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Fruits from shade trees in coffee: how important are they?

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Abstract Agroforestry systems often receive attention and support in the literature for what is perceived as the benefits from multiple products associated with the trees that create the "forest" component of the setting. A comparison of small coffee growers' use of fruits derived from the coffee agroforestry holding in Guatemala and Peru reveals that significant differences exist between these groups—not merely in the importance of the fruits themselves, but in the ways they are used. The overall importance of fruits from the coffee system accounts for a relatively small portion of the total value coming from the coffee area (about 10%), but the consumption and sales of the various products do generate needed income or sustenance for most farmers. The fate of fruits shows significant differences between the two countries. Whether at the farm level or on a per hectare basis, Guatemalan coffee farmers are more linked into a market economy and sell significantly more fruits than Peruvian farmers. The opposite is the case when on-farm consumption (use value) of the fruits is compared. While the potential value of these products may be quite large (from $95 to $270/ha), we find that little gets consumed or sold, resulting in tremendous loss of potential benefits that could flow from these sources. Both groups lose more fruits than are sold or used, with Guatemalans foregoing more than three times the dollar value per hectare than Peruvians ($151/ha vs. $44/ha). Data about the economic context within which these growers and the fruits from coffee are found reveal possible reasons as to why we see the differences in use and exchange values realized in the two countries.

Keywords Shade coffee · Fruits · Agroforestry · Farm income · Guatemala · Peru

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Introduction

Agroforestry systems often receive attention and support in the literature for what is perceived as the benefits from products associated with the trees that create the "forest" component of the setting. Geared as they so often are to the production of a focal crop like coffee or cacao, with supplemental or obbligato products in the form of fruits and wood products, many agroforestry systems reportedly contribute to the diet, income and general well-being of the land managers involved (Garrity 2004; Garrity and Cooke 2010; Gockowski and Dury 1999). Research efforts focused on farmers' welfare with links to tree products from agroforestry have centered around domestication of local tree crops such as the bush mango (*Irvingia gabonensis*), African nut (*Ricinodendron heudelotii*), or African plum (*Dacryodes*

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edulis) (Garrity and Cooke 2010; Leakey et al. 2005), or on timber tree production within cacao or coffee systems (Beer 1995; Somarriba 1990). As noted elsewhere, studies that focus on the value derived from fruits from the shade trees in coffee are lacking (Albertin and Nair 2004), resulting in little data that reveal the fate of these associative products. Knowledge of these products and how important they are to land managers can be critical to biodiversity maintenance in the tropics, for as Chazdon et al. (2009) state:

> "To truly understand the current status and forecast the future state of tropical diversity, we must also understand levels and patterns of biodiversity in landscapes actively managed and modified by humans for a wide variety of traditional and *commercial purposes*…" (emphasis added)

This study examines the value of fruits produced in coffee agroforestry systems in Peru and Guatemala, revealing that the diversity, importance and fate of such products can vary greatly from one place to another. While the potential realized value of these products may be substantial, the ways these non-coffee products are used (or not used) can differ dramatically. Understanding the overall socioeconomic matrix in which farmers operate provides insight into these differences.

Scant studies of coffee agroforestry systems reference the benefits linked to and derived from the non-coffee products flowing from the shade systems (Escalante et al. 1987; Escalante 1995; Kehlenbeck and Maass 2004; Langemann and Heuveldop 1983; Muschler 1999; Rice 2008). Given that it is small landholders, most often the sub-sector responsible for managing such diverse, multi-use systems, who deserve focused attention from policymakers concerned with agriculture and development (Garrity 2004; IAASTD 2009; WOLA 2008), studies of how agroforestry systems contribute to local income are sorely needed. Several studies have focused on shade coffee settings and acknowledged the importance of fruits from the system (Méndez et al. 2001, 2010; Moguel and Toledo 1999; Perfecto et al. 2007; Philpott et al. 2007; Soto-Pinto et al. 2007; Somarriba et al. 2004; Escalante et al. 1987; Escalante 1995; Westphal 2008) and some have catalogued the different contributions that shade trees can make. But it is the assessment of the actual value—whether in terms of use or exchange—of the shade-derived products associated with agroforestry systems that can better inform us as to the real importance of these associated products at the farm level. A comparison of the wood products harvested from coffee systems in Guatemala and Peru (Rice 2008) showed significant differences in how growers use the hardwood species that comprise the shade cover in coffee agroforestry systems. The study at hand evaluates the fate of fruits from the coffee agroforestry setting, comparing their relative importance to Guatemalan and Peruvian growers and how they use these products, as well as examining the rural context within which growers manage the coffee agroforestry system.

Study area and methods

This study draws from structured surveys and field observations made between 1999 and 2003 in Peru and Guatemala, and on field observations and informal interviews in a number of Latin American coffee settings. Data on fruit grown within the coffee production area of the farm were gathered through a series of specific and open-ended questions on the type, quantity and value of goods associated with the coffee agroforest system. "Value" refers to both the *exchange* value of the fruits (i.e., realized from products sold locally, regionally, and—in the case of the coffee itself—internationally), as well as the *use* value (realized from in situ consumption by the farm family) of fruits derived from the shade component. The "shade component" refers to the shade trees themselves. Local market prices provided the metric for both types of value.

The Peru site encompasses the valley and upland areas adjacent to the Apurimac and Ene Rivers, located near the towns of San Francisco and Quimbiri in southern Peru. The Apurimac River drains in a generally northwest orientation within an area stretching between 11°30′ and 13°00′ latitude south and 73°30′ and 74°30′ longitude west. The area straddles the departments of Ayacucho and Cuzco, and the coffee area has long intermixed with other land uses at elevations between 800 and 1,450 m above sea level (SCIPA 1961). For Guatemala, the study draws upon numerous areas such as the department of Sacatepequez near the colonial town of Antigua, the borders of Lake Atitlán and the highland area of the department of Huehuetenango near the Mexican border. These Guatemalan sites range in elevation from 900 to 1,400 m above sea level.

Growers were interviewed using structured questionnaires and informal discussions that focused on the fruits derived from the coffee holdings. Given the small size of the holdings (2–4 ha of coffee area, on average) and producers' detailed knowledge of their holdings, growers were asked to provide information on the species and number of various fruit trees, the number of fruits an average provides, and the value of these fruits when sold at market. Data on total number of fruits for all types mentioned could then be generated and the value derived. The questionnaire and the informal discussions with growers gathered data on the use, exchange, and loss of these fruits, seeking to provide an understanding of how value is or is not realized. Income from other sources like off-farm labor, out-of-country remittances and income from other crops was also gathered and quantified from these discussions and questionnaires.

Interviews were completed with 186 producers in Peru and 153 in Guatemala. While visits to individual farms occurred for nearly all of the interviews, the information presented is based on answers provided by the producers. Information obtained from interviews includes farm-level information on farm characteristics, as well as income from coffee and other products derived from the coffee agroforestry system. One-way analysis of variance has been used to determine significant differences between the two countries' coffee sectors. Contrasts are drawn from the entire data set for both countries.

Results

At the farm level, Peruvian growers mentioned twice as many fruits on average compared to Guatemalan farmers (3.9 vs. 1.9, respectively), revealing a significant difference ($F = 111.6$; df = 1,335; and $P < 0.0001$). Questionnaires yielded data on the more important fruits produced, and the proportion of all growers identifying the top five most important species were calculated. Differences in ranking major fruits emerge immediately, with a higher percentage of Peruvian growers providing answers than their Guatemalan counterparts (Tables 1 and 2).

While the combined total of all shade-derived products (wood, fruits, animals, etc., see Rice 2008) generates more value on average at the farm level in Guatemala than in Peru (Table 3), there are differences in the fate of these fruits. Their sale or exchange brings nearly seven-fold more value to Guatemalan growers in absolute monetary terms, and more than twice the amount percentage-wise (Fig. 1). By contrast, Peruvian producers realize nearly three times the value from personal, on-farm use (consumption) of the fruits. As Table 4 shows, however, farmers in both countries could realize much more value from the fruits produced on their farms, losing 60 and 45% of this potential value in Guatemala and

Table 1 Proportion of Guatemalan coffee farmers ranking various fruits obtained from the shade trees in coffee; $n = 152$

Ranked as:	1st Fruit	2nd Fruit	3rd Fruit	4th Fruit	5th Fruit
Chamedorea spp.	–	5	9	11	8
Citrus × *sinensis*	21	22	15	7	8
Other *Citrus* spp.	3	11	4	26	15
Diospyros spp.	–	4	–	–	–
Mangifera indica	2	–	6	–	–
Musa spp.	36	24	17	19	39
Persea americana	26	12	11	11	–
Sechium edule	–	4	–	4	–
Spondias mombins	5	8	15	4	–
Other	9	10	13	18	30
% providing answer	*77*	*50*	*31*	*18*	*9*

Calculations based on those farmers providing answers

Table 2 Proportion of Peruvian coffee farmers ranking various fruits produced from the shade trees in coffee; $n = 152$

Ranked as:	1st Fruit	2nd Fruit	3rd Fruit	4th Fruit	5th Fruit
Citrus aurantifolia (lime)	<1	4	9	3	8
Citrus × *limon*	–	< 1	1	2	–
Citrus spp. (mandarin)	2	4	6	4	11
Citrus × *sinensis*	7	9	11	8	8
Inga spp. pods	–	–	–	2	–
Mangifera indica	3	6	1	4	1
Musa spp.	73	62	67	63	58
(# *Musa* spp. types)	{13}	{14}	{11}	{15}	{13}
Persea americana	13	11	2	11	12
Other	1	3	3	3	2
% providing answer	*97*	*86*	*77*	*63*	*40*

Calculations based on number of farmers answering

Table 3 Average value (US dollars) of all shade products and fruits from coffee farms (for all growers at farm level); SE in parentheses

	Guatemala ($n = 152$)	Peru ($n = 185$)	*t*-test results
Total shade value[a]	348 (*39*)	227 (*35*)	$t = 2.28$ (df = 335) $P < 0.02$
Fruits sold	139 (*30*)	19 (*27*)	$t = 2.94$ (df = 335) $P < 0.004$
Fruits used	25 (*7*)	70 (*6*)	$t = 4.86$ (df = 335) $P < 0.001$
Fruit value as % of total shade value	47%	39%	

[a] Value includes both use and exchange value of all products from the shade component (e.g., fruits, firewood, lumber, etc.)

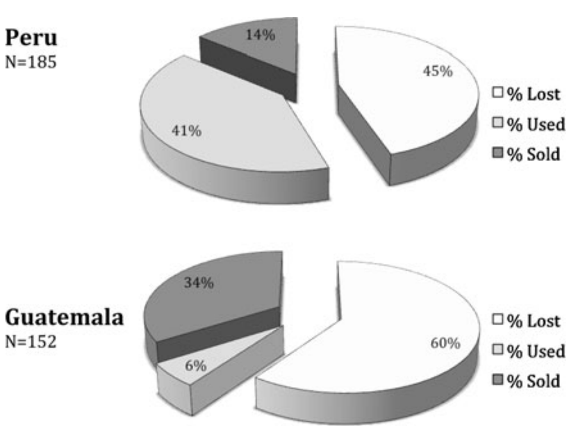

Fig. 1 The fate of fruits in shade coffee farms in Peru and Guatemala, based on average farm value of all fruits

Peru, respectively. Figure 1 shows the fate of fruits for both countries in terms of percent value used, sold and lost. *Per hectare*, Guatemalan growers stand to realize almost three times the potential as their Peruvian brethren, and exceed that difference in exchange value nearly 10-fold. Guatemala's producers see a use value of only half that of Peruvian growers, and lose, again on a per hectare basis, between three and four times the value by neither using nor selling the fruits. Comparing farm and income characteristics also reveals significant differences (Table 4). Even though total farm area is not significantly different, Guatemala has greater coffee area, income (from both coffee and shade products), and other income not associated with the coffee area *per se*.

Discussion

As Tables 1 and 2 show, a higher percentage of Peruvian coffee farmers answered affirmatively about fruits in general compared to those in Guatemala,

Table 4 Profile of farm and income for shade coffee systems in Guatemala and Peru; calculated averages (with *SE*) at the farm level unless otherwise noted

	Guatemala ($n = 152$)	Peru ($n = 185$)	t-test results
Farm size (ha)	9.1	10.1	n.s.
Coffee area (ha)	3.5 (0.42)	2.1 (0.39)	$t = 2.38$ (df = 335) $P < 0.018$
Coffee as % area	77 (2.17)	33 (1.96)	$t = 15.03$ (df = 335) $P < 0.001$
Coffee income (USD)	3824 (373)	1003 (338)	$t = 5.6$ (df = 335) $P < 0.001$
Coffee inc. USD/ha	2198 (143)	528 (130)	$t = 8.6$ (df = 335) $P < 0.001$
Yield (kg/ha)[a]	781 (50)	310 (45)	$t = 6.96$ (df = 335) $P < 0.001$
Shade value (USD)[b]	348 (39)	227 (35)	$t = 2.28$ (df = 335) $P < 0.02$
Shade Value[b] (USD/ha)	224 (29)	140 (27)	$t = 2.11$ (df = 334) $P < 0.04$
Potential fruit income	411 (62)	164 (56)	$t = 2.94$ (df = 335) $P < 0.004$
Fruit Potential (USD/ha)	270 (44)	95 (40)	$t = 2.90$ (df = 334) $P < 0.0039$
Lost fruit income	248 (45)	75 (40)	$t = 2.85$ (df = 335) $P < 0.005$
Fruit Loss (USD/ha)	151 (33)	44 (29)	$t = 2.43$ (df = 334) $P < 0.015$
% Lost for fruits	60	45	n/a
Fruit Sales (USD/ha)	99 (24)	10 (22)	$t = 2.67$ (df = 334) $P < 0.007$
Fruit Use (USD/ha)	20 (6)	41 (5)	$t = 2.73$ (df = 334) $P < 0.007$
Other income (USD) (off-farm and other)	1733[c] (147) [29% of all; 45% of coffee]	771[d] (133) [39% of all; 77% of coffee]	$t = 4.87$ (df = 335) $P < 0.001$

[a] Global average = 750 kg/ha

[b] Includes both use and exchange value of all products from the shade component (e.g., fruits, firewood, lumber, etc.) See Rice 2008, for the role of wood products

[c] 33% from farmer's off-farm work; 23% from family members; 34% from loans; 10% from milpa

[d] 10% off-farm; <1% family members; 48% credits/loans (45% credits); <1% remittances; 40% from chacra, with 21 and 13% of that from coca and cacao, respectively

with at least twice as many listing a third, fourth and fifth fruit. Musaceous species (bananas and plantains) ranked high, with 36 and 73% of growers mentioning it first for Guatemala and Peru, respectively. This group stands out as a distinctive collection for Peruvian farmers, where the percentage of those listing it never drops below 58%, compared to Guatemalan producers, where that fraction never surpasses 39%. Moreover, the varieties of musaceous fruits in Guatemala topped out at four, whereas Peru outstripped that number with up to fifteen types being mentioned.

Guatemala, as Table 1 shows, tended to have a more even spread of different fruits on the farms, with avocados, oranges, other citrus and *pacaya* (male inflorescence of the palm *Chamedorea* spp.) being listed. Peruvian producers manage and differentiate more citrus and musaceous species.

The average difference in those providing answers between the two groups for each of the first-through-fifth category is 37.5%, with a greater fraction of Peruvian growers providing an answer in each case. The relative importance of fruits can be gleaned from these response percentages, where only half the Guatemalan growers responded to listing a second fruit, compared to Peru, where that 50% level was not reached until the fifth fruit listed (40%). Guatemalans seem to specialize in a relatively limited set of products.

In absolute terms, Guatemalan growers realize 53% more value (a significant difference) from all shade-derived products compared to Peruvian growers, and the fraction attributable to fruits is also greater (47% vs. 39%). Peruvian coffee producers consume more of the fruits derived from the coffee systems, whereas Guatemalan growers realize value via sales (Table 3). Both groups lose significant value, whether calculated at the farm level or on a per hectare basis (Table 4). Differences at the farm level in the value of fruits sold versus those used is significantly different for the two groups. However, while Guatemalan growers see a 7.3-fold greater value from fruits *sold* than Peruvian producers, they realize only about a third as much value from fruits *used*. Within the more market-oriented and economically active Guatemalan landscape, coffee growers are either buying fruits to eat, or not eating them much at all (an unlikely situation, given our general knowledge of tropical settings where fruits are produced).

The percentage of total value derived from the coffee system that is attributable to fruits is 9 and 11%, respectively, for Guatemala and Peru. Such figures may seem low for what has been viewed by many as important components of small farmer agroforestry systems, but these averages mask those cases in which growers depend upon agroforestry products quite heavily. Some farmers obtain upwards of 40% of their *cafetal* income from these products. In the department of Sacatepequez, for instance, growers report that the production of *Diospyros* spp. (persimmons or *nísperos*) each year provides cash at a time when other sources of income are quite scarce (personal observation).

Growers in both countries produce bananas, avocadoes and citrus fruits, with mango being of limited importance (because coffee is generally grown at higher elevations than mango). While the pods of *Inga* spp. find some commercial value only with Peruvian farmers, Guatemala growers alone produce hog plum (*Spondias mombins*), pacaya (*Chamedorea* spp.), persimmons (*Diospyros* spp.) and *chayote* (*Sechium edule*) in their shaded coffee systems.

The value of fruits derived from the shade trees in both countries show the dollar equivalent value and how fruits figure into the overall context of the shade-derived products (Table 3). For both groups, the value of fruits hovers around 10% of the total value attributable to the coffee system (see above). This contrasts with the Escalante et al. (1987) study of two coffee agroforestry regions in Venezuela, where the shade component accounted for 58% of the income—though not differentiated into use, exchange or loss—*and* in a different country. While the Venezuela study did not explicitly state it, the figure seems to refer to the value of fruits alone (not the shade). Though the fruits in the study at hand account for a relatively small fraction of the value associated with the coffee systems, a somewhat wider optic can help to see the social and infrastructural landscapes that underlay the significant differences found.

From coffee price differentials assigned to individual countries, it is well known that Guatemalan coffee fetches a higher price on the world market than does Peruvian coffee. While Peru has seen higher prices than Guatemala at times historically, growers in Guatemala received an average price 44% higher than those in Peru between 2000 and 2005 (ICO website 2010). Decades of development projects aimed at improving coffee yields and backed by the United States Agency for International Development, coupled with local efforts from Guatemala's National Coffee Association (ANACAFE), have led to higher yields for growers, whereas Peru's coffee sector has languished by comparison. These distinct trajectories have played a role in what are particular social and agricultural landscapes, not the least of which are significant differences in coffee area cultivated, absolute coffee income as well as coffee income per hectare, and yields—with Guatemalan growers showing a greater involvement and commitment to more intensified management practices (Rice 2008). Coffee in Guatemala is relatively more important in the national economy as an income generator, making up 8% of the foreign exchange (personal communication with E. Eskanasy 2010), compared to Peru, where it competes with hefty mineral exports and accounts for only 2.2% of foreign exchange (Infotrade/Promperu, 2010). For Guatemalan producers, the importance of coffee has undoubtedly drawn them into activities and shaped their attitudes, opportunities and actions with respect to market oriented practices and involvement in general.

Peruvian growers arguably fall into the realm of subsistence farmers more easily than the Guatemalans. For instance, farm income from coffee alone in Guatemala averages \$3824 (Table 4), which is 45% more than the per capita Gross National Income of \$2640. The average Peruvian grower's coffee income of \$1003 weighs in at nearly *one-quarter* the per capita GNI, by contrast (World Bank 2008). Moreover, a question of remoteness and connectivity emerges when the presence and condition of roads (obviously a strong market connection feature) are compared. Peru has a road network density of 0.06 km per square km of land nationally, compared to Guatemala's 0.13 km per square km. And the percent paved roads is 14 vs. 35, respectively, conditions which place Peruvian growers—perhaps especially in this particular study area—at a disadvantage in terms of getting fruits to market (Magid Elabyad, personal communication). Moreover, the number of vehicles per thousand people in Guatemala is more than twice that in Peru, with 116 vs. 52, respectively (World Bank 2008), a critical factor in getting fruits to markets.

The physical connections to markets provided by the more reliable and extensive road network in Guatemala are mirrored by the lacework of connections within the social landscape (see next section). Comparing activities of growers and their family members outside the farm unit supports the notion that coffee landscapes can differ greatly due to geography. Together, these market connections and activities, as well as the income generation related to them, help round out the picture of why we find differences in the use, sale and loss of fruits in these two grower groups. Yet, the lost value by Guatemalan producers is still high at 60% of the potential that could be gained from the fruits (Table 4). Considering that the Guatemala setting is better connected with road networks and that growers realize more value via sales than consumption, this hefty loss is perplexing from a straight economic perspective.

Other Income Farmers, especially small growers, have varied strategies for survival and often work to create an array of additional sources of income. These include off-farm work by the farmer, income brought in by other family members, credits/loans from local and national sources, remittances from abroad, and income from other crops grown in the *milpa* (in Guatemala) or *chacra* (in Peru)—that portion of the farm dedicated to subsistence or other cash crops. Off-farm income itself shows a significant difference between the two groups, with Guatemalans realizing \$1691 on average, compared to Peruvians \$462 average off-farm income ($F = 42.9$; df = 1,335; $P < 0.0001$).

Guatemalan growers receive more than double the income from these sources than their Peruvian counterparts (Table 4), testament to the fact that a more densely populated rural landscape can engender and support more economic activity and more opportunities for market connections of various kinds. For Guatemala, other income accounts for 29% of all income, compared to Peru, where it accounts for somewhat more, at 39%. While difficult to verify, I would argue that the former may be more a function of opportunity, whereas the latter derives from hardscrabble necessity. When considered on a per unit area basis (Table 4) that coffee in Guatemala yields more than twice the absolute income than in Peru, and fruits more than double the value (all on a per hectare basis), the importance of coffee and the value of fruits for sale in the Guatemalan context stands out in rather bold relief.

A salient difference in these two rural economies where coffee farmers ostensibly dominate the landscape is the scope of the various sources of income from off-farm work. Table 5 provides a listing of these sources. The widely varied income generation sources within the Guatemalan setting bolster the notion that a much more economically active and integrated rural landscape exists there compared to the Peruvian case. While both groups show sources of income related to the farm, Guatemalan coffee producers and their family members are involved in a more diverse, interconnected network of economic activity than that found for Peruvian producers. The number of off-farm job types listed in Guatemala exceeds 20, compared to the four mentioned in Peru. The diverse social network characterizing and surrounding the farm family in the Guatemalan case undoubtedly plays a role in finding and maintaining the connections needed to sell fruits for cash. Moreover, while the other crops listed (from the *chacra* or the *milpa*) do not differ in number so much, the Guatemalan growers' list tends toward a more specific and targeted categorization of final products.

It is worth elaborating upon the role of coca production in Peru, which tends to generate a relatively hefty fraction of the income. As a culturally embedded crop, coca and coca leaves hold special status within rural Peru as a traditionally revered product, used in their dried form and chewed for their stimulant effect. Its use is widespread and socially accepted. Aside form this traditional use, dried leaves are also used in the processing of coca paste and, ultimately, cocaine, for both the legal and illicit markets.

Small landholders in the Apurimac River valley region of Peru grow coca for personal use and for sale—with many sales going to the illicit market (personal communication with growers and various agency workers in the area). It is a crop that demands little in the way of cultivation and agronomic

Table 5 Sources of other income for small coffee farmers in Guatemala and Peru not associated with the shade coffee system products

	Guatemala	Peru
Off-farm work	Mason, tailor, pharmacist, dentist, X-ray technician, watchman, midwife, cantina owner, picking coffee, day laborer, power plant worker, transport, ANACAFE monitor, beekeeper, teacher, farm manager, baker, weaver, organic coffee promoter in cooperative, barber	Day laborer, mason, chainsaw operator (distinct from day laborer), warehouse worker
Other crops/ products	Sugarcane, cardamom, cattle, citrus, chickens, *flor de Jamaica* (*Hibiscus* spp.), vegetables, grafted plants (coffee, avocado)	Annual crops, animal sales, cheese making, eggs, meat and coca leaves

attention, providing two and even three crops per year. It can grow on poor soils and the harvested leaves are easily dried on plastic sheets along the roadside and sold to individuals who arrive at the farm to collect them and pay cash immediately. Compared to the cultural practices needed to produce either coffee or cacao, the amount of work and attention demanded by a coca crop is relatively scant. In short, coca leaf production and sale provide Peruvian coffee growers with income that allows them to survive from 1 year to the next, similar to the above-mentioned persimmons for Guatemalan growers.

Conclusion

This study shows that fruit production within the coffee agroforestry system and subsequent use or sale of the fruit can vary between countries. The differences seen here between the ultimate fate of fruits—as well as the socioeconomic contours embedded in the rural setting of Guatemala and Peru—emphasize and reinforce the notion that geography matters. Coffee growers realize value from the fruits, but in different ways. For reasons undoubtedly linked in part, at least, to the socioeconomic and infrastructural settings of the two countries featured here, Guatemalan coffee farmers tend to sell a greater fraction of the fruits they produced, whereas Peruvian growers consume a larger portion than they sell.

The data presented here were gathered within a specific time period in these two countries. The importance or contribution, therefore, of the fruits from the shade component to the overall farm economy must be understood as a snapshot image of what is possible in the coffee world. Obviously, during periods in which coffee prices and/or off-farm labor generate relatively robust streams of revenue for the farm family, the importance of these fruits may wane. Conversely, in times of low coffee prices or periods in which other income sources are scarce, the shade tree products can certainly play a more central role in terms of both use and exchange value.

Long term studies on these products' role over a sustained period would be useful in terms of shoring up our general knowledge about the products from agroforesty systems, and would allow for more definitive conclusions about the importance of the fruits of shade coffee systems to farm families. Moreover, studies across time would also be more likely to discern any effects that fluctuating coffee prices might have on the relative importance of the obbligato products from these agroforestry systems.

However small or intermittent the reliance upon the fruits of these coffee agroforestry systems may be, the maintenance of diversity of useful plants within these settings seems to be an entrenched feature of rural small holder survival strategy. Understanding the various types of products generated from these systems, as well as their fate, can be useful for a range of national and international planners and decision makers, as well as for agricultural and environmental/biodiversity policy formation.

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