Historical dynamics of reproduction of agriculture in Igarapé-Açu (Northeast of the State of Pará): A study focusing on agrarian systems

Aliomar Arapiraca Da Silva[1], Francisco Romualdo de Sousa Filho[2], Jonacir Corteletti[3], Wilza da Silveira Pinto[4], José Luiz da Silveira[5], Sílvio Roberto M. da Silva[4], Albrecht Kasper[6], Urbano Marcelo Marques[7] and Frederico Luiz Silva Cahete[2]

[1] CEPLAC-MAA -Superintendência da Amazônia Oriental, Belém/PA, Brazil; [2] SHIFT ENV44, NAEA-UFPA, Belém/PA, Brazil; [3] EMBRAPA -Amazônia Oriental, Belém/PA; [4] Fazenda Escola de Igarapé-Açu –FCAP, Igarapé-Açu/PA, Brazil; [5] CEPLAC-MAA Escritório da CEPLAC em Castanhal, Castanhal/PA, Brazil; [6] SHIFT ENV44, LAI-FU Berlin, Gemany; [7] SHIFT ENV25, EMBRAPA -Amazônia Oriental, Belém/PA, Brazil

ABSTRACT

The present study has the character of a diagnosis and aims at characterising and analysing the conditionals of reproduction of agriculture in the area of the old agrarian frontier of Eastern Amazon, particularly in Igarapé-Açu (PA). In order to reach this objective, the following methodological steps were taken: first, a „landscape reading" to show the artificialness introduced by humans in the landscape of the area under study; the second step was a reconstitution of the historic dynamics of agrarian systems, based on interviews with „privileged informants", followed the third step, which was the „agro-socio-economic zoning" of the area; the fourth step was the elaboration of a typology of the diverse producers, based on the previous steps; finally, a socio-economic survey of the type of producers was undertaken. These five steps allowed for a recomposition of an information basis to explain the changes that have occurred, and to deal with the strategies of reproduction of agriculture in the areas of the agrarian frontier of Eastern Amazon, thus allowing for the outlining of demands required by new research projects.

Key words: family agriculture, agrarian systems, use of secondary forests.

RESUMO

O presente estudo, com caráter de um diagnóstico, tem por objetivo caracterizar e analisar as condicionantes da reprodução da agricultura em área de fronteira agrária antiga na Amazônia Oriental, de modo particular em Igarapé-Açu (PA). Para alcançar este objetivo, usou-se os seguintes passos metodológicos: o primeiro, foi o da „leitura da paisagem" para visualizar a artificialização do meio pelo homem na área do estudo; o segundo, deu-se através da reconsti-tuição da dinâmica histórica dos sistemas agrários, a partir de entrevistas com „informantes privilegiados"; desses dois, partiu-se para o terceiro passo que foi o „zoneamento agro-sócio-econômico" da área; o quarto, foi a elaboração de uma tipologia dos diversos produtores, tomando por base os passos anteriores; e, por final, o quinto passo foi o levantamento sócio-econômico dos tipos de produtores. Estes cinco passos permitiram recompor uma base de informações para explicar as transformações ocorridas e para tratar das estratégias de reprodução da agricultura nas áreas de fronteira agrária da Amazônia

Oriental, possibilitando, assim, o delineamento de demandas para a realização de novos trabalhos de pesquisa.
Palavras chaves: agricultura familiar, sistemas agrários, uso de florestas secundárias

Zusammenfassung

Die vorliegende Studie hat zum Ziel, die Bedingungen der Reproduktion der familiären Landwirtschaft in alten Agarsiedlungsgebieten des östlichen Amazoniens insbesondere in Iguarapé-Acu (Pará) zu beschreiben und zu analysieren. Um dieses Ziel zu erreichen, wurden folgende methodische Schritte unternommen: erstens erfolgte eine "Beschreibung der Landschaft", um die Veränderung der Umwelt durch die Menschen des Untersuchungsgebiets darzustellen; zweitens eine Rekonstruktion der historischen Dynamik der Agrarsysteme anhand von Interviews "priveligierter Informanten"; drittens eine agro-sozioökonomische "Zonierung" des Gebiets; viertens, auf der Grundlage dieser ersten Schritte, die Erabeitung einer Typologie der diversen Produzenten; und schließlich als fünfter Schritt die sozio-ökonomische Erhebung der verschiedenen Typen von Produzenten. Diese fünf Schritte lieferten die Informationsbasis für die Erklärung der festgestellten Veränderungen und die Behandlung der agrarischen Strategien in Gebieten der Agrargrenze des östlichen Amazoniens. Dadurch wurde gleichzeitig die Notwenigkeit neuer Forschungsarbeiten begründet.
Schlagworte: familiäre Landwirtschaft, Agrarsysteme, Nutzung von Sekundärwäldern

INITIAL CONSIDERATIONS

The present study is part of a major one having the character of a diagnosis, which was undertaken in the Municipality of Igarapé-Açu, in the Bragantina Region of the State of Pará. Field research for the diagnosis lasted from October 1996 to February 1997, and was performed by an interdisciplinary and interinstitutional team of researchers. Project SHIFT-ENV 25 Capoeira initiated this study, which at first also involved EMBRAPA Amazônia Oriental and CEPLAC (Executive Committee of the Cocoa Cultivation Plan) a Department of the Agriculture and Supply Ministry. In a second stage they were joined by Projeto SHIFT-ENV 44 and FEIGA-FCAP (the Farming School of Igarapé-Açu of the College of Agrarian Sciences of Pará).

The objective of the study was to characterize and analyze the conditionals of agriculture in Igarapé Açu, as a way of identifying demands for undertaking new research studies; this was justified by a strongly felt need that research should not be restricted to Experimental Stations. The methodology employed is based on the use of a systemic approach to the study of local agrarian reality. It relies on studies undertaken by the Institut National Agronomique Paris-Grignon (INA-PG) and by the Institut National de la Recherche Agronomique (INRA), presented in Capillon and Sebillote (1980), Brosier et al. (1999) and, Dufumier (1996).

By employing this approach and by characterizing local rural reality, we highlighted the study's function in a global way, showing the interactions, causes and effects between different elements and factors, both internal and external, that form its structure. Thus, the systemic focus which was employed gave us a theoretical and methodological tool which is essential in carrying out the reconstitution of the evolution and differentiation of the production systems practiced by farmers.

METHODOLOGICAL CONSIDERATIONS

1 Geographic identification of study area

The study, having a diagnostic character, was carried out in Igarapé-Açu, which was decreed a Municipality in October 26, 1906, by State Decree-Law number 985. It is located in Mesorregião Nordeste Paraense (04) and Microrregião Bragantina (010); has an area of 756 km2. It has boundary lines with the municipalities of Maracanã and Marapanim in the North; with the municipality of Santa Maria do Pará in the South; with the municipalities of Nova-Timboteua and Santa Maria do Pará in the East; and with the municipalities of Castanhal and São Francisco do Pará in the West. The seat of the Municipality is 110 km from Belém, the State Capital, at the geographical coordinates of 1o, 07',41'' latitude South and 47o,47',15'' longitude West from Greenwich. The main means of access is by road, mainly by BR 316; it can also be reached by state roads (PA) 127, 242, 426 and 424. Residing population in August 1, 1996 was found to be of 30,651 inhabitants (FIBGE,1998); 15,618 (51%) were urban dwellers and 15,033 were rural ones. Demographic density was 40.5 inhabitants per square kilometer.

2 Methodological aspects and field research techniques

Methodological stages of survey and analysis of the agrarian world of Igarapé-Açu were schematized as follows:

LEVEL OF ANALYSIS		SYNTHESIS
MUNICIPALITY OF IGARAPÉ-AÇU	Analysis of agrarian history (Regional zoning of municipality)	Building of agrarian systems
PRODUCTION UNIT	Case study	Building of production systems. Elaboration of typology
GROUP OF DOMESTIC ANIMALS (same species)	Study of breeding	Building of breeding systems
PLOT (treated in a homogenous manner)	Study of plantation	Building of plantation systems

This shame was divided in two parts; the first, analytical, „descending" part, consisted in a general perception so as to reach the particular; and the second phase, synthetic and interpretative, recovered the information so as to ordain it from the level of detail in a certain locality up to the level of municipality. In this second phase, the ordination of information allowed for the conception of, at first, the systems of breeding[1] and cultivation[2]; followed the production systems[3], enclosing the breeding and cultivation systems, and at last the agrarian system[4], comprising the production systems.

2.1 Lecture of landscapes

The first step in data collection was to verify how humans have artificialized the agrarian space of the municipality under study. This was called „landscape reading ", that is, surveying the whole area of the municipality under study with the aim of going through and identifying the main heterogeneities (different types of agriculture, availability or absence of water resources, different uses of land, presence or absence of vegetation, and so on).

2.2 Analysis of agrarian history

In a general way, in the Amazon Region, there is scarce information available to allow for the understanding of the dynamics of development in a municipality and its surroundings, considering the nature of technical and social changes which have occurred, and the relationship cause-effect between technical and social changes. So the second step of the survey aimed at generating information that was not available[5]; it was than proceeded to interview the aged people of the region which had had contact with agriculture and that were aware of the changes that had occurred. The interviews[6], 28 in all, with these „privileged informants[7] " were not organized by means of closed questionnaires, but rather in a „semi-structured" form. This was done with the aim of obtaining information about the following

[1] The breeding system which is defined as a collection of animals of the same species, divided by age and sex, according to certain proportions and submitted to defined technical itineraries" (Groppo, 1991, p. 25). The technical itinerary applied to the breeding system is a combination and succession of techniques destined to products from animals or to production of animals of one same domestic species with the work force and the means of production within the same exploitation" (Dufumier, 1996, p.82).

[2] This is defined as a collection formed by a surface of land managed in a homogenous way, by cultures according to their order of succession and by technical itineraries that are applied to them (Dufumier, 1996; Groppo, 1991). The technical itinerary is the logic and ordained sequence of techniques applied to a vegetal species cultivated in the same plot (Sebillote, 1974).

[3] This concept coming from Dufumier (1985, p. 3) defines that „as a more or less coherent combination, in time and space, of certain quantities of work force (familiar, paid for, etc.) and of distinctive means of production (lands, buildings, machines, instruments, livestock, seeds, etc.) so as to obtain different agricultural productions, vegetal and animal". According to this definition, a production system refers to the structured collection, on one hand, of production factors, and on the other end, of productions, be it vegetal or animal, managed by the producer in its production unit, so as to attain his objectives.

[4] Defined by Mazoyer (1987) as follows: a mode of exploitation of the environment historically created and durable, a system of production forces (a technical system), adapted to bioclimatic conditions within a certain space and corresponding to social conditions and to the needs of the moment". Thus, the agrarian system consists in a mode of exploitation of the cultivated environment appearing from successive transformations historically undergone by the original environment, by means of an adequate combination of means, equipment and tools" (Groppo, 1991, p. 26).

[5] We also had recourse to bibliographic research and consultation to primary sources.

[6] In the interview, a distinction was made between information corresponding to the personal history of the person being interviewed and the information related to the region as a whole.

[7] Age of *„key informants"* ranged from 79 to 93 years. All mentally sane.

points: (a) - which were the production systems established in the region (main productive activities of the production systems, and their relative weight in the economy of the production unit; for each productive activity: technical level of the practice, estimate of profit and capacity of accumulation; also social organization and social relations of production: paid work, mutual help, exchange of working days, shared production, etc.) (b) - how did production systems evolve (loss of interest in some productive activities, development of others, etc., evolution of practices, and evolution of social relations of production); and (c) - which factors favored evolution and transformation of production systems (population dynamics such as: migration flows and settlements in the agrarian frontier; introduction of new tools or practices; introduction of exogenous capital; changes in price and market relationships, impacts of national and international policies; road openings, etc.).

2.3 Zoning of agro-socio-ecologic spaces as function of homogenous problems

The third step, zoning, had the objective of spatially dividing the municipality in zones having similar physical, socio-economic and agronomic character, and the formulation of hypothesis about the problems faced by the identified zones. Other aspects besides these were taken into account, such as: dynamics of occupation; presence of old settlers or newcomers having some resources; land possession; population density; development of external infrastructure and services; level of market integration; use of land; and technical level of management.

Specifically, the aims of zoning were the following: (a) to characterize the region under study so as to allow for a primary definition of distinctive problems identified in different zones; (b) formulation of tentative hypothesis about the socio-economic rationale of different actors in production systems existing in the municipality under study; (c) Definition of criteria for selecting production units to be further analyzed in detail. This detailed analysis allow for the confirmation or rejection of the tentative hypothesis previously formulated; and, (d) generate useful information for the survey which was performed afterwards.

Didactically the zoning evolved through the following phases: (a) delimitation of homogenous zones and description of same; (b) regrouping zones having similar character; and (c) final delimitation (spatially, the municipality was divided in 6 zones[8]) and description of main agrarian problems detected.

2.4 Typology of production systems and of producers

The typology and its understanding depend on the previous knowledge of the three first phases of the survey, and are fundamentally tied to three aspects: (a) interviews with producers, basic material for elaboration of typology; it were made from a non random sample of 22 production units chosen because of the results found in zoning; (b) the elements outstanding in the studies of landscape reading and reconstitution of agrarian history, as well as in the zoning, enriched and oriented the analysis of present production systems; and, (c) the historic study supplied dynamic content to the analysis of agrarian reality in the municipality.

[8] The details about each of the 6 zones will be found in the diagnosis report which was elaborated by the interdisciplinary team of researchers responsible for this study.

2.5 Content of interviews

The interviews had different aspects, such as: (a) structural data of the production unit (available surface and its potential use, manpower, production capital and its distribution in the different production items, etc.); (b) reconstruction of all inner and outer activities occurring in the production unit during the last complete agricultural and annual cycles; (c) identification of production relationships between producers of each zone: selling manpower, leasing of production capital and land; finally, (d) historical aspects of production systems with regard to means of production (surface, capital, manpower) and to activities performed by the producer's family, be it in husbandry or in handicraft or in eventual paid jobs outside the production unit.

RESULTS

1 Of the formation of agrarian space and dynamics of agrarian system in Igarapé-Açu

So as to understand the process of formation of agrarian space and the dynamics of the agrarian system in the municipality under study, we have first to consider both the spontaneous settlement processes and oriented settlement processes, presently being tutored by the State. They had distinctive features as to pattern of occupation of agrarian space in different historical moments. Secondly it should be considered that access by road and the dominant transportation systems strongly conditioned the pressure for expanding peopling of spaces and the development of economic activities in different historical periods. Interpretation of the development of economic activities, on the other hand, allowed us to reconstitute the very dynamics of transformation and exploitation of the biophysics environment which constitutes the landscape and conditioned performances, productive strategies and adapted development patterns.

What follows is an effort to enlighten the variables identified by the study, although having a diagnostic character, for each historical period.

- **The pattern of space occupation and the relationships within the system shaped as from the dominance of interactions by fluvial ways: The period before 1895.**

The dynamics of transformation and exploitation of agrarian space, up to the last decade of the 19th century, was related to spontaneous settlement by the so called „paraense[9]". This occupation process rebounded as a distinctive form of social use of space which organized itself by means of fluvial ways (Maracanã River, and, in a minor way, the Jambu-Açu River, an affluent of the Marapanim) which formed the basic organization of local economy up to the beginning of the 20th century. Economic exchange between settlements regarding occupation through the Maracanã river, developed commercial interactions between Porto Seguro, Santarém Novo, Maracanã and Belém; as regards occupation through the Jambu-Açu river, interactions with Marapanim and Belém.

The frontiers of this fluvial system were established according with navigability and the reach of trails starting from navigable points. Function of the system as relates socio-economic relationships was tied, on one side, to the barter system with commercial financiers (the

[9] As they were born in Pará and presented types of behavior in dealing with original nature which were different from those of the people who came from the Northeast, mainly as from the building of the railway.

bosses) in Belém and, on the other side, to commercial intermediation, frequently cared by Portuguese businessman which had implanted „strong" outlets in localities such as Maracanã and Porto Seguro. Besides, relationship with producers implied in exchange and use of the „caderneta" system (individual notebooks to write down debit and credit of each producer)[10].

Production systems[11] existing in this historical period, exploited mostly cultivation systems such as rice, corn, beans and cassava. Production aimed at consumption of the production unit, with any leftover being sold to economic agents as described. Hunting, fishing and extractive activities had an important role, seeing as they were abundant in the region. Size of plantations would depend on the work force available within the family, and its needs. This fact represented a difference, at the level of each production system, as to human pressure on the biophysics environment.

- **The pattern of space occupation and relationships within the system shaped as from the dominance mediated by the railway: The period between 1895 and 1940.**

State Government policy to place settlers in Bragantina - based on the construction of a railway[12] and establishing nucleus of settlers along the railtracks - and its implementation, created a new pattern of land occupation. This new pattern of space occupation, at the level of Igarapé-Açu, became established as from the demarcation of the settler's nucleus of Jambu-Açu. Founded in 1895, this nucleus grew rapidly[13], establishing a new dynamics of transformation and exploitation of agrarian space. This settlement policy was also centered in the establishing of a well defined network of land communication which brought about the permanent occupation of the space in between igarapés, which up to then had only been used sporadically. Besides, there was an attempt to give agricultural use to the land by establishing settlers (mostly migrants from the Brazilian Northeast, but also immigrants from Spain) which occupied 25 hectare plots distributed along crossroads (vicinal roads). In contrast with the previous historic period, this represented a reduction on original dimension of production units.

It was verified that, in this historical period, there was a significant differentiation process related to the formation of production systems. This was due to the fact that the immigrants settling there had arrived with different financial resources (some had capital, others did not), available work force varied according to the family, as well as the accumulated technical knowledge on how to deal with certain activities, cultivation and nature. Such factors caused (a) a difference in the original size of production units[14], seeing that those immigrants

[10] System in which the dealer would write down whatever he sold or bought from the producer, so that, within a certain period of time, he would have a *financial account* of credit and debts.

[11] These were characterized basically by their *fronts* (extension of land on the waterfront).

[12] It was built between 1875 and 1914. It started in Belém and ended 228 km away, in Bragança. In Igarapé-Açu the laying of the rails happened in 1901. The railtracks crossed the municipality in the middle, West to East, (having a branch going South do Prata Settlement).

[13] Four years after its foundation, in 1899, about 180 plots were already occupied. In the first year of this century, its population reached 1890 inhabitants, and there were 49 rural agro-industries (5 rum distilleries and 44 mills manufacturing cassava flour). And, by 1907, 399 settler plots had been distributed (Conf. Cruz, 1955 e Penteado, 1968).

[14] It could comprise one or more plots of land. The criteria for various plots to constitute one production unit, is that, management, working strength and tools, could be handled homogeneously by the producer.

bringing capital were able to buy more than one plot of land[15]; (b) the size of gardens (both commercial and for self use) as immigrants having a greater availability of family work force would cultivate greater areas; (c) the sprouting of rural agroindustries[16] (such as those processing sugar cane to produce molasses, sugar and rum); and, (d) the implantation of cultures which were exclusively commercial (such as cotton[17]). This fact, on one hand represented a certain degree of intensification of systems, and on the other hand, a diversification of managed cultivation systems at the level of each one of them.

Cotton, along with rice and cassava, during this historical period, were the main systems to be cultivated in the majority of production units. The establishment of agroindustries that processed cotton and rice[18], in the second decade of the present century, in the seat of the municipality, was a stimulating factor for expanding areas under cultivation[19], although it was conditioned to the factors already described. These three types of farming also had the role of main products to be commercialized by producers.

In this historical period, flourishing of production systems was based on the natural fertility of the soil. It was this fertility that supported agrarian production[20], causing a golden period of development in the Igarapé-Açu Settlement[21]. The technology for management and use of land was related to the annual practice of slashing and burning primary forest, using primitive working tools (axe, sickle and machete). Hunting and fishing had an important role due to the richness and diversity of regional ecosystems. As to commercial relations between settlers and economic agents, the predominant system was the buying on leaf [22], intermediated by tropeiros[23], which transported products from the production units established along the crossroads till the warehouses established in villages such as Porto Seguro, São Jorge do Jabuti, Curi, São Luiz and, mainly in the seat of the municipality.

The conjunction of factors described above led to a differentiation, at the level of each system, as to human pressure on the biophysics environment. The result was a scenery in which the vegetal cover of primary forest disappeared in most of the production units. This degree of intensification in the use of land presented as a consequence, in some production units, the exploitation of areas with resting periods of up to 3 years.

---

[15] Reports by *key informants* show that some immigrants bought as many as 6 plots, be it to be worked individually, or by married offspring that lived together with the family.

[16] By means of technical knowledge accumulated and available capital, both by Northeastern and Spanish immigrants.

[17] Knowledge accumulated by some Northeastern immigrants in dealing with this culture favored the implantation and expansion of the area being cultivated. They brought the first seeds with them.

[18] He would buy the product *in natura* from producers, beneficiate it and sell to consumer markets in Belém or Manaus. He also sold beneficiation services to producers (on a percentage basis).

[19] Cultivated area in different productive units varied, according to data obtained from *key informants*, between 2 and 30 *tarefas* (1 *tarefa* being equal to 3025 m2; 1 hectare equals 3.3 tarefas).

[20] Productivity of the main products under cultivation, in the period, according to *key informants*, was as follows: cotton (10 to 15 *arrobas* - 150 to 225 kg - for each *tarefa*); rice (10 to 12 bags weighing 60 kg per *tarefa*);. beans (5 to 8 bags with 60kg per *tarefa*); cassava (20 to 30 bags of 60 kg per *tarefa*); and corn (5 to 6 bags of 60 kg per *tarefa*). These differences in physical productivity for each culture was a result of different levels of consortium, of spacing, and of general handling applied to cultures.

[21] In this period, the main exports were: rice for Belém and Manaus markets, beans for Belém market; cotton mainly for the Brazilian Southeast; and cassava flour for Belém and Brazilian Northeast markets.

[22] System in which the trader would finance the cost of production and the grower would be obliged to deliver his production to the former; at the time of delivery they would proceed to the "*financial account*" stating debts and credits.

[23] Agents responsible for conducting a group (from 6 to 12) beasts of burden, to transport the production.

- **The patterns of space occupation the relationships within the system constituted from the dominance of interactions due to railway and roads: The period from 1940 to 1964.**

The establishing and shaping of a road system for transportation, in this period, came to join the already existing rail system, allowing for - among other things - better conditions of production flow. At first, roads joined the Igarapé-Açu Settlement to other settlements and the State Capital (Belém) and in a second bout, the roads consolidated relationships of the municipality to other regions of the country, allowing for the opening of new markets for local products.

The functioning of production systems still continued, based on natural soil fertility. However, the conjunction of power of demographic pressure, land partition and opening of new markets to local production, caused a growing intensification[24] on use of land resulting, mainly towards the end of the period, in a considerable decrease in natural soil fertility . Besides, the techniques employed in management and use of land did not evolve - they went on being centred in the yearly practice of slash and burn of the still existing primary forest and brush, by means of primitive tools (axe, sickle and machete). Hunting, fishing and extractive activities, in spite of diminishing substantially, went on being important as nutrition complements for the settlers.

Cotton and cassava are the main farming systems practiced with commercial aim. However, rice growing - an exploitation that had significant commercial importance in the previous period - became limited almost exclusively to self consumption in the majority of production units, due to diminished productivity, as a consequence of the drop in natural fertility of the soil. Other crops that were remarkable, although mainly for self consumption, were corn and beans.

As to socio-economic relationships, the prevailing system still was the „buying on leaf", with commercial financiers established in Igarapé-Açu, and neighboring municipalities - mainly Castanhal and São Francisco do Pará - and in the State Capital (Belém). Both the flow of production and commercial intermediation within the municipality went on being in charge of the tropeiros. However, it is in this period that trucks started being introduced in transportation of products from the settlements established in crossroads till the warehouses established within the municipality and on the other side of its frontiers.

The dynamics of transformation and exploitation of agrarian space gave shape to the agrarian system, in this period where primary forests disappear altogether from production units (except in the area of the Prata Settlement). In this context, farming systems are directed almost exclusively to the areas having vegetal cover of brush, where farming plots were cultivated with one or two crop cycles before being abandoned to rest for a period - generally - never over 10 years, in most production units.

[24] According to data supplied by *key informants*, being cultivated in production units varying from 3 and 30 *tarefas* . Data from *Censo Agrícola* of 1950 and 1960 has more details: in 1950 there were 1376 establishments, in which cultivated areas varied according to the following: 3% having up to 3 *tarefas*, 30% between 3 and 6 *tarefas* ; 59% between 6 and 17 *tarefas;* and 6 % having a tilling area between 17 and 33 *tarefas*. By 1960 there were 2188 establishments, which also presented varied cultivated areas, that is: 14% had up to 3 *tarefas;* 36 % between 3 and 6 *tarefas;* 35% between 6 and 17 *tarefas;* and 10% between 17 and 33 *tarefas*.

- **Pattern of space occupation and relationships in the system formed as from the dominance of road interactions: The period after 1964.**

The period starting from the middle of the sixties up to now, comprises the reshaping of the agrarian system in Igarapé-Açu. It is the result, on one side, of the deactivating of rail transportation[25] and the establishing of roads, and on the other side, of the joining of forces established by new social actors that get into the municipality by means of demographic pressure, by land partition and by intensifying its use (a consequence of the land management system practiced [26] in production systems ever since previous periods). This joining of factors resulted in an agrarian crisis which took to a restructuring of production and of production units within the municipality.

In this context, the strategies adopted by producing families are varied, as for instance: leaving for gold and precious stones panning regions, migration for urban centers; and occupation of land in new frontiers. In all these instances, though, for most farmers, the strategies implied in the permanence of some family members in the place, allowing for an alternative to assure the reproduction of family based agriculture in this space[27]. Farming systems practiced in family production units, go on being centered on production of corn, beans, rice and cassava, but with remarkable decrease of physical productivity[28]. Cotton growing was practically abandoned in most production units during the sixties, mainly because of the deactivation of an agroindustry which was located in the seat of the municipality and would buy the settlers' production. However, cotton growing had a surge during the eighties, using a technology which is non dependent on natural soil fertility[29].

The implantation of permanent crops (black pepper and oil palm) and semi-permanent (passion flower fruit), mainly aimed at the market, produced a reorganization of production in a considerable number of production units. This fact represented the introduction of a new production pattern based on use of fertilizers and pesticides. This process started in the second half of the sixties with the arrival of new productive agents to the municipality - the Japanese - who, by means of land buying, started a process of reordenation of ownership which is more visible in certain areas of the municipality. To start with, they implemented cultivation of black pepper, followed by palm oil.

Black pepper farming was fully established by the first half of the seventies, be it in the areas exploited by the new agents, or in the land belonging to the first settlers or their

[25] Commercial interactions based on the Belém-Bragança railway are interrupted in 1964 when the Government deactivated it.

[26] The system of management and use of land was based on the practice of slashing and burning the vegetation cover of a certain area. In this system, plots of land were cultivated for one or two cycles of culture before being abandoned for rest. The gradual decrease of the rest period along the agrarian history of the municipality, on the other hand, did not allow for due accumulation of biomass, nor for due covering of plots, thus hindering reproduction of fertility in the soil and the control of invading weeds.

[27] Data in *Censo Agropecuário* of 1985, show that 72% of exploitations had areas under 4 plots, that is, under 100 hectares (FIBGE, 1987).

[28] These cultures were exploited in the consortium form, in which, after slashing and burning of the brush, it was proceeded to planting - in a sequence - corn, rice, cassava, ad beans. Productivity varied around 3 bags of 60 kg per *tarefa* for rice; 2 to 3 bags of 60 kg per *tarefa* for beans; 2 to 3 bags of 60 kg per *tarefa* for corn; and, for cassava, from 0 to 12 bags of 60 kg per *tarefa*.

[29] This process was encouraged by a public policy developed by the State Government, executed by the State Rural Extension Service (EMATER-PA), from whom the producer would receive seeds, fertilizer and pesticides, with the condition of handing the production to EMATER-PA to be sold. In this moment, a financial account would be performed, in which the expenses with the inputs would be deducted from the price of sale.

descendants[30]. This expansion process was encouraged by a policy of incentives set by the Federal Government (PROTERRA and POLOAMAZÔNIA) and thrived with the rewarding prices obtained in international markets. However, this activity practically disappeared during the second half of the eighties, as a consequence of phytosanitary problems (fusariosis). As from the middle of the present decade, it has been retaken by producers having some capital, that are planting good sized areas[31].

Palm oil, ever since the beginning of implantation has been adopted only by farmers of Japanese origin, the plantations having from 25 to 350 hectares. Its expansion in the municipality is favored by bioclimatic conditions, and by a policy of fiscal incentives set by the Federal Government, through SUDAM (a Department for the Development of the Amazon Region), which allowed for the implantation of a local Agribusiness (PALMASA - Agroindustrial Palmeira da Amazônia S.A.) in January 1989.

Cultivation of the passion flower fruit is very recent in the municipality. It was encouraged at first by a private agribusiness (AMAFRUTAS)[32] as well as being favored by financial resources from the FNO (Fundo Constitucional do Norte). This program was of primary importance, seeing that it provided the decapitalized producer with capital, as this culture requires strong financial resources, be it for implantation, be it to care for the plantation.

Another reshaping of production and of production units also happened by the use of land as seeded pastures[33], for cattle breeding in areas previously occupied with food cultures. This fact happened because local urban businessmen and other productive agents that came to the region during the seventies, started buying plots from early settlers. They would buy many neighboring plots, forming production units (fazendas),some of them having an area greater than 20 plots (500 hectares).

Within this conjuncture it was verified that there were three main processes occurring in the period: (a) reordainment of real estate, with valuation of land (old settlers sold plots so as to apply money in the financial market, that was then paying high interests); (b) implantation of alternative cultures, aimed at the market (black pepper, palm oil and passion flower fruit) which involved producers having some amount of capital; (c) creation of a market of part time work in local agrarian space which is helpful for producers having little or no capital. Besides, these processes were conductive towards a differentiation at the level of each production system, of human pressure on the biophysical environment.

---

[30] In 1980, according to *Censo Agropecuário*, there were 1958 establishments in Igarapé-Açu. Within this universe, 788 establishments were cultivating 1982 hectares of black pepper, there being 3,002,065 plants. (FIBGE, 1983).

[31] In some cases, implanted areas reached 20,000 plants, one of them reaching 100,000 plants.

[32] The trade of this product through AMAFRUTA, with rewarding prices was only true in the first few years after implantation of this agroindustry, with the result that after working at first as stimulant to expansion, it became decadent soon after, in a significant way. In the last few years, a positive reaction in prices has started, caused by - among other factors - intermediate agents that are making it possible to place the product in other markets, like São Paulo, for instance.

[33] The last few *Censo Pecuário* clearly show this scenery. Thus, growth of use of land with seeded pastures was of 543 hectares in 1970; of 677 hectares in 1975; of 2664 hectares in 1980; of 6695 hectares 1985; and of 8152 hectares in 1995.

2 Present agrarian reality

The study of agrarian production in the municipality of Igarapé-Açu allowed us to identify four categories of producers, based on size of existing production units. These categories of producers exploit production systems which were grouped in activities of: agriculture, agrisilvaculture, agriextrative, agribreeding and breeding.

Table 1: Types of producers and production systems practiced in Igarapé-Açú (1997).

PRODUCTION SYSTEMS	EXISTING TYPES			
	Micro	**Small**	**Medium**	**Great**
Agriculture	X	X	X	X
Agriextrative	X	X		
Agribreeding		X	X	X
Agrisilvaculture		X	X	X
Breeding		X	X	X

Source: Field Research

Micro Type – Mainly old settlers and/or their descendants, practicing production systems of the agriculture and agriextractivism group, based in family work force, represent 38% of the farmers of the municipality. Their production units occupy an area which is smaller than that of the original settlers, that is, 25 hectares. Production aims at self consumption, and the left over is sold; in this case, whenever the gain is not sufficient for social reproduction of the family, the workforce is usually sold for farming or non-farming purposes. It should be pointed out that, within these production units, gardens are a very important item[34] – being present in practically all plots - not only as a complementary source of nutrition, but also for commercial purposes.

Small Type – represent 56% of the farmers of the municipality; their production units have areas measuring from one to less than 4 plots (25 to 100 hectares). The components of this type are either old settlers and their descendents or new productive agents that came to the municipality as from the sixties. In these production units, the main practice is to keep diverse cultures, using basically family manpower, but hiring of part time workers is not unusual. In some cases they work in non complex activities, and keep a flexible working schedule, which does not require much manpower. This category of farmers is responsible for the exploitation of most part of the commercial culture within the municipality. The production systems they exploit are catalogued as activities of agriculture, agriextrativism, agrisilvaculture, agribreeding and breeding. In here as well, at least in part of the production units, gardens have an important role.

[34] In these „backyards" are exploited systems of small animal breeding (birds and pigs), and a great variety of cultures such as: avocado pear, mango, coconut, pupunha, cashew, cupuaçu, lemon, orange, açaí plantado, ingá, pineapple, guaiava, cocoa, jaca, urucu, coffee, black pepper, and others, the size and exploitation of these cultures being quite different from one unit to another.

Table 2: Main characteristics of production systems practiced by small family farmers in Igarapé-Açu.

Production system	Total Surface put to use	Culture, breeding and extractive systems (ha)	UMW (1)	Net gain per system (R$)	Vegetation cover (ha)
Agriextrativism (PU = 25 ha)	10,3 (ha)	Garden Corn + Cassava (0,6)	0,4 (family manpower)	313,00	*Brush over 30 years old (10,0)
		Vegetal Coal (7,4)	0,7 (family manpower)	958,00	*Brush between 10 and 12 years (5,0)
		Backyard (2,0)	0,08 (family manpower)	515,00	*Brush between 2 and 5 years old (7,4)
Agriculture (PU= 25 ha)	7,3 (ha)	Garden: Cassava + Beans (1,5)	1,41 (family manpower)	124,00	*Brush over 20 years old (2,0)
		Urucu (1,0)	0,97 (family manpower)	302,00	*Brush between 12 and 15 years old (5,0)
		Passion flower fruit (3,0)	2,14 (family manpower)	4.920,00	*Brush under 5 years old (1,0)
		Consortium: Murici + Cupuaçu (1,8)	3,21 (family manpower)	5.270,00	
		Backyard (0,6)	0,04 (family manpower)	347,00	
Agrisilvaculture (PU=32 ha)	10,27 (ha)	Garden: Corn + Cassava (7,4)	2,96 (family manpower and hired help)	3.457,00	*Brush over 50 years old (1,5)
		Urucu (1)	0,6 (family manpower)	479,00	*Brush with varied ages (14,0)
		Black pepper (0,45)	0,6 (family manpower)	36,0	
		Consortium: Rubber tree + Cupuacu (2,42)	0,04 (family manpower)	Implantation	
		Beans (1,0)	0,34 (family manpower)	348,00	
		Backyard (0,42)	0,06 (family manpower)	598,00	

Note: (1) – Workman Unit (corresponds to 2000 hours per annum; equal to 250 days/man/year).

Source: Field research .

Medium Type – are approximately 4% of farms of the municipality; having areas that range from four to less than twelve plots (from 100 to less than 300 hectares). It has old settlers and/or their descendants, but mostly new productive agents that arrived in the municipality after the sixties. The system they work with ranges from diversified cultures to those having but little complexity; they are also engaged in breeding, which might be the mainstay of some proprieties. In most situations it was verified to be intensive soil preparation, by means of chemical and organic fertilizers. The work force still is based mostly on family ties - mainly in those production units belonging to the first settlers and their descendants - and in hired help, in the case of the new productive agents that have arrived during the three last decades. The production systems practiced grouped under activities in agriculture, agribreeding, agrisilvaculture and breeding.

Great Type - gathers basically new social actors (urban businessman of the municipality itself and productive agents from other regions). These farmers occupy around 2% of the proprieties. The areas they work cover 12 plots or over (300 hectares or over), and the production systems they practice are grouped under the activities of agriculture, agribreeding, agrisilvaculture and breeding. Such activities are compatible with absentee landlords, as are usually limited to breeding and cultivation of little complexity and that - excepting for palm oil and black pepper - require low use of manpower. These great owners were strongly favored by policies of fiscal incentives which the Federal Government issued in the seventies and eighties.

In order to have an overview of the economic reproduction of farmers within the various production systems which are exploited in the municipality under study, one should keep in mind - among other items - the demand for work force in the area being worked and the net agricultural income which is retained by the producer. This net income should allow for due compensation of family work units, as well as financing investments required for the development of farming production units. Thus, even if the results of the diagnosis have considered a fairly complex range of categories of agriculturists in this article, we shall present in detail only three cases of producers classified as being of the small type, which is characterized mainly for using family work force, with eventual hiring of help (Table 2). It can be verified, in the cases being detailed, how important is the backyard sub-system within the production system, as the best compensation for the family workforce. Besides, as it is an activity practiced in a fixed area, pressure on vegetation cover is slight.

FINAL CONSIDERATIONS

The path we have followed in this study takes to make some final considerations about the following points:

- The shaping of the agrarian system has been based on the dynamics of the means of transportation that were dominant in distinctive periods: fluvial, by rail and by road;
- This has conditioned the pattern of effective occupation of space and the valuableness of the areas, the economic extent of the system, the market structure and the merchandise that could be exchanged, and, consequently, the type of placement of local production in regional and national markets;
- The understanding of pressure of population expansion within the space and the economic activities that developed, allowed us to reconstruct the dynamics of transformation and exploitation of the biophysical environment which nowadays conditions productive performances, productive strategies and adapted models of development - mainly whenever environment is considered a strong limitant of productivity;
- Dynamic history of space occupation by different social actors conditioned, on one side, a differentiation in sizes of production units, of areas being worked for commerce and for self consumption.. On the other side, it took to the establishing of agribusiness both rural and urban (flour mills and mills for beneficiation of rice and cotton) the implantation of cultures aimed at commerce (cotton, black pepper, palm oil and passion flower fruit). Such factors allowed for a certain degree of intensification of the system and diversification of cultivation systems managed in each production unit.

Finally, considering the diversity and complexity of agricultural situations that were verified - and there were many - with which are faced researches, extensionists, administrators and other professionals dealing with rural development of the Amazon Region, it is necessary to indicate and limit problems at organization and working scale levels, over which one intends to intervene. This study, although in the character of a diagnosis, searched to evidence the demands for future research and development studies.

REFERENCES

Brosier, J, Vissac, B, and Le Moigne, JL, 1990: Modélisation systèmique et système agraire. Institut National de la Recherche Agronomique, Paris.

Capillon, A, and Sebillotte, M, 1980: Etude des systèmes de production des exploitations agricole. Typologie. Séminaire Caraibe sur les systèmes de production agricole, INRA-IICA.

Cruz, E, 1955: A Estrada de Ferro de Bragança, SPVEA., Belém.

Dufumier, M, 1985: Systèmes de production et développment agricole dans le Tiers Monde. Les cahiers de la recherche développment 6, avril, Montpellier.

Dufumier, M, 1996: Les projets de développment agricola. Manuel d'expertise. Karthala et CTA (ed), Paris.

Fundação Instituto Brasileiro de Geografia e Estatística, 1953: Censo Agrícola de 1950. Rio de Janeiro, FIBGE.

Fundação Instituto Brasileiro de Geografia e Estatística, 1965: Censo Agrícola de 1960. Rio de Janeiro, FIBGE.

Fundação Instituto Brasileiro de Geografia e Estatística, 1975: Censo Agropecuário de 1970. Rio de Janeiro, FIBGE.

Fundação Instituto Brasileiro de Geografia e Estatística, 1979: Censo Agropecuário de 1975. Rio de Janeiro, FIBGE.

Fundação Instituto Brasileiro de Geografia e Estatística, 1983: Censo Agropecuário de 1980. Rio de Janeiro, FIBGE.

Fundação Instituto Brasileiro de Geografia e Estatística, 1989: Censo Agropecuário de 1985. Rio de Janeiro, FIBGE.

Fundação Instituto Brasileiro de Geografia e Estatística,1998: Censo Agropecuário de 1990. Rio de Janeiro, FIBGE.

Fundação Instituto Brasileiro de Geografia e Estatística, 1998: Contagem da População 1996. Rio de Janeiro, FIBGE.

Groppo, P, 1991: Diagnóstico de sistemas agrários: una metodologia operativa (tres estudios de caso en Chile). FAO – Oficina Regional para América Latina y el Caribe, Santiago.

Mazoyer, M, 1987: Dynamique des systèmes agraires, rapport de synthèse du colloque sur la dynamique des systèmes agraires. Paris: Ministère de la Recherche et de la Technologie.

Penteado, AR, 1968: Problemas de Colonização e de Uso da Terra na Bragantina do Estado do Pará. Junta de Investigações de Ultramar. Lisboa.

Sebillotte, M, 1974: Agronomie et agriculture. Essai d'analyse des tâches de l'agronome. Cahiers de l'ORSTOM, Série Biologie 24, Novembre, 3-25.