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Relatório de pesquisa

Cinderella fruits and cultural forests in Pacaya-Samiria, Peruvian Amazon

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Abstract

CINDERELLA FRUITS AND CULTURAL FORESTS IN PACAYA-SAMIRIA, PERUVIAN AMAZON

Tropical forests and associated disturbed habitats (successionary communities created by tree falls, landslides, shifting river channels, and clearing by people) are orders of magnitude richer in species than temperate woodlands and consequently have provided ample opportunities for plant domestication. Many crops domesticated in tropical forests are not only important sources of sustenance and income for locals but are also traded extensively in global markets. This is particularly so for the Amazon which has provided us with cacao, the source of chocolate and rubber, both utilized in virtually every country, as well as Brazil nut. Now açaí, a palm fruit native to Amazonia with high levels of antioxidants, has burst on the world stage in a variety of products ranging from fruit juice blends to ice cream and even shampoo. Tropical forests, including the Amazon, contain wild populations of many tropical crops, an important resource for further crop improvement because they are a reservoir for many valuable genes not found in the domesticated gene pool. Tropical forests are also a cornucopia for new crops. Several hundred wild and domesticated fruits are consumed in the Amazon, and those that have reached national and international markets represent only the tip of an iceberg. Here we focus on the importance of wild and cultivated fruits in the Pacaya-Samiria National Reserve, a vast wetland at the confluence of the Marañón and Ucayali Rivers in the Peruvian Amazon.

Keywords: Cultural forests, crop domestication, ethnobotany, non-timber forest products, crop genetic resources

Resumo

FRUTAS CINDERELA E FLORESTAS CULTURAIS EM PACAYA-SAMIRIA, AMAZÔNIA PERUANA

Florestas tropicais e habitats perturbados associados a elas (comunidades sucessoras criadas por quedas de árvores, deslizamentos de terras, mudanças de canais dos rios, e desmatamento por ação humana) são mais ricas em espécies do que florestas temperadas

e, conseqüentemente, apresentam amplas oportunidades para a domesticação de plantas. Muitas plantas domesticadas nas florestas tropicais são não apenas importantes fontes de sustento e renda para a população local, mas também são largamente negociadas em mercados globais. Isto é particularmente verdade para a Amazônia, que forneceu-nos o cacau, a fonte de chocolate, e a borracha, ambos utilizados em praticamente todos os países, bem como a castanha do Brasil. Agora, açaí, uma fruta de palmeira nativa da Amazônia, com altos níveis de antioxidantes, estourou no cenário mundial em uma variedade de produtos que vão desde o suco de frutas, passando pelo sorvete e até xampu. As florestas tropicais, incluindo a Amazônia, contem populações selvagens de muitas culturas tropicais, um recurso importante para a posterior melhoria de plantas cultivadas, porque elas são um reservatório de muitos genes importantes não encontradas no universo de genes domesticados. As florestas tropicais são também uma cornucópia para novas culturas. Várias centenas de frutas selvagens e domesticadas são consumidas na Amazônia, e aquelas que atingiram os mercados nacionais e internacionais representam apenas a ponta do iceberg. Aqui vamos enfocar a importância de frutas silvestres e cultivadas na Reserva Nacional Pacaya-Samiria, uma vasta zona úmida na confluência dos rios Marañón e Ucayali na Amazônia peruana.

Palavras-chave: Florestas culturais, domesticação de cultivares, etnobotânica, produtos florestais não-madeireiros, recursos genéticos vegetais.

Resumen

FRUTAS CINDERELA Y BOSQUES CULTURALES EN PACAYA-SAMIRIA, AMAZONÍA PERUANA

Los bosques tropicales y hábitats alterados asociados con ellos (las comunidades sucesoras creadas por la caída de árboles, deslizamientos de tierra, cambios en los cauces de los ríos y la deforestación por los seres humanos) son más ricos en especies que los bosques templados y, por tanto, presentan amplia oportunidad para la domesticación de plantas. Muchas plantas domesticadas en los bosques tropicales no sólo son importantes fuentes de sustento e ingresos para la población local, sino también las más negociadas en los mercados mundiales. Esto es particularmente cierto en el

caso de la Amazonía, que nos ha proporcionado con el cacao, fuente de chocolate, y el caucho, que se utilizan en casi todos los países, así como la nuez de Brasil. Ahora, açaí, fruto de una palmera nativa de la Amazonía, con altos niveles de antioxidantes, irrumpió en la escena mundial en una variedad de productos que van desde jugos de frutas, helados e incluso a través del champú. Los bosques tropicales, incluyendo la Amazonía, contienen las poblaciones silvestres de muchas cosechas tropicales, un importante recurso para nuevas mejoras de las plantas cultivadas, ya que son una reserva de numerosos genes importantes que no se encuentran en la población de los genes domesticados. Los bosques tropicales también son una cornucopia de nuevos cultivos. Varios cientos de frutas silvestres y domesticadas se comen en la Amazonía, y aquellos que han alcanzado los mercados nacionales e internacionales representan sólo la punta del iceberg. Aquí nos centramos en la importancia de las frutas silvestres y cultivadas en la Reserva Nacional Pacaya-Samiria, un extenso humedal en la confluencia de los ríos Marañón y Ucayali en la Amazonía peruana.

Palabras claves: Bosques culturales, domesticación de cultivos, etnobotánica, productos forestales no maderables, recursos fitogenéticos.

Figura 1 - Aguaje (*Mauritia flexuosa*) palms along the margins of lake on the Amazon floodplain opposite Tamshiyacu, Loreto, Peru 06-18-2006.

> "The country of the Amazon is the garden of the world, possessing every requisite for a vast population and an extended commerce."

These words, written by an American naturalist in the mid-19th century (Edwards, 1847) could not have captured the potential of the biological riches of the Amazon any better. William Edwards in his wandering up the Amazon was impressed, like the many explorers that preceded him in the 16th and 17th centuries, with the great diversity of plant and animal life that abounds in the region.

Although many naturalists and explorers were enthralled with the rich array of plants and wildlife in the Amazon, and some, such as Henry Walter Bates (1863) expressed concern about the wanton destruction of natural resources in Amazonia, the region has generally been considered a backwater with respect to crop domestication. For example, the great Russian plant geneticist and plant explorer, Nikolai Vavilov, left Amazonia a blank when he drew up his global map of plant domestication centers in the early twentieth century (Vavilov, 1949, 1997). In the Americas, Vavilov considered only the Andes and Central America of sufficient importance as a source of crop plants to warrant designation as center. Most publications on crop domestication have generally followed suit.

Amazonia as a major region for crop domestication has been overlooked for several regions. First, discussion on plant domestication has generally focused on cereal food crops, rather than root or tree crops. Second, far more archaeological work has been undertaken in temperate and subtropical areas that the tropics. Third, plant remains are better preserved in the drier areas, as opposed to the humid tropics were organic matter decomposes quickly.

When one considers tree crops, particularly fruits and nuts, Amazonia has been a major center of plant domestication as recognized by the "father" of ethnobotany, Richard Evans Schultes at Harvard (Schultes, 1990). Starting in the 18th century, cacao was planted along the Amazon and in the Amazon estuary at the behest of the Portuguese crown and was an important export commodity during the colonial era. As the British Empire spread into fever-ridden jungles in the Old World, colonial masters were looking for ways to treat malaria and other maladies. Cinchona bark (source of quinine) was sought out in the eastern slopes of the Andes, on the tip of indigenous peoples. The British in India invented gin and tonic (which is flavored with quinine) to help combat malaria and to provide some welcome grog after the afternoon tea. The rubber boom swept Amazonia in the latter half of the 19th century and first decade of the 20th century as the bicycle craze in Europe followed by the launching of automobile production in the United States created an ever growing market for rubber.

In the early 20th century, Brazil nut extraction began on a large scale in parts of the Amazon, particularly the Tocantins Valley, spurring efforts to plant the tree. Fortunately, Brazil nut can be grafted so desirable genotypes can be multiplied easily and several landowners from Amazonas to Acre have planted orchards of the tree.

In the latter part of the 20th century, purported health benefits of fruits of the açaí palm (mainly *Euterpe oleracea*, but also some *Euterpe precatoria*) spurred yet another boom in Amazonia based on a native plant. Juice of the gracious açaí palm has long been consumed in the region, but when marketers began touting the antioxidant virtues of açaí juice exports to other parts of Brazil and abroad triggered widespread planting of the water-loving palm by small and large landholders alike, especially in the Amazon estuary (Brondízio, 1999, 2008; Brondizio et al., 1994). River dwellers also manage wild stands of the palm to optimize production of both fruit and heart-of-palm. As with many economic plants in Amazonia, it can be hard to draw the line between truly wild stands and feral or managed populations.

Cacao, cinchona, rubber, Brazil nuts, and açaí are the best known crops domesticated in the Amazon, but dozens of fruit and nut trees have been recruited in the region, some of which are only know emerging from obscurity because of the pull of extra-regional markets.

TRADITIONAL KNOWLEDGE AND CULTURAL FORESTS

For generations, rural folk in Amazonia of diverse occupations have consciously and unconsciously manipulated the vegetation in their environs. Interventions in the landscape range for the deliberate planting of trees and bushes near campsites or villages, managing fallow periods to favor fruit-bearing trees, to discarding seeds on middens or along trails, some of which later sprout. This re-arranging

of the biological furniture to increase the density of desirable plant species has been undertaken by rural folk with wide-ranging livelihoods, from fishers to farmers and extractivists, such as rubber tappers. In the 1980s, the contribution of these "hidden" actors began to be recognized by anthropologists, geographers, and botanists who were engaged in field work among indigenous and other peoples living in the interior (Anderson, 1988; Balée, 1988, 1989; Balée, W. and A. Gély, 1989; Balick, 1984; Denevan, W.M. and J.M. Treacy, 1987; Padoch et al., 1985). The açaí boom, driven by the growing global appetite for antioxidants in the diet, is but one of many plants, ranging from fruit and nut trees to medicinals, that are nurtured in cultural forests and planted in home gardens and fields in Amazonia.

The surviving indigenous groups as well as rural folk of diverse occupations (*campesinos, caboclos, ribeirinhos, ribereños, mateiros*) are carrying on a long tradition of molding the landscape to suit their needs (Guix, 2005). People have been sculpting landscapes in the Amazon for millennia, as evidenced by numerous and extensive black earth sites and earth works (Erickson, 2008; Heckenberger et al 2003).

While not every hectare in Amazonia has felt the hand of man, many of the landscapes in the region are cultural to varying degrees. To the untrained eye, such fingerprints can be hard to detect, but the unusual accumulation of economic plants in many localities provides a hint that people may have been active in the area.

This co-evolution of people and place has important implications for conservation and development. Local knowledge of plant resources is a major resource that warrants greater recognition because it can help make agriculture more "green" as well as more productive. This is especially so in Amazonia where agroforestry—the intercropping with one or more perennials—is particularly well suited to the environmental and cultural conditions of the region. Locals have devised many innovative agroforestry systems and are constantly reinventing them, often with newly domesticated fruits and nuts from the forest.

If profitable and environmentally-sound land use practices are adopted, pressure on the remaining forests will likely diminish. And agroforestry will play a key role in helping relieve pressure on the remaining forests. By spotlighting the many ways that farmers have incorporated wild trees into their commercial and subsistence plots, it is hoped the interdependence of people and the forest will be better appreciated. Here we highlight the importance of floodplain forests as a source of fruit for river dwellers in the Reserva Nacional Pacaya-Samiria in the Peruvian Amazon.

PACAYA-SAMIRIA

Inhabitants in the Pacaya-Samiria Reserve, one of the world's largest wetland reserves spanning 2,000 sq km at the junction of the Marañón and

Ucayali Rivers in the Peruvian Amazon, incorporate at least 148 fruits in their diet (Appendix 1). Our survey was limited to a dozen communities, but over 100 settlements are scattered throughout the reserve, so it is likely that at least a couple of hundred fruits are eaten by people living in the reserve. Pacaya-Samiria is inhabited by river dwellers of mixed ancestry, but predominately Cocama-Cocamilla, and even some Shipibo in the southern fringe of the reserve. When the park was created in 1982, the existing residents were allowed to stay, although with some restrictions on the amount of game and other forest products they are allowed to sell. Most of the residents are engaged in fishing, agriculture, and the extraction of non-timber products, especially palm fruits and thatch.

Fruits are a significant source of vitamins, oils, and protein in the local diet as well as a source of income, particularly from the sale of aguaje (*Mauritia flexuosa*) palm fruits to urban markets. Aguaje is by far the most important fruit, both economically in terms of market acceptance (the fruits are sold as far afield as Lima) and nutritionally (very high in vitamins A and C). Many other wild fruits are also make a significant contribution to the local diet because of their nutritional value and because some of them also sell briskly in markets. Even fruits with no documented nutritional benefits can also be important because they are esteemed for their flavors and textures.

The Pacaya-Samiria National Reserve

Figura 2 - Fruits of aguaje palm, known as buriti or miriti in Brazil, soaking in a bowl of water. After soaking, the fruits are either eaten or made into juice, called aguajina in Peru. Miraflores, Rio Tigre, Loreto Peru, 04-26-2006.

Figura 3 - Aguajina, juice of aguaje palm fruits, a nutritious beverage popular in the Peruvian Amazon and in the Amazon estuary. Miraflores, Rio Tigre, Loreto, Peru, 04-26-2006.

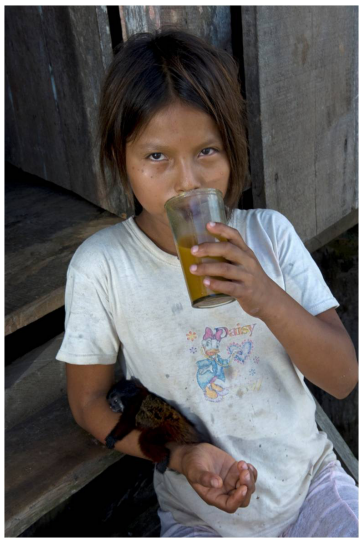

Figura 4 - Girl with pet saddle-back tamarin (*Saguinus fuscicollis*) drinking aguajina. Miraflores, Rio Tigre, Loreto, Peru 04-26-2006.

is also a significant reservoir of genes for upgrading some existing crops. The fruits of wild cacao (*Theobroma cacao*), for example, are gathered in forests as a snack throughout the reserve. Cacao is an important plantation crop in dozens of tropical countries and yields are periodically threatened by emerging diseases and pests. Sources of resistance to such attacks have sometimes been found in wild populations of cacao, but much remains to be learned about the desirable genes in wild stands of cacao. A lot is at stake here considering that the chocolate is a $10 billion global industry.

Of the 148 edible fruits documented for Pacaya-Samiria, only 12 are exotic (such as mango, breadfruit, and banana). The remaining are native to Amazonia or other parts of the Neotropics. Three quarters of the fruits consumed in Pacaya-Samiria are gathered in the wild, mostly from floodplain forests, indicating the importance of maintaining forest cover for the sustenance of communities living in the reserve. Indeed, two-thirds of the fruit species occur in forests while a quarter are found in second growth communities (Appendix 2).

Disturbed sites, such as along paths or regrowth after fields are abandoned, are thus also significant sources of wild fruits. Many of the fruits in regrowth communities are harvested by children. Indeed, there is a whole class of fruits in second growth that can be considered "children's fruits" because they are gathered and eaten

pretty much exclusively by youngsters. Such fruits tend to be small, such as species of *Clidemia* and *Miconia* in the Melastomataceae family, but because they are often close to the ground, are easily spotted by children (Smith et al., 2007).

Some disturbance of forest cover thus increases biodiversity, at least in regard to edible fruits, but wholesale destruction of forests would drastically reduce the availability of fruits consumed locally and sent to markets. At present, no major threats to the forest cover in Pacaya-Samiria are on the horizon, but in surrounding areas urban growth and improved transportation links could eventually favor cattle ranching, as has occurred in many parts of the Brazilian Amazon, thereby threatening the production of timber and non-timber forest products.

Some of the wild fruits in Pacaya-Samiria are also cultivated in home gardens (*huertas*) and fields (*chacras*). At least twenty fruit trees encountered in forests, including caimito (*Pouteria caimito*), genipap (*Genipa americana*) and macambo (*Theobroma bicolor*), are also planted in home gardens and/or fields (Appendix 2). Locals are thus recruiting new crops, some of which may eventually be planted on a wider scale. About one-fifth of the edible wild fruits gathered in forests have been incorporated in a wide assortment of agroforestry configurations assembled by local farmers. Most of the wild fruits are as yet little known outside of Amazonia. Conservation of floodplain forests is thus important on two accounts: as sources of new crops, and as genepools of some existing crops.

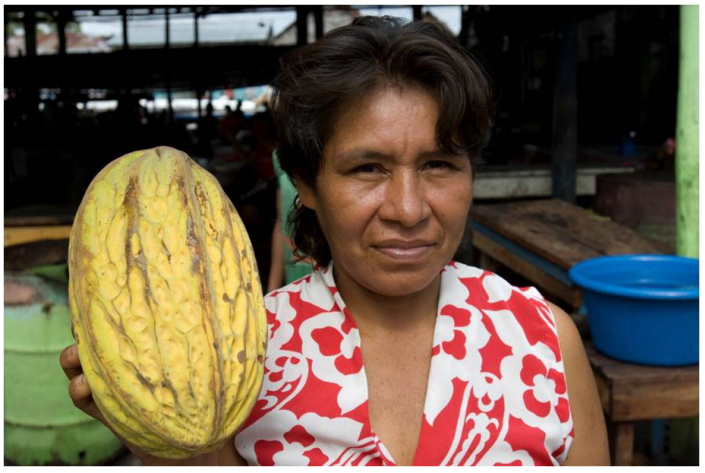

Figura 5 - Macambo (*Theobroma bicolor*) in a street market. The pulp of this near relative of cacao is eaten fresh while the seeds are roasted. Puerto Nanay, Iquitos, Peru 04-13-2006.

Figura 6 - Boy eating pulp of macambo (*Theobroma bicolor*). Manco Capac, Rio Puinahua (a branch of the Ucayali River), Loreto, Peru 04-14-2006.

The western part of the Amazon appears to be especially rich in edible fruits, in part because of increased rainfall and rising landforms in the foothills in the Amazon. Furthermore, wetlands in western Amazonia contain more edible species of fruits than uplands, which is counter-intuitive in that upland forests are thought to contain more species of plants and animals that floodplains because the latter are less than instead of that stable and subject to periodic inundations. With respect to fruits, at least, the highly dynamic floodplains of the Peruvian Amazon are a veritable treasure trove of potential new economic plants.

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APPENDIX 1.

Fruits gathered or cultivated for human or livestock consumption in the Reserva Nacional Pacaya-Samiria and along the margins of the reserve, Peruvian Amazon (does not include fruits gathered for fishbait). Voucher specimens were collected with the authorization of INRENA (now reorganized with another name) and deposited with the Herbario Nacional in Lima and herbariums of the the Missouri Botanical Garden in Oxapampa, Peru, and St.Louis in the U.S.

Local Name (s)	Scientific Name	Family	Voucher
Aceitunilla	*Diclidanthera penduliflora*	Polygalaceae	IHC 7571
Aguaje	*Mauritia flexuosa*	Arecaceae	
Aguajillo	*Mauritiella armata*	Arecaceae	IHC 7898
Almendra*	*Terminalia catappa*	Combretaceae	
Ana huayo	*Plinia sp.*	Myrtaceae	IHC 7794, 7912
Anona	*Rollinia mucosa*	Annonaceae	
Anonilla	*Annona nitida*	Annonaceae	
Anonilla	*Annona Montana*	Annonaceae	IHC 7819
Anonilla	*Annona hypoglauca*	Annonaceae	NS 019, 023; IHC 7801
Arazá, guayaba brasilera	*Eugenia stipitata*	Myrtaceae	
Ayahuma ♦	*Couroupita guianensis*	Lecythidaceae	
Ayamanchana, uvita	*Lantana trifolia*	Verbenaceae	NS 006
Azúcar huayo	*Maripa axilliflora*	Convolvulaceae	IHC 7621, 7903
Bolaina	*Guazuma ulmifolia*	Malvaceae	
Bombo huayo	*Salacia juruana*	Celastraceae	IHC 7889
Cacahuillo	*Theobroma obovatum*	Malvaceae	IHC 7832
Cacahuillo	*Theobroma subincanum*	Malvaceae	
Cacahuillo	*Herrania nitida*	Malvaceae	IHC 7582, 7837
Cacahuillo	*Herrania nycterodendron*	Malvaceae	IHC 7825
Cacao	*Theobroma cacao*	Malvaceae	
Caimito	*Pouteria caimito*	Sapotaceae	IHC 7786
Caimitillo	*Alibertia edulis*	Rubiaceae	NS 018, IHC 7780
Caimitillo	*Pouteria torta subsp. glabra*	Sapotaceae	IHC 7790, 7796
Caimitillo	*Pouteria sp.*	Sapotaceae	IHC 7745
Camu camu	*Myrciaria dubia*	Myrtaceae	
Camu camu del grande	*Myrciaria floribunda*	Myrtaceae	
Cashillo	*Cathedra acuminata*	Olacaceae	IHC 7789

Cashu	*Anacardium occidentale*	Anacardiaceae	IHC 7555
Charapa shimbillo	*Inga stenoptera*	Fabaceae	
Charichuelo	*Garcinia brasiliensis*	Clusiaceae	IHC 7783, 7866
Charichuelo	*Garcinia macrophylla*	Clusiaceae	IHC 7570, 7902
Charichuelo	*Garcinia madruno*	Clusiaceae	NS 001
Charichuelo	*Garcinia gardneriana*	Clusiaceae	IHC 7626
Chontilla	*Bactris riparia*	Arecaceae	IHC 7567
Chope	*Gustavia longifolia*	Lecythidaceae	IHC 7908
Chope	*Gustavia augusta*	Lecythidaceae	IHC 7845
Ciruela	*Bunchosia armeniaca*	Malpighiaceae	IHC 7587
Coco*	*Cocos nucifera*	Arecaceae	
Cocona	*Solanum sessiliflorum*	Solanaceae	
Coconilla	*Solanum stramoniifolium*	Solanaceae	
Cormiñón	*Vitex orinocensis*	Verbenaceae	IHC 7585
Coto huayo	*Anonospermum chlorianthum*	Menispermaceae	IHC 7793
Cotoruntu	*Rudgea loretensis*	Rubiaceae	NS 017, IHC 782
Crista huayo	*Simaba orinocensis*	Simaroubaceae	IHC 7625
Granadilla	*Passiflora quadriglandulosa*	Passifloraceae	IHC 7821
Granadilla	*Passiflora nitida*	Passifloraceae	NS 013, IHC 7797
Granadilla	*Passiflora riparia*	Passifloraceae	IHC 7627
Guaba	*Inga edulis*	Fabaceae	
Guabilla	*Inga ingoides*	Fabaceae	NS 021, IHC 7594, 7593
Guabilla	*Inga laurina*	Fabaceae	IHC 7568, 7618
Guanábana	*Annona muricata*	Annonaceae	
Guayaba	*Psidium guajava*	Myrtaceae	
Guayaba del agua	*Psidium acutangulum*	Myrtaceae	IHC 7739, 7813
Guayaba de restinga	*Mouriri tessmannii*	Memecylaceae	NS 024, IHC 7860, 7574
Guineo, maduro*	*Musa sp.*	Musaceae	
Habilla	*Omphalea diandra*	Euphorbiaceae	IHC 7828
Huanchaco huayo	*Psychotria loretensis*	Rubiaceae	IHC 7865
Huasaí, chonta	*Euterpe precatoria*	Arecaceae	
Huasaí brasilero	*Euterpe oleracea*	Arecaceae	

Huevigato	*Cordia nodosa*	Boraginaceae	IHC 7788
Huicungo	*Astrocaryum murumuru*	Arecaceae	
Huito	*Genipa americana*	Rubiaceae	
Huitillo	*Duroia micrantha*	Rubiaceae	IHC 7843
Juanache	*Eugenia inundata*	Myrtaceae	IHC 7861
Lancetilla, lanza huayo	*Eugenia discreta*	Myrtaceae	IHC 7803, 7888
Lanza caspi	*Eugenia multirimosa*	Myrtaceae	IHC 7892
Lanza huayo	*Mouriri sp.*	Memecylaceae	
Limón*	*Citrus aurantifolia*	Rutaceae	
Lucma	*Pouteria longifolia*	Sapotaceae	IHC 7740, 7907
Macambo	*Theobroma bicolor*	Malvaceae	
Mamey, pomarosa*	*Syzygium jambos*	Myrtaceae	
Mangua*	*Mangifera indica*	Anacardiaceae	
Manito de gato	*Perebea longepedunculata*	Moraceae	NS 014, IHC 7785
Mata pasto	*Clidemia septuplinervia*	Melastomataceae	NS 012, IHC 7763
Mata pasto	*Clidemia octona*	Melastomataceae	NS 003
Mata pasto	*Clidemia hirta*	Melastomataceae	NS 031, IHC 7761
Mata pasto	*Clidemia japurensis*	Melastomataceae	NS 030, IHC 7753
Mata pasto	*Miconia serrulata*	Melastomataceae	IHC 7765
Mata pasto	*Miconia nervosa*	Melastomataceae	IHC 7805
Meta huayo	*Moutabea aculeata*	Polygalaceae	IHC 7867
Mullaca	*Physalis angulata*	Solanaceae	IHC 7592, 7807
Mullaca lanudo	*Physalis pubescens*	Solanaceae	IHC 7811
Naranja*	*Citrus sinensis*	Rutaceae	
Ñejilla menuda	*Bactris bidentula*	Arecaceae	
Ñejilla	*Bactris bifida*	Arecaceae	NS 016, IHC 7890
Ñejilla	*Bactris brongniartii*	Arecaceae	IHC 7799, 7850, 7742
Ñejilla	*Bactris concinna var. Sigmoidea*	Arecaceae	NS 004, 026, IHC 7839
Ñejilla	*Bactris maraja*	Arecaceae	NS 002, IHC 7885
Ñejilla	*Bactris martiana*	Arecaceae	IHC 7630, 7822
Nispero	*Bellucia pentamera*	Melastomataceae	NS 009, IHC 7773, 7905
Ojé ♦	*Ficus insipida*	Moraceae	

Palillo	*Campomanesia lineatifolia*	Myrtaceae	IHC 7629, 7827
Palillo silvestre	*Campomanesia sp.*	Myrtaceae	
Palta*	*Persea americana*	Lauraceae	
Pampa sanango	*Tabernaemontana siphilitica*	Apocynaceae	IHC 7613, IHC 7820
Pampa tortuga	*Duguetia odorata*	Annonaceae	IHC 7738, 7791, 7840
Pandicho, pan de arbol*	*Artocarpus altilis*	Moraceae	
Papaya	*Carica papaya*	Caricaceae	
Parinari	*Couepia chrysocalyx*	Chrysobalanaceae	IHC 7584
Parinari	*Couepia ulei*	Chrysobalanaceae	NS 022, IHC 7849
Paujillo	*Gnetum leyboldii*	Gnetaceae	IHC 7857
Pichico huayo	*Abuta grandifolia*	Menispermaceae	IHC 7873
Pijuayo	*Bactris gasipaes*	Arecaceae	
Piña	*Ananas comosus*	Bromeliaceae	
Platano*	*Musa sp.*	Musaceae	
Puricho huayo	*Salacia cordata*	Celastraceae	IHC 7577
Puropuro	*Passiflora serratodigitata*	Passifloraceae	IHC 7558, 7583, 7591
Quinilla	*Eugenia lambertiana*	Myrtaceae	NS 015, 025
Quinilla	*Eugenia patens*	Myrtaceae	IHC 7859
Rifari	*Miconia longifolia*	Melastomataceae	IHC 7851
Sachamangua	*Grias neuberthii*	Lecythidaceae	IHC 7844
Sacha pandicho	*Pachira acuatica*	Bombaceae	IHC 7890
Sacha uva	*Cordia collococca*	Boraginaceae	IHC 7806
Sanango	*Tabernaemontana sananho*	Apocynaceae	NS 005, 010, IHC 7769
Sapo shimbillo	*Inga auristellae*	Fabaceae	IHC 7766
Sapote	*Matisia cordata*	Malvaceae	
Seca boca	*Paullina alata*	Sapindaceae	IHC 7751, 7887
Seca boca	*Paullinia pachycarpa*	Sapindaceae	IHC 7883
Secana	*Sicana odorifera*	Cucurbitaceae	
Shambo huayo	*Stylogyne cauliflora*	Myrsinaceae	IHC 7876
Shambo huayo	*Stylogyne longifolia*	Myrsinaceae	NS 028
Shapaja	*Attalea phalerata*	Arecaceae	

Shebón	*Attalea butyracea*	Arecaceae	
Shimbillo	*Inga cinnamomea*	Fabaceae	NS 021, IHC 7594, 7593
Shimbillo	*Inga bourgonii*	Fabaceae	IHC 7814
Shimbillo	*Inga punctata*	Fabaceae	IHC 7798
Shimbillo de la cocha	*Inga leiocalycina*	Fabaceae	IHC 7624
Shimbillo	*Inga ruiziana*	Fabaceae	IHC 7562, 7595
Shimbillo	*Inga nobilis*	Fabaceae	IHC 7551
Shimbillo rabo de mono	*Inga acuminata*	Fabaceae	NS 029, IHC 7628, 7871
Sinamillo	*Oenocarpus mapora*	Arecaceae	
Situlle	*Dimerocostus strobilaceus*	Costaceae	
Tamamuri	*Brosimum lactescens*	Moraceae	IHC 7744
Taperiba*	*Spondias dulcis*	Anacardiaceae	
Toronja*	*Citrus paradisi*	Rutaceae	
Tortuga huayo	*Duguetia spixiana*	Annonaceae	NS 020, IHC 7818, 7855
Tortuga de restinga	*Duguetia odorata*	Annonaceae	
Tucunareñahui	*Clavija elliptica*	Theophrastaceae	NS 007, IHC 7793, 7830
Tumbo	*Passiflora quadrangularis*	Passifloraceae	IHC 7552, 7764
Ubos	*Spondias mombin*	Anacardiaceae	
Ungurahui	*Oenocarpus bataua*	Arecaceae	
Ushun	*Buchenavia grandis*	Combretaceae	IHC 7795, 7846
Uvilla	*Pourouma cecropiifolia*	Urticaceae	
Vaca paleta	*Inga macrophylla*	Fabaceae	
Vino huayo	*Coccoloba densifrons*	Polygonaceae	NS 008, IHC 7575
Yarina	*Phytelephas macrocarpa*	Arecaceae	
Yumanasa	*Muntingia calabura*	Muntingiaceae	IHC 7560
Zorro caspi	*Tapura amazonica*	Dichapetalaceae	IHC 7841

* Not native to Amazonia

♦ Eaten by livestock

APPENDIX 2.
Habitats of fruits consumed in the Pacaya-Samiria National Reserve, Peruvian Amazon.

Bosque= Forest
Purma= Second growth
Chacra= Cultivated field
Huerta= Home garden

Local Name (s)	Scientific Name	Bosque	Purma	Chacra	Huerta
Aceitunilla	*Diclidanthera penduliflora*	+			
Aguaje	*Mauritia flexuosa*	+		+	+
Aguajillo	*Mauritiella armata*	+			
Almendra*	*Terminalia catappa*				+
Ana huayo	*Plinia sp.*	+			
Anona	*Rollinia mucosa*			+	+
Anonilla	*Annona nitida*	+			
Anonilla	*Annona montana*	+			
Anonilla	*Annona hypoglauca*	+			
Arazá, guayaba brasilera	*Eugenia stipitata*				+
Ayahuma	*Couroupita guianensis*	+	+		+
Ayamanchana, uvita	*Lantana trifolia*		+		
Azúcar huayo	*Maripa axilliflora*	+			
Bolaina	*Guazuma ulmifolia*		+		+
Bombo huayo	*Salacia juruana*	+			
Cacahuillo	*Theobroma obovatum*	+			
Cacahuillo	*Theobroma subincanum*	+	+		
Cacahuillo	*Herrania nitida*	+	+		
Cacahuillo	*Herrania nycterodendron*	+			
Cacao	*Theobroma cacao*	+		+	+
Caimito	*Pouteria caimito*	+		+	+
Caimitillo	*Alibertia edulis*	+			
Caimitillo	*Pouteria torta subsp. glabra*	+			+
Caimitillo	*Pouteria sp.*	+			
Camu camu	*Myrciaria dubia*	+		+	+
Camu camu del grande	*Myrciaria floribunda*	+			
Cashillo	*Cathedra acuminata*	+			

Cashu	*Anacardium occidentale*				+
Charapa shimbillo	*Inga stenoptera*	+			
Charichuelo	*Garcinia brasiliensis*	+			
Charichuelo	*Garcinia macrophylla*	+			
Charichuelo	*Garcinia madruno*	+			
Charichuelo	*Garcinia gardneriana*	+			+
Chontilla	*Bactris riparia*	+			
Chope	*Gustavia longifolia*	+			
Chope	*Gustavia augusta*	+			
Ciruela	*Bunchosia armeniaca*				+
Coco*	*Cocos nucifera*				+
Cocona	*Solanum sessiliflorum*			+	+
Coconilla	*Solanum stramoniifolium*			+	
Cormiñón	*Vitex orinocensis*		+		+
Coto huayo	*Anomospermum chloranthum*	+			
Cotoruntu	*Rudgea loretensis*	+			
Crista huayo	*Simaba orinocensis*	+			
Granadilla	*Passiflora quadriglandulosa*	+			
Granadilla	*Passiflora nitida*		+		
Granadilla	*Passiflora riparia*	+			
Guaba	*Inga edulis*		+	+	+
Guabilla	*Inga ingoides*		+		+
Guabilla	*Inga laurina*	+			
Guanábana	*Annona muricata*				+
Guayaba	*Psidium guajava*		+	+	+
Guayaba del agua	*Psidium acutangulum*	+			
Guayaba de restinga	*Mouriri tessmannii*	+			
Guineo, maduro*	*Musa sp.*				+
Habilla	*Omphalea diandra*	+			
Huanchaco huayo	*Psychotria loretensis*	+			
Huasaí, chonta	*Euterpe precatoria*	+			+
Huasaí brasilero	*Euterpe oleracea*				+
Huevigato	*Cordia nodosa*	+			

Huicungo	*Astrocaryum murumuru*	+	+		
Huito	*Genipa americana*	+			+
Huitillo	*Duroia micrantha*	+			
Juanache	*Eugenia inundata*	+			
Lancetilla, lanza huayo	*Eugenia discreta*	+			
Lanza caspi	*Eugenia multirimosa*	+			
Lanza huayo	*Mouriri sp.*	+			
Limón*	*Citrus aurantifolia*				+
Lucma	*Pouteria longifolia*	+			
Macambo	*Theobroma bicolor*	+			+
Mamey, pomarosa*	*Syzygium jambos*				+
Mangua*	*Mangifera indica*				+
Manito de gato	*Perebea longepedunculata*		+		
Mata pasto	*Clidemia septuplinervia*		+		
Mata pasto	*Clidemia octona*		+		
Mata pasto	*Clidemia hirta*		+		
Mata pasto	*Clidemia japurensis*		+		
Mata pasto	*Miconia serrulata*		+		
Mata pasto	*Miconia nervosa*	+	+		
Meta huayo	*Moutabea aculeata*	+			
Mullaca	*Physalis angulata*		+	+	+
Mullaca lanudo	*Physalis pubescens*		+	+	
Naranja*	*Citrus sinensis*			+	+
Ñejilla menuda	*Bactris bidentula*	+			
Ñejilla	*Bactris bifida*	+			
Ñejilla	*Bactris brongniartii*	+			
Ñejilla	*Bactris concinna*	+			
Ñejilla	*Bactris maraja*	+			
Ñejilla	*Bactris martiana*	+	+		
Nispero	*Bellucia pentamera*		+	+	
Ojé ♦	*Ficus insipida*	+			
Palillo	*Campomanesia lineatifolia*				+
Palillo silvestre	*Campomanesia sp.*	+			
Palta*	*Persea americana*			+	+
Pampa sanango	*Tabernaemontana siphilitica*		+		

Pampa tortuga	*Duguetia odorata*	+			
Pandicho, pan de arbol*	*Artocarpus altilis*			+	+
Papaya	*Carica papaya*		+	+	+
Parinari	*Couepia chrysocalyx*				+
Parinari	*Couepia ulei*	+			
Paujillo	*Gnetum leyboldii*	+			
Pichico huayo	*Abuta grandifolia*	+	+		
Pijuayo	*Bactris gasipaes*			+	+
Piña	*Ananas comosus*			+	+
Platano*	*Musa sp.*			+	+
Puricho huayo	*Salacia cordata*	+			
Puropuro	*Passiflora serratodigitata*		+		
Quinilla	*Eugenia lambertiana*	+			
Quinilla	*Eugenia patens*	+			
Rifari	*Miconia longifolia*	+			
Sachamangua	*Grias neuberthii*	+		+	+
Sacha pandicho	*Pachira acuatica*	+			
Sacha uva	*Cordia collococca*	+			
Sapo shimbillo	*Inga auristellae*	+	+		
Sanango	*Tabernaemontona sananho*	+	+		
Sapote	*Matisia cordata*	+		+	+
Seca boca	*Paullina alata*	+			
Seca boca	*Paullinia pachycarpa*	+			
Secana	*Sicana odorifera*				+
Shambo huayo	*Stylogyne cauliflora*	+			
Shambo huayo	*Stylogyne longifolia*	+			
Shapaja	*Attalea phalerata*	+	+	+	+
Shebón	*Attalea butyracea*	+	+		
Shimbillo	*Inga cinnamomea*	+			+
Shimbillo	*Inga bourgonii*	+			
Shimbillo	*Inga punctata*	+			
Shimbillo de la cocha	*Inga leiocalycina*	+			
Shimbillo	*Inga ruiziana*	+		+	+

Shimbillo	*Inga nobilis*	+			
Shimbillo rabo de mono	*Inga acuminata*	+			
Sinamillo	*Oenocarpus mapora*	+			+
Situlle	*Dimerocostus strobilaceus*		+		
Tamamuri	*Brosimum lactescens*	+			
Taperiba*	*Spondias dulcis*				+
Toronja*	*Citrus paradisi*				+
Tortuga huayo	*Duguetia spixiana*	+			
Tortuga de restinga	*Duguetia odorata*	+			
Tucunareñahui	*Clavija elliptica*	+	+		
Tumbo	*Passiflora quadrangularis*				+
Ubos	*Spondias mombin*	+	+	+	+
Ungurahui	*Oenocarpus bataua*	+			+
Ushun	*Buchenavia grandis*	+			
Uvilla	*Pourouma cecropiifolia*			+	+
Vaca paleta	*Inga macrophylla*	+		+	+
Vino huayo	*Coccoloba densifrons*	+			
Yarina	*Phytelephas macrocarpa*	+			+
Yumanasa	*Muntingia calabura*		+		
Zorro caspi	*Tapura amazonica*	+			

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