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TRANSPORTATION, SPATIAL ORGANISATION AND COLONIZATION

SUCCESS IN THE BRAZILIAN AMAZON

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Since 1970 the announced policy of Brazil's federal government regarding small farm colonization in the Amazon has passed through two phases. Social development objectives were highlighted in the 1970-1973 period, when the newly created National Institute of Colonization and Agrarian Reform (INCRA) was to convert landless laborers into family farmers through "integrated colonization projects" (PICs). After 1974 economic growth objectives moved into the foreground. Private colonization companies and cooperatives were to lead the colonization effort. INCRA, with much reduced funding, was to consolidate existing PICs and to bring some order to spontaneous settlement through "directed settlement projects" (PADs). The latter function, better described as producing semi-directed settlement, is assuming much larger proportions than initially anticipated.

This article examines the central role of transportation and spatial organization in the initial stages of semi-directed colonization. It applies particularly to the western colonization frontier, i.e. northwestern Mato Grosso, Rondônia, and eastern Acre, an area dominated by migrants from the Center-South. Brief reflections on the transition from "integrated" to semi-directed colonization provide the context for a

case study of settler adaptation problems relating to transport difficulties in PIC Paulo de Assis Ribeiro (PIC-PAR), Rondônia the largest semi-directed project to date. Generalizations regarding PIC-PAR are derived from interviews with key informants, a 1% sample of settlers (economic strategy, adaptation problems, perception of the economic-institutional-physical environment) and a 33% sample of property files (background of occupant, land use, property transactions) collected in 1979. The article concludes with tentative considerations toward an appropriate spatial and transportation strategy for semi-directed colonies.

#### From "integrated" to semi-directed colonization

The so-called "integrated colonization projects" of the early 1970's, encompassing some 29,000 settler families to date, have been described in numerous studies (e.g. Kleinpenning, 1977, 1978; Moran, 1981; Smith, 1981; Wesche, 1974). Several lessons which derive from the experience and political demise of the PICs are relevant to this study. Heavily subsidized projects for small farms which do not show rapid economic return cannot expect sustained political support, particularly after Brazil's passage from economic miracle to energy crisis. The public agencies involved have proven unable to coordinate and effectively implement complex programs and procedures. Safeguards, designed to protect marginal settlers and to protect the system against abuse by settlers, which were built into the process of settler selection, land titling and credit release, have proved counterproductive. Several authors (e.g. Mueller, 1980; Wood and

Schmink, 1978) postulate that the complex institutional framework in PICs has severely impeded settler progress. Bunker (1980) goes as far as concluding that the cost imposed on PIC settlers by this framework is significantly greater than the benefits derived. It appears that the system, rather than managing to protect the weaker settlers, has contributed to their replacement by others with greater capital resources and adaptability to the institutional framework. Finally it is evident, though this has been insufficiently highlighted in previous studies, that inadequate transportation is the most fundamental obstacle for PIC settlers, especially those on side roads, magnifying the cost and inefficiency of settler access to services and markets, and severely constraining their development options.

Though INCRA has been somewhat discredited, has discontinued publicity for colonization in the Amazon, and in coordination with other agencies, has even attempted to block arriving migrants, there is a continuing, even increasing need for government involvement in colonization.

The dynamics of actual or threatened spontaneous land occupation have obliged the expansion of some government colonization projects and the creation of new ones, albeit with much reduced services, as well as the regularization of de facto land occupation. As in earlier years INCRA has had difficulty keeping up with settler demand, and has frequently been forced into remedial action and stop-gap measures. This situation is likely to continue, given the increasing militancy of landless migrants, (e.g. see Souza Martins, 1980; Perpétuo, 1981), and the technological, land use and

land tenure transformations which expel rural labor and small farmers from other parts of Brazil (Souza Martins, 1980). Of particular significance in this context is the steady generation of a massive supply of capitalized potential colonists through the structural transformations in the rural areas of the Center-South, a phenomenon which is unique in Latin America. Private colonization schemes can at best accommodate a fraction of potential settlers, and only those endowed with some capital.

Encouragement for continued government involvement also comes from a reevaluation of settler potential. The "quality" of settlers has improved as government induced migration was replaced by spontaneous migration with an increasing prominence of more experienced and better capitalized settlers from the Center-South, many of whom were independent farmers. Settler substitution through natural selection has worked in the same direction. There is now a tendency to view the settler as a "misused resource" (Mueller, 1980) who performs better than was to be expected given the obstacles he has to face. This point is underlined by rapidly improving production statistics, particularly from the PICs in Rondônia.

The image of small farmers has furthermore, ironically, been enhanced by their principal adversaries, the large livestock raisers of Amazonia, who campaigned through their Association of Amazon Entrepreneurs against government colonization as environmentally destructive and economically unproductive in order to highlight their role in the economic progress of Amazonia. Now the cattlemen bear the brunt of criticism, even in government

circles, for their poor performance in social, economic and environmental terms (e.g. Mahar, 1979; Ministerio de Agricultura/CEDEPLAR, 1979; Goodland, 1980). Recently the Association of Amazon Entrepreneurs has acknowledged the need for support of small farms (e.g. Amazonia, 1980).

In this context of continued demand for government colonization, reduced funding and acceptance of a greater role of private enterprise INCRA has evolved an approach of partial direction and assistance.

#### PIC-PAR: Context and settler characteristics

PIC Paulo de Assis Ribeiro characterizes semi-directed colonization as it has emerged on the western frontier. PIC-PAR is strategically located in southern Rondônia (Fig.1), some 90 road kilometers from Vilhena, the principal gateway to Amazonia for rural migrants arriving from the South. The PIC was established in August 1974 to relieve migrant pressure in PICs Ouro Preto, Padre Adolpho Rohl and Gy-Paraná. In May 1975 it was linked to Vilhena with a low quality dry season road. The location choice for the project was influenced by a concentration of relatively good soils and the relatively favorable position in relation to migrant flows from and markets of South-Central Brazil. A major determinant was the potential of land tenure conflict, since the area had attracted the attention of squatters and contained four major land claims totalling some 165,000 hectares.

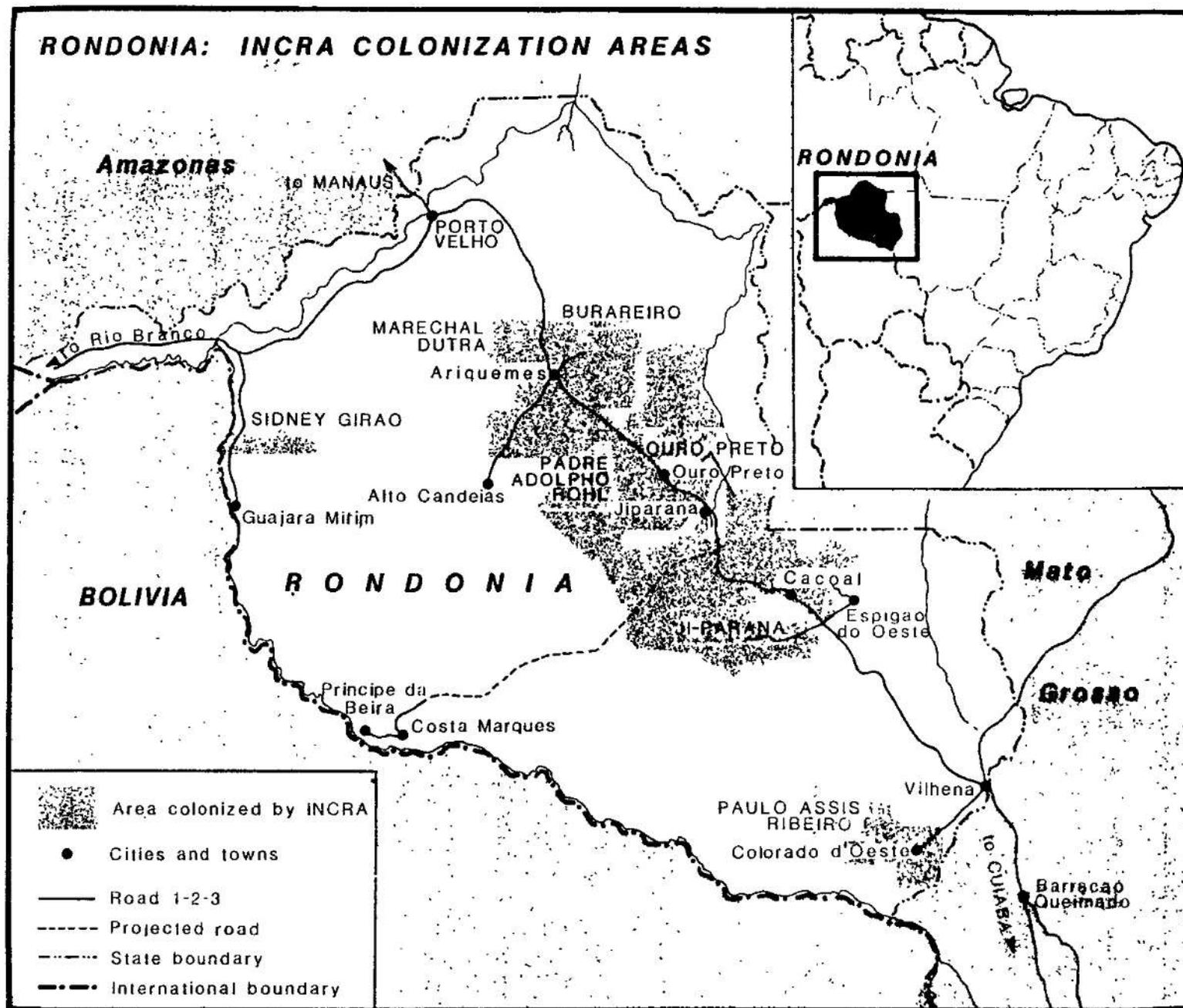


Fig. 1

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As in earlier PICs INCRA allocated standard 100 hectare lots. By late 1978, all of PIC-PAR's 3,000 lots had been claimed. Many contained several families. Squatters had penetrated into surrounding areas, spontaneously extending the INCRA land survey. The area population reached an estimated 40,000 in 1979 and 70,000 in 1981. Its main urban center, Colorado, exceeds 10,000 inhabitants.

Though an "integrated" project in name, PIC-PAR represents the limited services typical of semi-directed colonization. In 1979, government services in the PIC were confined to land allocation and tenure regularization (INCRA), feeder road construction (INCRA), agricultural extension services to some 8% of settlers (ASTER), one crop warehousing facility (CIBRAZEM), basic education facilities, a small hospital, and, since early 1979, malaria control (SUCAM). These services are inferior in variety, quantity and quality to those in most of the longer established rural areas of Brazil.

The near totality of settlers in PIC-PAR were born or have resided in the Center-South (FIG. 2). Some 71% had their last residence in either Mato Grosso or Paraná. Most derive from earlier 20th century frontier areas within these states. At least 78% had migrated before. Compared to migrants from the Northeast, who are more prominent in eastern Amazonia, these settlers from the Center-South represent a higher proportion of former landowners, greater experience with farm management and exposure to modernization, and generally, some capital, which ranges

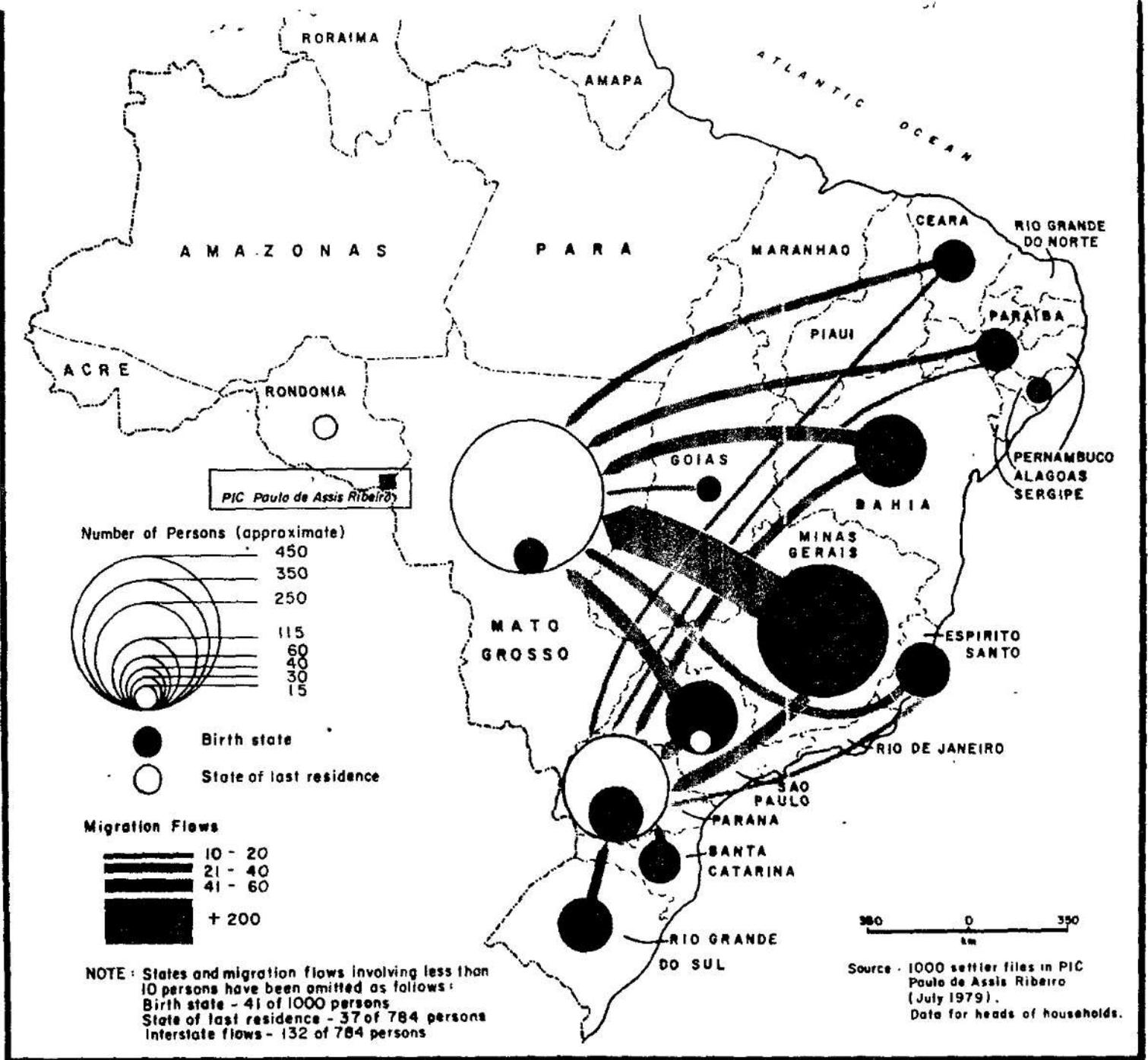


Fig 2

6a

from several hundred to thousands of dollars. Widespread previous exposure to frontier environments has doubtlessly contributed to a more rational assessment by these settlers of the opportunities and risks they face on the Amazon frontier.

Land use strategy

Except for the requirement that 50% of each lot remain under tree cover, which applies throughout Brazilian Amazonia, settlers face neither official land use restrictions nor guidance. Their near universal strategy is to proceed rapidly from annual crops (rice, corn, beans) to coffee and, to a much lesser extent, pasture. Cacau, rubber, citrus and other tree crops are considered by the settlers as possibilities for the longer term future.

Economic considerations explain the popularity of coffee: It can be intercropped with annuals until productive in only 2 or 3 years and thus does not require credit financing. Its favourable price to weight relationship and storage characteristics facilitate adaptation to high cost and unpredictability of transport. Finally coffee justifies wage labor once it is productive, and limits capitalization of the farms and expansion of cultivated acreage. By contrast the generally underpriced food crops, strongly affected by transportation cost, must normally be grown with family labor and impose land rotation and stagnation of the area under cultivation.

As a result of this land use strategy there is a relative absence of tree fallow in PIC-PAR, and presence of secondary bush generally indicates problems and miscalculations on the part of the settler or a transitional stage toward pasture development. Most of the farmers have cleared 5-15 hectares.

#### The Transportation bottleneck

Most of the settlers interviewed have limited expectations, and in fact exhibit some distrust of government assistance. This is partly attributable to the widely publicised failures of supervised credit programs in other PICs. Settler criticism is primarily focussed on the most visible, and in the final analysis most crucial bottleneck to the activation of private small-farm enterprise - inadequate local transportation.

In 1979, four years after its construction, the single access road to the colony remained usable only in the dry season. Single engine aircraft, often stripped of seats and other non-essentials to maximize payload, provided a rainy season link to Vilhena. Less than 60% of the lots were reachable by truck in the dry season. Only some 10% fronted on roads permitting some regularity of truck and jeep traffic during the rainy period.

Already disadvantaged because of great market distance, settlers have to bear the cost of delayed local road construction, as well as of ongoing unreliability of road transport due to maintenance problems. Inadequate or non-existent transportation particularly impacts on the settlers' access to services and ability to plan and thus on their ability to engage in productive work during the crucial initial three year period which largely determines whether there is take-off, stagnation or replacement of the initial settlers.

The problems of inadequate transportation, sharpened by capital shortage, generally produces a time lag extending anywhere from a few months to several years between the moment of land allocation by INCRA and the effective full time occupation and development of the lot.

Where dry season truck transport does not reach the vicinity of the lot, or cannot be expected to materialize by the first harvest, settlers consider investment in commercial agriculture as counter-productive. Given the relatively low prices for annual crops which obtain in the area, human portorage or animal transport (even if cargo animals were available, which they generally are not in the early stages of settlement) are not economically justified. Development of coffee and other perennials is equally delayed since most settlers depend on initial intercropping of perennials and annuals where the latter assure subsistence and cash flow. Work on the lot is restricted by the difficulty of moving in supplies, and few

settlers consider residing on the lot for extended periods until at least minimal access to education, health care and other services is available.

Furthermore, most settler families require remunerated employment in the initial stage. In contrast to areas dominated by larger enterprise where labour is in demand for clearing and preparation of land on the pioneer fringe, wage labour in PIC-PAR can only be absorbed in the urban center and on the well established farms in the core area. Employment opportunities for women and children are virtually confined to the urban center.

Consequently, many owners of not yet fully accessible lots expend only token efforts toward the development of their lot in order to satisfy INCRA's requirement for effective occupancy and to fend off squatters. Meanwhile they reside and make their livelihood in the core area of the PIC, elsewhere in Rondônia or even in their areas of origin. Prolonged separations of families are common in this transition period.

In order to prolong their residence elsewhere until service conditions and income opportunities on the lot have improved, and to accelerate the expansion of cultivated acreage or to accommodate landless relatives and friends, settlers with some capital frequently resort to contracting out the task of coffee planting. Contractual arrangements generally provide for the contractor to clear the land and to interplant coffee and annuals

for two years. Normally only coffee seedlings are provided by the owner. The contractor is entitled to the annual crops and occasionally some compensation in cash. In this fashion, the owner shifts the cost and risk of initial transportation difficulties to the contractor while capitalizing his property.

Settlers who are forced by lack of economic alternatives to move to their lot before road access is available or who invest effort in expectation of the imminent arrival of the road suffer a heavy rate of attrition. Rotting harvests, health problems magnified by poor nutrition and the inability to reach medical care, the drudgery and time wasted in bringing in basic necessities, and the depressing isolation during the rainy season undermine the determination of settlers who arrived with the expectation of rapidly moving into commercial agriculture.

Thus inadequate transport serves as the principal mechanism in decapitalizing the settler by blocking the effective utilization of starting capital toward agricultural development while imposing maintenance costs and risks. Numerous settlers in PIC-PAR had consumed their savings and were in debt to private lenders when the road finally arrived at their lot.

Such weakening of resolve and financial resources exposes settlers to exploitation. Settlers who require access and starting capital depend for their economic survival on loggers who have assumed a key role

in the development of PIC-PAR. Loggers will contract with several contiguous settlers, and occasionally with individual settlers, to extend existing roads to their lot line and to furnish logging tracks within the lot suitable for the evacuation of crops. The settlers generally supply the lumber for culvert and bridge construction and compensate the loggers with timber on concessional terms in accordance with the loggers' assessment of road construction costs incurred. The loggers' leverage as principal providers of access and starting capital is generally used to acquire additional timber rights at prices which compare unfavorably to what can be expected once access is secured and as accessible resources decline in the area. While lumber is a vital source of income for most colonists during the initial stage of settlement, colonists deprived of access are usually forced to rapidly divest themselves of a much larger proportion of their timber than their counterparts in better serviced areas.

Logging is a very lucrative business for the logger, since lumber prices are rising, and since prices paid for logs in Colorado and Vilhena represent a five-fold and seven to eight-fold increase respectively over the commercial terms which settlers receive for uncut timber on lots located near the periphery of the colony. Hence, there is an active interest on the part of logging entrepreneurs to establish access to and contractual control over previously inaccessible timber. Logging roads tend to be of poor quality and are generally abandoned by the logger once his immediate purpose has been served, leading to renewed isolation unless community effort or help from INCRA provides some minimum upkeep.

The weakened economic condition of many settlers similarly plays into the hand of local middlemen who manage to purchase annual crops, particularly rice, at a fraction of local market value before harvest and oblige the producer to store the produce until they can transact it to purchasers arriving from the South during the dry season. The availability of a CIBRAZEM warehouse in Colorado, which guarantees the official minimum price, provided no viable alternative until 1979 since producers had to transport their product to Colorado. Then, after a waiting period, they had to collect payment in Jiparana, which, at the best of times, involved a two to four day round trip depending on the settler's location within the colony. This problem has been partially resolved by the authorization in 1979 of a private bank in Colorado to serve as payment agent.

Production credit sources were equally beyond reach in Jiparana given the cost and time expended in the numerous trips required to negotiate and withdraw individual installments. Finally the transportation bottleneck opened the doors to corruption by government officials; e.g. one INCRA official extracted large bribes from numerous settlers for the allocation of centrally located lots.

There is little doubt that transportation problems were instrumental in producing the resale of more than one third of the lots in PIC-PAR, though few of the displaced settlers remain in the area to attest to this. In fact one may distinguish a group of pioneers who are rapidly worn out

financially, physically and psychologically and who are replaced by more demanding settlers with solid capital resources once infrastructure conditions become sufficiently attractive. Much as it may wish to select substitute settlers from its waiting lists of landless poor, INCRA is forced to condone commercial transactions, since original occupants must be compensated for land improvements, debts incurred and appreciated real estate values.

#### Selective spatial densification as a short term solution

It appears that many of the problems identified in the case study area and in other INCRA colonies result from the allocation of scarce and poorly managed public resources to excessively large areas. Spatial concentration of infrastructure, services, settlers and economic production in the first stage of colonization suggests itself as a partial solution, particularly given the considerable entrepreneurial skills and capital endowment of colonists and the spatial concentration of pockets of higher soil fertility in the western frontier. The preliminary observations toward such a strategy of spatial densification which are presented here are necessarily sketchy and are intended to provide a framework for debate.

The principal obstacle to densification is the insistence in INCRA colonies on a minimum property size of 100 hectares. Assuming initial low technology in a fragile environment, this minimum size

model was to assure long term upward mobility of socio-economically disadvantaged settlers, absorption of settler offspring and environmental protection, the latter objective being bolstered by the regulation that 50% of each property remain under tree cover. While of arguable merit in the long term, this model, combined with inadequate infrastructure and services, has constrained technological and land use options, and has contributed to low technology, low area production intensity, and reduced proportion of products marketed. Finally, it has led to decapitalization, replacement of weaker settlers and property amalgamation. Thus the possibility of achieving long term socio-economic objectives has been significantly reduced.

These results confirm the experience of other colonization areas in Amazonia that availability of abundant land in itself does not produce successful family farmers. In fact most of the scant examples of successful family farming are characterized by varying combinations of 1) small area utilized per family 2) progressive settlers, 3) modern appropriate technology with labor intensive practices, 4) viable commercial products and market access, 5) community organization, 6) effective institutional support and 7) limited government regulation. In the initial stage of colonization which determines economic survival, small farmers do not require access to a large property. If they remain at the level of annual food crops produced with traditional technology, available family labor constrains the surface

which can be utilized, even when one considers the implications of land rotation. On the other hand if the farmer achieves the breakthrough to tree crops or higher technology the increased return per hectare assures reasonable short term upward mobility on a limited area.

The broad outlines of what the author considers to be an appropriate strategy for the initial stage of semi-directed government colonies are as follows:

- 1) Confinement of colonies to areas with relatively high soil potential. These should be rapidly delimited through a land capability survey, preferably utilizing the environmental perception skills of local inhabitants.

- 2) Rapid demarcation of rural lots in the 10 to 30 hectare range, and urban lots up to 1 hectare (to permit some agricultural activity) in centrally located future town sites. Both rural and urban lot size should increase with distance from centers.

- 3) Immediate construction of all-season roads connecting all lots to their nearest center and the centers with each other and to the nearest highway. Simultaneous provision of basic health and education services.

- 4) Allocation and immediate titling of one rural and one urban lot per household on a first come first served basis without screening of applicants. No land use restrictions would apply on rural lots. Land transactions would be unrestricted except for maximum permissible

property size. (Size limits could be gradually relaxed over time).

5) Retention of unsurveyed areas as a forest reserve, part of which may eventually be used for expansion of settlement. The desirability of replacing the 50% forest rule with a contiguous forest reserve in new colonies has largely been accepted in POLONOROESTE, the federal development plan for Rondônia and western Mato Grosso (World Bank, 1981).

No further government services or infrastructure should be contemplated until the essential conditions listed above have been met.

The proposed strategy is sufficiently simple to be manageable under early frontier condition. It focusses government attention and action on the essentials, and permits the necessary speed of implementation to forestall spontaneous land occupation. It provides higher quality land to the largest possible number of colonists and establishes the basic conditions for unobstructed development of private initiative. Whatever the technology or land use choice, a large part of each lot can be developed within a short time span. The spatial density of human occupation and agricultural production in relation to public infrastructure should be sufficient to justify upkeep of and eventual expansion beyond the basic services mentioned.

Spatial density also permits a higher degree of central place residence and frequency of interaction which are essential to community organisation and community participation in the maintenance of essential

infrastructure, particularly roads. It enhances formation of a local market, and in the aggregate of several colonies, a regional market. This in turn brings the possibility of increased labor absorption in non-agricultural activities, middleman competition and frequency of transportation service. The farmer benefits from cheaper production inputs and improved farmgate prices for his output, his land use and technological options are broadened, and he can realize an adequate income on a significantly smaller acreage than is the case in the traditional dysfunctional colonies.

Densification and increased functional efficiency are also crucial to counteract the effects of rising transportation costs in the wake of Brazil's energy crisis which have added to the competitive disadvantages of remoteness from national and international markets. Equally, functional efficiency is basic to reliable support systems such as extension service, credit, and pest control which <sup>will</sup> eventually be required to counteract the high risks associated with the intermediate stage of agricultural technology.

The proposed strategy of course does not assure small farmer success. It does, however, help to define an appropriate target population of small farmers through property size limits which tend to discourage larger entrepreneurs and speculators. It also gives small farmers a realistic chance to put their limited assets to productive use, and to capitalize rather than decapitalize their property during

the initial stage of settlement. Those who sell their property benefit from the increased land value which results from reliable transportation facilities in a well-functioning local economy.

An eventual expansion into surrounding space of lesser quality with larger property size units will doubtlessly be required. It may involve partial resettlement from the core area or allocation of additional land to residents of the core area. Whatever its form, initial development along the above lines would go a long way toward ensuring that it proceeds in an orderly fashion, that it is supported by an institutional framework which has been able to show rapid economic return on initial public investment and which has had time to organize itself, and that it benefits from the existence of a functioning nucleus and the capital and experience accumulated in the core area.

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