Changing Floodplain Livelihood Patterns in the Peruvian Amazon

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I. Introduction

Amazonia continues to be developed at a fast pace. Consonant with these changes, knowledge on the region is accumulating rapidly. Students of the watershed are increasingly concerned with the social, economical, and ecological outcomes of the developments that range from family farming to large scale ranching, mining, and hydroelectric projects. The activities, carried out along a number of fronts and often based on inadequately conceived plans or on limited surveys, have tended to perform below expectations. Agriculture, in particular, has been the focus of much criticism. Farming which led the way for subsequent changes, was intended to solve a number of problems for the countries sharing the basin. These included the relief of demographic pressures in the centers of traditional settlement, integration of weakly controlled portions of the national territory, and increase in food and fiber output to feed the expanding population and to export the surpluses. The overall results of the agricultural sector have been disappointing.

As the farming projects have been directed to the environmentally fragile interfluvial rainforests, they have led to ecological disruptians, including widespread deforestation and stream siltation. The activities, carried out without concerns to aboriginal inhabitants, have served to either demise them as a result of mistreatment and spread of diseases, or to displace them from their homelands. In a similar way, the colonization projects devised to grant adequate farmlands to the landless and small owners from the regions of dense settlement, have not been able to fulfill the stated social objectives. In the absence of effective safeguards to protect farms from consolidation, accumulation of land in the hands of a minority has been unavoidable. After a period of 10 to 15 years, colonists' lots have been incorporated into the holdings of successful settlers or those of investors. Governmental goals of increasing food and fiber products from the newly occupied portions have not been attained either. As Shuurman (1979, 37–40) points out, colonists have normally adopted a strategy known as "peasant economy," where farmers tend to first meet their subsistence needs and participate in the market economy only marginally. A more important reason for the limited success of agricultural programs in Amazonia, is the poor choice of crops and agricultural systems. Emphasis on cereals, beef, and exportable commodities like coffee and cacao, associated with production techniques modelled after those of developed economies and ill-suited to the region have been responsible for the poor performances. There-

fore, the lack of success" . . . of the bulk of Amazonian development projects underscores the necessity for radiacally different strategies if development is to be humane, productive, and ecologically sound" (Posey 1984, 96).

Increasingly, scholars of Amazonia are turning their attention to locally-devised livelihood systems in solving some of the agricultural problems. Indigenous subsistence techniques, adapted to suit local environmental conditions and refined over the centuries, have been able to meet the people's dietary requirements on a sustained basis, while causing minimal adverse effects to the region's ecosystems. The basin, covering an area of over 6.0 million square kilometers, is characterized by great biotic and edaphic diversity (Denevan 1970; Campbell 1984; Meggers 1983). Recognizing the ecological differences, aboriginal inhabitants developed resource management methods appropriate to each area. Recent attempts involve the possibilities of adopting traditional subsistence techniques to satisfy modern food needs. Research of aboriginal farming techniques has been pursued along several lines (Denevan 1971, 1982; Geertz 1963; Harris 1971; Hiraoka 1982; Nations and Nigh 1980; Posey 1982, 1983; Smole 1976). However, the studies to date have emphasized the farming practiced on the interfluvial forestlands. An aspect that may enrich the rapidly increasing literature on the subject is the study of traditional livelihood systems on the floodplains. A start has been made, but the coverage is still incomplete to provide a basin-wide picture (Bergman 1980, Denevan 1982; Hiraoka 1985; Stocks 1981).

Although the alluvial bottomlands occupy only two percent of Amazonia, approximately 120,000 km^2, they are endowed with one of the richest edaphic bases within the watershed. As such, the riparian zone has traditionally been the sites of densest settlement. The potentials of the zone have begun to be re-evaluated in view of the failure of interfluvial agricultural projects. For example, Brazil has embarked on a new program to develop the floodplains with the PROVALE Project (Junk 1984, 91). Similarly, the Instituto de Investigaciones de la Amazonía Peruana (IIAP), has begun feasibility studies to better utilize the bottomlands along the Amazon, Ucayali, and Huallaga rivers. As governments attempt to open the fluviatile zone for large scale developments, there is an urgent need to accumulate resource management data, including existing economic systems, so that planners equipped with a choice of alternatives can avoid costly social, economical, and ecological errors taking place on the upland forests.

The purpose of this paper is to relate the livelihood activities of floodplain inhabitants in the northeast Peruvian Amazon. Specifically, the paper attempts to: (a) outline the principal techniques of riparian subsistence; (b) explain the adaptive responses developed by the inhabitants to externally-generated processes for changes; and (c) discuss the possible roles of current riparian livelihood patterns for regional rural development.

The current floodplain residents of the Peruvian Amazon, collectively called *ribereños*, consist of acculturated Indians of various linguistic groups and mestizos. The ribereño subsistence techniques are deemed appropriate for regional development purposes because: (a) many traditional features of resource management are still practiced by the riverine people, despite their extended and regular contacts with the outside society and economy; and (b) as participants in the inter and intraregional markets, ribereño livelihood systems can be more easily adapted to a cash-oriented economy than those of less acculturated groups.

Field data is based on information gathered from the *caserío* or hamlet of San Jorge, located on the floodplain of the Amazon 60 kilometers upriver and south of Iquitos (Figure 1). The caserío consists of 34 households, with a population of 250. The caserío has a nucleus around a soccer field. The grade school, chapel, two general stores, and dwellings are found surrounding the open ground. The remaining houses are scattered along the river, forming a loosely-knit line settlement. The selection of the caserío was made according to three criteria: (a) location on the floodplain, (b) subsistence prac-

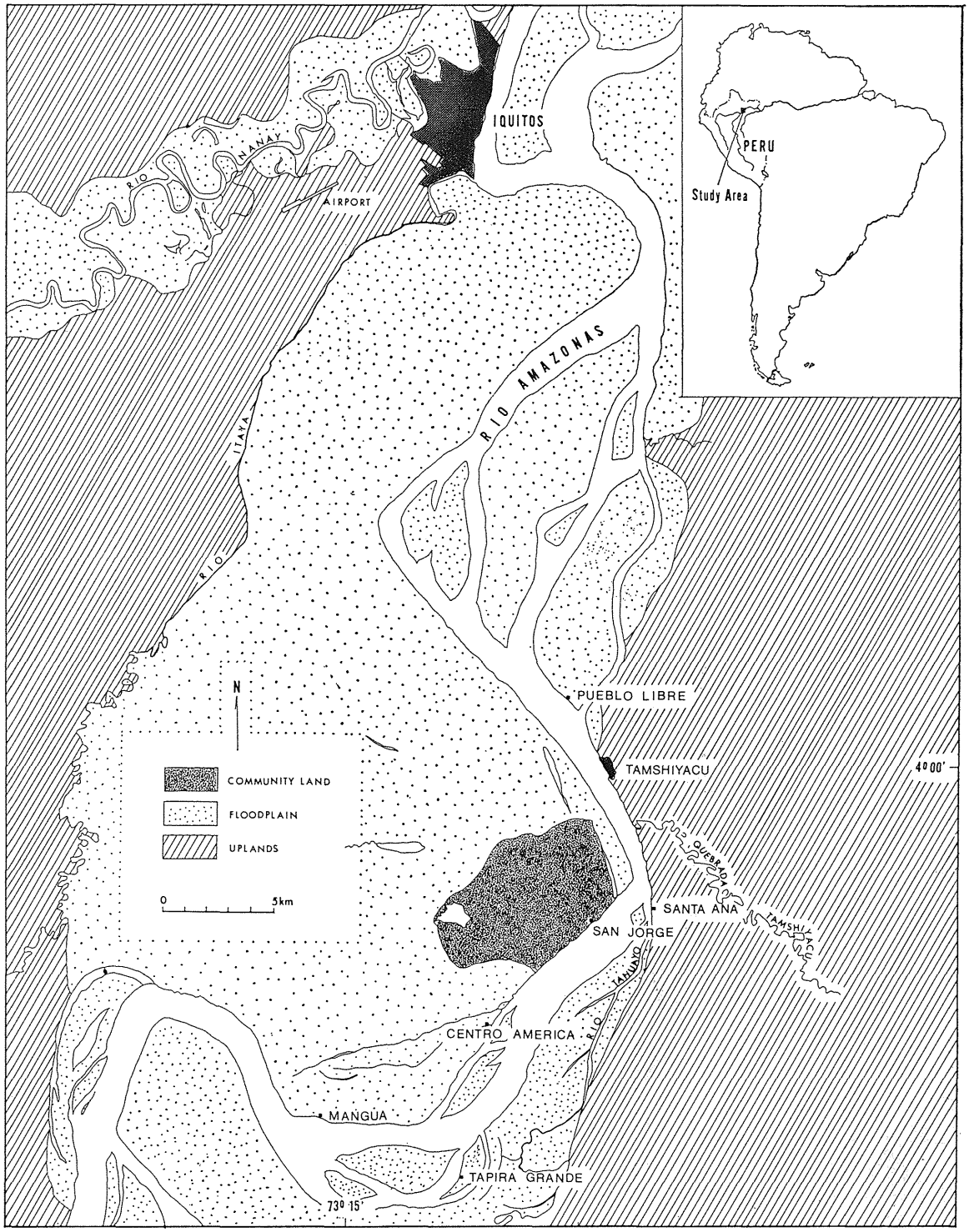

Fig. 1. Location Map of Study Area.

tices representative of the region, and (c) distance from Iquitos.

II. The Floodplain

II-1. *Floodplain Landforms*

The study area is characterized by two types of landforms: the floodplain of the Amazon, and the interfluvial uplands that rim both sides of the valley. The latter, locally termed *altura*, is part of the extensive Tertiary uplands that dominate over much of Western Amazon. Rising between 20 and 40 meters above the mean level of the river, the altura has been subjected to long processes of weathering and dissection. The rainforest-covered surface is deeply incised by a dense network of streamlets called *quebradas*. Swidden farming is practiced on the deeply weathered but nutrient poor soils. The term *bajo* is applied to the low-lying, poorly-drained, alluvium-filled terrain formed and drained by the Amazon

Fig. 2. Main biotopes of San Jorge.
(Servício Aerofotográfico Nacional, Airphoto No. 214-215-72, July 21, 1972)

River. The floodplain in the Iquitos area varies between 15 and 25 kilometers in width, and it is made up essentially by alluvial materials transported during the Quaternary period from the Andean mountains to the west (Figure 1).

The floodplain is distinguished by a number of landforms. Having a gradient of only 0.045 meter per kilometer, the Amazon meanders back and forth within the broad valley. As it swings, the river deposits and sculpts its sediments, creating a variety of landforms. The most conspicuous relief features within the bottomland are the depositianal landforms represented by levees and islands. The natural levees locally called *restingas* form the highest terrain and they occur at various angles to the main channel. Although the restingas are only 40–80 meters wide, they may extend for several kiloneters. As some of the levees, especially the relict ones, remain above water during the flood season, they have become the preferred sites for settlement and cropland location. Alternating deposits of sand and silt on shallower portions of the channels often lead to the development of islands. If water dynamics remain constant over a number of years, vegetation colonizes the island and helps anchor the alluvial matter. Insular terrain is not stable over an extended time period and it is normally submerged underwater during the high water season, but the high fertility of its soils always attracts the neighboring ribereños who use it for farming and settlement sites. The floodplain landforms include the oxbow lakes *(cochas)*, backswamps *(tahuampas)*, palm swamps *(aguajales)*, side channels *(caños)*, ravines draining the backswamps *(quebradas)*, and the main channel *(brazo principal)*. Although not important as residential or agricultural areas, the aquatic environments play a significant role in the economy of the ribereños as fishing, gathering, and logging sites (Figure 2).

II-2. *Climate*

An equatorial rainforest climate typifies the study area. Iquitos receives an average of 2,800 millimeters of rains per year. Precipitation occurs throughout the year and monthly means exceed 260 millimeters, except for the months of July through September, when less than 170 millimeters are received (ONERN 1976, Anexo p. 37). This rainfall decline is reflected in the behavior of some deciduous species. Plants like *zapote (Quararibea cordata)*, *quillo sisa (Palicourea macrobotrys)*, *ubilla (Pourouma cecropiaefolia)* and *guaba (Inga edulis)* lose their leaves during a short period to return with a display of flowers in early October, when precipitation begins to increase again. Despite its location near the equator, temperatures show some variation during the course of a year (Figure 3). Average mean temperature oscillates around 26.3°C, but during the short dry season, cloud cover lessens and the monthly averages rise to over 27.0°C (ONERN 1976, Anexo p. 13). Between the months of September and November, daytime temperatures may rise to 35°C even in the shade. On such occasions, ribereños retire from the more arduous farming activities to switch to fishing or household chores. The local precipitation patterns, however, is of minor significance to the flood dynamics since the rise and ebb of the water is influenced largely by the rainfall regimes in the headwater areas of the Marañon and its tributary streams.

II-3. *Hydrodynamics*

For the riparian inhabitants, nothing is more important than the yearly oscillation of the water level. The annual flooding and ebbing of the river not only build and modify the landscapes, but they touch almost every aspect of the floodplain biotic world as well. For example, the breeding and migration of fish, hunting of animals, extraction of commercial and construction logs, and timing of agricultural activities are all influenced by the annual oscillations of river level.

Flooding in Northeast Peru begins in late January or early February. The onset of the season is visible on the banks, not only by the gradual rise of the river level, but also in the water color, and the

amount of floating debris. At first the river seems to hesitate, as its level fluctuates upward and downward. As the water volume increases, the low-lying surfaces are inundated and the water penetrates inland. The seed and fruit eating characins begin to enter the tahuampas and cochas, while others follow in search of preys and breeding grounds. As land areas decrease, ribereños prepare for the long "winter" by harvesting the last grains, and by digging and processing the manioc for flour (Figure 4). The river crests in mid-May. By then, except the highest levees, all the floodplain is under water. On the islands,

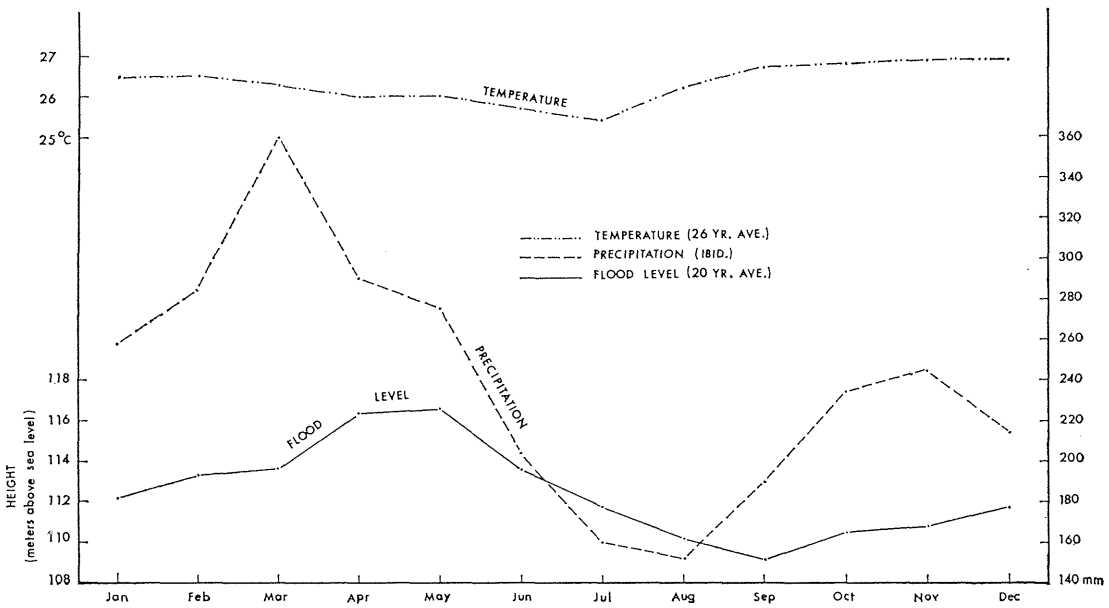

Fig. 3. Climatic and river level characteristics of Iquitos.

Fig. 4. Fariña-making. Manioc begins to be processed into flour in early February when rising water gradually submerges the low levees. The fariña constitutes the main flood season staple for those without access to restingas altas.

fields are 1.0 to 2.0 meters below the surface, and water flows freely under the stilted dwellings and the floodforest. As the floods connect with the tahuampas and cover the low levees, penetration into the floodforest is facilitated. Ribereños seize the opportunity to float the commercially valuable logs and construction materials. Hunting is also done at this time. As the rising water reduces the habitat of land animals, they tend to gather on the few remaining strips of land easing their harvest. Flood forest activities, however, are not dependable because of considerable variability in the crest heights. The average yearly range in water level is 8.5 meters, but differences of 4.0 meters may be registered between one year and the other. Another feature of relevance to the riparian inhabitants is the flood duration. Experience dictates that the low levees are flood free for an average of seven months. Consequently, semi-perennials like manioc, and two plantings of cereals like rice and maize are conducted on the restingas. These crops are lost in the event the water begins to rise earlier than normal years. Food supply during the high water season also becomes critical if the flood is unusually long. This is especially true when the previous agricultural season was already short. In order to regulate food production, the local people attempt to predict the onset, as well as the duration of the inundation period by seeking telltale signs in nature. For example, the migration of a catfish, *manitoa*, is supposed to presage the beginning of the floods, while the height of *churo* (snail) eggs, deposited on tree trunks, provides clues to the expected flood levels (Figure 3).

In contrast to the gradual rise, the ebb of the Amazon is swift. Although the surface reaches its lowest point in early September, most of the water is lost by late July. As the river level declines, the low-lying grounds are progressively drained and once again the backswamps and the oxbow lakes become isolated from the main channel. Concurrently, with the rapid emergence of bottomlands, the ribereños begin to plant.

II-4. *Hydrochemistry and Soils*

Much of the Amazon water and the sediments it carries in solution and suspension originate in the Andean ranges and their foothills. The turbid, milk-tea colored water, commonly designated as "whitewater," derives its characteristic property in the headwater portions. As the Marañon and its main tributaries carry the weathered and eroded materials from the geologically young rocks, like limestone and shale, and descend the steep eastern slopes, their bedloads are sorted and the finer particles are dissolved or carried in suspension. As the rivers flow through the dense tropical forests, organic materials are also incorporated into the water. The sediments are rich in plant nutrients like calcium, potassium, magnesium, iron, and trace elements, as well as dissolved minerals (Table 1). In spite of considerable dilution by organic acids emanating from the selva, the water pH in the Iquitos area is still over 7.0 (Swabey 1959, pp. 44–47).

The mineral rich mixture is deposited on the baja during the annual floods. Sedimentation begins once the river overflows the restingas and penetrates inland. Deposition is thickest near the main channel and decreases away from it, as the water speed decreases. Most minerals are dropped within a distance of 300 meters from the shores. Accumulation also results on channel sites with slow water speed, such as the inner bends of meanders, to form sand and mud banks. Islands are formed when deposition occurs in mid-channel. Depending on location, deposits of up to 1.5 meters may result from a single flood season. Humans also aid in the process of deposition. In clearing the flood forest, ribereños often leave a wood belt of 10 and 20 meters along the shore to reduce water speed and hasten siltation. On the islands, grass and weeds are cleared once the water begins to rise, but care is taken to leave 30–40 centimeter stems to induce sedimentation.

Floodplain soils have been known for their high productivity. The excellent potentials of the eda-

Table 1. Water Chemistry of the Amazon and Nanay Rivers, Iquitos.

Characteristics	Amazon (whitewater)	Nanay (black water)
Alkalinity, P	0.00	0.00
Alkalinity, MO	62.60	4.20
Cl	12.90	1.60
Color, units	25.00	30.00
CO_2, free	6.50	——
Dissolved oxygen	5.84	6.41
Hardness, total (as $CaCO_3$)	73.00	3.00
Hardness, Ca (as $CaCO_3$)	57.00	1.00
Hardness, Mg (as $CaCO_3$)	16.00	2.00
Ca	22.80	0.40
Mg	3.89	0.49
NH_3-N	0.057	0.004
NO_2-N	0.004	0.001
NO_3-N	0.039	0.008
pH, units	7.20	5.20
PO_4	0.101	0.019
SiO_2	9.74	6.54
SO_4	14.11	20.16
Temp., °C	29.0	28.5
Transparency, cm	33.0	46.0
Turbidity	155.6	62.3
BOD, 20°C	0.90	1.12

Source: Swabey (1959: 47).

Table 2. Soil Test Data of Floodplain Soils, San Jorge, Northeast Peru.

Location	Depth (cm)	pH (H_2O)	Organic C	N	Al	Ca	Fe	K	Mg	Na	P	Si
			%		mg/l							
Restinga Alta												
2 year-old plantain field	15	5.3	0.47	0.05	6.3	0.3	3.8	1.6	0.5	1.4	0.2	14.2
6 year-old purma	15	5.1	0.65	0.07	0.6	0.2	0.3	1.0	0.1	1.6	0.0	6.5
Restinga Baja	15	8.0	0.96	0.05	0.0	62.3	0.0	2.2	4.9	2.5	0.1	3.0
Barreal	15	8.0	0.92	0.03	0.0	50.7	0.0	2.8	4.3	3.7	0.1	3.8
Playa	15	8.2	0.15	0.01	0.2	24.7	0.2	1.8	1.9	2.5	0.1	3.8

phic base results from two factors. As is commonly known, the annual siltation by the rising water serves to replenish the soils with clayey minerals rich in salts. The high base content of the water is seen by the electrical conductivity that reaches 60–70 μS cm^{-1}/20°C. The soil pH of annually flooded levees and islands, reflecting the characteristics of water-borne materials, is on the basic side (Swabey 1959, 44–47; Junk 1984 56–57; Nicholaides, et. al. 1983, 108–110) (Table 2). The base-rich floodplain soils have high cation exchange capacities and favor the development of expanding lattice clays like montmorillonite, even under conditions of low organic matter supply. These clays are able to hold large amounts of water and this water is released gradually to the plants during dry spells. The combination of high mineral salt content and favorable chemical and physical properties in the soils enables

the riparian inhabitants to annually cultivate fertility-demanding cereals and vegetables on a continuous basis (Roosevelt 1980, 115–116).

Crop cultivation is further assisted by year-round warmth and relatively well-distributed precipitation.

Soils on the floodplain, however, are not of uniform fertility. Moisture retention capacities and nutrient content vary widely. On relict levees not subject to yearly flooding, base materials tend to decline whenever agriculture is practiced continuously (Table 2). Here, the processes of leaching and erosion return part of the minerals to the river in the form of organic detritus, tree trunks and branches, and dissolved organic matter (Junk 1983, 88). On the sand and mud banks and on the island, edaphic characteristics vary from place to place, and from one year to the other, reflecting the annual water dynamics. Consequently, the same agricultural resource base cannot be expected every year. Another feature of soils on the floodplain is their impermanence. Islands and restingas, formed by fine silt, change as the channels shift. Therefore, farmland loss is frequent due to the processes of undermining and slumping.

II-5. *Floodplain Vegetation*

Reflecting the varied drainage conditions, the floodplain forests in Northeast Peru show some areal diversity. Four forest types can be distinguished, of which three are found on the inundation zone: (a) *aguajal*—palm forest dominated by stands of *Mauritia flexuosa* and growing on swamps away from the river's edge; (b) *tahuampa*—forest standing on permanently inundated swamps and receiving nutrients during the annual floods; (c) *restinga baja*—seasonally-flooded forest; and (d) *restinga alta*—forest not subject to yearly submergence, except the highest floods. Floodplain forests usually do not possess trees as varied and as tall as those of the altura. Among the floodplain forests, the restinga baja and restinga alta vegetation have been the sites of greatest changes, since most of the farming and extraction of fruit, seeds, resins, and logs have occurred there.

III. The Ribereños

Considerable demographic shifting and miscegenation have occurred in the northeast Peruvian Amazon since the sixteenth century.

During the colonial period, slave raiding expeditions, diseases, and missionizing activities altered the aboriginal population on the floodplains. By the mid-nineteenth century, the riparian zone between Nauta and Iquitos, i.e., between the confluence of the Marañon and Ucayali rivers and Iquitos, a stretch of about 150 kilometers was inhabited by less than 3,000 people, including natives and mestizos (Herndon 1952, pp. 109–110, 129–132; Smyth-Lowe 1836, pp. 258–262). Major migrations into the area began in the 1880's, following the onset of the rubber boom. The need for workers to tap the latex from the floodplain forests led to the inflow of people from distant places.

Exploitation bases called *fundos gomeros* were established along the Amazon and its tributaries by Europeans, Brazilians, and especially Peruvians from the department of San Martin, located on the high selva of the Eastern Andes. Financed by traders in Iquitos, the *patrones* or rubber bosses canvassed the riverine zones for gatherers. The Cocama, Cocamilla, and Jebero Indians, inhabiting large villages along the Ucayali, Huallaga, and Marañon rivers were captured or induced to migrate through advances of money and manufactured goods (Chaumeil 1981, pp. 49–55; San Román 1975, pp. 125–146; Stocks 1981, pp. 85–94). Several fundos gomeros were established in the study area, including San Jorge and Centro America. Following the collapse of the Hevea boom, a number of exploitive cycles based on other floodplain products like *tagua* nuts *(Phytelephas macrocarpa)*, *cumala* seeds *(Virola* sp.*)*, animal skins,

and cabinet woods like mahogany and cedar followed. In order to keep the scarce workers on the fundos, the operators resorted to socioeconomic practices experimented elsewhere in Latin America, i.e., the debt-peonage and *compadrazco* systems. Through advances of money and goods, especially the sugar cane distillate *aguardiente*, or through fictitious social ties, the natives were held in the fundos (San Román 1975, 167–175). Some fundos, like the one operated by the famed Casa Arana of Iquitos, held as many as 12,000 aborigines at a time. Those at the study area were modest in size, with no more than 150–200 individuals each. The demise of the fundos began in the 1950's. A series of changes, including the substitution of vegetable ivory by synthetics, exhaustion of easily extracted timber stands, or control of fur trade, made the exploitive ventures increasingly difficult and uneconomical. Operators began to seek alternate opportunities in the city of Iquitos. The final blow was dealt by the agrarian reform law of 1969, when properties were either expropriated or transferred to the workers. Thus, many former fundos were transformed into present-day caseríos.

Livelihood in the fundos was carried out by the natives themselves. As the gathering activities were not too time-demanding, workers found sufficient time to produce their subsistence needs on plots allocated by the owners. Crops were grown with techniques familiar to the aborigines. Cultural elements like language, dietary techniques, and oral traditions were also diffused by the workers brought from headwater regions. Since most of the inhabitants had come from culturally similar areas in the Upper Amazon, evolving communities showed many similarities. Communal identity came to be reinforced through increasing intra-village marriages and limited migrations.

IV. Ribereño Livelihood

Ribereño subsistence has been based on farming, fishing, hunting, and gathering of forest products. The acquisition of sustenance needs has depended on the familiarity of the floodplain biotopes and the integrated management of the floodplain resources. In the study area, the inhabitants distinguish a total of 14 biotopes (Table 3). Farming is practiced on six biotopes, as follows: (a) *restinga baja*—low natural levees; (b) *barreal de orilla*—foreslope of levees; (c) *barrizal*—backslope of levees; (d) *barreal de isla*—extensive mud banks of recently emerged, low-lying islands; (e) *playas*—insular sand banks; and (f) *restinga alta*—tops of high levees not subject to flooding. All the agricultural biotopes are subject to annual inundation, except the restinga alta.

Two agricultural systems are practiced within the floodplain. A seasonal agriculture based on the cultivation of annuals characterizes the flood-prone biotopes, while a short-fallow swidden with semi-perennials to perennials is carried out on the restinga alta. The floodplain biotopes are distributed along a slight vertical gradient. Subsistence on the bottomlands depends on the recognition of the biotope

Table 3. Ribereño Biotopes and Their Uses.

Landforms	Biotpes	Characteristics	Products	Remarks
Natural Levee				
	Restinga Alta	Top of highest levee, not subject to inundation; sandy to silt-loam soils; swidden practiced	Manioc, plantains, banana, taro, yam, maize, sweet potato, peach palm, and fruit trees like papaya, pineapple, caimito, guaba, ubilla, macambo, zapote, umarí, coffee, tea	Year round cultivation; settlement site; house garden

	Restinga Baja	Top of levee subject to inundation; sandy to silt-loam soils	Manioc, plantain, breadfruit, sugar cane, mamey, taperiba, rice, maize, peanut, pole beans, melons, some vegetables	Flood free up to nine months; settlement site if restinga alta unavailable; house garden
	Barreal de Orilla Alto	Upper foreslope of levee; annual inundation; sandy to silt-loam soils	Maize, manioc, cowpea, peanuts	Flood free up to nine months
	Barreal/Playa de Orilla Bajo	Lower foreslope of levee; annual inundation; mud and sand bars with sandy-silt loam soils	Rice, cowpea	Flood-free less than seven months
	Barrizal/Bajial Alto	Upper backslope of levee; annual inundation; loam-clay loam soils	Rice, maize, cowpea, peanuts, vegetables like ají dulce, tomato, caihua	Flood-free up to nine months
	Barrizal/Bajial Bajo	Lower backslope of levee; annual inundation; loam-clay loam soils	Pole beans, cowpea cucumbers, rice	Flood-free less than seven months
Mid-channel Bar (Isla)				
	Barreal de Isla	Mud bar of emerging island; annually inundated; sandy loam-silt loam soils	Rice	Flood-free less than six months
	Playa	Sandbar of emerging island; annually inundated; sandy soils	Cowpea	Flood-free less than six months
Backswamps and Lakes				
	Aguajal	Shallow swamp; aguaje palms dominate	Aguaje fruit and suri extraction	
	Cocha	Meander cut off; standing water bodies of varying size and depth; connected to the river during annual floods	Fish, aquatic birds, and animals like capybara and cayman caught	Important hunting and fishing grounds
	Tahuampa	Backswamps formed on depressions between levees; mostly forest covered; river water penetrates during annual flooding	Fish, animals, commercial timber, and construction materials	
River				
	Río, Caño, Quebrada	Main avenues of navigation and fishing	Fish	Year-round exploitation

differences resulting from vertical displacements and their use in an integrated fashion. The naming of biotopes reflects this environmental familiarity. As can be seen from Table 3, the average useable period of the agricultural biotopes varies from 5 months for the barreal and playas to 12 months for the restinga alta. Since most crops, excepting rice and some varieties of plantains, do not tolerate water-logged conditions, land use is largely determined by the length of flood-free days.

The restinga baja is the first biotope to appear after the floods. Since it has the longest growing season, crops like rice, maize, peanuts, manioc, bananas, and plantains are planted. Harvest of semi-perennials like bananas, plantains, and manioc has been uncertain, especially in recent years with the increase in the number of high floods, but ribereños annually plant them hoping that a number of low floods will follow.[1)] Planting on the restinga baja is discriminated by micro-terrain differences. Bananas, sugar cane, and bread fruit are placed on the highest portions. Manioc, peanuts, and rice follow in descending order of elevation. If annuals are planted initially, double cropping is attempted on some restingas. Rice or maize will invariably be the second crop, but their harvests are often lost as the reaping season coincides with rising water.

The barreales de orilla and barrizales appear next. These biotopes, covering a vertical span of 8–10 meters, show a mixed land use. Maize and peanuts are raised on higher portions, while rice and cowpeas are planted on lower slopes. The barrizales with heavier soils are often preferred for vegetable cultivation. *Ají dulce, caihua*, and tomatoes yielding over an extended period are placed on higher slopes, while rapidly maturing or short-yielding species like beans and cucumbers are found on lower slopes.

Playas and barreales are the lowest of the biotopes, along with the lower slopes of barreales de orilla and barrizales. Since these biatopes are dry for less than 180 days, quick-maturing crops like melons, watermelons, and cowpeas, or water tolerant rice are selected.

IV-1. *Flood Zone Farming*

i. *Farming Techniques*

The agricultural season in the inundation zone begins soon after the river crests in mid-May. As the water level begins to lower rapidly, ribereños begin to prepare the seeds, and planting starts once the biotopes appear in early June. Two factors prompt the rush of activities: the limited growing season, and the scarcity of food following a long flood period.

As most of the biotopes on the flooded area are exposed within a period of 25–30 days, activities associated with planting have to be done rapidly. Ribereños at the study area possess fields on at least three different biotopes. An average of 3.2 plots were held in the inundation zone by the 34 San Jorge households. Each household also held an average of 5.4 plots on the restinga alta. The management of so many holdings on spatially separated locations requires a detailed scheduling of daily activities. This is especially true during the planting season, when other chores like fishing, and gathering of palm fruits are carried out in other biotopes. Seeds are either broadcast, or planted with digging sticks. Rice, for example, is broadcast over the still soggy barreal surfaces soon after the water has retreated. Other seed crops, e.g., maize, beans, and peanuts are dropped into shallow holes made with digging sticks. Vegetatively reproducing items like manioc and plantains are planted by burying the stalks by means of large digging poles or machetes. Although some intercropping can occur, the trend in the bottomlands is to raise crops on a monocultural fashion. These holdings range between 0.3–1.2 ha in size, the only exceptions being the rice fields on the barreales. Here, farms are larger and average 2.3 ha. Little care is given to the plants once they are sown. Weeding is carried out between 25–35 days of planting. This activity is time-consuming on the restingas bajas. Here, rank grass and weeds are cut leaving a portion of the stalks for increasing sedimentation. The clearing is done prior to the onset of the floods

Table 4. Floodplain Crop Yields.
(metric tons)

Crops	Location	Yield per Hectare
Rice (husked)	Barreal	3.0– 4.5
	Restinga Baja	2.0– 2.5
Maize	Restinga Alta	0.5– 1.0
	Restinga Baja	1.5– 2.5
Chiclayo (cowpea)	Playa	0.6– 0.9
Peanuts (shelled)	Restinga Baja	0.9– 1.0
	Playa	0.5– 0.7
Manioc	Restinga Baja	7.5–12.0
	Restinga Alta (original planting and cutipa)	6.0–13.0

in January or February. The vegetation is covered over by the sediments, but as the roots remain alive, they begin to compete with the cultigens once the water subsides.

Harvests begin in late August. Green beans and maize are ready for picking after 70–75 days of sowing. These are followed by squashes, melons, rice, and peanut in September and October. Some crops continue to be reaped until early February, when the fields are again covered by water. The last harvested items are those from double-cropped fields, and manioc. A long harvest season is possible through multi-speciation and multi-variety seed selection. Strategies like these have been developed by the ribereños to provide them with dietary variation, nutritional satisfaction, extended harvests, and labor distribution over an extended period. Another important aspect is the nature of food production. Although carbohydrate supply is an important function of the flooded zone, a more significant role is the production of storable cereals. *Yuca* or sweet manioc from the restinga baja is converted into *fariña*, manioc flour, in late February and March. This carbohydrate-rich flour serves as the main staple commodity during the long flood and post-flood season, but it must be supplemented by more nutritious food items. Maize and beans, are grown primarily as complements to the fariña, to supply part of the deficient amino acids and vegetable fats. More recently, rice cultivation has become a prominent item, but its cultivation is primarily as a source of cash income. Although farming can be practiced only on a seasonal basis on the inundation zone, the main attraction is the possibility of obtaining high yields (Table 4).

ii. *Land Preparation*

Farm plots on the restingas bajas and tahuampas are opened by clearing the forest cover. Flood forests are not as dense nor as high as their counterparts in the uplands. After a suitable site has been found along the river, the first task consists in deforesting it. Clearing is normally done between August and October, when the busy planting activities are over, and after the forest floor has dried. If possible, *mingas* or communal exchange labor parties are formed to remove the undergrowth and to cut the trees. The tasks require an average of 57 days of labor per hectare. The fallen vegetation is left to dry for about a month before burning it. Crops are sown immediately after burning, if they are to be harvested prior to the onset of the floods. Once opened, fields can be planted on a continuous basis, but the common pattern is to abandon after two or three years because of extreme difficulty in weed control. Since large labor inputs are required for deforestation and rank growth control of restingas bajas, the ribereños of San Jorge prefer to use the barreales and playas for cultivation (Figure 5).

Barreales and playas in the mid-channel are the preferred ribereño agricultural sites. New islands,

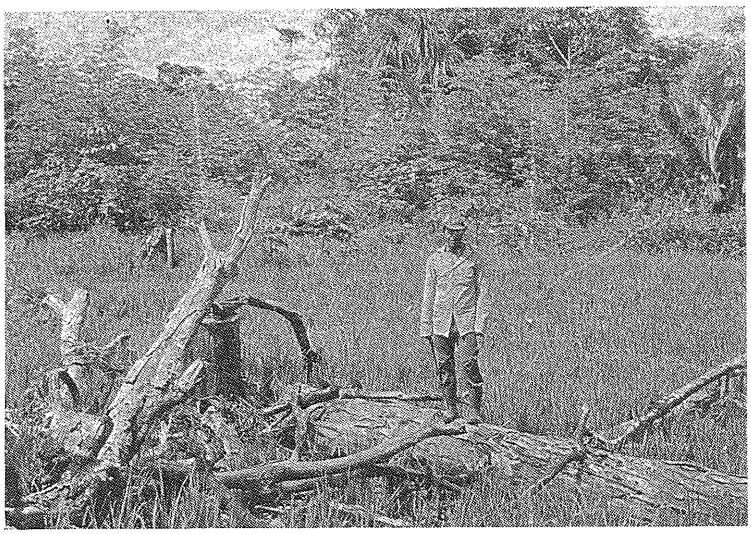

Fig. 5. Rice on restinga baja. As the main cash crop, rice in the floodplain is sown on the most fertile soils.

aside from birds and small insects, are free of rodents that cause much crop destruction. In addition, the floods that annually deposit plant nutrients also control part of the insect pests and the plant pathogens. Most important, however, is the limited labor required in land preparation (Higbee 1945, 409–410). As plant colonization of playas and barreales is still in the initial stages, the only flora to be controlled are grasses like *gramalotes (Paspalum repens)*, and wild canes *(Gynerium sagitatum)*. These are cleared with machetes at the beginning of the flood, so that fields emerge free of weeds when the water ebbs. Since gramalote and *caña brava* removal are the only activities needed for field preparation, the demand for insular biotopes is high. However, the number of islands and their area are limited. This leads to frequent conflicts among the residents. At San Jorge, less than 25 percent of the inhabitants have access to the insular biotopes.

IV-2. Restinga Alta Farming

The restinga alta is the only floodplain biotope where agriculture is carried out on a year round basis. Occupying the highest portions of natural levees, the biotope is rarely covered by water. Since rejuvenation of plant nutrients does not occur periodically, cropping is not viable on a continuous basis. A short fallow swidden is practiced as an adaptive response to the environment. Unlike the inundation zone, where monocultural stands are increasing, a polycultural, polyvarietal cropping pattern is practiced to better utilize the meager edaphic resources. Reflecting the soil characteristics, the restinga alta soils are devoted primarily to fruit and carbohydrate-rich items like manioc, bananas, plantains, taro, and yams.

i. *Land Uses*

Being the highest terrain, the biotope has been used for the construction of dwellings, house orchards, and swidden plots (Figure 6). Ribereños' homes are built on these high grounds to be free from floods. Orchards, measuring 0.1 to 0.2 ha, and planted with a variety of medicinal herbs, tubers, and fruit trees surround the houses. *Chacras*, or swidden plots, occupy the restinga altas in plots of 0.2–1.5 ha and extend in a ribbon-form, following the contour of the restingas. These chacras are within a distance of 5.0 kilometers of the village. Since crops from the swidden plots are transported on foot, fields beyond

Fig. 6. Ribereño shelter. Homes are built of locally-available construction materials. *Huacapú (Vouacapoua americana)*, resitant to rot, is used as main posts, while palm trunks and fronds are employed for thatching and flooring. Floors are raised between 1.0–2.5 meters above the ground for protection from floods and for comfort.

an hour's distance is normally shunned. To fulfill the need for multiple chacras, the ribereños occupy a number of restingas near the settlement (Figure 2).

ii. *Farming Techniques*

Farming on restinga alta begins with deforestation. *Monte* or climax flora is no longer found near the caserío. Closest surviving forests are now 4.0–4.5 km away. Since there are no seasonally-determined cropping cycle, openings can be made at any time of the year. The sequences of felling, drying, and burning is followed, and the new plot is ready for planting after 60–65 days of deforestation. Manioc, plantains, and banana stalks are the first to be planted. An average of 6,200 manioc cuttings, and 1,000–1,200 plantain and banana shoots are buried per hectare. Other tubers like yams and taro, slow-growing fruit trees, such as papaya, *macambo (Theobroma bicolar)*, *zapote*, and *pifuayo (Bactris gasipaes)*, and a few beans, squashes, *ají*, and pineapples fill the open spaces if their seeds or stalks are available at the time. Maize, if decided, is seeded a month later, when the manioc is well established (Figure 7). The sowing is not haphazardous. On the biotope margins, where soils are clayey and poorly-drained, strips of rice may be sown. A variety of plantain called *sapucho* replaces rice, if the patch is well-drained but subject to light flooding. Similar plant segregation is practiced on levee tops according to soil quality. When maize is growing vigorously and dominates the field, it is termed as a *maizal*. A weeding is done during the maizal stage. Once the cereal is harvested, the second stage becomes dominated by yuca and it is called *yucal*. If need arises, the tuber can be dug after five months of planting. Since a number of varieties are planted, the original planting yields for 11–12 months. Tubers are harvested at the rate of 15–20 stalks at a time (Figure 8). Rank growth in the vicinity is cleared with the machete, and a new cutting is buried at the time of harvests. The second planting, called *cutipa*, grows in the shade of bananas. Cutipa yields are about 50–60 percent of the original planting, but they extend the harvestable period to as much as 22–24 months. At the same time, the manioc provides added shading and serve to partially control weed growth. As the cutipas are dug, seeds of fruits that thrive on secondary stands, e.g., *guaba*, *caimito (Chrysophyllum caimito)*, and ubilla are sown. When the chacra's visual landscape is dominated by the *Musa* varieties, the ribereños term it as the *platanal*. By the end of the first year, standing at 4.0–

Fig. 7. Restinga alta polyculture. Bananas, plantains, maize, yam, and manioc are visible in this 30-day old chacra.

Fig. 8. Restinga alta harvest. Manioc, the main staple of the floodplain, deteriorates within three to four days of exposure to the atmosphere. Dependence on the tubers requires the ribereños of San Jorge to visit their chacras every four to five days. Other food items like papaya, *yarina* fruit, plantains, and ají are harvested when the tubers are dug.

5.0 meters above the ground and occupying approximately 8.5 square meters of surface, the plantains and bananas begin to produce. If the platanal surface is kept free of weeds and insects, plantains yield for three years, i.e., each plant yield at least three bunches. Two varieties of bananas, the sapucho and the guineo, can be harvested for 10 years, even after chacras are abandoned for *purmas* or natural regrowth. On average, weeding ceases after the second or third harvest of plantains. The main reason for the semi-abandonment is the decline in yields. Output that averages 200 bananas per bunch in the first harvest,

declines to 115 by the second time, and 50 by the third harvest.

The purma stage lasts between 4–20 years. This is a period of controlled regrowth. While the rank flora is accumulating the nutrients on their limbs and leaves, and in the soils, ribereños make infrequent visits to the purmas to gather products. Every ribereño recognizes that fallowing is necessary for soil fertility regeneration. At the same time, he harvests items that were planted specifically for the purma stage. These include some of the banana varieties mentioned above, caimito, guaba, zapote, pifuayo, guava, breadfruit, and *toronja*. When the number of fruit trees is dense, or if some species do not tolerate much competition, minor clearing is made around the cultigens. Flora characteristic of the regrowth cycle, such as, *atadijo (Croton* sp.), *topa (Ochroma lagopus)*, and *yarina (Phytelephas macrocarpa)* are extracted for fibers and construction materials. The purma, then, is not a phase of total abandonment and fallowing. Rather, this semi-managed woodland should be seen as a form of agroforestry which is an integral part of the swidden cycle. The practice does not appear to be an adaptive strategy devised by the ribereños, rather, its origins should be sought in aboriginal swiddens (Denevan 1984).

Purmas may be converted to chacras after the fourth or fifth year. The decision to clear the plot is gaged on the floral composition of the purma. When surface-covering grasses and shrubs disappear as a result of declining amounts of solar insolation reaching the ground, the soils are believed to be sufficiently rich for another cropping cycle. This stage appears to occur when less than 5 percent of light reaches the forest's surface. In clearing the purma, planted species like bananas, caimito, zapote, and macambo are left standing, since they will continue to produce in the new chacra, especially after the burning when the ash increases soil pH, as well as other micronutrients and they become available for plant uptake (Sanchez, et. al., 1982, 824), A new cycle commences subsequent to the burning.

Farming yields on the restinga alta vary considerably, reflecting a number of variables. Highest outputs result from chacras opened from monte alto. If all else is kept constant, floral age appears to determine crop production in the chacras opened from purmas (Table 4). San Jorge inhabitants recognize that lesser harvest will result from a *purma verde*, regrowth less than 15–20 years, where successional flora still dominates. Often, yields are sacrificed for convenience. An increasing number of four to six year old purmas near the caserío is placed into production. Chacras in the vicinity of San Jorge are now on their fourth or fifth cycles of use. The major consequence of such a choice is the progressive decline of yields in general, and the inability to raise nutrient-demanding grains. Decreasing returns and the difficulty of securing cereals from the flood-free biotope have led ribereños to specialize land use. The restinga alta is viewed as a year-round carbohydrate supply base. The integrated use of the restinga with the flooded biotopes brings many benefits to the inhabitants. Agricultural activities on the dry land chacras do not have to be seasonally adjusted. As a result, labor timing is flexible. Availability of fresh food sources, although not too varied, do not require the San Jorge people to build storage spaces, nor set aside large quantities of storable food items for the flood season. Further, the ability to produce manioc and plantains, the two main staples of the region, during the flood season enables the residents to earn extra cash income. Agricultural activities alone, however, have not been able to provide the subsistence needs of the people. Deficiency in nutritional sources have been sought in the other floodplain biotopes.

IV-3. Hunting and Fishing

The varied aquatic biotopes of the Amazon floodplain have supported an abundant and varied faunal population. Birds, reptiles, rodents, and primates, and other land animals, living on the land and water interface, as well as the great quantities of fish in the lakes, swamps, and rivers have long been harvested as major sources of protein and fats. Floodplain fauna especially fish, still continue to be

Table 5. Food Production of a
(October 5, 1983—

Month	Fish kg H	Fish kg S	Manioc kg H	Manioc kg S	Suri kg H	Watermelon kg H	Watermelon kg S	Beans kg H	Beans kg S	Plantain kg H	Plantain kg S	Pineapple kg H	Animal kg H
Oct.	24.5	—	70	18	1.3	37	28	19	—	34	—	18	5.5 armadillo
Nov.	33	—	120	—	—	—	—	—	—	56	30	—	—
Dec.	64	15	140	95	0.5	—	—	16	—	75	—	—	—
Jan.	57.8	—	200	15	—	—	—	—	—	50	180	—	0.5 sacha cuy
Feb.	42.25	3	138	5	—	—	—	—	—	68	10	—	17.0 paca
Mar.	50	5	210	120	—	—	—	—	—	78	—	—	—
Apr.	89	168	230	5	—	—	—	—	—	124	—	—	4.0 armadillo 2.0 agouti 8.0 paca
May	56	114.5	201	—	—	—	—	—	—	191	10	—	4.0 agouti 10.0 achuni puma 9.0 paca 1.0 garza 10.0 motelo 2.0 huasa
Jun.	47.5	17.0	335	112	—	—	—	—	—	160	54	2	1.0 pucacunga
Jul.	64	2	385	416	—	—	—	—	—	118	25	—	—
Aug.	48	—	149	422	—	—	—	—	45	137	163	—	—
Sep.	40.5	2	90	—	—	21	11	5	10	35	—	—	—
Total	616.55	326.5	2,268	1,208	1.8	58	39	40	55	1,126	472	20	74.0

Note: H=home consumption S=sale

important food items for the ribereños.

i. *Hunting*

There are almost no taboos against the consumption of animal meat among the ribereños. The relatively high population density and the long inhabitation of the area have either depleted or driven away most of the prized animals from the region. As can be seen from Table 5, a variety of species is harvested from the floodplain. A few species, however, dominate the list of catch. As is true of many Amazonian locations where human altered habitats are extensive, fauna thriving on purmas and crops, e.g., rodents, birds, and monkeys, comprise the principal catch. Hunting is most productive during the flood season, when most land surfaces are submerged. Non-arboreal mammals like armadillo, agouti, paca, and tapir seek food and refuge on thin strips of remaining restinga alta. On moonless nights between mid-March and mid-May, when dry terrain is minimal, the ribereños go on bunting forays fol-

Typical Ribereño Household
September 13, 1984)

Pifuayo kg H	Rice kg H	S	Maize kg H	S	Aguaje kg H	S	Squash kg H	Chonta units S	Melon kg S	H	Macambo kg S	H	Yam kg H	S	Guaba kg H	S	Caimito units H	S
—	20	—	—	—	—	—	—	—	8	10	—	—	—	—	—	—	—	—
—	78	417	77.7	247.5	—	120	3	—	—	—	—	—	—	—	—	—	—	—
—	2	—	—	329.0	—	—	2	—	—	—	—	—	—	—	—	—	—	—
20	—	—	—	—	—	40	—	60	—	—	—	—	—	—	—	—	—	—
5	—	—	—	—	—	—	—	—	—	—	1	—	—	—	—	—	—	—
12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	40	80	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	35	—	—	—
—	12	—	—	—	86	901	—	—	—	—	—	—	—	—	—	—	—	—
—	—	—	—	—	—	813	—	—	—	—	—	—	3	16	—	—	100	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
33	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
70	116	410	77.7	576.5	86	1,874	5	60	8	10	1	—	7	16	75	80	100	—

lowing paths specifically opened for such a purpose. The flood season also enables easy penetration to the tahuampas in small canoes called *tahuamperos*. Arboreal mammals like lemurs and monkeys, or those inhabiting the margins of the water, e.g., caymans and capybaras are hunted from the water. About 70 percent of the annual catch is harvested during the high water period. Rarely do the inhabitants venture beyond a radius of about 15 km from the hamlet. This is especially true of night hunting when orientation in the forest is difficult. The shotgun is the main hunting equipment, but the high cost of munitions forces the ribereños to use alternate gears when the preys are small, or when the hunter can get sufficiently close to the animals. For example, caymans are caught with spears thrown from canoes, or with baited hooks suspended on trotlines tied to tahuampa trees. Traps are used for small rodents like forest rats, and birds. Easy to build and manage, a variety of traps are used throughout the year. Hunting yields an average of one kilogram of meat per hour of effort. This figure is comparable to that

of fish catch (Table 5). However, participation in hunting is decidedly minor compared to fishing. Fishing preference is not based on tastes, but on faunal depletion and economics. Hunting for exportable hides until the 1960's seriously depleted species like peccaries, ocelots, jaguars, and caymans. Habitat destruction and slowly but steadily increasing riparian population with attendant needs for animal proteins have increased the pressure on larger animals like tapir, paca, and capybara. On the other hand, the high cost of shotguns limit the number of potential hunters. In 1984, there were only 10 shotguns in the village. Therefore, the bulk of the inhabitants were precluded from participating in hunting the more desired animals. The low cost of animal meat at Iquitos, compared to that of fish, serves to discourage hunting as well. As the peak season for animal harvests coincides with that of fish, demands in the market is limited.

ii. *Fishing*

Fishing forms an integral part of ribereño subsistence. About 25 percent of San Jorge inhabitants' food getting activities is taken up by fishing activities. Aside from supplying the bulk of animal proteins (75–85 percent), and serving as a source of income, fishing is perceived as a pleasureable pursuit by the menfolk. Between 22–30 tons of fish, i.e., approximately 90–120 kgs per capita, are caught annually by the villagers in the areas around San Jorge. Most of the fish is harvested from the Amazon, its tributaries, and lakes in the neighborhood.

Fish behavior varies in accordance with changes in the river's water level. Familiarity with the fish's breeding, feeding, and migration habits enables the riparian dwellers to acquire the family needs throughout the year. In order to guarantee a steady supply, the ribereños have to adjust their techniques and sites according to the behavior of the fish. For example, between August and October, when water level is lowest, *pejes negros* or dark-colored fish are sought in the side channels, playas, and shallow lakes with cast and gill nets. Yields are high during this season. When the flood levels begin to replenish the tahuampas and oxbow lakes, the fish seeking refuge and feeding grounds begin to disperse into the broad floodplain and their harvest becomes difficult. Although illegal, ribereños use the *barbasco* roots (*Loncho-*

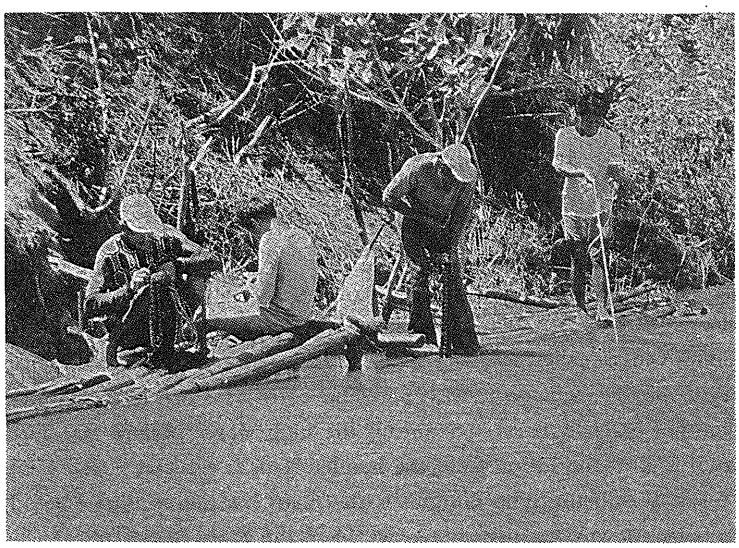

Fig. 9. *Mijano* fishing. Fishing is a year round activity for the ribereños. During the mijano, when fish is especially abundant, fishermen build simple platforms along the river to catch the migrating schools of fish. The fish are kept alive in nylon sacks and they are taken to Iquitos.

carpus nicou) at the beginning of such a season when fish is entering the floodplain depressions. Later, when inundation is at its maximum, the inhabitants seek the fish in the tahuampas. Riding the tahuamperos, the fish is caught with gigs, trotlines, and poles. Once the flood crests, the fish begins to return to the main channel, and forming mixed schools called *mijanos*, they migrate upriver. Fish is caught from platforms built on the edge of the main channel, next to sites where the fish are leaving the tahuampas (Figure 9). Small fish of various species, like *bagre (Mystus tengara)*, *boquichico (Prochilodus nigricans)*, *chambira (Rhaphiodon vulpinus)*, *denton (Charax gibosus)*, *lisa (Schzodon fasciatus)*, *palometa (Mylossoma duriventris)*, *sábalo (Brycon* spp.*)*, *sardina (Triportheus* spp.*)*, and *yahuarachi (Gasterotomus lateor)*, are caught with cast nets, while larger ones represented by *Pimelodids* like *dorado (Brachiplatystoma filamentosum)*, *saltón (Brachiplatystoma* spp.*)*, and *tigre zungaro (Pseudoplatystoma tigriinum)*, weighing as much as 90 kilograms are captured with 50 to 75 meter-long bottom trotlines.

Despite the large number of species found on the floodplain waters, only a few comprise most of the ribereños' catch. Part of the explanation for the heavy reliance on a few species results from the excessive harvest of a few prized fish like *gamitana (Colossoma macropomum)*, *paiche (Arapaima gigas)*, *corvina (Plagioscion* spp.*)*, and *paco (Colossoma bidens)* within the last 30 years by commercial fishermen based at Iquitos. Using a combination of seine and gill nets with piscicides like dynamites and barbasco, outsiders have systematically depleted the floodplain lakes easily accessible from Iquitos and the main channel.

The ribereños themselves have been partially responsible for the ichthyological decline. The use of piscicides during the periods of fish scarcity, the adoption of fine meshed nets, and the possibilities of marketing part of their catch in Iquitos can be cited as factors. The selective catch of ichthyofauna is also influenced by cultural practices. Consumption of a number of species of the Pimelolididae family, such as, the *cunchi maman*, *cahuara*, and *canero*, scaleless and possessing a mucous surface, is avoided as being unclean and unhealthy.[2)] The electric eel *(Electrophorus* spp.*)*, *atinga (Symbranchus marmoratus)*, and the *raya (Potamotrygon histrix)* are likewise avoided. Freshwater dolphins, locally called *bujeos* are never caught because of the supernatural powers attributed to them in the local folklore (Smith 1981, 95–98).

In spite of the decline in the harvest of valued species, fishing in the neighborhood of San Jorge is still sufficient to meet the protein and some cash needs of its inhabitants. On a yearly basis, the yield for the combined techniques employed averages about 1.2 kilograms per hour of fishing. This figure is comparable to that reported by Bergman for a Shipibo village along the Ucayali River (Bergman 1980, p. 235). The figure appears to be low, when constrated to the Itacoatiara fishermen on the Brazilian side of the Amazon, who bring-in an average of 6.3–8.7 kilograms of fish per hour of labor (Smith 1981, pp. 83–84), But it is necessary to keep in mind that San Jorge fishermen still rely essentially on premodern fishing and transportation techniques. Most fishing sites lie within one to two hours by canoe, i.e., a radius of about 4.0–6.0 kilometers from the caserío. In 1984, there were only 24 cast nets and 8 gill nets owned by the ribereños. Those without nets had to rely on a variety of traditional equipments like harpoons, gigs, and trotlines.

IV-4. Exploitation of Floodplain Flora

The use of floodplain flora plays an important role in riparian subsistence. As pointed out above, floodplain forests have traditionally offered a number of food, fiber, and construction needs to the people of San Jorge. In addition, latex, vanilla, cumala seeds, tagua nuts, and other items have been exploited commercially within the last century. Favored by easy and inexpensive transport costs, logging in the restinga baja, tahuampa, and restinga alta forests began in the 1930's with the selective removal of ma-

Table 6. Logs Processed in Iquitos.
(plank feet)

Year	Mahogany	Tropical Cedar	Others	Total
1964	2,113,755	7,377,188	5,259,375	33,750,318
1965	818,245	10,010,846	11,946,961	22,776,052
1966	702,981	11,342,340	9,895,565	21,940,886
1967	994,837	11,101,292	8,033,557	20,129,686
1968	1,813,524	16,423,352	24,116,074	42,352,950
1969	2,593,308	13,386,590	20,375,368	36,355,266
1970	251,855	8,755,619	16,240,801	25,248,275
1971	541,132	13,093,094	15,739,222	29,373,448
1972	800,883	12,935,253	27,529,570	41,265,706

Source: ONERN (1976: 94).

hogany and tropical cedar. With the establishment of plywood factories in Iquitos and Pucallpa after the 1960's, and the increasing demands for inexpensive construction and furniture materials, large number of species began to be exploited from the riparian zone (Table 6). At San Jorge, trees like *capinurí (Clarisia biflora)*, *catáhua (Hura crepitans)*, *caupuri (Virola* sp.*)*, *muena (Croton* sp.*)*, *ayahuma (Couroupita* sp.*)*, and *lopuna (Chorisia insignis)* are cut from August to February, i.e., when the flood forest floor is still dry. Logs are left to dry until the water begins to fill the tahuampas. Once the logs begin to float, they are cut into standard lengths of 2.80 meters and removed to sites along the Amazon for shipment to the mills. The logging operation at San Jorge is currently run by two individuals. The limited participation results from the inability of the majority of the inhabitants to mobilize the funds necessary for the various stages of the operation and the unfamiliarity with the bureaucratic procedures to obtain the necessary logging concession permits. The logging activities offer seasonal employment opportunities for 8–12 males in the settlement. The activities of cutting the logs into standard size and transporting them to assembly points have to be done swiftly before the water subsides. The individual flotation of the logs through the flood forest is a slow process, and requires a large work force. Since these timbering activities occur during the period when few chores exist, they are welcomed as an opportunity to earn extra income.

Some of the traditionally extracted food items have acquired commercial value in recent years as an outcome of mass-exodus of riparian population to the urban areas. San Jorge inhabitants have learned to market three palm products from the floodplain forest: aguaje, suri, and chonta. The first two are harvested from the aguaje palm that forms almost solid stands in the aguajal, while the chonta is the heart of the *huasaí* palm *(Euterpe edulis)* that grows on restingas bajas. Between late May and early November, when the fruit of the aguaje ripens, ribereños in need of cash enter the aguaje swamps to cut the 40–50 meter tall palms and collect their fruit. In June, 1984, a 50 kg container of aguaje, representing about four or five hours of work sold for $S 10,000,00 in Iquitos. This amount is equivalent to a 4-day rural wage. Therefore, despite the arduous labor involved in transporting the fruit from the aguajal to the river, those in need of cash willingly perform the tasks. *Suri* is the larva of a beetle that deposits its eggs in the trunk of freshly cut aguajes. The larvae, rich in fats and vitamins, are gathered by splitting the aguaje trunks after two months following the laying of eggs (August–December). Between 150 and 200 of these 5–7 cm long worms are collected from a single trunk. Considered as a delicacy, the suri is sold between $S 150.00 and 200.00 apiece. The hearts of huasaí palms are in great demand by the urban consumers as an alternative to vegetables during religious holidays, especially Christmas and Easter week. Sold in bundles of 20 chontas, gathered with an input of seven hours of labor, they obtain

between $S 6,000.00–8,000.00 in Iquitos. As these examples illustrate, the ribereños of San Jorge have become increasingly involved in the cash economy. Some of the income has been earned by adopting traditional items to new opportunities, or by cultivating products specifically aimed for the markets. In other instances, income has been generated through wage labor. The transition from subsistence to a cash oriented economy has been accelerated in recent years by a number of events and processes external to the region.

V. Changing Rivereño Subsistence

External societies and economies began to influence Amazonian peoples and environments over 400 years ago. After accounts of the region were diffused following Orellana's expedition in 1542, Europeans led by Spanish and Portuguese began to canvass the rainforest in search of exploitable goods. The aboriginal inhabitants and the resources located astride the Amazon and its tributaries were the first to feel the alien impact. Natives from densely occupied sedentary villages were uprooted as slaves for Brazilian coastal plantations or they were organized to work in local farming and gathering activities (Oliveira, A.E. 1983, 144–213). Although the colonial exploitive activities greatly affected the demographic make up and served to exhaust many of the floral and faunal resources of the region, their impacts were either areally or chronologically limited. Local economies were also linked with that of the developed world, but the exploitive and cyclical nature of the external demands did not alter the basic subsistence structure of the inhabitants. Accelerated changes to the region's society and economy began in the 1950's. The national and international diffusion of transportation and communication technologies, increasing demands for the area's resources, and the government's regional integration and development attempts are beginning to affect many facets of ribereño life and environment. In response to the new stimuli, riparian inhabitants have been changing accordingly. Their livelihood activities are being adapted for a market-oriented economy. Their society, however, has not been able to adjust so swiftly and many ribereños are struggling in dealing with the changes. Although still insignificant, the transition from subsistence to a commercial way of life is beginning to be manifested in the community and in the environment.

V-1. Factors Responsible for the Changes

Contemporary alterations in riparian livelihood have resulted from a number of externally-induced factors, intentional as well as unintentional. Among the technological innovations, the introduction of outboard motors served to significantly modify life along the rivers. Prior to the 1960's, a trip from San Jorge to Iquitos was a two-day journey. Steamboats existed, but they were infrequent and costs prohibitive. Therefore, the majority of the riverine inhabitants preferred to travel on canoes. Downstream voyage was rapid and Iquitos could be reached in 6 to 7 hours, but upriver travel was arduous and time consuming. Between 12 to 14 hours were necessary to return to the village. Further, the small dugouts could not carry more than 60–80 kilograms of cargo. Trips to the city were infrequent as a result of the time, labor, and transportation capacities. Most of the basic needs, such as, oil, sugar, salt, cotton cloth, and aguardiente were purchased at the patron's *bodega*, at inflated prices. The advent of outboard motor revolutionized transportation on the floodplains. The relatively low cost of the motors enabled enterprising ribereños to build eight to ten ton wooden boats and to equip them with 40–50 horse power motors to transport people and goods. The *colectivo*, as the vessel is called, allows San Jorge residents to reach Iquitos on an average of 3:30–4:00 hours. The return trip still takes six to seven hours. However, the large capacity, the relatively low transportation cost, and the daily frequency allow ribereños to market most surplus goods, ranging from fish, aguaje, to agricultutal products. The increased accessibility has

Table 7. Material Goods Owned by San Jorge Residents

Item	Quantity
Cast net	24
Canoe (dugout)	29
Chain saw	1
Bed	21
Boat (planked)	3
Electric generator	1
Kerosene lamp	3
Kerosene stove	3
Gill net	8
Mortar and pestle	18
Outboard motor	4
Peque peque	8
Radio/radio cassette	19
Refrigerator (kerosene)	2
Sewing machine	10
Shotgun	10
Winch (manual)	1

served as an incentive for a greater geographical mobility among the population. Health care and medicines are sought in Iquitos, often at the expense of traditional medicine and practices. With increasing contacts with urban life and manufacturing products, urbanward migrations have increased and a larger number of manufactured goods are being purchased by the ribereños. The more successful individuals of San Jorge have begun to acquire motors of their own. By 1984, there were four outboard motors and eight *peque peques*[3] in the village (Table 7). Analogous to automobiles, the ownership of motors allows freer scheduling of activities and access to distant zones.

As in developing regions elsewhere, Iquitos has been the major beneficiary of recent developments in mass communications technology. Among the new mass media, the radio and television waves have come to alter ribereño life. In addition to the six radio stations, three television stations have been set up in the city. The lack of electrical power and the limited purchasing power does not allow San Jorge residents to watch the television programs, but radio programs are regularly captured. Over one half of the households owned either a radio or radio cassette in 1984 (Table 7). The radio waves have brought mixed results. The news and talk programs have increased the ribereños' awareness of developments elsewhere, but other programs such as music and commercials have brought negative consequences. For instance, the urban-oriented programs are changing the values of riverine inhabitants and foreign music, especially American, has practically obliterated folk music. The relentless commercials are rapidly changing the priority objectives and along with them the resource use techniques of the ribereños. To satisfy the material wants created, the residents are increasingly devoting their time to the production of marketable goods.

Petroleum exploitation in the Peruvian Amazon began with the discovery of Ganzo Azul field along the Río Pachitea, near Pucallpa in 1938, but the impact on the riparian population of northeast Peru did not occur until the 1970's. The exploration and successful discovery of several oil fields near the Peru-Ecuador border after 1971 brought many changes to Iquitos and adjacent areas. As the head of navigation of ocean-going vessels on the Amazon, the heavy equipment and machinery needed for the

production and shipment of oil were first brought to Iquitos and then transshipped by either aircraft or shallow-drafted boats to the drilling sites. Aside from serving as the cargo assembly point, Iquitos, as the only significant urban center in the Peruvian Amazon, was chosen as the regional headquaters for the oil companies. During the initial phases, i.e., between 1972 and 1975, approximately 15,000 laborers were needed for road opening, drilling, pipeline construction, and transportation crews (Chirif 1983, 55). Most of the unskilled workers were recruited from the region. At San Jorge, over 25 percent of the male population over 30 years of age in 1983 related that they had worked in oil company-related occupations. The relatively high wages paid by the companies enabled the ribereños to remit part of their wages to the families and to purchase manufactured goods. Workers were released once the labor-intensive projects were completed. Some returned to the caseríos, but most sought the urban life in Iquitos by living in the *pueblos jovenes* (San Román 1975, pp. 226–228). The short exposure to wage labor and cash-oriented consumption patterns outside the community influenced the world view of many. Therefore, the experience during the oil-boom years also acted as a strong incentive to change the subsistence techniques toward market-oriented ones.

National and international demands for tropical goods offer wage opportunities for the ribereños. Iquitos continues to serve as the major assembly point for the Peruvian Amazon products. Tropical fish, ornamental plants, animal skins, and cabinetwoods gathered in the upper basin converge into Iquitos for processing, packaging, and shipping. Two households at San Jorge, for example, earn supplementary income by capturing ornamental fish in the neighboring tahuampas and cochas between August and September. This activity is done under contract from exporters in Iquitos. At Santa Ana, a village of about 600 people across the river from San Jorge, four households engage in hunting peccaries *(Tayassu pecari)* during slack periods in their agricultural activities. Villarejo (1979, p. 151) estimates that 150,000 peccary skins are exported annually from Iquitos alone. These items are exported as far as Japan. The income earned from such activities are irregular, but the periodic demands for the regional products are increasingly involving the ribereños into the cash economy. At the same time, to increase the efficiency of exploitation, contractors often sell "tools of the trade" like shot guns, chain saws, or peque peques on easy terms. In order to satisfy the payment obligations or to purchase other manufactured goods, ribereños are investing a larger proportion of their time in income-generating pursuits.

In response to a number of real and perceived threats, the Peruvian government has accelerated the efforts to integrate and develop the Amazonian portions of its territory. Peru has been plagued by a number of social, economical, and political problems in recent years. Runaway population growth (2.6 percent per year) is severely taxing the economic growth of the country. Inability to modernize the rural sector, especially the Andean highlands, has led to increasing shortages in food production, as well as urbanward migrations, especially to metropolitan Lima. Leftist groups in highland departments, especially Ayacucho, continue to threaten the political stability of the country. The balance of payments situation has deteriorated as the prices for the major export items consisting of minerals like copper and iron continue to be depressed, while imports of material goods favored by a free trade policy have increased. The determined efforts by the Brazilians to develop its Amazonian territory through highway, mineral, power and agricultural projects within the last 15 years, and the Brazilian-inspired Amazonian Pact (1978) are seen by many Peruvians as potential threats to the territorial integrity of Peru (Rumrill 1983, 110–117).

The economic development and integration of the tropical forestlands were to relieve some of the difficulties stated above. Colonization was promoted along the eastern foothills to absorb some of the excess population from the *sierra* and *costa*, and to increase agricultural outputs. Agro-industrial projects were concurrently encouraged in order to hasten the development attempts (Zumarán 1982, 13–29;

Rumrill 1982, 73–75). A regional development entity, *Organismo de Desarrollo de Loreto* (ORDELOR) headquartered at Iquitos, was established in 1977 to coordinate and promote social and economical changes (Parodi 1982, 107–114). In 1980, Iquitos was granted the free port status with Decree-Law No. 23,100. The new law was to stimulate the establishment of manufacturing plants, especially high value-low bulk industries like electronics and precision instruments analogous to those of Manáus, Brazil. While trying to ameliorate the national problems, these programs were also intended to integrate the region's population.

It is still premature to judge the outcomes of the region's multiple projects on the nation, but regionally, they are affecting ribereño subsistence in various ways. For instance, trade liberalization, especially imports, has involved the riparian inhabitants into a commercial economy. Manufactured goods ranging from razor blades to electronic equipments have become accessible to many ribereños. Individuals with some savings can also abandon rural life and move to the city to hawk the imported items as *ambulantes*, street vendors. Attempts at increasing agricultural production, on the other hand, have tended to polarize wealth among the floodplain inhabitants. As development policies did not take into account the local conditions, the policies benefitted only selected people. At San Jorge, two individuals became the major beneficiaries of agricultural credits and technical assistance. One was the owner of the local store and the *de facto* patrón in the community. Ownership of the store, appliances, and agricultural equipments facilitated credit application. A perceptive individual, this person had developed considerable contacts with ORDELOR and agricultural bank personnel while serving as the *teniente gobernador*.[4] The other was the lay preacher for the local Evangelist chapel. His frequent trips to Iquitos on church matter had given him considerable insights on the potential opportunities.

Compulsory military service and the educational system have served as effective means in effecting cultural change among the ribereños. At age 18, young men serve for two years in one of the three branches of the armed forces. Although the conscripts are rarely removed from the selva, they are exposed to various parts of the region during the service. For most soldiers, these are the first outings beyond the confines of their villages and Iquitos, and they serve to expand the boys' horizons. During the service, alien concepts and behaviors are also learned. Among them are the ideas of duty and loyalty to the country, concepts that shift the young adults' allegiance from the community to the nation. Simultaneously, the boys' mental images of the environment are changed. From the known, localized and manageable riparian ecosystems, the draftees are introduced to multiple ecosystems that are complex to be comprehended. The officers, trained mostly in coastal cities, come equipped with urban ideas, behaviors, and consumption patterns that greatly influence the soldiers. The outcome of such a training is the difficulty of some to readjust to the village mode of subsistence. At San Jorge, those released from service often alternate between urban and rural jobs. In most cases, they return with economic values turned toward commercial production, and with a different perspective toward the environment.

The educational system has also acted as an agent in changing the traditional subsistence patterns of the ribereños. As primary education is compulsory in Peru, the Ministry of Education sends teachers even to the caserío level. The government staffs the schools, but the local inhabitants are held responsible to build the school and the teachers' residences. In 1984, there were three teachers at San Jorge, to instruct a total of 99 children. Several features of the current educational system serve to disrupt the traditional livelihood. The female, mestizo teachers are from other riparian settlements, but they hardly identify with local needs and problems. Although raised in rural environments, their subsequent training in urban areas have led them to adopt urban values and consumption patterns. Their limited educational background, their perception of belonging to a higher social class than local inhabitants, and their insensitivities have isolated them within the community. The proximity of Iquitos and the relatively

high wages the teachers receive enable them to return to the city once or twice a month. The long contact hours with the children in class, and the frequent trips to the city, resulting in the diffusion of different urban culture trends, invariably influence the young students' behavior, especially that related to subsistence.

In a centralized state as Peru, the educational system is also centralized and inflexible. Although the system derives many of its outlines from those of developed countries, there is hardly any allowance for regional variations (Stocks 1981, 135–137). A perusal of texts suggest that contents are primarily urban-oriented. Themes depicting Amazonian and other regional distinctivenesses and realities are not found. During the school years, students are taught two different views of society and economy: a local and largely subsistence oriented one at home and the community at large, and another that attempts to homogenize society on a national scale along urban-industrial lines. These changing behavioral patterns, in turn, contribute to alter riparian livelihood.

V-2. Adaptive Responses to External Elements

Ribereño life is rapidly changing under the pressure of a number of externally-generated factors. In order to accomodate the new situations, floodplain inhabitants have been devising a variety of strategies. Among the adaptations, three features in particular, stand out: (a) agricultural and other resource use patterns; (b) spatial organization; and (c) demographic shifts.

i. *Changes in Resource Management*

Farming is changing in a number of ways. New crops have been incorporated into the agricultural cycle. The rapid expansion and sophistication of Iquitos' population have meant increasing demands for food items in general, but especially horticultural items like vegetables, milk, and fruit. The floodplain zone, with its moist and fertile soils, has been ideally suited for vegetable cultivation. San Jorge, located only four hours from the market, is able to sypply part of the vegetable needs. Some of the ribereños, realizing the locational and edaphic advantages, have begun to produce tomatoes, ají dulce, *cuento*, pole beans, cucumbers, caihua, and melons for the market. Typically, these crops are raised on a small corner of the restinga baja fields during the *merma* or low water season. Since most of the vegetables are produced only during the merma, and prices tend to fall, more enterprising individuals have begun to experiment with vegetable raising on the restingas altas. Cereal crops have also increased in area. Rice, although not a novel item on the floodplain, is now being planted on monocultural plots of 10–15 ha. At San Jorge, over 95 percent of the grain is marketed. Maize, formerly a subsistence grain, is now raised primarily for sale in both the restingas alta and baja. In a similar way, tubers and fruits are planted beyond the household needs in an attempt to earn extra income. Working hours have increased for those engaged in producing part of their crops for the market. As most of the income is used to satisfy the growing appetite for manufactured goods, or to meet externally imposed expenses, such as, purchases of books and uniforms for the school children, and not to increase productivity, some individuals labor almost twice as much as those engaged mainly in subsistence activities. Wage labor has incremented along with increasing participation in the cash economy. Adults in each San Jorge household work between 500–700 hours per year for wages. Young adults, between 14 and 20 years of age, make up about 70 percent of the labor force. These men, without family obligations, but in need of income to pay for clothing, and beverages and cigarettes on weekends, attempt to earn income whenever opportunities arise. One of the major drawbacks of the trend toward cash generation has been the demise of many community-wide activities. Recreational activities involving the entire caserío are declining in frequency and size, as many individuals are now engaged in income-producing pursuits. The twice a month *obra comunal* (communal work) for clearing trails, servicing bridges, and weeding the soccer field is still at-

tended, but an increasing number of people prefer to pay the $S 1,000.00 fine alleging more urgent matters elsewhere. Likewise, *mingas* or labor exchange parties have largely disappeared at San Jorge.

Emphasis on exchange economy is affecting the rate of floodplain floral and faunal exploitation as well. Except for specific resources like latex, tagua nuts, or cumala seeds that gained short term prominence as commercial items, most floodplain products were managed to satisfy subsistence demands. This perception of resources has changed drastically within the last three decades. As the Iquitos' population swelled, demands for commodities that were familiar to the emigrés in the rural areas expanded. As mentioned above (p. 22), aguaje fruits, suri, chonta, and wild fruit have been sought by the urban residents. Simultaneously, extra regional demands for tropical goods continue. Realizing the additional income possibilities, ribereños began to exploit the goods on their own or as contract laborers. The accelerated rate of resource extraction appears to be unduly taxing the floodplain environment. At San Jorge, mahogany and tropical cedar, the two most sought-after trees, are no longer found in accessible areas within community bounds. The near disappearance of these logs now force the people to use alternates like catahua, of less durability, for their canoes. The quasi solid stands of Mauritia palms in the aguajales around San Jorge are also depleting rapidly. Between 2,300 and 2,700 aguaje trunks, i.e., an average of 80 palms per family, are felled yearly to collect the fruits that are sold in Iquitos. According to the residents, only 10 years ago, they were able to fill a 50 kg burlap bag with a 80 to 90 minute labor input from trunks felled in the vicinity of the settlement. In 1983–1984, the time required to harvest and bring the same quantity of aguajes to the settlement was between four and five hours. Fisheries are likewise following a similar path. It is now rare for the inhabitants to be able to eat fish like paiche and gamitana. With the virtual extinction of more appreciated ichtyofauna, people have been forced to consume formerly culturally unacceptable species or those having rapid breeding rates, such as the cahuara, boquichico, yahuarachi, and sardina. The declining yields from the environment has begun to concern the elders in the community and their views are frequently expressed in the community meetings. However, the difference in environmental ethics have only served to exacerbate the rift between the young and the old.

ii. *Reorganizing Land Use*

Ribereños' spatial organization is gradually modifying as an adaptive response to market stimuli. In general, all biotopes are experiencing more intensive use. With expanding markets and diffusion of motors, the range of ribereño activities has increased. In between chores, inhabitants occasionally venture 20 to 30 kilometers away on fishing trips to exploit streams and cochas that were reached occasionally with canoes. Personal ownership of motorized vessels has also enabled the use of more distant agricultural biotopes like insular barreal and playa. The crossing of the Amazon to reach the islands have always been perilous and thus feared by the women. Fording has been dangerous during stormy weather. With outboards, the size of the vessels has expanded and more frequent visits to the fields have been eased. Thus, horticultural plants, requiring more frequent care can now be planted five to seven kilometers away from the village. At San Jorge, there is a farmer who cultivates a 20 ha plot in a barreal, 15 kilometers upriver. The same farmer also raises manioc, maize, and plantains on three restinga altas totalling 4.0 ha and located five kilometers upriver. Preference for such locations was based on the availability of rich soils. As the easily accessible restingas situated in the vicinity of San Jorge have been worn out as a result of continuous use, those desiring productive restingas prefer to travel relatively large distances by water.

Another visible trend on the landscape is the simplification of land use. Multicropping on the inundation zone has never been practiced on a scale like the restinga alta. The short growing season and the annual renewal of plant nutrients through flooding obviated polyculture. Some intercropping,

Table 8. Characteristics of Emigrants Whose Relatives Live in San Jorge.

Destination		Age at Migration		Occupation at Destination	
Iquitos	25	40–45 yrs	2	Farming	1
Napo River	2	35–39	0	Fishing	1
Brazilian Amazon	1	30–34	1	Housewife	5
Ucayali River	1	25–29	3	Maid/cook	4
Lima	1	20–24	8	Student	7
		15–19	10	Unskilled worker	12
		10–14	6		

however, did exist. For example, chiclayo beans, manioc, and peanuts were associated in a single field. Multiple cropping was necessary in an economy of self-sufficiency. Increasingly, the trend is toward monocultural crops for sale. In order to maximize returns, the best soils are sown with cash products. Rice and chiclayo beans dominate the two insular biotopes of barreal and playa.

iii. *Rural Emigration*

Emigration from the village represents an adaptive response to changing livelihood conditions. Prior to the 1970's, possibilities for geographical, social, and economical mobilities were restricted. Iquitos, with a 1961 population of 57,777, offered limited opportunities for employment. Migration to the coastal cities was almost impossible without information and contacts. Limited migration took place between caseríos, but it was insignificant. Ribereño migrations from fundos were also restricted by social and economical obligations. The increasing rural population, demise of large estates, changing value systems, and the oil boom can be pointed out as some of the major urbanward migration factors. The rural exodus that began in the 1960's accelerated in the 1970's and continues to date. The results of this demographic shift can be appreciated by the growth of Iquitos. There were 110,242 people in 1972, and 203,568 by 1981 (Instituto Nacional de Estadística 1981, 45). Caseríos throughout the northeast Peruvian Amazon have been losing population to Iquitos.

According to San Jorge informants, 11 families moved out of the community within the last five years. Of these, all except one took up residence in Iquitos. In addition, 30 individuals, whose families still live in the caserío, are outside the community (Table 8). As emigrants elsewhere, young people are involved in the rural-urban migrations. Interviews from San Jorge and neighboring villages suggest that there are no sex differences among the young emigrés. Almost invariably, the ribereños' destination is Iquitos. In the absence of educational opportinities beyond the elementary grades in the caserío, those wishing superior training normally leave for the regional center. The majority, however, leave the community after the completion of the primary school for employment. Girls depart at age 13–15 to seek jobs as baby-sitters, maids, or cooks in middle class families. Military service usually serves as the triggering mechanism for boys' urbanward migration. After the service, most boys remain in the city. Without appropriate urban skills, the only employment opportunities awaiting them are menial tasks, or selfemployment such as street vendors. Since earnings are not sufficient for setting up their own living quarters, those not living with their bosses, seek shelter in relatives' homes located in one of the pueblos jóvenes. For most, even the sub-standard living conditions of the city is preferable to that of the floodplain. The great disparity in social infrastructures, educational possibilities, and other urban amenities are sufficient to attract the young emigrés. The illusory socioeconomic mobility potentials are undoubtedly important inducements as well. Parents also encourage the youngsters to go to the city, since they equate urban living with social ascent.

The changes taking place in ribereño society and economy, as seen from San Jorge, are similar to those of "modernizing" societies elsewhere in the Third World. As these communities are linked and integrated to the national and international societies, traditional systems are replaced by simplified ones often incongruous with local people and environment.

VI. Summary and Conclusions

An attempt was made to relate the subsistence activities among the inhabitants of a community located on the floodplain of the Amazon in northeast Peru. Emphasis was placed in explaining: (a) the traditional livelihood patterns; (b) the changes occurring in the traditional forms of subsustence; and (c) the outcomes of such changes.

Almost every aspect of life in the floodplain is touched by the annual inundations. In such an environment, successful subsistence is based on the familiarity of the yearly floods and minute knowledge of the multiple biotopes, with their unique edaphic, floral, and faunal characteristics. The sustained-yield economy of the ribereños is based on a combination of activities that includes farming, fishing, hunting, and gathering. By synchronizing the agricultural activities with the alternating cycles of ebb and rise of the river level, ribereños have been able to obtain high yields from the rich floodland biotopes. Fertility demanding cereals and vegetables have been raised within the inundation zone. Manioc, bananas, and other commodities, able to be produced on soils of lesser fertility, but rich in carbohydrates, have been grown on terrain not subject to flooding. They complement the diet and provide food needs when bottomlands are submerged. In a similar way, the detailed familiarity of other biotopes, and of animal and fish behavior, have enabled the San Jorge inhabitants to harvest their animal protein needs on a sustained basis. Additionally, the seasonal exploitation of floodplain forests for fruit, nut, palm heart, and other needs satisfied most of the people's requirements for food, fiber, and shelter. Cash needs for acquiring the limited items not produced in the community, e.g., oil, sugar, salt, and manufactured goods were met by disposing surplus commodities from their agricultural fields and other biotopes. This nutritionally adequate and ecologically stable livelihood system, greatly influenced by aboriginal ways, is now undergoing a rapid metamorphosis.

A series of factors external to the area, e.g., integration attempts by the nation, an economic boom based on petroleum, increasing demands for regional commodities by the developed world, and the diffusion of transport and communication technologies are beginning to effect changes on the ribereño livelihood. Signs of change began to be manifested in the 1950's. The fluvial zone inhabitants' involvement in the monetary economy began to increase initially as a result of the diffusion of outboard motors that eased the marketing of riparian products. Increased urban population and purchasing power as a result of oil discoveries in the northwest selva served as added incentives for the rural population within a 80-kilometer radius of Iquitos to produce for this city. Other factors like the free port status conferred to Iquitos, and the establishment of a regional development organization have been changing the floodplain inhabitants' economy into a market-oriented one.

External influences during the last three decades are already bringing about notable changes to ribereños' life and landscape. Environmental changes are beginning to occur. Farming biotope use is being simplified as monocultural fields increase. Accelerated natural resource exploitation is leading to the depletion of some floral and faunal species. At San Jorge, prized woods are already hard to find, and the rapid cutting of aguaje palms are likewise diminishing the once abundant stands. Many valuable fish species have disappeared and the ribereños are now consuming those that were once considered unclean or unhealthy. Fish and animal populations will be further affected by the alterations taking place on the floodplain land-water interface. As logging and agricultural activities increase on the

tahuampas and restingas bajas, refuges, feeding, and breeding grounds are decreased or altered. Ribereño culture is being modified in a number of ways. Consumption patterns have been moving toward a materially-oriented one and an increasing proportion of goods now consist of manufactured items purchased in Iquitos. Community institutions like communal exchanges of labor and food sharing are changing alongside socialization and recreation patterns. National, urban-oriented trends are slowly displacing local, traditional ones. Much of the changes are the effect of mass communications, easy urban access, and governmental institutions like rigid and standardized school and military service. Youngsters, impatient with the rates of change in the villages are emigrating rapidly toward the city. Despite the meager social and economical infrastructures, once in the city, migrants tend to reside there permanently.

From the review of San Jorge, it is possible to point out that the study of traditional floodplain subsistence systems offers important clues for devising economically viable and ecologically stable models for floodplain development, especially for family farmers.

The ribereño subsistence system is arranged in an integrated fashion, i.e., the floodplain biotopes are seen as part of a system, where individual biotopes contribute one or more of the inhabitants' needs. The combination of biotopes changes spatially within the floodplain, but in each location the ribereños are able to satisfy most of their food and material wants. The small surpluses have been destined for exchanges of goods unable to be generated in the area. The increasing homogenization of the riparian economy is swiftly demising the local systems. Since riparian livelihood varies greatly within the floodplain, reflecting local microenvironmental differences, it is necessary to document as many as possible of these systems before they are changed to more simple and ecologically less apt ones. Although floodplain environments are more resilient than their interfluvial counterparts, the floodplain dynamics, especially the relationships between human biotope alterations and other life forms, have to be understood before development activities begin. Another aspect to be taken into account is that of the scale of development projects. The floodplain does not lend well to large, mechanized activities. Each of the biotopes are small in areal extent and they occur discontinuously, often separated by several kilometers in distance. Therefore, the riverine zone is suited to accomodate family farmers, each managing a number of biotopes and producing a variety of goods for home as well as for the market.

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Footnotes

1) Ribereños assure that high floods have become common in recent years. San Jorge, Pueblo Libre, and Tapira Grande residents describe that until about 15 years ago, most of the restingas bajas along the Amazon were lined with dense stands of plantains, citrus, and fruit trees like breadfruit, *taperiba*, and *mamey*. These plants can no longer be cultivated because of frequent high floods. For arguments contrary to such testimonies see Nordin, C.F. and R.H. Meade (1982).

2) For a description of similar practices in the Itacoatiara area of the Brazilian Amazon see Smith (1981, pp. 87–94).

3) *Peque peque* refers to an air cooled engine used for propelling small watercrafts in the Peruvian Amazon. These gasoline engines develop between 2.0 and 16 horse power. A propeller is mounted at the end of a 2.0 to 2.5 meter-long shaft, encased in a steel tube, and connected to the main engine shaft. The low cost (US$200.00–500.00), low maintenance expenses, and reliability of the peque peque are cited as main advantages of the contraption. By means of a long handle attached to the engine plate, the shaft can be moved both horizontally and vertically with relative ease. Mounted on a small boat or dugout, the engine enables navigation in shallow and vegetation debris-covered channels. The versatility and the low cost have made the peque peques the most popular navigation equipment in the riparian zone.

4) For administrative purposes, each caserío is represented by an elected official called *teniente gobernador*. Once approved by the departmental prefect, the individual becomes responsible for maintaining law and order within the community. He is also responsible for carrying out orders transmitted by other officials in the administrative hierarchy.