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Home Garden Diversity of the Tahuayo Region, Peru

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Cover Page Footnote

We are grateful to the residents of the communities of the Tahuayo River for making it possible to complete this research. We acknowledge the support of the University of Southern Indiana Foundation. Two anonymous reviewers provided valuable feedback that helped to improve our article. We also wish to thank Amazonia Expeditions for logistical support.

DATA NOTES

Home Garden Diversity of the Tahuayo Region, Peru



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ABSTRACT

We examined cultural and environmental factors affecting species diversity of home gardens in Amazonian Northeast Peru based on 33 surveys conducted in July/August, 2014, in three communities varying in remoteness, demography, ecological zone, and ethnicity. The results support the idea that community variation in home gardens is not influenced by a single factor such as remoteness, but instead is the result of multiple cultural and environmental factors. Similar to other studies of Amazonian home gardens, fruits and medicinal plants make up the bulk of home garden diversity; however, we did not find an association between a tourism and reduced garden diversity.

INTRODUCTION

Home garden use in Amazonia in most cases complements larger horticultural fields (**chacras**) that focus on market as well as subsistence production.[1] A substantial amount of literature on Amazonian home gardens exists--with the majority coming from the fields of botany and ecology. Important contributions include the works of Ban and Coomes (2004), Coomes and Ban (2004), Lamont et al. (1999), Padoch and de Jong (1991), Perrault-Archambault and Coomes (2008), and Wezel and Ohl (2005), and recent research addresses such important issues as species diversity, soil types, and plant distribution (see Kawa et al. 2015). The information presented here builds on the established literature on home gardens in Amazonia while focusing on species diversity (species richness) and intercommunity variation in home garden production.

The primary goal of this research was to gain initial insight into species diversity and use in three Amazonian communities in northeastern Peru. Our research began by defining the various components relevant to our research. We followed a model set forth by Cuanalo de la Cerda and Guerra Mukul (2008) in their research on home gardens in Yucatan, Mexico. The categories we chose include: 1) fruits, 2) medicinal, 3) vegetables, 4) wood, and 5) ornamentals/use (see Appendix One for a complete list of species).[2]

METHODS

Research for this project was carried out in northeast Peru's Loreto district in communities associated with the **Área de Conservación Regional Comunal Tamshiyacu Tahuayo** (ACRCTT).

Located between the Tamshiyacu and Tahuayo rivers, the Tamshiyacu Tahuayo consists of approximately 440,000 hectares of protected land. The region contains numerous communities ranging in size from fewer than fifty individuals to a few hundred

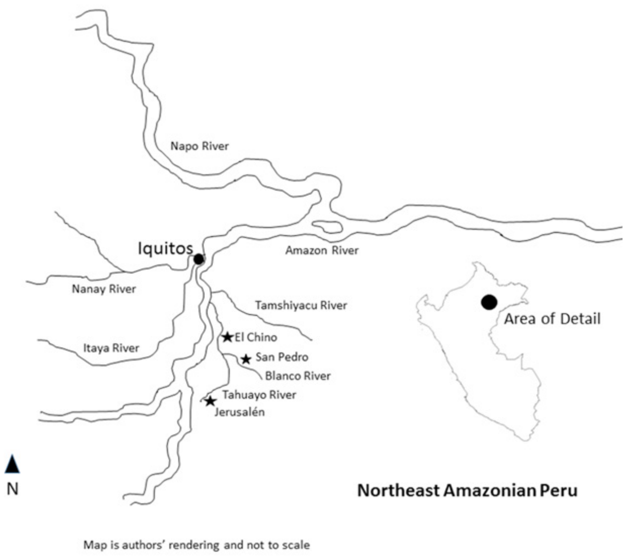

FIGURE 1. Map of the study area.

individuals. Ten communities are directly associated with the Tamshiyacu Tahuayo Conservation Area.

Several variables were considered in selection of the communities including community size, researcher familiarity with the communities, and geographic distribution of the communities. Our selection was based on these criteria as well as the fact that the three communities are in relative proximity to one another. An additional consideration was the relative remoteness of the three study communities.

The communities of study for this project include the villages of El Chino (pop. ~ 200), San Pedro (pop. ~ 40), and Jerusalén (pop. ~ 50). El Chino is located approximately ten hours upriver from the city of Iquitos. San Pedro is located an additional hour upriver from El Chino along the Río Blanco and Jerusalén is approximately five hours upriver from El Chino. We intentionally chose communities that have different levels of access to major centers of trade to account for the variable of remoteness. All three communities were settled more than sixty years ago, with the oldest community (El Chino) being settled approximately eighty-five years ago. The communities fit within the larger demographics of the region in terms of ethnicity, livelihood strategies, and size. All of the communities are comprised of residents referred to locally as **ribereños** (river dwellers)[3] with El Chino and San Pedro being predominantly of mixed ethnicity, and Jerusalén being settled by indigenous Achuar and considered to be a Native Community.

We collected data during the summer of 2014 in all three communities, and a total of 33 household gardens were documented. We met with community leaders in each community in order explain the objectives of our research and to gain permission for our study. The methodology for this research included visiting home gardens and documenting species diversity. Due to the relatively small size of each community, home gardens were accessed using a non-random sampling method known as convenience sampling (Bernard 1995). Convenience sampling is commonly employed in ethnographic work, especially when the goal is to gain preliminary data. Our strategy and sample size correspond closely to previous studies on Amazonian home gardens including those conducted by Lamont et al. (1999) and Padoch and de Jong (1991). We were not drawn to any specific homes, but instead went house to house in each community and asked for heads of household to participate in our study. Some homes were not occupied during our research and we simply moved on to the next home. We collected data from 58.9 percent of the households present in the communities of study. Twenty of 46 households were sampled in El Chino (Figure 2), 6 of 7 households in San Pedro, and 7 of 13 households in Jerusalén. Our sample size was limited in the village of Jerusalén due to multiple households not being occupied during our stay. This is a common feature in ribereño communities since families often leave their home communities to spend time in the city of Iquitos or to visit relatives in other communities for extended periods of time. Ultimately, our sample size was a product of planning combined with circumstance–including limitations on time–aimed at generating preliminary data that would help us to decide on the feasibility of doing a more extensive

study. While a larger sample size would be necessary to make any broader generalizations about the results of our data, the data are indeed representative of the communities studied.

FIGURE 2. Homes in El Chino.

At each home, we asked the male or female head of household if they would accompany us to the area surrounding their home and provide us with information on the plants that make up their home garden. We asked people to identify the different plants and provide us with the local name of each plant as well as its use values. It was imperative that we were not merely identifying plants on our own, but that we were getting resident responses that would illuminate the values assigned to plants and local classification of the plants. Responses were captured using a simple survey table that reflected the five component categories mentioned in the introduction. We used Duke and Vasquez's (1994) *Amazonian Ethnobotanical Dictionary* and complementary works by Wezel and Ohl (2005) and Padoch and de Jong (1991) to complete our process of identification of plants. Our identification method follows the work of Wezel and Ohl (2005) and reliance on common names for identification, which is appropriate when used consistently and for comparative purposes within and amongst communities.

We collected size of household and number of children and adults present in each household to better understand how household size and composition might affect home garden diversity. Ultimately, these data provide insights into the possible cultural causes for the variation in species diversity within communities and amongst communities.

RESULTS

We compared the distribution of species per household, as well as the distribution of species amongst communities. We focused on establishing species distribution lists for each community and then cross-analyzing those lists to look for relevant patterns pertaining to species presence and distribution.

We identified a total of 120 species in the 33 home gardens that we surveyed. The total number of species documented was greatest in El Chino and least in Jerusalén (Figure 3).

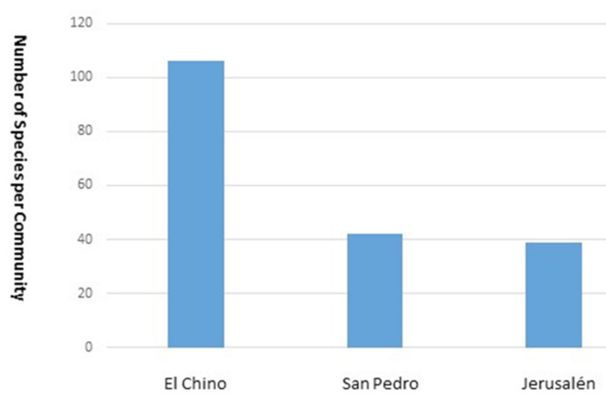

FIGURE 3. Number of species named, by human community.

El Chino also had the highest mean number of species per garden in the three communities, and Jerusalén had the lowest mean number of species per garden. Figure 4 provides the distribution of species by category.

The average number of species per component category per garden varied markedly between villages (Figure 5). However, in all three villages, home gardens had higher incidence of fruits and medicinal plants than the other three component categories.

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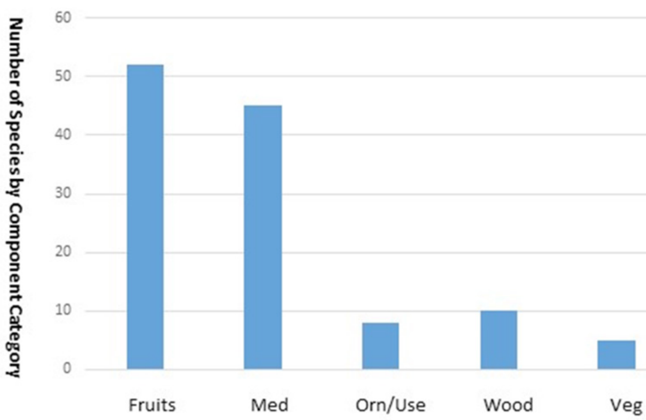

FIGURE 4. Number of Species named, by category.

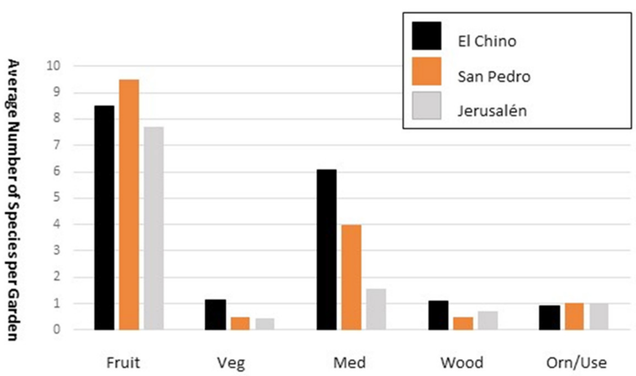

FIGURE 5. Mean number of species named per garden, by category and community.

Additionally, the home gardens of El Chino had a higher average number of species per garden (19) than did San Pedro (15) and Jerusalén (11).

In sum, the overall species diversity was greatest in El Chino. Correspondingly, per garden species diversity was also greatest in El Chino. Species diversity in each of San Pedro and Jerusalén was less than half of the that in El Chino. Moreover, Jerusalén had the lowest overall species diversity as well as the lowest average number of species per garden.

DISCUSSION

Variation in home garden diversity can be attributed to numerous variables. Household demography,

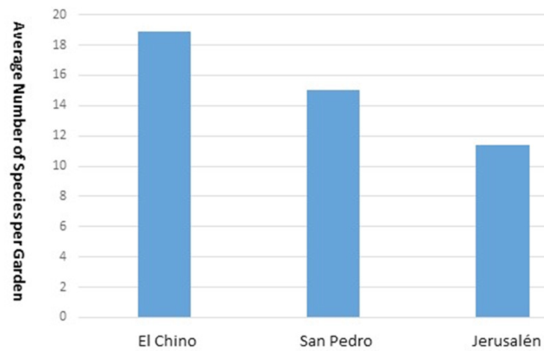

FIGURE 6. Average number of species per garden.

community remoteness, and environmental variation are variables that can influence garden diversity. Although our data set is not large enough to come to any firm conclusions, some tentative observations can be made based on the patterns that we observed.

Our data suggest a correlation between household size and species diversity, with higher average household size corresponding to lower species diversity. Analogous research conducted by Cuanalo de la Cerda and Guerra Mukul (2008) and Kawa et al. (2015) provides evidence of a similar pattern. Both studies indicate that households with multiple children have less time to engage in home garden practices and therefore have gardens with less diversity. Our data provide confirmation of this since the village with the lowest average household size (El Chino, 3.8 individuals) had the highest species diversity in our study. Jerusalén had the highest average household size (6.6 individuals) and the lowest species diversity in our study.

Several studies address the issue of species diversity and distance from urban markets (e.g., remoteness of communities) (see Fernandes and Nair 1986; Padoch and de Jong 1991; Lamont et al. 1999; Perrault-Archambault and Coomes 2008; Wezel and Ohl 2005). Our initial expectation was that remoteness of community would have a direct correlation to high garden diversity, in part due to a lack of access to commercial goods and a perceived need for a reliance

on local production. The findings of our study are contrary to our initial belief regarding remoteness and diversity. Ethnicity is one factor that might be a reason for this. Wezel and Ohl (2005) conclude that remoteness results in less species diversity due in part to ethnic isolation and a lack of diffusion of plant species and knowledge. This could account for the limited species diversity present in the home gardens of San Pedro. Specifically, Wezel and Ohl (2005) cite native communities as having less ethnic and cultural mixture than communities located closer to urban centers where knowledge of plants is expanded due to population movement and cultural contact. Thus, the most heterogeneous communities would be expected to exhibit high species diversity in home gardens due to various cultural influences (see also Perrault-Archambault and Coomes 2008).

Our data correspond to the patterns acknowledged by Wezel and Ohl (2005) and Perrault-Archambault and Coomes (2008) while also providing additional insights regarding species richness amongst the communities of study. Of note is the fact that Jerusalén is an Achuar community that is comprised almost entirely of an extended family unit and the community represented the lowest overall diversity of species. This is in contrast to the findings of Perrault-Archambault and Coomes (2008), who suggest that ethnicity is critical for understanding species diversity. More specifically, Perrault-Archambault and Coomes (2008) note high species diversity amongst Achuar communities when compared to other ethnic groups of their study area. While there may be a correlation between Achuar ethnic identity and high species diversity in the research of Perrault-Archambault and Coomes (2008), our research suggests something quite different and thus emphasizes need for further study.

While remoteness of community is a potential contributor to limited garden diversity, it is perhaps more appropriate to recognize community heterogeneity as a potential contributing factor to species diversity. In addition, the livelihoods of community residents also play an important role in garden diversity. For example, El Chino is home to multiple practitioners of traditional medicine and therefore garden diversity is correspondingly extensive, particularly with regard to medicinal plants. In Jerusalén, there is a strong focus on hunting and the production of market crops, thus limiting the reliance on home gardens. These observations notwithstanding, there are important environmental variables to consider when analyzing species diversity in home gardens of the Tahuayo.

Seasonal flooding is the most significant environmental condition that affects the home gardens of all three of the study communities along the Amazon River's tributaries. Communities experience seasonal flooding differently depending on the ecological zone upon which a community is built, with the most important factor being community elevation with reference to river level–a difference of only a few meters can significantly impact the ability to sustain home gardens.

Common themes related to seasonal flooding and home garden diversity emerged during conversations with residents from the three study communities. In Jerusalén, people consistently referenced the terrible flood of 2012 as significantly reducing their home gardens. One individual told us that the floods killed everything. In fact, the flooding was so severe in 2012 that homes were flooded up to their roofs. In San Pedro, flooding is rarely an issue as most homes are set back from the river and at a higher elevation than are homes in either of the other two communities. However, leaf-cutter ants are a significant problem. Gardeners indicated that the ants decimate gardens and will even cut to shreds the plastic that is wrapped around the trunks of saplings to protect them and multiple heads of household indicated that it is not always worth the effort to try to maintain an expansive home garden. Species diversity can thus be interpreted as at least partially influenced by environmental factors including environmental zone, seasonal flooding, and the impact of insects on home garden viability.

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SUMMARY OF FINDINGS

Home gardens are an important component of food security in rural Amazonia. Our data provide insight into the distribution of plant species and indicate that fruits and medicinal plants are the most prevalent of all plant types grown in the home gardens of the Tahuayo, with the most common fruits being *E. stipitata* (**guayaba brasilera**) and *M. flexuosa* (**aguaje**). The latter is a valued commercial fruit that is produced not only in home gardens, but also on a much larger scale in chacras. The most common medicinal plants cultivated in the home gardens of the Tahuayo include *C. citratus* (**yerba luisa**), *M. alceifolia* (**malva**), and *M. alliacea* (**sacha ajo**), all of which are used to treat common ailments such as stomach aches and joint pain.

Compared to a more extensive survey of plant diversity conducted by Wezel and Ohl (2005) in the southern Peruvian Amazon, our research indicates significantly greater diversity. The study by Wezel and Ohl was conducted in two communities and examined both home gardens and horticultural fields. Nineteen home gardens were surveyed as opposed to our 33 home gardens. Seventy-one species were identified by Wezel and Ohl. However, the authors did not include ornamental plants or timber species in their study. If we remove ornamental plants and timber species (17 species in total) from our data set, our results still reflect more diversity than those of Wezel and Ohl (103 total species as compared to 71 species).

Our results are more compatible with those of a similar study conducted by Lamont et al. (1999) in the northern Peruvian Amazon near the confluence of the Napo and Amazon rivers. The study, conducted in three villages, inventoried diversity in 51 home gardens and documented a total of 161 species as compared to our 120 species. Two things stand out when we compare our study to that of Lamont et al. (1999). The first is that in both studies fruit-producing species were most common with medicinal plants being the second most common type of plant. Perhaps more interesting is where our studies diverge. Lamont et al. (1999) found the lowest species diversity in the community of Palmeras. The explanation for low diversity is that the community benefits from a nearby tourist lodge and therefore home gardens play a minimal role in the local economy (Lamont et al. 1999). Our research directly contradicts this as we found the greatest species diversity in the village of El Chino. Like Palmeras, there is a tourist lodge located near El Chino, and the village does receive an economic benefit from tourists who purchase crafts at a market that is held each time a boat of tourists leaves the lodge to return to Iquitos. In addition, there are numerous community members who dedicate a significant amount of time to the horticulture of the chambira palm (*Astrocaryum chambira*) and the weaving of its fibers for craft production (see Bauer 2015). Residents of El Chino also gain income by being employed by the local lodge, with most who are employed working on a part-time or temporary basis. The fact that our research contradicts the conclusion of Lamont et al. (1999) that tourism is the main variable influencing species diversity in home gardens signifies that further research is needed—aimed specifically at the question tourism and home gardens.

A final note is that any conclusions that we have made are tentative and relative due in part to our limited sample size. A more comprehensive study, that would lend itself to more substantial results, would require not only increasing sample size within each community, but also increasing the number of communities included in the study.

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NOTES

[1] Most families have horticultural fields (*chacras*) in addition to a household garden. Manioc, plantains, and other staple crops are grown for subsistence and market.

[2] The categories presented here are general in nature and every attempt was made to fit plant species into appropriate categories as they are conceived of within the local cultural context. Where plants fit into multiple categories, they were assigned to the category of most significant use.

[3] The term ribereño refers to individuals of mixed ethnic descent who rely on fishing, hunting, and extractive resource activities to make a living (Chibnik 1994, Padoch 1988) and an important feature of ribereño identity is the strong presence of indigenous cultural influences (Chibnik 1991; Bauer 2014) that come in the form of indigenous knowledge as well as indigenous language. While all three of the communities associated with this project are ribereño communities, various indigenous cultural contributions including Shuar and Yagua exist in the study communities.

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APPENDIX 1. Occurrence # of Gardens

Scientific Name	Local Name	C	SP	J	Total	Component Category
Alchornea discolor	palometa huayo	1			1	O/U
Aloe vera	savila	1			1	M
Anacardium occidentale	casho	4	4		8	F
Anaxagorea brevipes	carahuasca			1	1	M
Annona montana	anona		1		1	M
Annona muricata	guanábana	2			2	F
Apeiba aspera	maquizapa ñaccha	1			1	F
Arachis hypogaea	maní	1			1	F
Arnica montana	arnica	1			1	M
Artocarpus altilis	pandisho	4	1	1	6	F
Aspidosperma excelsum	remo caspi			1	1	W
Astrocaryum chambira	chambira			1	1	F
Attalea phalerata	shapaja	2			2	F
Ayapana triplinervis	caguena	1	1		2	M
Bactris gasipaes	pijuayo	1	2		3	F
Bixa orellana	achote	3	1		4	O/U
Brugmansia aurea	toé	2	2	1	5	M
Brunfelsia grandiflora	chiric sanango	1	2	2	5	M
Buchenavia fanshawei	yacushapana	1			1	W
Calathea lutea	bijao	10	4	3	17	O/U
Campsiandra angustifolia	huacapurana	1			1	M
Canna indica	achira	5	1	2	8	M
Capsicum annuum	aji dulce	4	1		5	M
Capsicum frutescens	aji charapita	4	2		6	M
Carica papaya	papaya	1			1	F
Cassia alata	retama	7			7	M
Cecropia membranacea	cetico	1			1	W
Cedrela fissilis	cedro blanco	9		2	11	W
Chenopodium ambrosioides	paico	1			1	M
Chrysophyllum caimito	caimito	1	4		5	M
Citrullus lanatus	sandia	1			1	F
Citrus aurantiifolia	naranja agría	1			1	F
Citrus limon	limón	4		1	5	F
Citrus maxima	pomelo	1			1	F
Citrus medica	cidra	7			7	F
Citrus paradisi	toronja	7	3	4	14	F
Citrus reticulata	mandarina	3		1	4	F
Citrus sinensis	naranja	1		1	2	F

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Scientific Name	Local Name	C	SP	J	Total	Component Category
Clidemia hirta	mullaca	3			3	M
Coccoloba barbeyana	vino huayo	1			1	F
Cocos nucifera	coco	3	5	6	14	F
Colocasia esculenta	papa china		1	2	3	V
Costus guanaiensis	caña agria	1			1	M
Couepia chrysocalyx	parinari	6	1		7	F
Couroupita guianensis	ayahuma	1			1	F
Crescentia cujete	huingo (mate)	9		2	11	F
Croton lechleri	sangre de grado	2			2	M
Curcuma longa	guisador	4			4	M
Cymbopogon citratus	yerba luisa	9		1	10	M
Cyphomandra hartwegii	gallinazo panga	1			1	F
Desmoncus leptospadix	vara casha			1	1	O/U
Dieffenbachia spp.	patiquina	11		1	12	O/U
Dioscorea trifida	sacha papa	1	1		2	V
Duroia paraensis	huitillo	7	1		8	W
Elaeis guineensis	palmito	1			1	O/U
Eryngium foetidum	culantro	5		1	6	M
Erythrina amazonica	huayruro			1	1	W
Erythrina fusca	amasisa	2			2	M
Eugenia stipitata	guayaba brasilera	15	5	5	25	F
Euterpe precatoria	chonta (acai)	9	2	1	12	F
Ficus insipida	ojé	1			1	M
Gossypium arboreum	algodón	1			1	M
Helosis guyannensis	aguajillo	1			1	M
Hura crepitans	catahua	3			3	O/U
Inga edulis	guaba	10	1	2	13	F
Ipomoea batatas	camote	4	1		5	V
Jatropha curcas	piñón	4	1		5	M
Jessenia bataua	ungurahui		2		2	F
Kalanchoe pinnata	hoja del aire	1			1	F
Leucaena leucocephala	rosario	5		1	6	O/U
Lippia alba	pampa orégano	8	1	1	10	M
Malachra alceifolia	malva	9		3	12	M
Mammea americana	mamey	6		5	11	F
Mangifera indica	mango (mangua)	6	2	5	13	F
Manihot esculenta	yuca	8			8	V
Mansoa alliacea	sacha ajo	7	3	2	12	M
Maranta arundinacea	shimi pampana		1		1	M
Mauritia flexuosa	aguaje	14	3	5	22	F
Maytenus macrocarpa	chuchuasi	2		2	4	F

Scientific Name	Local Name	C	SP	J	Total	Component Category
Mentha citrata	mentha	1			1	M
Miconia impetiolaris	rifari	1			1	M
Morinda citrifolia	noni			1	1	F
Musa paradisiaca	platano	11	6		17	F
Musa sapientum	banano (guineo)	2			2	F
Myrciaria dubia	camu-camu	5			5	F
Myrciaria floribunda	shawinto	1			1	F
Ocimum micranthum	albaca	2			2	M
Oenocarpus mapora	cinamillo	6		1	7	F
Opuntia ficus-indica	tuna		1		1	F
Oxandra euneura	yahuarachi caspi	1	1		2	W
Passiflora edulis	maracuyá	1			1	F
Peperomia pellucida	congona	2			2	M
Peperomia rubea	lancetilla	5			5	M
Persea americana	palta		1		1	F
Petiveria alliacea	mucura	4	3		7	M
Phyllanthus stipulatus	chanca piedra	1			1	M
Phytelephas macrocarpa	tagua (yarina)			1	1	F
Piper peltatum	santa maría	1			1	M
Plantago major	llantén	1			1	M
Plinia clausa	anahuayo	2	1		3	F
Pourouma guianensis	sacha ubilla	2	3		5	F
Renealmia alpina	mishquipanga	2			2	F
Rheedia gardneriana	charichuelo	6			6	F
Ruta chalepensis	ruda	1			1	M
Saccharum officinarum	caña de azúcar	9		3	12	F
Solanum coconilla	coconilla		1	1	2	F
Solanum sessiliflorum	cocona (topiro)	3	2	1	6	F
Spondias mombin	ubos	5			5	W
Swietenia macrophylla	caoba	2			2	W
Synadenium grantii	planta de la vida	1			1	M
Syzygium jambos	pomarrosa	2			2	F
Tagetes erecta	rosa sisa	1			1	M
Theobroma bicolor	macambo	2			2	F
Theobroma cacao	cacao		1	1	2	F
Urena lobata	yute	1			1	M
Urera baccifera	ishanga	1			1	M
Virola calophylla	cumala	1			1	W
Vismia ferruginea	pichirina	1	1		2	M
Xanthosoma violaceum	papa huitina	4			4	V
Zingiber officinale	kión (ahinhibre)	2	1		3	M

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