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## TRADITIONAL HOME GARDENS OF PETÉN, GUATEMALA: RESOURCE MANAGEMENT, FOOD SECURITY, AND CONSERVATION

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**ABSTRACT.**—Conservation and development agencies in Petén, Guatemala have been promoting home gardens among migrant families in order to improve the welfare of these families and to conserve natural resources. The agencies have not been successful. However, native Peteneros do have a productive gardening system that is compatible with resource conservation. This essay describes the structure, management, and economic and social benefits of 23 traditional Petén home gardens, which have over 180 useful plant species. Traditional gardens in Petén are highly diverse, rich, and productive (mean number of species per garden is 54; mean number of plants is 392). In addition, the gardens can contribute up to 15 percent of household income, improve family nutrition, and strengthen social networks. However, for reasons described in this essay, traditional home gardening is declining in Petén.

**Key words:** Petén, Guatemala, gardens, conservation, social networks.

**RESUMEN.**—Las agencias de la conservación y del desarrollo que trabajan en Petén, Guatemala, han venido promoviendo huertos de traspatio (jardines caseros) entre las familias que han migrado a Petén para mejorar el bienestar de estas familias y conservar los recursos naturales. Estas agencias no han tenido éxito. Sin embargo, los Peteneros nativos tienen un sistema de huertos de traspatio productivo y compatible con la conservación de los recursos naturales. Este ensayo describe la estructura, gestión, y los beneficios económicos y sociales de 23 huertos tradicionales de Petén, que tienen más de 180 especies útiles. Los huertos tradicionales en Petén son altamente diversos, ricos, y productivos (el promedio de especies por huerto es 54; el promedio de plantas individuales es 392). Además, los huertos pueden contribuir hasta el 15 por ciento del ingreso familiar, mejorar la nutrición de la familia, y consolidar redes sociales. Sin embargo, por las razones descritas en este ensayo, el cultivo de huertos tradicionales está declinando en Petén.

**RÉSUMÉ.**—Les agences de conservation et de développement dans Petén, Guatemala avaient favorisé les jardins aux logements des familles migratrices afin d'améliorer le bien-être de ces familles et de conserver les ressources naturelles. Les agences n'ont pas réussies à leur but. Mais les Peteneros indigènes lui-mêmes ont un système de jardinage productif qui est compatible de ressource. Cet essai décrit la structure, la gestion, et les bienfaits économiques et sociales de 23 jardins aux maisons traditionnels de Petén, qui ont plus de 180 espèces de plantes utiles. Les jardins traditionnels dans Petén sont fortement divers, riches, et productifs (le moyen d'espèces par jardin est 54; le moyen des cultivars par

jardin est 392). En outre, les jardins peuvent contribuer jusqu'à 15 pour cent du revenu de familiale. En plus, ils peuvent améliorer la nutrition de famille, et renforcer les réseaux sociaux. Cependant, à cause que des raisons décrites dans cet essai, le jardinage traditionnel de maison diminue à Petén.

## INTRODUCTION

This essay describes the structure, management, and socio-economic benefits of traditional gardening practices in the neotropical lowlands of Petén, Guatemala's northernmost department (equivalent to a province or state). In 1959 the government of Guatemala opened then sparsely populated Petén to development and colonization. State policy favored and still favors capitalist agro-export development, including promotion of industrial logging and large cattle raising estates. The state has also used Petén as a safety valve to vent peasant demands for access to land. The results of these contradictory policies have led to the conversion of over 40% of Petén's forests to pasture and croplands, and the population has grown from 25,000 people in 1964 to an estimated 600,000 by 2006, 60% of whom depend on small-scale swidden to survive. Factors, such as increasing land concentration, soil depletion, and inadequate access to markets, threaten smallholder economic and nutritional welfare.

Alarmed by accelerating rate of deforestation, the government, with international donor aid, created a National Council of Protected Areas in 1989 to manage the Maya Biosphere Reserve, created in 1990. In 1990, international non-governmental organizations (NGOs) began promoting "sustainable" agricultural, agro-forestry, and gardening projects to conserve natural resources and improve smallholder welfare in order to stall the advance of the agricultural frontier. The NGOs have generally ignored traditional Petén practices although Peteneros achieve what the NGOs have been unable to do – develop a gardening system with multiple benefits (Atran et al. 2002; Chemonics 2003; Ruonavaara 1996; Shriar 2002).

As many comparisons will be made to Ruonavaara (1996), the purposes of her study should be described, even if briefly. Ruonavaara notes that NGOs and the government have sought agricultural alternatives to "inappropriate" agrotechnologies migrants bring from the highlands to the lowlands of Petén. Alternatives have included "improved" home gardens designed to satisfy householders' needs and to conserve the environment. However, the NGOs have attempted an inappropriate transfer of temperate climate garden models to the tropical lowlands, while ignoring traditional Petén gardening practices (1996:1–5). As a corrective, Ruonavaara develops a "conceptual model" of native Petenero gardens based on direct observation and on Peteneros' own understanding of gardening. She describes and compares the bio-physical structure of gardens in San José, a native Petén Maya community, and Santa Ana, a community with many migrants, where, preliminary studies indicated, the migrants had "diverse and complex *ladino* gardens" (Ruonavaara 1966:43, italics in the original). Ruonavaara worked primarily with women, selected through her informal contacts with people in both towns. The bio-physical model is well-developed, but, perhaps because her garden field work was limited to two

months, she found it "...difficult to elicit [from the gardeners] in-depth discussions of management practices." Thus, "...further documentation of more detailed management practices remains to be done..." (Ruonavaara 1996:117). The present study is another step in that direction.

## STUDY AREA AND METHODOLOGY

Petén (35,400 km<sup>2</sup>) comprises one-third of Guatemala's land mass. Petén can be divided into three broad geographic regions: (a) the northern forests, which constitute the southernmost extension of the Yucatán plateau; (b) the central lake region, which includes Lake Petén Itzá and an extensive savanna just south of the lake region; and (c) the southern forests which are moister than the northern ones. Native Peteneros tend to live in densely settled, nucleated towns, commuting to their swidden plots which are usually located four or more kilometers from town. Petén farmers maintain orchards and gardens near their swidden plots, sometimes in fallowed plots. They and their families also have gardens in the patios of the town house. Two of the oldest towns in Petén (San Andrés and San José) are located in the mesic forests rising from the northern shores of Lake Petén Itzá. There are several equally old towns (La Libertad and San Juan de Diós) in the central savanna (Figure 1).

Most of the soil derived from the karstic geology of neotropical Petén depends on leaf litter for organic nourishment. Removal of forest cover leads to soil erosion and depletes soil nutrients, reducing crop yields. Gardening is one way Peteneros adapt to their environment without extensive forest conversion.

This study is based on a sample of 23 native Petén gardens in the towns of San José and San Andrés, located on the northern side of Lake Petén Itzá, and Libertad and San Juan, located in the savannas of south-central Petén, as noted above. Fifteen of the gardeners are descendents of pre-Conquest indigenous Itzaj Maya populations resident in the Petén long before the Spanish conquest of the region. Six gardeners are *Ladinos* of mixed Spanish and Maya descent whose families have lived in Petén since before 1835. In two cases, the male head of household is a non-Peténero married to a native Peténera. Some data was also obtained from six recent migrants to Petén, five of them *Ladinos* from eastern Guatemala and one a Maya from the western highlands of the country.

Four methods were used. (a) Mapping: gardens were measured, and plants of all species (except ornamental flowers) in each garden were placed on a grid map and counted; (b) Plant identification: botanists at Fundación ProPetén, a Guatemalan NGO, identified the plants; (c) Survey: with the help of local students, a survey was used to obtain socio-economic and demographic data for each household; (d) Ethnographic interviews: guided and informal interviews were conducted by the authors with gardeners on site. In several cases, records were kept on plant use and on what plants were sold, in what quantities and at what price.

## GARDEN SIZE, STRUCTURE, AND MANAGEMENT

Traditional gardens are relatively large, varying from 770 to 6,340 m<sup>2</sup> with a mean of 1,856 m<sup>2</sup> and a median of 1,573 m<sup>2</sup>, and have four distinct strata. The

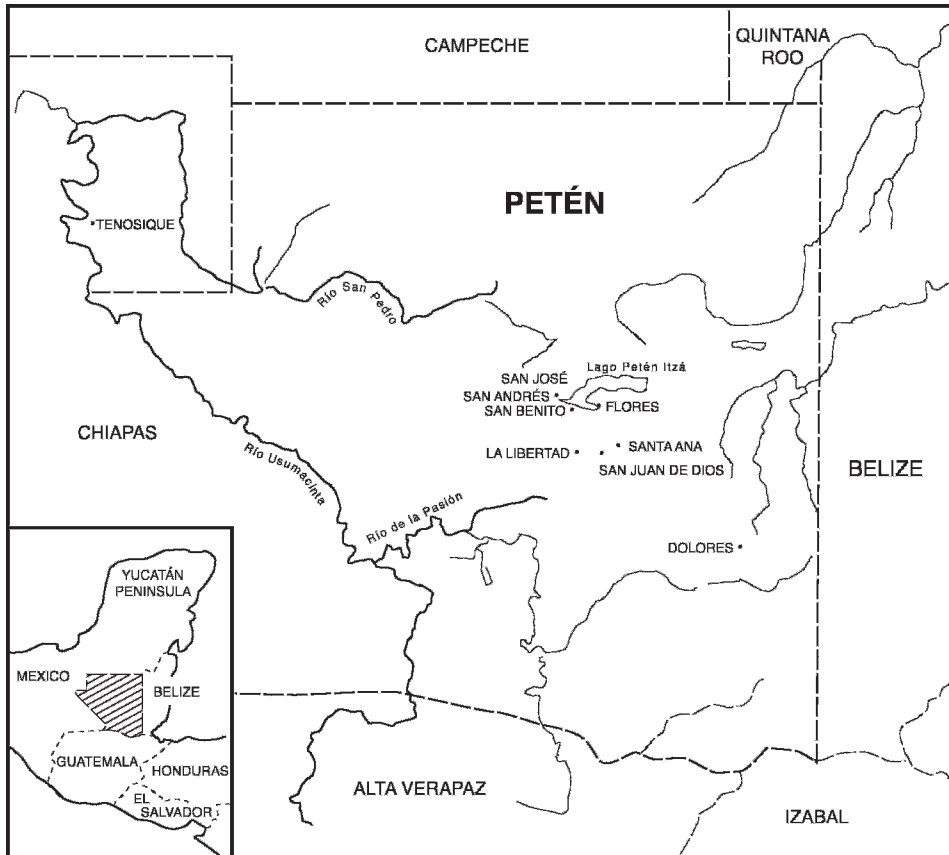


FIGURE 1.—Location of communities (map by the authors).

lowest stratum consists of herbs, ornamentals, and some other plants. The mid-level stratum consists of shrubs, small fruit trees, and leafy growth from root plants. The third stratum is mainly fruit trees, and the highest is composed of canopy trees. Ruonavaara (1996) notes a fifth stratum – vines and epiphytes – but we saw few epiphytes and could not clearly distinguish this level. Gillespie et al. (1993:169) found the “diversity of garden architectures efficiently used sunlight ... [and though gardeners seemed not to know] about optimal spacing of trees and shrubs ... the light interception study suggests that they develop such a structure.” We found gardeners do discuss the need to trim canopy trees to make sure that they do not block access to sunlight for other plants.

The gardens, roughly rectangular in shape, have a recognizable horizontal floor plan. The house (facing the street) and detached kitchen area, with few large trees, is suitable for plants requiring sunlight. Here there are plants in pots (some for transplanting), trellises for chayote (*Sechium edule* Jacq.), herbs, condiments, some shrubs, and a few short fruit trees, as well as the “woman’s plantation” (flower beds). The perimeter of the house lot and garden is protected by wooden fences (in fact, in Petén gardens are called “fences” not “gardens”). Large palm

and canopy trees are along the sides and especially at the rear of the yard and close to the fence. Herbs or shrubs may be planted between the trees. A central area contains a wide range of roots, tubers, vegetables, shrubs, and fruit trees. Run-off from the kitchen and washbasin keeps this area damp and moist. There is usually a clear area for construction of a second house located on either one side of the house or toward the rear of the yard.

Peteneros manage their gardens using detailed knowledge of minute variations in garden soil and terrain, and of the history and needs of particular plants. Gardeners use a wide-range of seedbeds, including elevated wooden structures that may be covered with black soil. Flowers, herbs, and certain vegetables are tended in the elevated wooden beds. Aside from the elevated beds, the most common way to protect young or fragile plants from domestic animals is to encircle the plant with spiny orange tree twigs or small stones and rocks.

Apparently, owing to management and species diversity, gardens are not plagued by weeds or many insects. Leaf-cutter ants are the major, if not the sole, insect threat (Ruonavaara 1996:63). Gardeners "cure" trees threatened by insects in several ways, including painting the trunk of trees up to a meter with lime or tying a bag containing a mixture of young maize cobs, lime, and eggshells around the trunk. They may also add soap to the water carried off from the house and other structures through narrow ditches that extend to the middle of the garden. The soapy water can kill aphids and other pests by removing the waxy covering that protects them from desiccation (Ferguson personal communication)<sup>1</sup>. Domestic fowl also consume their share of insects.

Older Peteneros are not familiar with NGO or even common Spanish words for composting, mulching, etc.; instead, they speak of "cleaning" the garden. This work is almost always done by women. For example, the women take black soil from one part of the garden (but not from the latrine area) and mix it with chicken manure or bird droppings to fertilize young plants. Gardeners make piles of leaf litter and refuse to be spread in parts of the garden. Gardeners say litter from coconut and avocado trees is especially good for "softening" and enriching the soil. To give but one other example, gardeners, especially in the savanna towns where soil is highly acidic, sweep refuse and leaf litter into one or more piles, burn them, and then spread the ash around the base of trees or throughout the garden. In short, gardeners know how to compost, mulch, and maintain soil moisture.

Four additional comments are in order, though space limitations allow no more than brief mention. First, generalizations about plant associations are difficult to make because the specific associations found in any given garden depend on the gardener's personal preferences, garden history, and environmental micro-variations. With this caution in mind, it may be noted that species requiring less shade are close to the house or in the small open spaces within the garden. Toward the rear of the yard, tall branching trees provide shade for plants such as coffee and malanga (*Xanthosoma sagittifolium* L.). Many gardens cluster together up to four plants. For example, the branches of an orange and gourd tree intertwine, and a squash plant uses the trunk and branches of both trees for support, while chili peppers nestle beneath all three plants. Gardeners rarely

make general comments about plant associations, but they do talk about associations in their own gardens.

Second, garden management involves treating plants, especially trees, as if they had individual personalities. If a fruit tree is not productive enough, people will “scold” or “shame” the plant by tying old shoes or tattered garments on one of its limbs. They may also hit it with the flat end of a machete. To quote one gardener: “You spank a tree as you would a child, to make the child grow straight.” A woman also may speak in an indirect fashion to intimidate a tree, usually one near the house, by telling another person within the hearing of the tree, that she plans to scold, whip, or even uproot it because it is not producing. This often “frightens” the tree into behaving (producing) as it should. In general, women, who spend more time at home than men, administer routine discipline to plants as well as to children.

Third, garden management is a family affair requiring an adult female and male and children. Adult men or older boys trim and transplant trees, repair fences, and, when needed, do heavy weeding. Women and children tend seedbeds and domestic fowl, protect young or fragile plants, do light weeding, mulch and “sweep” the garden, and so on, but men may also help with these tasks. The division of labor is not rigid, except for the cultivation and preparation of annatto (*Bixa orellana* L.), a woman’s work. Annatto is the one plant explicitly cultivated for sale, and the income belongs to the woman who plants and prepares it. Otherwise, a well-managed garden implies the presence of a complete family.

Last, Peteneros sometimes talk as if domestic animals, especially domestic fowl (chickens, ducks, turkeys) were intrinsic to gardens. Just as one plant “helps” another, as in the case of the cluster mentioned previously, so the fowl “help” the garden. The fowl dispose of insects and their droppings can be used as fertilizer, and, in turn, the fowl get to eat kitchen refuse. Gardeners care for the fowl, and the fowl provide them with eggs and meat. (Pigs are not common in the home gardens, though many women keep them elsewhere as a sort of ambulatory emergency bank account.) There is, in all of this, a sense of reciprocity – plants “help” one another grow, men and women share garden tasks, fowl “help” the garden, which sustains them, and so on.

#### NUMBER AND DIVERSITY OF PLANTS

We found over 180 species of plants in the gardens (Corzo 2005:68–74). The mean for the two towns on the northern shores of Lake Petén Itzá was 49 species per garden, and the mean for the two savanna towns was 57. In contrast, the mean for the six migrants’ gardens was 17 species, a number consistent with Mollinedo Pastrana’s (1997) observations of *ladino* migrant gardens. As for individual specimens, across the entire sample the mean was 392 plants per garden (Table 1). Garden plants are used for everything from food and condiments to fuel wood and craft goods (Table 2). However, the principle uses are for food and food seasoning, for medicine, for adornments (marigolds and crotons are especially favored), and for timber to make tools and for use in building construction.



TABLE 1.—Number of species per household garden, Petén.

Garden	San Andrés	San José	La Libertad	San Juan de Dios	Migrant Gardens
1	46	76	68	50	12
2	72	51	66	58	16
3	58	36	63	67	17
4	48	32	81	45	17
5	51	32	57	70	21
6	32		59	58	
Mean	51.2	45.4	65.7	58.0	16.6
S.D.	13.3	18.8	8.6	9.6	3.2

Ruonavaara used the Brillouin diversity index to compare Itzaj Maya gardens in San José with *ladino* migrant gardens in Santa Ana. She found "The average diversity index of Itzaj Mayan gardens is 2.5, while that of the *ladino*" migrant gardens in Santa Ana "is 2.6" (1996:74). Because Brillouin may be appropriate when a plant community is completely censused (Ruonavaara 1996:60; Mugarren 1988), and because we wanted to compare our results with Ruonavaara's, we used the same measure she did. We also used a Shannon-Weaver index, which also measures diversity, as a double check. Shannon-Weaver is a measure of diversity or heterogeneity, combining richness (number of taxa or species) and evenness, that is, "how equally abundant species are" (Mugarren 1991:7). Homogeneity is the opposite of diversity. Dominance refers to the comparison of the most frequent to all less frequent taxa.

Our Brillouin H diversity index is significantly higher than Ruonavaara's, ranging from 4.0 to 4.4. For the Itzaj of San José our Brillouin H index was 4.2. The major reason for the difference may be that Ruonavaara did not count every plant in the garden, whereas we did. The Shannon-Weaver diversity index for our sample also is high (Table 3). Gardens are managed so that no particular plant or small handful of plants dominates the whole, as the "average evenness measure" indicates (Table 3). The result strengthens the observation that Peteneros manage their gardens to make the best use of the available space (Gillespie et al. 1993).

TABLE 2.—Principal use of plants in Petén gardens.

Principle Use	Number of Species Used
Food, including condiments	102
Medicinal	40
Timber (for construction and tools)	23
Ornamental	22
Living fences	7
Fuel wood	6
Craft goods	3
Ritual	2
Other (including forage for horses)	8
Total	214

Source: Corzo 2005:42. Some plants have more than one use, but the focus here is on the principal use as defined by the gardeners.



TABLE 3.—Diversity and evenness of Petén gardens.

	San Andres	San Jose	Libertad	San Juan
Brillouin H diversity index	4.0	4.2	4.4	4.4
Shannon-Weaver diversity index	4.3	4.6	4.7	4.7
Average evenness measure	0.926	0.801	0.947	0.947

As Table 3 indicates, gardens are more diverse in the savanna communities (San Juan de Dios and La Libertad), where the commitment to traditional gardening is greatest, than in the lakeshore communities (San Andrés and San José). People in the savannas have traditionally relied more on gardening than those in lakeshore communities because the savannas soil is less productive for milpa than the soil of the lakeshore. Consistent with this observation, garden composition is most homogeneous in San Juan (the most traditional of the communities considered here), and the least homogeneous in San José, where people are giving up gardening faster than in the other communities. As the dendrogram, measuring taxonomic degree of relationship among plant species in each garden indicates, San Juan gardens are relatively more homogenous (Figure 2). In addition, San Juan gardens are more similar to La Libertad gardens than to gardens in lakeshore towns.

In short, traditional gardens exhibit low dominance and notable richness. The more traditional gardens (San Juan, La Libertad) are richer, more even and have lower dominance than less traditional ones (San Andrés, San José). Peténero gardens are richer than migrant ones; just as traditional Petén milpas have more inter-crops than migrant milpas (Atran et al. 2002).

The plants most frequently found in the gardens are citrus, coconuts, nanzas, avocados, chili peppers, annonas, hog plums and bananas (see Table 4 for a list of plants including scientific names, authorities, and common names). The most common genera are *Citrus*, *Capsicum*, *Musa*, *Spondias* and *Solanum*. A majority of the plants most commonly found in the gardens – those that occur in 75% or more of the gardens – are trees (Table 4). In this sense, the term “forest garden” (Ford et al. 2005, present volume) is descriptive. However, in Petén “fences” are associated with residence in town and village and are distinguished from orchard-gardens found adjacent to milpas where major crops such as maize and beans are planted. Even people who no longer farm may and do maintain elaborate gardens in town, and so it is reasonable to call them home or even town gardens.

#### ECONOMIC AND SOCIAL BENEFITS OF TRADITIONAL GARDENS

The economic contribution home gardens make to household welfare is often said to be “marginal” (as noted in Kintz’s review of the literature 1990; also see Ruonavaara 1996). However, we found it could be substantial. It is easy to overlook the financial benefits of a garden – except for annatto, sales are small; prices vary from person to person and almost from day to day; and gardeners do not keep account books. Moreover, women, who make most of the sales, treat them as incidental to social visits. The cultural convention is that gardeners do

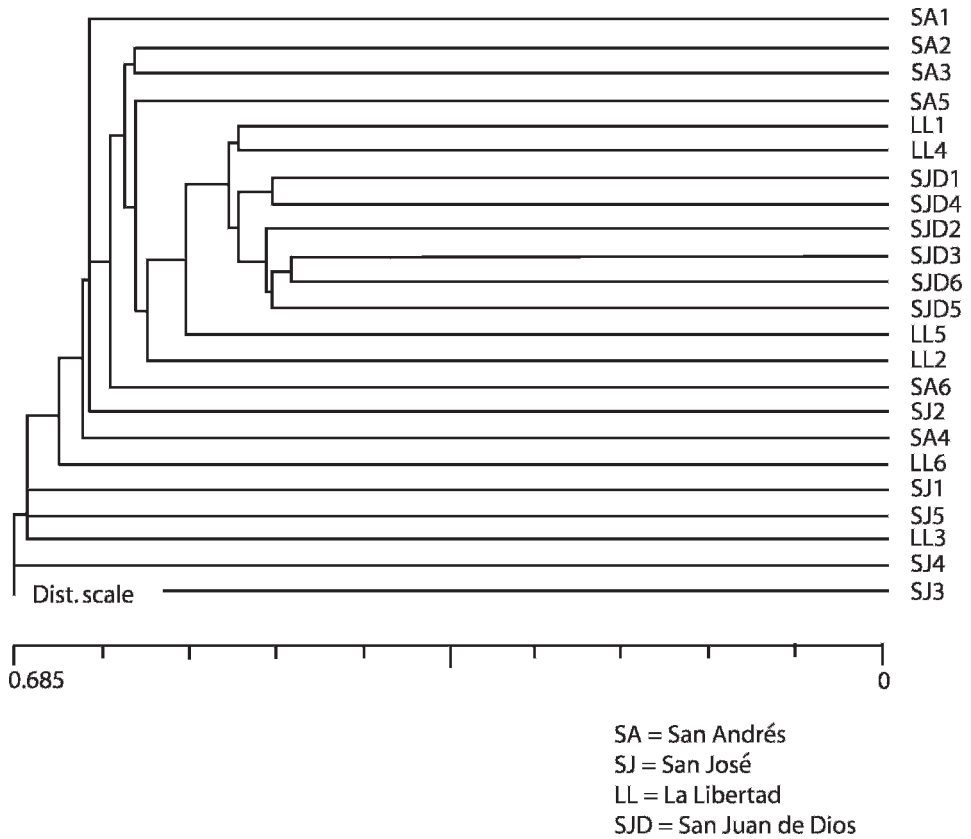


FIGURE 2.—Simple linkage cluster.

not “sell” their products for that would violate norms of generosity. Rather, a visitor expresses an interest in some product, which the gardener may initially offer as a gift, and which the visitor may accept as such or insist on paying for. Hence, to collect financial data means constant visiting and direct observation. In this case, college students who are from and live in La Libertad and San Andrés collected data from their kinfolk. In general, the college students and their families are, like most native Peteneros, economically better-off than the vast majority of the farmers who have migrated to Petén in recent decades. However, none of the students or their families are wealthy and some would be considered “poor” by other Peteneros.

In 2002 the monetary value of garden sales averaged Q1,267 (Q = quetzal, the standard unit of Guatemalan currency; in 2002, 1 USD was equivalent to approximately 7 quetzales). When the equivalency value of products consumed rather than purchased was added in, the value of the gardens varied from Q2,290 to Q3,047, without taking into account poultry and eggs. This meant the value of the average garden was about 15 percent of total household income. Leiva et al. (2002:72) report a similar figure (18%) for ten Q’eqchi households in Chisec, Alta Verapaz.

TABLE 4.—Species which appear in 50 per cent or more of gardens in sample.

Scientific name	Common name	English Scientific name	Common English name
<i>Citrus sinensis</i> (L.) Osbeck	Sweet orange	<i>Aloe vera</i> L.	Aloe
<i>Citrus limon</i> (L.) Burm. f.	Lemon	<i>Coffea Arabica</i> L.	Coffee
<i>Cocos nucifera</i> L.	Coconut	<i>Solanum nigrum</i> L.	Black nightshade
<i>Brysonima crassifolia</i> L. Kunth	Nanze	<i>Brosimum alicastrum</i> Sw.	Breadnut
<i>Persea Americana</i> Mill.	Avocado	<i>Talisa olivaeformis</i> Kunth	Guaya
<i>Capsicum spp.</i> L.	Chili pepper	<i>Xanthosoma sagittifolium</i> L.	Malanga
<i>Cordia dodecandra</i> DC	Copte	<i>Capsicum chinense</i> Jacq.	Habanero
<i>Musa x paradisiacal</i> L.	Plantain	<i>Jatropha curcas</i> L.	Purging nut
<i>Manifera indica</i> L.	Mango	<i>Terminalia catappa</i> L.	Tropical almond
<i>Psidium guajava</i> L.	Guava	<i>Bixa orellana</i> L.	Lipstick tree
<i>Citrus reticulate</i> Blanco	Mandarin orange	<i>Manihot esculenta</i> Crantz	Manioc
<i>Annona reticulate</i> L.	Custard apple	<i>Saccharum officinarum</i> L.	Sugarcane
<i>Annona muricata</i> L.	Soursop	<i>Cnidocolus acontifolius</i> McVaughn	Chaya
<i>Yucca elephantipes</i> Regel	Izote	<i>Annona squamosa</i> L.	Sweetsop
<i>Gliricidia sepium</i> Jacq.	Madre cacao; quick stick	<i>Erythrina guatemalensis</i> Krukoff?	Coral tree
<i>Bursera simaruba</i> (L.) Sarg.	Gumbolimo	<i>Coriandum sativum</i> L.	Coriander
<i>Carica papaya</i> L.	Pawpaw	<i>Allium spp.</i> L.	Chive
<i>Capsicum frutescens</i> L.	Cayenne pepper	<i>Cedrela Mexicana</i> M.Roem	Cedar
<i>Musa sapientum</i> M.	Banana	<i>Sechium edule</i> Jacq.	Chayote,Squash
<i>Spondias purpurea</i> L.	Hogplum	<i>Spondias spp.</i> L.	Hogplum

In fact, the 15% underestimates the potential economic contribution gardens can make to the family economy in Petén. Because they are better educated than most migrants and have access to higher-paying occupations, Peteneros on average earn more than most smallholder migrants, who, in 2002, were averaging gross incomes of about Q8,604 per year (Chemonics 2003:6). An additional Q1,267 in cash would hardly be "marginal." Another advantage to garden income is that in Petén women, who administer most of this income, more often invest it in household welfare than men do (Ferguson, personal communication).

Gardens can also make up for shortfalls in farm production. Although field maize and beans are the dietary staples, when they are in short supply, gardens produce enough throughout the year to help sustain the household. Since people have more control over water with respect to gardens than to farm fields, gardens are less vulnerable to climatic stress, particularly short-term droughts, than farm fields. Moreover, the diversity of foods produced in the gardens may improve family nutrition (Grandia 2004).

Gardens also have social benefits that are easily as important as the financial ones, even if a metric cannot be assigned to social values. Gardens provide families with privacy in towns where much of life is otherwise lived under constant public scrutiny. The garden is a shaded space where family and intimate

friends can gather to exchange gardening tips and the gossip of the day. Peteneros comment on the pleasing odors of the plants in the garden, and they make fine distinctions about the taste of the fruits, herbs, and other plants there. Women, more than men, also express delight in the colors of the flowers in the "woman's plantation." Each woman has her own particular repertoire of garden knowledge, and when other women seek her advice about gardening, this adds to her prestige. Gardening occasions a good deal of social bonding. Gardens provide people and most certainly provide older women with social and aesthetic (olfactory, visual, gustatory, and even tactile) pleasure as well as material benefits in the form of medicinal plants, foodstuffs, supplementary income, and so on. It is not an accident that the best place to interview people is in their gardens, where they are relaxed and open. Interestingly enough, people who had the least contact with NGOs were the most generous with their time, information, and companionship.

The exchanges (gifts, information, gossip) that occur with respect to gardens strengthen a household's and an individual's (especially a woman's) social network. The person to whom ego gifts garden products or imparts gardening "secrets" can be approached for assistance in a wide range of social, economic, and political contexts. The personalized networks of kin, friends, and neighbors, expressed and strengthened in connection with gardening, are important in a society that lacks strong public welfare institutions and where political life is highly personalized. The "fences" of Petén are socially as well as botanically rich spaces.

### CONCLUDING DISCUSSION

Traditional home gardens in Petén have "multiple functions" (Ruonavaara 1996:112). Gardens may play a role as *in vivo* gene banks. They contribute to food security and have the potential to improve nutrition, though this is subject to further research. Well-established gardens can also make significant contributions to household finances. Gardens provide people with places and occasions for reinforcing personalized social bonds that help compensate for the absence of strong public welfare institutions. Just as important, though impossible to quantify, gardens are a secure somewhat private space, blessedly free of biting insects, where grandparents, parents, and children can relax and enjoy life.

Despite the benefits, younger Peteneros are losing interest in gardening and other agrarian pursuits for several related reasons. Rapid demographic and economic growth in Petén has generated demands for a wide range of services in NGOs, public education, commerce, and in building trades. Peteneros (on average much better educated than most migrants) are moving from agriculture into these higher-paying sectors. Higher incomes give the youth the opportunity to invest in leisure-time activities, particularly in the urban center of Petén, and recently improved roads makes it easier to reach the center. In the past several years, town and even village real estate prices have skyrocketed, leading some Peteneros to sub-divide their house lots for sale or to build houses on existing lots to accommodate kin. We observed that as a result of all this, younger Peteneros lack the time, need, or interest to garden.

However, as the NGOs assert, impoverished migrants could benefit from improved gardens. About 50% of them do no gardening at all (Shriar 1999:147). The problem seems to be that NGO-promoted gardens are not compatible with local environmental conditions or people's needs. NGO gardens have less species diversity than traditional ones, tend to be "...single-layered structure[s] of introduced annual species..." (Ruonavaara 1996:94; cf Atran et al. 2002), planted in straight lines with homogeneous plots within the garden (Corzo 2005:40). Whatever the case, the intended beneficiaries are not adopting the NGO gardens. As Ruttan (1988:256) notes: "Experience has taught us ... that when peasants refuse to adopt the practices recommended by agronomists and economists, it may be the experts rather than the peasants who are wrong."

It might make more sense to promote traditional Petén home gardening through householder-to-householder programs, thereby building on an informal practice already in place (Ruonavaara 1996). Older Peteneros, especially older women, express regret about the decline of traditional gardening and are willing to share their knowledge with others, so there is a corps of experts on hand. Perhaps the best role for NGOs is simply to facilitate links between these experts and the migrants. This would make it easier to combine traditional expertise with modern scientific knowledge and also be a way to maintain local knowledge, which is carried in oral tradition (Faust 1998:20). Traditional gardening knowledge is science, albeit with a small "s," and enlisting traditional Petén gardeners in extension programs can benefit migrants and help maintain an important knowledge base derived in part from the past and in part from each gardener's on-going experimentation and experience. If Peteneros were given leadership positions in extension programs, benefits might accrue to migrants and to conservation and might encourage Peteneros themselves to maintain their knowledge. The NGOs seem to have lost their bet, so it is time to turn to the local experts.

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#### NOTES

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