SPECIES COMPOSITION, DIVERSITY, AND USE OF HOMEGARDENS AMONG THREE AMAZONIAN VILLAGES[1]

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Lamont, Susan R., W. Hardy Eshbaugh *(Department of Botany, Miami University, Oxford, OH 45056), and* **Adolph M. Greenberg** *(Department of Sociology, Gerontology, and Anthropology, Miami University, Oxford, OH 45056).* SPECIES COMPOSITION, DIVERSITY, AND USE OF HOMEGARDENS AMONG THREE AMAZONIAN VILLAGES. *Economic Botany 53(3):312–326, 1999. Homegardens represent a traditional form of land use common in tropical regions of the world. Species composition, structure and function of homegardens may be influenced by ecological, socio-economic and cultural factors. The three villages in the Peruvian Amazon in which homegardens were studied differed in terms of cultural background, distance to urban markets and the influence of tourism. Data were collected on species composition, abundance and use of plants in the homegardens. Comparison of the three villages revealed that tourism had the greatest impact on species composition, diversity and use of plants in homegardens.*

LA COMPOSICIÓN DE ESPECIES, DIVERSIDAD Y USA DE HUERTAS EN TRÉS CASERIOS AMAZONICOS. *Huertas representan un uso tradicional de la tierra el cuál es común en regiones tropicales del mundo. La composición de especies, estructura y función de las huertas puedan estar influídas por factores ecológicos, socioeconómicos y por culturas. Las tres villas en la Amazona Peruana en que las huertas fueron estudiadas diferenciaron en la historia cultural, distancia al mercado urbano y la influencia del turismo. Datos fueron colectados en la composición de especies, abundancia y los usos de las plantas en las huertas. Comparación del los tres caserios demostró que el turismo tiene el impacto más grande en la composición de especies, diversidad y uso de las plantas en las huertas.*

Key Words: homegarden; Amazonian villages; ethnobotany; Peru.

Homegardens (domestic garden, kitchen garden, dooryard garden, huerta domestica) have a long tradition in many countries, although their structure, function, species composition, and management vary throughout different regions of the world (Fernandes and Nair 1986). Various definitions of homegarden have been discussed, and, in tropical regions most describe a multilayered, species rich agroforestry system (Christanty 1990:12–13; Niñez 1990:187–191; Rico-Gray et al. 1990; Torquebiau 1992). Homegardens typically include a wide variety of trees, shrubs, herbs and vines used as sources of food, medicine, fodder, firewood, construction materials, market products and ornamentals. Research on homegardens has been gaining interest in recent years for their potential as models of economically efficient and ecologically sustainable agroforestry systems (Budowski 1990:3; Fernandes and Nair 1986; Smith 1996).

Species composition, structure and function of homegardens may be influenced by ecological, socio-economic and cultural factors, such as distance from urban markets, household size and composition, environmental degradation, and family tradition (Christanty 1990:10; Gliessman 1990; Michon and Mary 1990:170; Moreno-Black, Somnasang, and Thamathawan 1996; Oré Balbin and Samaniego 1996; Padoch et al. 1985; Rico-Gray et al. 1990). Studies on Amazonian homegardens have focused on their role in agricultural development, since these systems have been shown to be especially species rich and productive (Padoch et al. 1985; Oré Balbin and Samaniego 1996; Smith 1996). Little is known about the variation in homegardens among rural Amazonian villages or the factors that influence species composition, structure and function of homegardens in this region (Padoch and de Jong 1991).

Homegardening in Amazonia is one of a variety of resource management activities em-

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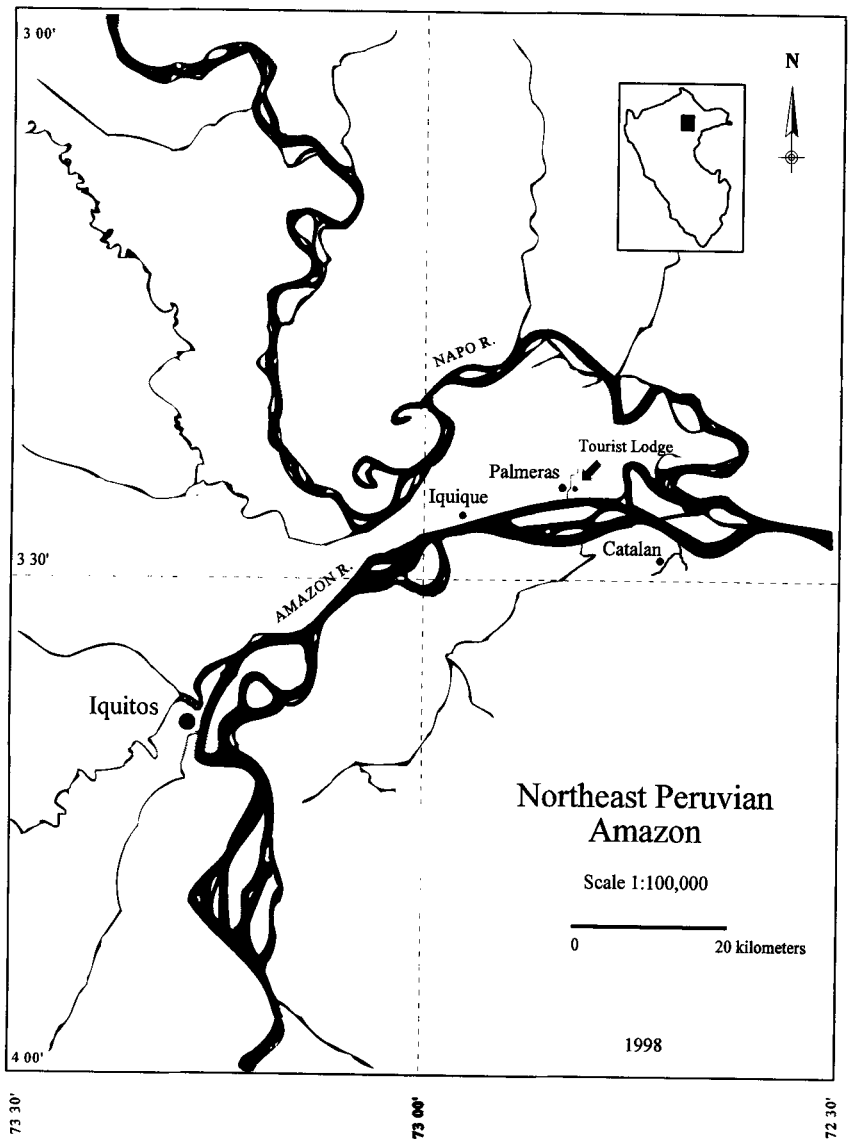

Fig. 1. Map of study area (map produced by Peter R. Claggett).

ployed by rural peoples, such as swidden fallow agriculture, hunting, fishing, and forest extraction (Padoch et al. 1985). The homegardens in this study comprised small cultivated areas (<0.5 ha) located adjacent to or surrounding households. They contained a mixture of native and introduced species which provided supplemental foods, medicines, construction materials, craft materials, spices, fiber, and ornamentals.

Homegardens were studied in three rural villages in the Peruvian Amazon. The villages differed in terms of distance to urban market, cultural background, and involvement with tourism. The purpose of the paper is to: a) compare homegardens in three villages in the Peruvian Amazon, based on species composition, diversity and use of species; and b) determine the influence of cultural background, distance to urban market, and tourism on species composition, structure and function of homegardens in each of the villages.

Study Sites

All three villages in the study are located in northeastern Peru (Fig. 1), in tropical rain forest that borders the Amazon river. Mean annual

temperature of the area is 26°C, and mean annual rainfall is 2600mm (Kalliola, Puhakka, and Danjoy 1993:12). The villages (Palmeras, Catalan, and Iquique) were chosen based upon ecological similarity, cultural background, and distance to Iquitos, the largest urban center in the area.

Iquique is located approximately three hours downriver by public boat from Iquitos, on land between the Amazon and Napo Rivers. It was settled approximately 80 years ago by peoples of mixed European and Amazonian ancestry. Land in this village is divided into ten-hectare parcels and distributed among the 46 households. Each new family is given a parcel, and additional parcels may be requested. Village elders own parcels close to the village center, whereas parcels of new members are located up to an hour's walk into the forest.

Palmeras is located approximately four hours from Iquitos, on the same land mass as Iquique. This area was settled by a group of indigenous Yaguas approximately 60 years ago. It is considered a Native Community, although many peoples of mixed ancestry have migrated to the community over the years. Forty-four percent of the 33 households in Palmeras contain at least one member who is related to one of the founding Yagua families. The community has acquired land tenure, although individuals do not have title to land. In the mid-1960s, a tourism company built a lodge adjacent to the village. The tourism company serves as a source of wage labor for some of the villagers and as a market for handicrafts.

Catalan is remotely located up a small tributary (Vainilla River) to the Amazon, approximately 10 hours by boat downriver from Iquitos. Catalan was settled approximately 40 years ago by a group of Yaguas and is considered a Native Community. Approximately 80% of the 24 households contain at least one member that is related to a founding Yagua family. Land ownership is similar to that in Palmeras. Very few households in Catalan have homegardens, due to destruction caused by free-ranging water buffalo in the community. Only those households separated by water or located a sufficient distance from the water buffalo are able to maintain homegardens.

METHODS

Field work was conducted during July and August, 1996 and January–June, 1997. A total of 51 gardens were surveyed. For every household granting permission, homegardens were surveyed and household members interviewed about the uses of each species. Species name and number of individuals were recorded for all useful plants except ornamentals, and size of homegarden was estimated. Eight homegardens were surveyed in Catalan (100% of homegardens), twenty-seven in Iquique (77%), and sixteen in Palmeras (76%). During data analysis, species were assigned to one or more of eight broad use categories: medicinal, fruit (including fruits grown for market), starch, craft, spice/condiment, other edible (including vegetables and fruits grown mainly for consumption), construction, and miscellaneous. Species inclusion in a particular use category is based upon the most common use(s) indicated for that species in each village. Many species are included in more than one category, and uses of some species differs among the villages. Voucher specimens have been deposited in MU (Miami University, Oxford, Ohio) and AMAZ (Herbario Amazonense, Universidad Nacional de la Amazónia Peruana, Iquitos, Peru) herbaria.

TABLE 1. TOTAL NUMBER OF SPECIES PER VILLAGE, MEAN NUMBER OF SPECIES PER HOMEGARDEN, SHANNON DIVERSITY INDEX (EXP H'), AND MEDIAN SIZE OF HOMEGARDENS IN CATALAN, PALMERAS, AND IQUIQUE, PERU.

	Catalan	Palmeras	Iquique
Total no. spp.	111	104	125
Mean no. spp.	39	27	30
exp H'	69.2	57.5	70.8
Median size	900m^2	100m^2	625m^2

RESULTS

Homegardens in Palmeras ranged in size from 36m^2 to approximately 5000m^2, with a median size of 100m^2 (Table 1). Eighty-eight percent were $\leq$ 400m^2. More than 80% of homegardens in Palmeras contained fewer than 100 individual plants (Fig. 2). Homegardens in Iquique and Catalan were larger than those in Palmeras, ranging in size from 400m^2 to 5000m^2, with a median size of 900m^2 in Catalan and 625 m^2 in Iquique. More than 50% of homegardens in these two villages contained greater than 100 individuals.

A total of 161 species in 56 families were

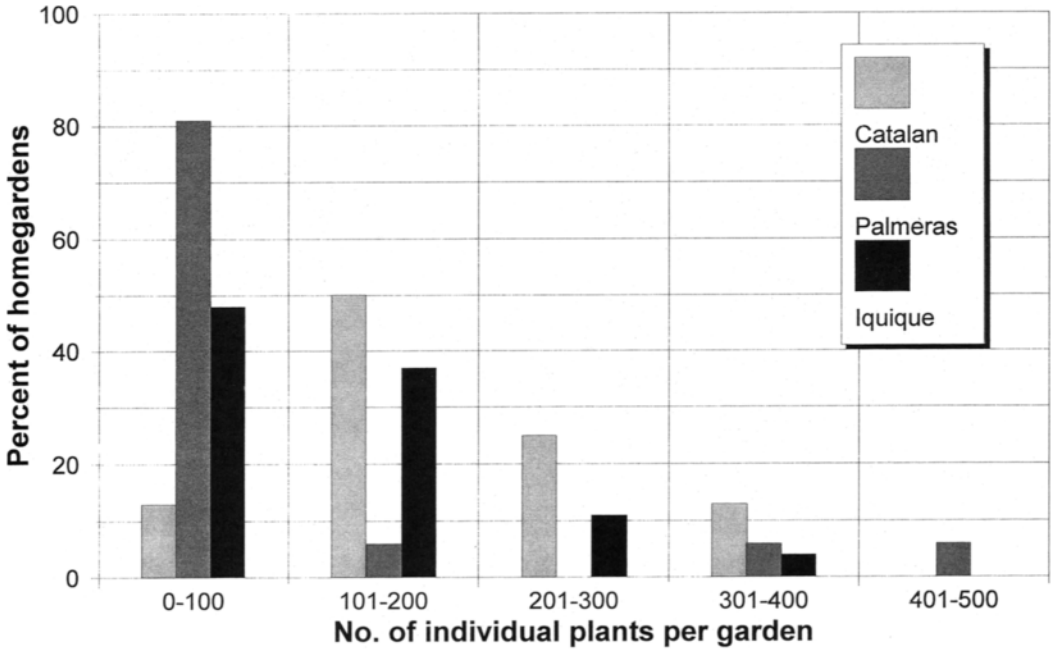

Fig. 2. Comparison of the number of individual plants in homegardens among the three villages.

found in homegardens of all three villages (Table 2). In all three villages, the greatest number of species were in the families Arecaceae, Solanaceae, Fabaceae and Rutaceae, averaging eleven, nine, eight and six species per village, respectively. Total number of species encountered and overall species diversity (calculated using the exponentiated form of the Shannon diversity index), were higher in Iquique and Catalan. Homegardens in Catalan and Iquique also contained a greater mean number of species per garden (Generalized Linear Model procedure, Poisson distribution assumed for error, Iquique vs. Palmeras or Catalan: $P = 0.0001$; Palmeras vs. Catalan: $P = 0.04$). Species similarity between any two villages, calculated using Sörensen's Coefficient of Community, was 75%.

Most species in homegardens of all three villages are used for their edible fruits (Fig. 3). Homegardens in Catalan and Iquique contained more fruit species, on average, than homegardens in Palmeras (Generalized Linear Model, Poisson error distribution, Iquique vs. Palmeras: $P = 0.0001$; Iquique vs. Catalan: $P = 0.001$; Palmeras vs. Catalan: $P = 0.004$). Medicinals were second highest in number of species. Each of the other categories contained, on average, five or fewer species.

Frequency was calculated by dividing the number of homegardens in which a species was present (per village) by the total number of homegardens in each village. More than 85% of the most frequent species (present in >50% of gardens) in Catalan and Iquique were fruit trees, compared to 58% in Palmeras. Four of the most frequent species in Palmeras homegardens were used in craft-making, whereas only two of the most frequent species were used for crafts in homegardens of Catalan and Iquique. *Inga edulis, Pouteria caimito, Mauritia flexuosa, Psidium guayaba, Mangifera indica* and *Musa* sp. were present in >50% of homegardens in all three villages.

Discussion

Several studies from tropical Asia and Latin America indicate cultural background may affect species composition of homegardens (Christanty 1990:13; Gliessman 1990; Padoch et al. 1985; Rico-Gray 1990). In this study, however, cultural background did not seem to influence overall species composition, given that the two Yagua villages (Palmeras and Catalan) were as similar to each other as to the village of Iquique. This may reflect the influx of people of mixed ancestry into these villages in the past several

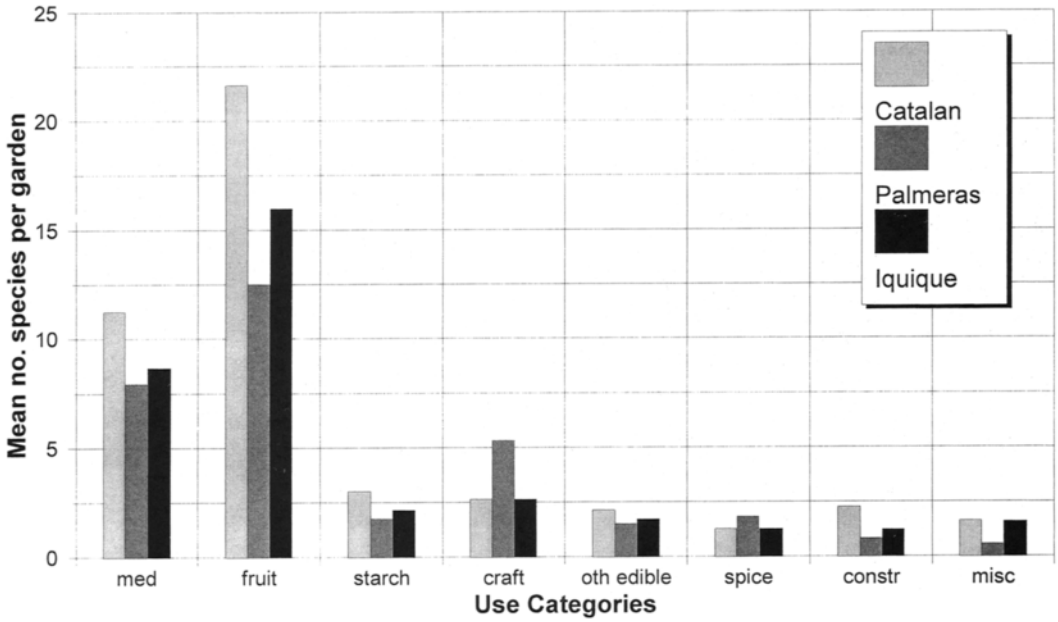

Fig. 3. Mean number of species per use category per homegarden in each of the three villages.

decades. Two species found only in homegardens of Catalan and Palmeras, however, do seem to be related to the Yagua culture. Shimipampana (*Maranta arundinacea*) and sanipanga (*Picramnia* sp.) are used as plant dyes for chambira (*Astrocaryum chambira*), the palm fiber used by Yaguas and other indigenous groups to weave bags ("jicras") and hammocks. In Catalan, jicras and hammocks are made mostly for household use, whereas in Palmeras, they are produced for the tourist trade.

The greatest differences among homegardens in the three villages are in overall species richness and diversity, average number of fruit tree species per homegarden, and average homegarden size. Studies on homegardens in tropical Java and Mexico indicate that urban market pressure results in decreased total species diversity but increased species of fruit trees that serve as market products (Marten 1990:160; Michon and Mary 1990:174; Rico-Gray et al. 1990). Studies on homegardens in many areas indicate species diversity is greater in remote villages, where homegardens are important sources of subsistence products, because markets for products are unavailable (Fernandes and Nair 1986). Results of this study do not fully support these theories, however. Species richness and diversity were high in Catalan, as expected, yet were also high in Iquique, where urban market pressure is greatest and sale of produce in the urban market most common. Although homegardens in Iquique did contain a fair amount of fruit tree species, the average number of fruit tree species per homegarden was greatest in Catalan, despite the distance from the urban market. Distance to urban market was not an important factor influencing species diversity and composition of homegardens in this case, due to the difficulty of travel in the region, and the presence of rural markets. The proximity of Iquique to Iquitos encourages villagers to travel to the city to sell seasonal produce, however, travel by public boat (the only source of travel for most villagers in Iquique) is difficult and unreliable, preventing frequent travel to Iquitos to purchase subsistence foods. Although fruit trees are important sources of supplemental income for most households in Iquique, homegardens remain an important source of food, and a diversity of species provides year-round produce for household consumption.

A similar situation exists in Catalan, where rural markets may influence species composition of homegardens. Despite the distance from the urban market, fruit trees in Catalan also serve as important sources of supplemental income because of the existence of rural markets, and

TABLE 2. PLANT USES AND FREQUENCIES IN HOMEGARDENS, CAT (CATALAN), IQ (IQUIQUE), PAL (PALMERAS). COMMON NAMES ARE THOSE MOST COMMONLY USED IN THE THREE VILLAGES.

Taxon	Common name	Frequency			Use
		Cat	Iq	Pal	
Anacardiaceae					
Anacardium occidentale L. (Lamont and Ríos 132 MU, AMAZ)	Cashew	63	48	25	fruit
Mangifera indica L. (Lamont and Ríos 157 MU, AMAZ)	Mangua dulce	63	74	81	fruit
Spondias cytherea Sonn.	Taperiba	0	4	0	fruit
Spondias mombin L. (Lamont and Ríos 154 MU, AMAZ)	Ubos	88	15	0	fruit, med
Annonaceae					
Annona muricata L. (Lamont and Ríos 59 MU, AMAZ)	Chirimoya	25	41	19	fruit
Rollinia mucosa (Jacq.) Baill. (Lamont and Ríos 175 MU, AMAZ)	Annona	38	67	19	fruit
Rollinia sp. (Lamont and Ríos 322 MU, AMAZ)	Annonilla	13	0	0	fruit
Apiaceae					
Eryngium foetidum L. (Lamont and Ríos 173 MU, AMAZ)	Sacha culantro	25	22	31	spice/cond
Apocynaceae					
Lacmellea sp. (Lamont and Ríos 223 MU, AMAZ)	Chiclihuayo	0	0	6	fruit
Araceae					
Caladium sp. (Lamont and Ríos 197 MU, AMAZ)	Lengua de Perro	50	15	25	medicine
Colocasia esculenta (L.) Schott	Pituca	38	37	44	starch
Colocasia sp.	Buseta (michuki)	13	0	0	medicine
Dieffenbachia sp. (Lamont and Ríos 314 MU, AMAZ)	Patiquina	13	26	19	medicine
Dracontium loretense K. Krause (Lamont and Ríos 145 MU, AMAZ)	Jergon Sacha	0	4	6	medicine
Arecaceace					
Astrocaryum chambira Burret (Lamont and Ríos 342 MU, AMAZ)	Chambira	13	0	0	crafts
Astrocaryum macrocalyx Burrett	Huicongo	0	0	6	fruit, const
Bactris gasipaes Kunth	Pihuayo	100	67	44	fruit
Bactris sp. (Lamont and Ríos 32 MU, AMAZ)	Ñejilla	0	0	0	fruit
Cocos nucifera L.	Coco	13	11	25	fruit
Elaeis guineensis Jacq.	Palma aceitera	25	0	6	misc. (animal feed)
Euterpe precatoria Mart. (Lamont and Ríos 200 MU, AMAZ)	Huasai	63	0	25	oth. edible, const.
Iriartea deltoidea Ruiz & Pav. (Lamont and Ríos 339 MU, AMAZ)	Huacrapona	0	4	0	const.
Jessenia bataua (Mart.) Burret. ssp. bataua (Lamont and Ríos 321 MU, AMAZ)	Ungurabi	25	7	19	fruit

TABLE 2. CONTINUED.

Taxon	Common name	Frequency			Use
		Cat	Iq	Pal	
Mauritia flexuosa L.f. (Lamont and Ríos 316 MU, AMAZ)	Aguaje	88	63	63	fruit, crafts
Mauritiella sp.	Aguajillo	13	0	0	fruit
Maximiliana sp. (Lamont and Ríos 225 MU, AMAZ)	Inayuga	0	0	13	fruit, crafts
Oenocarpus mapora H. Karst (Lamont and Ríos 317 MU, AMAZ)	Bacabilla	63	33	63	fruit, crafts
Phytelephas macrocarpa Ruiz & Pav. (Lamont and Ríos 142 MU, AMAZ)	Yarina	75	22	0	fruit, const
Scheelea cephalotes (Poepp. ex Mart.) Karsten (Lamont and Ríos 323 MU, AMAZ)	Shapaja	13	0	6	const.
Socratea exorrhiza (Mart.) H. Wendl. (Lamont and Ríos 340 MU, AMAZ)	Cashapona	50	15	0	const.
Asteraceae					
Ayapana pilluanensis (Gardner) R.M. King & H. Rob. (Lamont and Ríos 174 MU, AMAZ)	Caguena	38	19	13	medicine
Pollalesta discolor (Kunth) Aristeg. (Lamont and Ríos 66 MU, AMAZ)	Ocuera negra	13	4	0	const.
Tagetes patula L.	Rosasiza	25	19	19	medicine
Bignoniaceae					
Crescentia cujete L. (Lamont and Ríos 181 MU, AMAZ)	Huingo	13	52	63	crafts
Mansoa alliacea (Lam.) A.H. Gentry (Lamont and Ríos 247 MU, AMAZ)	Ahosacha	25	19	25	medicine
Xylophragma sp. (Lamont and Ríos 211 MU, AMAZ)	Sanipanga	13	0	25	crafts
Bixaceae					
Bixa orellana L. (Lamont and Ríos 57 MU, AMAZ)	Achiote	13	22	44	crafts, spice/cond.
Bombacaceae					
Ceiba samauma (Mart.) K. Schum. (Lamont and Ríos 312 MU, AMAZ)	Huimba	25	0	0	craft, misc. (cotton)
Ochroma pyrimidale (Cav. ex Lam.) Urb.	Topa	13	4	0	crafts
Quararibea cordata (Bonpl.) Vischer (Lamont and Ríos 95 MU, AMAZ)	Sapote	75	70	44	fruit
Bromeliaceae					
Ananas comosus (L.) Merr.	Piña	50	44	31	fruit
Cannaceae					
Canna sp. (Lamont and Ríos 34 MU, AMAZ)	Achira	13	22	44	crafts

TABLE 2. CONTINUED.

Taxon	Common name	Frequency			Use
		Cat	Iq	Pal	
Capparidaceae					
Capparis sp. (Lamont and Ríos 279 MU, AMAZ)	Tamarra	13	0	0	medicine
Caprifoliaceae					
Sambucus sp.	Sauco	0	7	0	medicine
Caricaceae					
Carica papaya L.	Papaya	25	37	38	fruit
Jacartia sp. (Lamont and Ríos 313 MU, AMAZ)	Sachapapaya	13	0	0	fruit
Cecropiaceae					
Pourouma cecropiifolia Mart. (Lamont and Ríos 176 MU, AMAZ)	Uvilla	88	44	31	fruit
Pourouma sp.	Sachauvilla	13	0	0	fruit
Chenopodiaceae					
Chenopodium ambrosioides L.	Paico	0	4	0	medicine
Chrysobalanaceae					
Couepia ulei Pilg. (Lamont and Ríos 58 MU, AMAZ)	Parinari	13	26	44	fruit
Clusiaceae					
Rheedia floribunda (Miq.) Planch & Tr. (Lamont and Ríos 27 MU, AMAZ)	Charichuelo	38	19	38	fruit
Convolvulaceae					
Ipomoea batatas (L.) Lam. (Lamont and Ríos 239 MU, AMAZ)	Camote	38	7	19	starch
Crassulaceae					
Kalanchoe pinnata (Lam.) Pers. (Lamont and Ríos 202 MU, AMAZ)	Paichicara	63	0	0	medicine
Cucurbitaceae					
Citrullus lanatus (Thunb.) Matsum. & Nakai	Sandia	0	11	0	oth. edible
Cucumis sativus L.	Pepina	13	0	0	oth. edible
Cucurbita pepo L.	Sapallo	0	11	13	oth. edible
Cyclanthaceae					
Carludovica palmata Ruiz & Pav.	Bombonaje	0	26	25	const.

TABLE 2. CONTINUED.

Taxon	Common name	Frequency			Use
		Cat	Iq	Pal	
Cyperaceae					
Cyperus sp.	Piripiri	0	0	6	medicine
Dioscoreaceae					
Dioscorea trifida L.f.	Sachapapa	50	19	6	starch
unknown	Riñon Papa	0	0	13	medicine
Erythroxylaceae					
Erythroxylum coca Lam. (Lamont and Ríos 258 MU, AMAZ)	Coca	0	0	6	medicine
Euphorbiaceae					
Euphorbia sp. (Lamont and Ríos 187 MU, AMAZ)	Piñon negro (menuda)	0	7	0	medicine
Euphorbia sp. (Lamont and Ríos 204 MU, AMAZ)	Yuca brava	13	0	0	medicine
Jatropha curcas L. (Lamont and Ríos 193 MU, AMAZ)	Piñon blanco	38	15	19	medicine
Jatropha gossypiifolia L. (Lamont and Ríos 245 MU, AMAZ)	Piñon negro	0	22	13	medicine
Manihot esculenta Crantz (Lamont and Ríos 43 MU, AMAZ)	Yuca	13	11	6	starch
Fabaceae					
Cassia reticulata Willd. (Lamont and Ríos 48 MU, AMAZ)	Retama	25	37	0	medicine
Cicer arietinum L.	Garbanzo	0	4	0	starch
Erythrina glauca Willd.	Amasiza	0	19	0	med., misc. (erosion control)
Inga cinnamomea Spruce ex Benth. (Lamont and Ríos 214 MU, AMAZ)	Vaca Shimbillo	25	15	38	fruit
Inga edulis Mart.	Guaba	100	74	56	fruit, med.
Inga feuillei DC (Lamont and Ríos 130 MU, AMAZ)	Shimbillo pacay	25	19	0	fruit
Inga sp. (Lamont and Ríos 222 MU, AMAZ)	Guabilla	13	4	38	fruit
Inga sp. (Lamont and Ríos 14 MU, AMAZ)	Shimbillo	13	22	19	fruit
Ormosia sp. (Lamont and Ríos 61 MU, AMAZ)	Huayuro	13	4	0	crafts
Sorghum sp.	Sorghum	13	0	0	misc. (animal feed)
Vigna unguiculata (L.) Walp.	Chiclayo	0	4	0	starch
Icacinaceae					
Poraqueiba sericea Tul. (Lamont and Ríos 186 MU, AMAZ)	Umari	100	33	19	fruit
Iridaceae					
Eleutherine bulbosa (Mill.) Urb. (Lamont and Ríos 191 MU, AMAZ)	Yagua piripiri	13	11	19	medicine

TABLE 2. CONTINUED.

Taxon	Common name	Frequency			Use
		Cat	Iq	Pal	
Lamiaceae					
Mentha piperita L.	Menta	13	4	13	medicine
Ocimum micranthum Willd. (Lamont and Ríos 51 MU, AMAZ)	Albaca	0	0	19	medicine
Lauraceae					
Persea americana Mill. (Lamont and Ríos 91 MU, AMAZ)	Palta	38	41	0	fruit
unknown (Lamont and Ríos 70 MU, AMAZ)	Moena	0	4	0	const.
Lecythidaceae					
Couroupita guianensis var. *surinamensis* (Mart. ex O. Berg) Eyma (Lamont and Ríos 133 MU, AMAZ)	Ayaumo	0	4	0	medicine
Gustavia angusta L. (Lamont and Ríos 267 MU, AMAZ)	Sachachopé	13	0	0	fruit
Grias neuberthii J.F. Macbr. (Lamont and Ríos 171 MU, AMAZ)	Sachamangua	75	67	13	fruit
Gustavia sp. (Lamont and Ríos 7 MU, AMAZ)	Chopé	13	4	0	fruit
Malpighiaceae					
Bunchosia armeniaca (Cav.) DC. (Lamont and Ríos 189 MU, AMAZ)	Ciruelo	0	4	0	fruit
Malvaceae					
Abelmoschus moschatus Medik. (Lamont and Ríos 198 MU, AMAZ)	Mishimuillo	0	4	0	medicine
Gossypium barbadense L. (Lamont and Ríos 153 MU, AMAZ)	Algodón	13	56	38	crafts, med., misc. (cotton)
Malachra alceifolia Jacq. (Lamont and Ríos 161 MU, AMAZ)	Malva	25	41	25	medicine
Urena lobata var. *reticulata* (Cav.) Guerke (Lamont and Ríos 47 MU, AMAZ)	Jute	0	15	19	craft, misc. (market fiber)
Marantaceae					
Calathea allouia (Aubl.) Lindl.	Dali dali	38	0	0	starch
Calathea insignis Petersen (Lamont and Ríos 4 MU, AMAZ)	Bijao	50	41	25	misc. (food wrapping)
Maranta arundinacea L. (Lamont and Ríos 125 MU, AMAZ)	Shimipampana	13	0	6	crafts
Maranta sp. (Lamont and Ríos 281 MU, AMAZ)	?	0	4	0	medicine
Melastomataceae					
Miconia sp. (Lamont and Ríos 277 MU, AMAZ)	Rifari	0	4	0	const.
Meliaceae					
Cedrela odorata L. (Lamont and Ríos 180 MU, AMAZ)	Cedro	50	41	38	const.

TABLE 2. CONTINUED.

Taxon	Common name	Frequency			Use
		Cat	Iq	Pal	
Moraceae					
Artocarpus altilis (Parkinson) Fosberg (Lamont and Ríos 318 MU, AMAZ)	Pan de Árbol	63	56	44	fruit
Ficus insipida Willd.	Oje	0	0	0	medicine
Ficus sp. (Lamont and Ríos 8 MU, AMAZ)	Renaco	13	4	0	medicine
Ficus sp. (Lamont and Ríos 284 MU, AMAZ)	Tangarana	0	4	0	medicine
Musaceae					
Musa x paradisiaca L. (pro sp.)	Platano, guineo	88	93	69	starch, fruit
Myrtaceae					
Calyptranthus sp. (Lamont and Ríos 238 MU, AMAZ)	Anihuayo	13	0	6	fruit
Campomanesia lineatifolia Ruiz & Pav. (Lamont and Ríos 178 MU, AMAZ)	Palillo	13	30	13	fruit
Eugenia stipitata McVaugh (Lamont and Ríos 136 MU, AMAZ)	Guayaba Brasilera	0	4	6	fruit
Psidium guayava L. (Lamont and Ríos 46 MU, AMAZ)	Guayaba	88	81	75	fruit, med.
Syzygium malaccense (L.) Merr. & L.M. Perry (Lamont and Ríos 242 MU, AMAZ)	Poma Rosa	63	52	38	fruit
Orchidaceae					
unknown	Orchid	0	4	0	medicine
Phytolaccaceae					
Petiveria alliacea L. (Lamont and Ríos 168 MU, AMAZ)	Mucura	0	19	31	medicine
Piperaceae					
Peperomia rubea Trel. (Lamont and Ríos 167 MU, AMAZ)	Lanzatilla	25	30	19	medicine
Pothomorphe peltata (L.) Miq. (Lamont and Ríos 16 MU, AMAZ)	Santa Maria	25	30	6	medicine
Plantaginaceae					
Plantago major L.	Llanten	0	4	0	medicine
Poaceae					
Coix lacryma-jobi var. *ma-yuen* (Rom. Caill.) Stapf (Lamont and Ríos 49 MU, AMAZ)	Rosario	0	22	81	crafts
Cymbopogon citratus (DC.) Stapf (Lamont and Ríos 208 MU, AMAZ)	Yerba Luisa	50	41	56	medicine
Gynerium sagittatum (Aubl.) P. Beauv.	Caña Brava	0	4	0	misc. (fencing)
Saccharum officinarum L.	Caña dulce	38	52	56	oth. edible
Sorghum sp.	Trigo	0	7	0	misc. (animal feed)

TABLE 2. CONTINUED.

Taxon	Common name	Frequency			Use
		Cat	Iq	Pal	
Portulacaceae					
Portulaca oleracea L. (Lamont and Ríos 201 MU, AMAZ)	Vertolaga	13	4	0	medicine
Rubiaceae					
Calycophyllum spruceanum (Benth.) Hook. f. ex K. Schum. (Lamont and Ríos 24 MU, AMAZ)	Capirona	0	0	13	misc. (firewood)
Coffea arabica L. (Lamont and Ríos 179 MU, AMAZ)	Cafe	0	22	6	fruit
Genipa americana L. (Lamont and Ríos 169 MU, AMAZ)	Huito	50	56	25	fruit, med., crafts
Rutaceae					
Citrus limon (L.) Burm. f.	Limon ácido	13	7	0	fruit
Citrus medica L. (Lamont and Ríos 195 MU, AMAZ)	Sidra	38	26	19	fruit
Citrus paradisi Macfad. (Lamont and Ríos 190 MU, AMAZ)	Toronja	100	59	44	fruit, med.
Citrus peruviana Ruiz & Pav. (Lamont and Ríos 134 MU, AMAZ)	Limon dulce	75	19	13	fruit
Citrus sinensis Osbeck	Naranja	25	7	25	fruit
Citrus sp.	Mandarina	0	4	13	fruit
Murraya paniculata (L.) Jack (Lamont and Ríos 194 MU, AMAZ)	Naranjilla	13	7	0	fruit
Zanthoxylum juniperinum Poepp. (Lamont and Ríos 17 MU, AMAZ)	Hualaha	0	0	6	const.
Sapotaceae					
Pouteria caimito (Ruiz & Pav.) Radlk. (Lamont and Ríos 54 MU, AMAZ)	Caimito	100	78	63	fruit
Solanaceae					
Brugmansia versicolor Lagerh.	Toe (1)	13	15	6	medicine
Brunfelsia grandiflora subsp. *schultesii* Plowman (Lamont and Ríos 212 MU, AMAZ)	Chirisanango	13	0	13	medicine
Capsicum annuum L. (Lamont and Ríos 156 MU, AMAZ)	Ahi dulce	13	30	69	spice/cond.
Capsicum frutescens L. (Lamont and Ríos 155 MU, AMAZ)	Ahi picante	38	11	19	spice/cond.
Cestrum hediundinum Dunal (Lamont and Ríos 177 MU, AMAZ)	Yerba Santa	0	19	13	medicine
Cyphomandra hartwegii (Miers) Walp. (Lamont and Ríos 40 MU, AMAZ)	Gallinaso panga	25	15	13	medicine
Lycopersicum esculentum Mill.	Tomate	0	4	0	oth. edible
Physalis angulata L. (Lamont and Ríos 160 MU, AMAZ)	Bolsa mullaca	0	11	0	medicine
Solanum americanum Mill. (Lamont and Ríos 5 MU, AMAZ)	Coconilla	50	4	19	oth. edible
Solanum sessiliflorum Dunal (Lamont and Ríos 10 MU, AMAZ)	Cocona	50	85	38	oth. edible
Solanum vanheurckii Müll. Arg. (Lamont and Ríos 33 MU, AMAZ)	Siucahuito	25	11	6	medicine

TABLE 2. CONTINUED.

Taxon	Common name	Frequency			Use
		Cat	Iq	Pal	
Sterculiaceae					
Herrania sp. (Lamont and Ríos 170 MU, AMAZ)	Cacahuillo (2)	0	4	13	misc. (pesticide)
Theobroma bicolor Bonpl. (Lamont and Ríos 185 MU, AMAZ)	Macambo	88	41	25	fruit
Theobroma cacao L. (Lamont and Ríos 122 MU, AMAZ)	Cacao	13	63	6	fruit
Theobroma grandiflorum (Willd. ex Spreng.) K. Schum. (Lamont and Ríos 188 MU, AMAZ)	Cocohuasu	0	4	0	fruit
Theobroma obovatum Klotzsch ex Bernoulli (Lamont and Ríos 235 MU, AMAZ)	Cacahuillo (1)	38	4	31	fruit
Tiliaceae					
Corchorus sp. (Lamont and Ríos 118 MU, AMAZ)	Ñucñucpichana	13	15	6	med., misc. (broom)
Guazuma sp. (Lamont and Ríos 107 MU, AMAZ)	Bolaina	0	4	0	const.
Urticaceae					
Urera sp. (Lamont and Ríos 165 MU, AMAZ)	Ishanga	25	7	6	medicine
Verbenaceae					
Lippia alba (Mill.) N.E. Br. (Lamont and Ríos 278 MU, AMAZ)	Pampa oregano	13	7	19	medicine
Verbena litoralis Kunth (Lamont and Ríos 182 MU, AMAZ)	Verbena	13	11	13	medicine
Zingerbiaceae					
Curcuma longa L. (Lamont and Ríos 184 MU, AMAZ)	Guisador	38	37	19	spice/cond.
Renealmia sp. (Lamont and Ríos 265 MU, AMAZ)	Mishquipanga	75	7	13	craft, misc (food wrapping)
Zingiber officinale Roscoe (Lamont and Ríos 166 MU, AMAZ)	Ahinhibre	38	15	13	medicine
unknown (Lamont and Ríos 164 MU, AMAZ)	Arcosacha	25	4	0	medicine
unknown	Pitaya	13	0	0	starch
unknown (Lamont and Ríos 243 MU, AMAZ)	Toe #2	0	0	13	medicine
unknown (Lamont and Ríos 237 MU, AMAZ)	Waquilla	0	0	6	misc. (fish poison)

many farmers in Catalan indicated that they grow fruits to sell "along the river" to other rural villages.

In Palmeras, lower species richness and diversity, lower diversity of fruit tree species and increased numbers of craft species in homegardens reflects the influence of tourism in the village. During peak tourist season, an average of 100 tourists may visit the village weekly, mainly to trade t-shirts for handmade crafts. Crafts are made almost exclusively from wild and domesticated plant products, such as seeds, bark, palm fibers, dried fruits and plant dyes. Both women and men make crafts, although women usually make a wider variety of crafts and spend more time making crafts. T-shirts from trades are often used as a form of currency in Palmeras to trade with other rural villages for subsistence products (such as fish, game, and manioc), and raw materials for craft-making, including palm fibers and seeds. Because of this, homegardens are not as important in Palmeras as sources of supplemental income or subsistence products, resulting in lower overall species diversity and lower fruit tree diversity than homegardens in the other two villages. Although more plants in Palmeras homegardens are used in craft-making, the average number of craft species per homegarden was only slightly higher in Palmeras compared to the other two villages, indicating the ability of Palmeras villagers to buy these raw materials from other villages.

Homegarden size in each of the villages is partly related to location of the household. In each of the villages, households situated towards the edges of the village center, where homes are less clustered, tended to have larger homegardens. In Catalan, only those households located far from the village center are able to maintain homegardens, due to the presence of water buffalo in the village center. In Palmeras, homes clustered at the edge of the village closest to the tourism operation have little space for homegardens, and many households located towards the interior of the village do not fully utilize available space for homegardens.

Many young families have recently migrated to Palmeras to participate in the tourist trade, and the smallest, least diverse homegardens in Palmeras belong to younger households with no ties to community elders. A study of homegardens in Moyobamba, Peru indicated that rapid population growth and changes in the age structure of the region resulted in land use changes and an apparent decline in gardening (Works 1990). In Palmeras, this may be the result of, in part, lack of sources for plant materials, as cuttings and seeds are often shared among family members, but also may reflect a decreased focus on gardening due to an emphasis on craft-making activities and the ability to purchase materials.

Conclusions

Species composition and diversity in homegardens was influenced more by tourism than by cultural background and distance to urban markets. Proximity to urban markets may influence species diversity and composition of homegardens in areas where travel is easy and frequent trips to markets are made to buy as well as sell produce. In remote areas, homegardens may serve as important sources of supplemental income because of the availability of rural markets for produce. Although homegardens in all three villages serve important functions as sources of foods, market products, medicinals, and construction and craft materials, the smaller size and lower species richness and diversity in Palmeras homegardens reflected a decreased reliance on homegardens for subsistence and market products due to the influence of tourism.

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