

RURAL DEVELOPMENT FORESTRY NETWORK

THE EFFECTS OF SEDENTARIZATION ON
AGRICULTURE AND FOREST RESOURCES IN
SOUTHERN VENEZUELA

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INTRODUCTION

While it is widely recognised that indigenous peoples throughout South America are experts in the use and management of tropical forests as well as tropical agriculture, the continued existence of this expertise is threatened as contact with western society and adoption of its lifestyle increase. As one works with Amerindians to preserve such knowledge and conserve the forests, one needs also to consider the development pressures which they are now undergoing as a result of such contacts. Development as used here means the process by which itinerant indigenous villages have been encouraged to settle in permanent sites. In southern Venezuela such settlements have experienced as much as a tenfold increase in population, in less than 30 years.

Although there have been important benefits to permanent settlement such as access to some medical services, improved infant survival and the formal education of children, livelihoods have become considerably less sustainable as well (Table 1). This is as a result of the decline in forested areas, wildlife availability, and nutritional well-being. In addition, settlers experience an increase in destructive fires owing to the predominance of sparse secondary vegetation near the village, which easily ignites during the dry season. The problem of poor nutrition is probably becoming more prevalent among indigenous groups throughout Latin America as they lose access to their traditional lands and become settled in one area. All these threats to indigenous survival, which come from a community's own growth or development process, are generally given less attention than the threats of large national and international development projects, gold-mining and guerrillas. This paper, therefore, explores the responses and the effects which permanent settlement and population growth in a Huottuja (also known as Piaroa) village in southern Venezuela have had on households' agricultural strategies and access to forest resources.

Table 1: The Effects of Sedentarization

GAINS	LOSSES
Schools	Reduced diversity of cultivated foods
Health services	Scarcity of edible wild flora and fauna
Improved infant survival	Nutritional deficiencies
Better access to markets	Increased deforestation
Electricity	Increased agricultural labour inputs
	Increased evidence of wild fires

THE HUOTTUJA

Population

The Huottuja people of southern Venezuela have traditionally maintained villages of 15 to 60 people (Overing and Kaplan, 1988). As a result of a national policy to populate and protect frontier areas, many indigenous groups were encouraged to settle in permanent sites during the 1960s and 1970s (MARNR, 1983-1984). Most settlement occurred near Puerto Ayacucho, capital of the then Federal Territory of Amazonas whose status has recently changed to that of a state. Several villages now total over 100 inhabitants complete with schools, medical dispensaries, electricity and at times running water.

The population of the Huottuja in Amazonas State totalled 5,660 in 1982. They were resident in 130 communities, of which 76% were permanent settlements characterized by houses concentrated on a specific site and 15% still lived in communal dwellings (OCEI, 1985). The latest census gives the number of Huottuja within Amazonas State at 9,828 (OCEI, 1992).

The Huottuja are agriculturalists practising swidden cultivation. Their staple crops are bitter and sweet cassava (*Manihot esculenta* Crantz and *Manihot dulcis* (Gmel.) Pax.), maize (*Zea mays* L.), yams (*Dioscorea trifida* L.f., *Dioscorea alata* L.), sweet potato (*Ipomoea batatas* (L.) Poir) bananas and plantains (*Musa spp.*). They supplement these carbohydrate-rich foods with fishing, hunting and the gathering of wild fruits.

THE CASE STUDY VILLAGE

Reasons for Settlement

Prior to the 1960s, the Huottuja had traditionally maintained homesteads throughout the northwest part of Amazonas State, mainly in headwater regions. Thirty Huottuja moved down from such a headwater area to settle in a lowland area with close proximity to **criollos/mestizos** (creole and mixed blood sedentary villagers). They constructed a traditional communal house made of palm leaves in which to live.

There was no single reason for this movement. Rather it appears that there were several contributory factors. Firstly, a measles epidemic killed many Huottuja during the 1960s, and malaria and chicken pox were also prevalent. Traditional medicine men could not cure these diseases and so some Huottuja left their original homesteads in search of treatment. Secondly, they also began to trade products such as latex and agricultural produce for machetes, clothes, guns and ammunition with the **criollos/ mestizos**. The National Guard also enticed them to settle by giving gifts of machetes, knives and other tools.

The Huottuja chose to remain in these sites because some of them perceived that the **criollo/mestizo** lifestyle was better. They noted that infant mortality rates were lower; and women preferred life in lowland areas to that of upland areas where the negotiation of steep hills with back-loads of 40 kg or more was necessary. The preference for a **criollo/mestizo** lifestyle also contributed in part to their adoption of evangelical Christianity.

Village Population

The village's population has grown steadily in size from the initial 30 in 1966 to 398 in 1992 as a result of births and immigration. The Huottuja who moved into the village were searching for better services or marrying into existing families. In 1976 and 1977, 60 houses were built with cement blocks and zinc roofs by the Ministry of Health and Social Assistance. A further ten

houses were built in 1993 to accommodate the increase in population. The houses have plumbing, (though the motor which pumps water from the river has been broken for 6 years), and they also have electricity supplied from the state capital, Puerto Ayacucho. As a result, many families now own refrigerators and televisions.

Development Projects

Many development projects have been initiated within the village by government bodies. The National Agrarian Institute (**Instituto Agrario Nacional**) began a cattle project in the early 1970s, with the intention of making the villagers self-sufficient in meat production. However, the cattle were disliked because they destroyed crops and fruit trees, and gradually they died or were sold.

Later, the Environment Ministry began a project to plant fruit trees on the old cattle pastures. The ministry's professionals supervised the planting by Huottuja villagers of *Anacardium occidentale* L., *Inga edulis* Mart., *Psidium guajava* L., lemons, oranges (*Citrus spp.*), and mangos (*Mangifera indica* L.). The project was a great success, yielding a bounty of fruits which all villagers were able to collect, until a fire destroyed almost every tree. An irrigation system was even set up to improve the land of these old pastures, which had turned into savanna but another fire destroyed the pipes.

Other projects included an apiary which no one has been trained to run and a special building for women to make flat cassava cakes (**casabe**) which is too hot to work in (women prefer in any case to work in their own homes). More recently in 1992, there was another agricultural project organized by the National Agrarian Institute sowing bitter and sweet cassava, pineapples (*Ananas comosus*, (L.) Merr) watermelons (*Citrullus lanatus* (Thunb.) Matsum. & Nakai), cucumbers (*Cucumis sativus* L.), cow peas (*Vigna unguiculata* (L.) Walp.) and maize. The initial harvests of cow peas and maize were low because the field was sown at the end of the rainy season, but the future of this initiative may be more promising than some of the others.

AGRICULTURAL ADAPTATIONS TO SETTLEMENT

The Traditional System

The original cultivars listed are still the predominant crops grown by villagers. In common with the traditional Huottuja agricultural system, each family usually clears one hectare of forest a year to plant up (MARNR, 1983-1984). The field is planted with cassava, maize, sweet potatoes, yams and fruit trees. The most popular fruit trees present are the peach palm *Bactris gasipaes* H.B.K., the Amazon grape *Pourouma cecropiifolia* Mart., *Inga spp.*, and *Pouteria caimito* (Ruiz & Pavón) Radlkofer.

The maize is harvested once after three to four months. The cassava may be harvested after only eight months or after two years. After the first cassava harvest, the stems are replanted which allows for a second harvest from the same field. Each field is then in cassava production for a total of two to three years. After this time the field is not abandoned, for it still contains fruit trees mature enough to bear fruit, and may also contain sweet potatoes and yams.

The Huottuja, therefore, do not depend upon only one field or one crop during a given time but harvest a variety of staples and fruits from several fields of different ages. The family is thus able to supply itself with a diversity of foods. This traditional system still exists in the lowland.

However, fields are at a greater distance from the village; there is less crop diversity; the number of fields cut each year per family is increasing; field sizes vary; and yields are declining.

Travelling Distance to Fields

The Huottuja prefer to cut their fields from forested areas with trees of over 20 m as they realize that the greater the forest biomass burned, the better their crop yields will be. Previously, when villages were located directly within the forest, fields were within a half hour's walk from the village (approximately 1-2 km). If forested areas of the preferred height became more distant, the villagers would move their entire settlements into another forested area. This strategy, however, is no longer possible for a village with block houses and schools. As the population has grown and the forest nearest the village has been cleared for agricultural fields, households have had to travel further to find the appropriate forest types for new fields. Now many fields are located over an hour's walk (4-10 kms) from the village. Some fields were also purposely moved further from the village in the 1970s to avoid the crop-destroying cattle. It is common for thatched shelters or houses to be built in these more distant fields. They serve as shelters from heat or rain as well as areas to process the cassava. On occasions, particularly during labour intensive periods such as field clearance and sowing, a family may move out to these houses for a week or more.

The selection of field sites also requires an historical understanding of the villager's movements. Some families utilize old fallow fields and continue to clear them to plant in the same localized area that their parents did when they first moved downriver to the current village site. The most distant fields are located in sites upriver where the elder members of the village grew up and their parents had sown fields. These elder members prefer to sow here saying that the land is better. Sowing at these sites over 8 km away is perhaps more than just a response to the decrease in forested areas close to the village, but also an illustration of an attachment to ancestral lands.

Crop Diversity

Traditionally, each field contained a mix of crops, but now within the case study village, certain fields are composed almost solely of cassava. This decreased diversity relates to the field's proximity to the village as well as to increased production for markets.

The areas closest to the village were being farmed by **criollos/mestizos** when the Huottuja arrived at the site. The Huottuja themselves continued to farm the same areas. As a result, some areas are now turning into savanna, while others have regenerated with only very sparse secondary forest vegetation. The soils are poor and the microclimatic conditions are generally dry, making them easily susceptible to fires. The current cassava fields near the village were recently cut from this sparse secondary forest vegetation. The Huottuja recognise that at these sites cassava is usually the only crop which can survive and therefore have tended towards monoculture. Despite the poor soils, some Huottuja say that certain fruit trees such as *Inga* could grow near the village as well, yet these are not planted. Villagers say that the produce is more likely to be eaten by passers-by and the area has a high probability of being burned. They, therefore, see planting fruit trees close to the village as a bad investment with little rewards.

However, the traditional species diversity of cultivars is found in fields more distant from the village. These more densely forested areas contain moister microclimates and the greater amount of vegetation provides more nutrients when burned to create fields. At these more distant sites it is also less likely that fruits will be stolen and that uncontrolled fires will occur.

Finally, some fields tend to monocultures because the families are producing cassava to make flour (**mañoco**) and flat cakes (**casabe**) to sell in addition to their own consumption. Families usually sell cassava as well as chillies, sweet potatoes, yams and wild fruits in the Saturday morning market of Puerto Ayacucho, which is located 37 km to the south of the village.

Field Size

It is also important to always have cassava close to the village as it is the staple crop, harvested year-round. There is an opportunity cost to travelling long distances and having to carry heavy loads from these distant sites; so planting still occurs frequently near the village but as there are more people, individual field sizes have become much smaller, usually 0.5 ha or less.

Annual Field Clearance

Traditionally a family would cut only one new field a year, usually of one hectare. Now, however, some families clear two new fields per year for a total area of two hectares. Two fields of the same age provide a form of insurance against crop-destroying fires; they may also contain different crop compositions — perhaps one field of sweet cassava and the other of bitter cassava. But above all the increased acreage is raised for cash-cropping reasons. Such a change has serious implications for the forest, since if more households adopt the practice, the rate of deforestation will greatly increase. Without tree crops, the woody regeneration of these fields will also be poor.

Yields

It would also seem, from interviews with older members of the village, that cassava yields are not as high as they used to be. People have to work harder and longer hours now, particularly as fields are more distant from the village. For example, one woman said that when they lived upriver, they could fill their basket with the tubers from three cassava plants, whereas now it takes 20 plants to fill the same basket. More time is now devoted to agriculture and less to wild foods collection in comparison to when they lived in smaller upriver communities.

Lower yields in some areas may be attributed to a shortening of fallow periods from ten years to seven or five years. If the vegetation of the fallow period is not sufficiently dense, then fewer nutrients are released to the soils during its burning to clear a new field. As a result crop yields may become reduced.

Communal Fields

In addition to individual fields, the villagers have a collective field of 7 hectares of cassava. The cassava is harvested from this field to support village events such as celebrations. Prior to such an event both male and female villagers will walk the 10 km to this communal field to harvest cassava. A thatched house is located near the field where they are able to process the cassava together. They are allowed to keep some of their harvest and processed cassava for their personal consumption. The cassava flour and flat cakes are stored for the event as well as sold. The money earned is then used to buy ammunition to hunt game to eat at the celebration. Other items such as flavoured soft drinks are also bought for the celebration.

Summary

Generally, the fields closer to the village are smaller and contain mainly cassava. It is the fields which are more distant which exhibit the traditional diversity of species. Therefore, one needs to look at the whole system of fields in order to understand the livelihood strategies developed. As

families face greater risks from fires and require more cash, for example to buy refrigerators or to send children to schools in Puerto Ayacucho, they have responded by avoiding extensive losses by not planting tree crops close to the village and relying upon cassava production for home consumption and sale. The more distant fields are therefore relied upon to provide the fruits of tree crops. A number of fields each containing a different variety of crops can reduce the amount of labour expended during each sowing season. For example, if a family has a sufficient supply of a particular perennial fruit such as peach palm in one or two of their fields, they do not have to plant this same species in every field, every year.

ACCESS TO FOREST RESOURCES

Traditionally Gathered Forest Food Sources

The agricultural system which yields mainly carbohydrates is integrated with collection of wild fruits which provide vitamins minerals, proteins and carbohydrates and game hunting and fishing which add fat and protein to the diet. Whereas most cultivated fruits are available in the dry season, wild fruits are mainly harvested during the rainy season. Wild game and fish are most abundant in the dry season. Alternative protein and fat sources during the rainy season include fruits of the palms *Jessenia bataua* (Mart.) Burret and *Oenocarpus bacaba* Mart. as well as ants (*Atta spp.*). The Huottuja utilize at least eighty-five wild fruits and at least sixty-one wild animal species.

Changing Access to Traditionally Gathered and Hunted Food Sources

Gathered Wild Fruits

The Huottuja of this case study still utilise this great diversity of wild products when they can find them. But some of these species have become scarce and a greater time investment is required for collection. As a result, many wild foods are no longer collected as frequently as before nor are they collected in the same quantities.

Nevertheless, whole days (usually once a week), are still spent collecting the wild palm fruits of the *Jessenia-Oenocarpus* complex and of *Euterpe precatória* Mart. for sale in the markets of Puerto Ayacucho. Usually a Huottuja will harvest and sell a sack of fruits weighing at least 40 kg of one or other species. The price of both fruits were Bs. 20 per kg — equal to US\$ 0.29¹. Each vendor could gross approximately Bs. 800, less Bs. 120 for transportation giving a net earning of Bs. 680 for 14 hours of labour (9 hours to collect plus 5 hours to sell). If one compares this to a day labourer's minimum wage of Bs. 300 for eight hours work, such a labourer would earn only Bs. 525 for the same 14 hours.

Villagers used to collect more wild fruits and to hunt more often than they do now. Fruits from the genera *Dacryodes*, *Brossimum* and *Couma* are now scarce, for instance. Previously, these fruits were collected by the basketful and were located close to the village. They began to disappear as other neighbouring ethnic groups began to cut trees to harvest the fruits, as opposed to climbing them, as the Huottuja do. In addition a fire in 1987 destroyed most of the fruit trees located near the village. Clearance of forest for agriculture has also been a contributing factor to wild fruit tree scarcity.

¹ The exchange rate is Bs. 68.82 = US\$ 1.00.

The fruits of the *Jessenia-Oenocarpus* palms are made into a milk-like beverage. In years past this beverage would be drunk every day when it was in season. Now it is perhaps drunk once a week with the majority of the fruits being sold in the market. As it is one of the most important fruits culturally and economically, efforts are still made to collect it through the investment of a great deal of time. The best sites for the palms are located at quite a distance, upriver from the original settlement site. The journey takes approximately two hours in a canoe with a 15 horsepower motor, followed by 45 minute walk. Not all villagers have the time or equipment to continue this collection. Their time is devoted more to agricultural activities or to off-farm employment, such as school teaching.

Game

Wild game is particularly scarce due to over-exploitation. Even the roads which connect the village to Puerto Ayacucho have impeded the migration of animals from upland areas to the Orinoco River. Fish have also gradually become scarce in the local river, but reached a crisis point of almost complete disappearance in 1993 when, early in the dry season, some villagers began harpooning fish by the sackful in order to sell in Puerto Ayacucho. The Huottuja traditionally also eat ants, termites, beetle larvae and tarantulas. They too are becoming scarce as forested areas are disappearing.

Shortfalls in the availability of meat and game can be somewhat offset by the purchase of fish from other villages as well as of canned tuna, sardines and rice. But rice, the cheapest alternative, cannot make up for the protein deficiency. If a family has no money and has not caught fish or game, it must go without, relying mainly upon cassava as its food source. The incidence of malnutrition, particularly of anaemia among the young and old, has therefore increased within the village.

Traditional Beliefs Concerning Gathered and Hunted Food Sources

The Huottuja believe that wildlife needs to be cared for spiritually by the **shamans** (traditional priests) of the area. But over the years there has been a decline in the number of **shamans** and there are now few left who know how to care for the natural resources of a particular village². According to the Huottuja, one result of the loss of **shamans** has been a decrease in the abundance of wild fruits, game and fish.

The Huottuja explain that there have been many spiritual conflicts between the good and evil **shamans** which evil **shamans** have tended to win, while many good shamans who cared for wildlife have died. The number of **shamans** has also fallen as a result of the adoption of Christianity. The overall decline in numbers has adversely affected the training of new **shamans** as several are required for the instruction and protection of one new one.

OFF-FARM EMPLOYMENT

Within the village there exist opportunities for employment as day labourer, school teacher, local level government official or nurse. Often men leave the village for short periods to work in other parts of Venezuela constructing traditional palm-thatched roofs for restaurants and resorts. Those village members who have access to a steady income are able to buy goods to start up small

² It would seem that such **shamans** might in the past have elaborated and endorsed common property resource management rules, which are now in abeyance.

shops which sell a variety of items from canned foods, rice and soft drinks to soaps and batteries.

Also, within the village, the trading of fish and wild fruits between individuals occurs. This sale differs from the traditional system where foods were shared among families. As the majority of families have refrigerators, favourite items for sale are frozen ices which are often made from the juice of garden fruits such as mangos or from wild fruits such as *Mauritia flexuosa* L.f. or of the *Jessenia-Oenocarpus complex*. Otherwise these frozen ices are made from fruit-flavoured powder mixes like Kool-Aid.

With the money earned, food is sometimes bought to replace scarce fish and game resources, but money is also saved to pay for sending children on to advanced education in Puerto Ayacucho, or spent on consumer items.

CONSEQUENCES OF SETTLEMENT

Nutrition

As game and fish become scarce, families often cannot meet their daily protein requirements, which results in anaemia among children, women and the elderly. While they have control over their agricultural plots, they cannot control the over-exploitation of wild resources by individuals within and outside the village, and suffer as a result.

Since fruit trees are less frequently planted in nearby fields, a family's supply of protein and of key vitamins and minerals may be reduced. The current practice of selling wild fruits rather than consuming them also adversely affects a family's nutritional well-being. The fruits of the *Jessenia-Oenocarpus* palm complex, for example, are good protein sources similar in quality to that of animals (Balick and Gershoff, 1981). The juice made from the fruits has a similar calorie content to that of human milk (Table 2). It fruits during the rainy season when there is less chance of catching wild game and fish than in the dry season. The fruits are then a particularly vital protein source and if they are sold rather than eaten, people lose nourishment which is not replaced by purchased foods such as rice or bread. Table 3 compares the essential amino acid composition of the *Jessenia bataua* juice with daily infant, schoolchild and adult requirements.

Table 2: Fat-Protein-Carbohydrate Contents of *Jessenia bataua* Juice and Cow's Milk³.

Approximate calories from each component	<i>Jessenia bataua</i> juice	Human milk	Cow's milk
FAT	55.3	45.9	49.8
PROTEIN	7.4	5.6	20.9
CARBOHYDRATE	37.3	48.5	29.3

³ Taken from Balick and Gershoff, 1981.

Fire

As there is more herbaceous vegetation than forest near the village and its access roads, the area is easily combustible during the dry season. Any careless match or burning of debris within a field can result in the destruction of crops and wildlife. When new fields are cut, certain farmers fail to put in firebreaks. When the adjacent vegetation is secondary, it is more easily burned than if the field had been cleared in denser forest. The result over the years has been the increased frequency of fires.

The direct consequence of these fires has been the loss of food for the village. Individuals have lost as many as 300 pineapple plants or 80 peach palms (*Bactris gasipaes*) from their fields. With so many fruit trees destroyed by fire, the supply of planting material has diminished. The decrease in the planting of trees is not only due to the lack of planting stock, however, but also due to the perception that it is a waste of time as the trees will eventually be lost to uncontrolled fires. Yet the lack of trees in fields has serious consequences for the regeneration of forests from old fields. The quality of forest regeneration will decline and perhaps exacerbate the process of the area's conversion to savanna.

Table 3: Comparison of Amino Acid Content of *Jessenia bataua* Protein and Human Milk Protein with Suggested Patterns of Amino Acid Requirements⁴

Amino Acid	<i>Jessenia bataua</i> Mg amino acid per g protein	Human Milk Mg amino acid per g protein	Suggested Patterns of requirements Mg amino acid per g protein		
			Infant	School child	Adult
Histidine	29	26	14	-	-
Isoleucine	47	46	35	37	18
Leucine	78	93	80	56	25
Lysine	53	66	52	75	22
Methionine + Cystine	44	42	29	34	24
Phenylalanine + Tyrosine	105	72	63	34	25
Threonine	69	43	44	44	13
Tryptophan	9	17	8.5	4.6	6.5
Valine	68	55	47	41	18

⁴ Based on data from Balick and Gershoff, 1981; FAO/WHO, 1973.

Knowledge Loss

The youth of the village are now no longer as familiar with the traditional forest food resources of the Huottuja because they simply have not seen them. These resources are no longer found near the village, and the children now spend more of their time in school than trekking in the forest. Although many children go out to the fields with their parents after school, there are some who do not. As a result, some children are not learning traditional cultivation methods or even how to process cassava. This has serious implications for their futures. With few income-earning opportunities, agriculture is vital to self-sufficiency. If these children lose the knowledge of cultivation, and any desire to practise it, food shortages may go beyond the existing protein scarcity to the lack even of the staple, cassava.

THE FUTURE

These settlement problems are recognized within the village, and by the Ministry of the Environment, and moves are being made to counteract them. The elders of the village are currently drawing up a code of practice for the village. For example, this code requires that fish are to be caught only for home consumption, not for sale. School teachers are teaching their pupils to plant trees around the school.

These same school teachers together with the Ministry of the Environment have developed a bilingual text on autochthonous food plants. It contains lists of these plants, explanations of their nutritional importance and suggestions for their conservation. The Ministry of the Environment has organized a series of teaching sessions and provided some equipment to prevent fires. It has also given several slide presentations on the value of indigenous plants. Additional projects include a nursery, and reforestation within the village.

For the first time, Christmas celebrations are to include performances of traditional myths as well as traditional games. Traditional foods will be present as before. Such activities are considered essential to make the young more aware of their culture, and to give them a desire to preserve it.

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VENEZUELA: AMAZON STATE AND SIPAPO FOREST RESERVE



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