Amazon rain

forest. Out of the multiplicity of strategies based on such information, new adaptive solutions to life in the Neotropics are likely to emerge. Such solutions are crucial both to Brazil and to the many countries with large humid tropical territories.

NOTES

[1]Two brief boom-and-bust cycles took place west of the Atlantic Coast. The first was the mining boom(1702-1760) in Minas Gerais and Goiás states; the second was the Rubber Era (1880-1920) in the Amazon. Neither boom was long-lived, nor did much remain of those eras except for impressive architecture to remind the inhabitants of a golden period(Simonsen, 1969: 247-301).

[2]This population includes both Amerindians and rural Brazilians. This paper deals only with the Brazilians as they were the only ones present in the area studied. However, what is said about them applies in all its essentials to aboriginal groups.

[3]The Transamazon Highway links the Northeastern cities of João Pessôa and Recife to the Amazonian towns of Marabá, Altamira and Itaituba, and is expected to reach the Peruvian border in 1976. The above mentioned Amazonian towns served as nuclei for colonization project administrators and road-builders until new communities were created along the highway. For a discussion of these planned communities see Kleinpenning(1975) and Moran(1975a). The shaded area in figure 1, between the cities of Altamira and Itaituba, was the main focus of colonization efforts(1971-74).

[4]The research on which this paper is based was made possible by funds from the Social Science Research Council and the National Institute of Mental Health. However, the conclusions, opinions, and other statements in this publication are those of the author and do not necessarily reflect those of the funding agencies. Field research was carried out between 1973 and 1974 in the Altamira region of the Brazilian Amazon(see figure 1 and note 3). This region was selected over others because it was selected by the Brazilian government to demonstrate the development model to be applied elsewhere in the Amazonian lowlands.

[5]While these areas have the appearance of virgin lands, indigenous populations are known to have lived in this area, clearing small gardens by slash and burn methods. Species associated with secondary succession(esp. Cecropia spp.) were observed in the fields still unoccupied by the colonists.

[6]Although it is true that a great deal of individual variability is present in all cultures(cf. Pelto and Pelto, 1975), traditional cultures tend to be far less pluralistic than modern societies(White, 1949).

[7]Billington has suggested in his studies of the American frontier situation that this simplification of a pioneer's "cultural baggage" is a process that often occurs in migration(1967:16).

[8]The term caboclo is widely used in Brazil for persons living in the backlands, or for anyone in a lower social position than the person speaking. Caboclo can indicate different racial mixtures in different areas of Brazil. For instance, while the southern caboclo studied by Willems (1952) is largely non-Indian, the Amazonian caboclo shows a predominance of the aboriginal element(Wagley, 1952). However, the term caboclo as used in this paper will refer to a cultural type rather than to the degree of racial mixture.

[9]Part of the government development plan was to provide health and educational services. To facilitate this process nucleated villages were built and farmers were encouraged to live in these planned communities rather than on their land. Besides the nucleated villages(agrovilas), the plan also included planned towns(agropolis) of about 300 persons and planned cities(ruropolis) of 1,000 families or more (cf. Kleinpenning, 1975; Moran, 1975a for details).

[10]We have added the hyphenated "-farmers" to make clear the fact that, despite their chosen strategies, these persons came with the primary intention of farming the land and turned to other interests when their efforts were not adequately rewarded. The hyphenated-farmer was not added to the entrepreneurs because it was awkward. Peons are also present in the area. These are commonly single men who have not expressed interest in having a title to the area's lands but who work for wages for various farmers. Unlike the farmers, who tend to be reasonably abstemious, the peons are rowdy during their weekend trips into town where they go for drinking and "having a good time."

[11]This group bears some similarity to the European-type mixed farmers, but are by no means identical(Wagley, 1968:126). The European independent farmer operates a self-sufficient agricultural enterprise that integrates the use of cattle and crops. Alfalfa and oats are planted to feed the cattle, the manure is collected and used to fertilize the crops, and butter and cheese are made from the milk. Other crops are planted to supply household needs and an efficient cottage industry, including canning and preserving, stores away supplies after the harvest. Such

11(cont.)
a system was not transplanted to Brazil except among a relatively small southern population of German and Dutch descent. Sioli(1973:330-334) has indicated that just such a system has worked well in the Brazilian Amazon, in an area colonized by some Germans in Para State's Zona Bragantina.

12The Altamira area seems to have been chosen as the center for Transamazon colonization efforts because of the presence of good soils in the vicinity of the town. Before the arrival of the road construction crews, the county had an average population of 0.10 persons per square kilometer. The county seat, also named Altamira, is served by the Xingú River, one of the larger Amazon afluents. Average temperature is 26 degrees centigrade, and rainfall approaches 1700 mm. per year. It has two marked seasons: a dry period(June-October), and a wet period(November-May). The area through which the road cuts is in the upland region, or terra firme, and has tropical moist forest characteristics.

13This is a role similar to that of the "cultural broker" who, in Wolf's terms, are "individuals who are able to operate both in terms of community-orientation and national oriented expectations,"(Wolf, 1956:1072). It is different in that many of these entrepreneurs, though not all, are newcomers operating in an area without strong traditional patrons and which is strongly influenced by national economic development plans.

14Caboclo soils were of remarkable quality: the pH was 1.6 higher on the average than those of other colonists; phosphorus content was even more dramatic--15.8 ppm on the average vs. 2.4 ppm for newcomers; calcium and magnesium were also remarkably higher: 5.76 mE/100 gms vs. only 1.76 mE/100 gms for newcomers. Pottasium, Carbon, and Nitrogen were not significantly different. Caboclo soils tended to be of 10 YR hue(brown or brownish black) while those of newcomers were of 7.5 YR hue(brown and dark brown). For full soil analyses see Moran(1975a).

15No caboclo colonist was, however, reported to use these methods. Nor do they use timbó, a general name given to a wide variety of poisonous vines which can stupefy fish in a damned up stream.

16Large bands of forty or more howler monkeys(Alouatta spp.) roam the area. Capuchins(especially Cebus apella Linn.) are the most often killed for food. Also found in the area are "sauim" or squirrel monkeys(Saimiri sciureus Linn.), "macaco barrigudo"(Lagothrix spp.),"zogue-zogue"(Callicebus spp.),

16(cont.)
owl monkeys(Aotus trivirgatus Humb.), and other unidentified species with local names such as "mão de ouro," "cara branca," "quatro olhos," and "cuambá."

17 For a thorough discussion of local food tabus and how they related to the people's conceptualization of health and disease see Fleming-Moran(1975).

18 Caboclos in the area said that there were days for the hunter(dias do caçador) and days for the game(dias da caça) Tuesday, Friday and Saturday were lucky days for the hunter, while Sunday and Monday were lucky days for the animals. On the latter days, hunting was not rewarding and was generally avoided. Wednesday and Thursday were neutral and ambiguous. Even on days when luck was on his side, the hunter could come home empty-handed. On such occasions he became concerned and began to investigate the possibility that he was empanemado(having bad luck) and began to seek the source so as to begin an effective cultural cure(Wagley, 1964:79-80; Galvão, 1951).

19 Panema is a sort of bad luck in hunting(Galvão, 1951). Panema can be caught by the touch of a menstruating woman on a hunter's or fisherman's articles; through not sharing game catches with needy neighbors or relatives(desconfiança); through mutilitation or abandonment of the carcass of hunted game; and through permitting a pregnant non-relative to eat his game. Fear for the loss of protein sources, namely game and fish, seems to reside at the root of caboclo beliefs in panema(Wagley, 1964:81; Moran, 1974:148).

20 The Brazilian Institute of Forestry Development(IBDF) will prosecute a man who sells animal pelts and see that he and his family are expelled from the colonizationarea for such violations. Game hunting is allowed only for consumption purposes. Of course, it is extremely difficult to police the forest and its inhabitants.

21 The Altamira region is relatively poor in forest fruits. Among thenotable absences are: "araçá"(Psidium araca Raddi.), "buritî"(Mauritia vinifera); "bacurí"(Platonia insignis Mart.), "biribá"(Rollinia orthopetala), "ingá"(Inga spp.), "jenipapo" (Genipa americana L.), "muricí"(Byrsonima crassifolia), "miritî"(Mauritia flexuosa), and "pupunha"(Guilielma speciosa M.).

22 This is the amino acid sorely lacking in the make up of manioc protein. This lack has been used to concemn manioc as a low-quality food. In a recent article Gross(1975:534) suggests that methionine may well be the ultimate factor limiting the size of aboriginal settlements in the Amazon. Gross admits that symptoms of protein dificiency have never been noted among relatively unacculturated tribal peoples

22(cont.)
in the Amazon region(1975:534-535) but he does not make the further step of asking or suggesting why. Consumption of Brazilnuts and manioc provides a balanced amino acid and carbohydrate diet. Sweet potatoes are also rich sources of methionine and are an important item in the tuberous diets of tropical forest peoples.

23 Fat intake among rural Brazilians is usually considered as too low(Castro, 1967). Açaí is consumed in enormous quantities whenever it is available. It is Para state's favorite fruit as indicated by their saying:"quem para em Pará para, se toma açaí fica."(Transl: who comes to Para stops, if he drinks açaí, he stays). Newcomers to the Amazon are initiated into the pleasures of açaí drinking immediately and their reactions carefully observed.

24 Pupunha is comparable to carrots(8,900 micrograms per 100 g.) while buritĩ and tucumã are many times richer (30,000 and 31,000 micrograms per 100 g. respectively). Pupunha is also rich in fats(Chavez et al. , 1949).

25 For a discussion of medicinal plants in the area consult Fleming-Moran(1975). Instrumental in the diffusion of such information among the farmer groups are the children. Being less restricted by cultural preferences and far more gregarious, they learn about the local foods and experiment with them. This method of diffusion also applies to medicinal plants, game meats, and methods of obtaining wild food sources. Since children act as family messengers and carriers they gain exposure to people's habits and resource use.

26 Children are gradually taught the skills needed to carry on these small-scale industries, first in the form of play and assuming increasingly larger shares of the labor. By age fifteen most children are able to perform all tasks except perhaps for the most strenous.

27 For example, while beans sold for Cr$100 per sack at harvest time, the price skyrocketed to Cr$200 per sack within four or five months. Some who could store their purchased supply of beans were able to sell them and buy as much as 30 head of cattle from the profits earned in the transaction. The main limitation to more of these sorts of operations by local entrepreneurs is their lack of adequate storage space.

[28] While none of these jobs are very lucrative, nevertheless, client wives tend to make a bigger contribution to the total household cash income than do the other wives in the community.

[29] The rise of a patrão class has been more fully explained in a recent paper dealing with the the emergence of social class in the Transamazon(cf. Fleming-Moran and Moran, 1975).

[30] Other farmers often asked the entrepreneurs for informal credit. Although the latter tried to discourage borrowing, it is provided informally and is an effective ally in the entrepreneurs' control over local agricultural production. If a farmer owes a certain amount at a local store, it is common practice for the entrepreneur to drive out to the debtor's land and buy off his harvest at the lowest price or carry off some of the farmer's poultry or swine as payments for the debt. The debtor is usually thankful that his debt has been cleared by the forceful creditor. However, in strictly economic terms, he has suffered a net capital loss. His only consolation is that he has personalized credit available whenever he is unable to pay for needed goods and services, because of a lack of cash resources.

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