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Shocks and Bribri Agriculture Past and Present

PAULA J. POSAS

ABSTRACT

The Bribri have a multifaceted agricultural system relatively high in agrobiodiversity in one of the most biodiverse regions on earth, the forests of Southern Costa Rica. Their agriculture and resource use patterns appear to have evolved over many centuries, informed by traditional ecological knowledge and cultural beliefs about the natural world. Tracing the history of Bribri agriculture from the oldest available documents from the first European contact offers evidence of centuries of crop cultivation, while review of the past century's records shows socio-economic and natural shocks as key drivers of agricultural change rather than population growth or market pressures. Bribri agricultural systems and practices today have changed in order to adapt yet still rely on traditional ecological knowledge and reflect various cultural beliefs relating to environmental stewardship, resource use, and appreciation of species diversity.

INTRODUCTION

Interestingly, despite the Bribri indigenous people maintaining a multifaceted agricultural system high in species diversity, some of the literature suggests that agriculture has only recently become important to the Bribri (Nygren 1998) and is hypothesized to have traditionally been of less importance than hunting, fishing, and gathering (Borge and Villalobos 1995). In this paper I argue that these may be overly rough characterizations. After all, it seems unlikely that the Bribri's extensive, detailed knowledge and adeptness in agriculture would be the result of it only having been important to the culture a short time. This paper thus examines available historical texts to gain insight into the role and evolution of agriculture in Bribri culture and history. Next, it asserts the role of socio-economic and natural shocks as key drivers of agricultural change particularly over the past century and draws on field research

and recent publications to provide an overview of current agricultural practices. Informing both past and present agricultural and land use practices is Bribri traditional ecological knowledge,¹ which has increased Bribri resilience in the face of numerous shocks and stresses as well as resulted in successful stewardship and enhancement of much of the surrounding biological diversity. A stress is understood as a continuous or slowly increasing pressure, common within the normal range of variability, while a perturbation or shock is a major spike in pressure beyond the normal range of variability for the system (see Marschke and Berkes 2006).

This exploration of Bribri agriculture occurs within the context of the resilience perspective on social-ecological systems. The term social-ecological system is used as the Bribri are viewed and view themselves

within their ecological context, not as separate from it (Folke 2006; Pretty et al. 2009). Resilience refers to the capacity to absorb shocks and still maintain function as well as the capacity for renewal, reorganization, and redevelopment (Folke 2006), requiring that there be adaptability in the social domain and adaptability to respond to and shape ecosystem dynamics and change in an informed manner (Berkes et al. 2003). Social-ecological resilience considers the interplay between disturbance and reorganization and sustaining and developing in a context of integrated systems feedback and cross-scale dynamic interactions.

The research question driving this work relates to the role of agricultural and land use practices in the Bribri's survival as a distinct culture that largely conserves surrounding biodiversity (including ecosystems, species, and genes). Smith and Wishnie (2000) define conservation in small-scale societies as practices designed to prevent or mitigate species depletion or habitat degradation. Such actions and practices are evident among the Bribri though, as Smith and Wishnie and previous authors have noted, documented cases of such societies managing with the prime objective of conservation are virtually non-existent. Rather, members of such societies "are likely to pursue enhancement of the resources needed for livelihood, safeguarding of homelands from exploitation by outsiders, and allocation of subsistence efforts to the most rewarding areas and resources currently available" (Smith and Wishnie 2000:516). Their choices will often result in conservation of biodiversity (particularly plant resources) and habitats, but will not necessarily be designed to do so and may have the opposite effect. This more nuanced and realistic view of human-environment relations in small-scale societies is helpful both for making policy and for grounding research, allowing for clearer understanding of motivations, outcomes, and contingencies. The findings presented in this paper are framed by a literature review and are based on three months of fieldwork in Talamanca, plus survey-guided interviews with 30 families that focused on culture and agriculture with particular emphasis on beliefs and crop species maintained. Due to the difficulty of finding consolidated material on Bribri agriculture, particularly in English, a special effort

has been made to identify and highlight historical and current sources of further information.

A review of literature focusing on early Bribri history and agriculture reveals the important role of shocks as drivers of agricultural change among the Bribri, at least from the 1500s and particularly during the 20th Century. This is distinct from the most commonly cited drivers of agricultural change—population growth and markets. The Bribri agricultural system was not shaped historically by pressures of increasing population, though population decline from an estimated 25,000 Talamanca inhabitants in 1638 to under 2,000 by 1895 (Vargas 1990:31) unquestionably had an influence. Over this time period, those who survived the shocks of the onslaught of European-brought diseases (such as smallpox, typhoid fever, and measles), conflict, and capture retreated to more remote areas in the mountains, moves that would necessitate changes in agricultural practices and production due to changing and often less favorable environmental conditions.

The Spanish brought cattle and horses to Talamanca by the 1600s, and a 1697 account mentions trade among the Terrabas, Chánguenes, Burucas, Téxabas, Urinamas, and Talamanca indigenous groups. The Talamanca were noted to have exchanged cacao with the Urinama for machetes. Trade for salt, hatchets, hammocks, dogs, and other things was also known to occur (Fernández 1918:16). Despite evidence of trading with crops since at least 1697, markets did not appear to be a significant influence until around the mid-20th century. Bribri agriculture on the whole can be characterized as changing in response to shocks—which can be thought of as spikes in pressure beyond the normal range of variability or sudden, often cataclysmic, events—that required adaptation and wise land management.

THE BRIBRI OF TALAMANCA, COSTA RICA

Data from genetic, linguistic, and archeological research provides evidence that Amerindians have

continuously occupied the lower Central American Isthmus for as long as 10,000 years (Barrantes et al. 1990). The Bribri indigenous people inhabit the region of Southeastern Costa Rica known as Talamanca, and are closely related to another Talamanca tribe in the Chibchan language family, the Cabecar. The Bribri and Cabecar were once a single political entity with religious leaders in common (Borge and Villalobos 1995; Bozzoli 1975), but geographical features restricted interaction between their seemingly close settlements and resulted in the separation of the groups some 300 years ago (Barrantes et al. 1986), accompanied by linguistic divergence (Bozzoli 1975). For a recent mapping of the Talamanca Bribri and other indigenous groups in Costa Rica, see Solano (2002:30).

The 2000 Census put the total population of Bribri living in reserves at 11,062 and the Talamanca Bribri population at 6,866 (Solano 2002). As of the 2011 Census, the total population living in reserves was listed as 12,785 with 7,772 living in the Talamanca Bribri Reserve. Of the 7,772, 61 percent spoke Bribri, a larger percentage than in the other Bribri reserves of Kekoldi, located about 4 km inland from Puerto Viejo, and Salitre and Cabarga on the Pacific side of Costa Rica. The Talamanca Bribri Indigenous Reserve (437 km²) and the Talamanca Cabecar Indigenous Reserve (227 km²) make up what is known as the Talamanca Indigenous Reserve, one of 22 national indigenous reserves established by law (Indigenous Law No. 6162) in 1977 to protect native lands and cultures (Borge and Castillo 1997). The Talamanca Indigenous Reserve is located in the southeast corner of Costa Rica's Limón Province and is itself part of the larger La Amistad Biosphere Reserve (1,939 km²), which received United Nations Environmental, Scientific, and Cultural Organization (UNESCO) World Heritage status in 1982. In 1990, La Amistad became a transboundary World Heritage Site when the adjacent 2,070 km² Panamanian La Amistad National Park was also inscribed on the World Heritage List.

The La Amistad-Talamanca protected area complex lies within a Conservation International-designated

Conservation Hotspot, a World Wildlife Fund (WWF) Global 200 Eco-region, a WWF/International Union for the Conservation of Nature (IUCN) Centre of Plant Diversity, and a BirdLife-designated Endemic Bird Area. It also overlaps a Ramsar wetland of international importance and two UNESCO Biosphere Reserves (United Nations Environment Program, UNEP 2009). Containing at least nine out of 12 Holdridge life zones and all five altitudinal zones found in the tropics, the area provides niches for a wide variety of species.² In fact, the Talamanca Range-La Amistad Reserves area is estimated to harbor almost four percent of the varieties of all terrestrial species on earth, with an estimated 30 percent endemism and "some 10,000 flowering plants, over 4,000 non-vascular plants, approximately 1,000 fern species, 80% of the country's mosses and about 900 lichens" (UNEP 2009:3). UNEP (2009:1) summarizes that the Talamanca Range-La Amistad Reserves area is a "uniquely biodiverse land-bridge where the faunas and floras of North and South America have been able to intermingle and interbreed. It retains remnants of Quaternary glaciation and is covered by the largest remaining natural forest in Central America." It is home to five indigenous groups, the most populous of which are the Bribri (Solano 2002).

EARLY ACCOUNTS RELATING TO BRIBRI AGRICULTURE

Today it would be impossible to characterize the Bribri without reference to their relationship to the land via agriculture. In their creation story, the Bribri spring from seeds planted by Sibö, God for the Bribri (Palmer et al. 1993; Stone 1956). Bribri folklore and oral histories involving crops are numerous (Ferreto 1982; Jara 1993; Pittier 1903). Archeological data provides evidence in the form of pollen from corn or maize (*Zea mays*) of incipient agriculture in lower Central America by 500 BCE, with suspected smaller scale corn cultivation from early in the 5th millennium BCE then evolution to widespread sedentary agricultural communities during the first millennium BCE (see Barrantes et al. 1990). Nevertheless, the

history of Bribri agriculture, and even Bribri history, is difficult to reconstruct (Borge and Castillo 1997; García Segura 1995). The dearth of oral histories recorded prior to the 20th century and sparse extant observations of early European explorers, conquistadors, and missionaries compound the challenge.

Archeological data is compatible with the thesis that the indigenous groups first contacted by the Spaniards in lower Central America may have developed *in situ* over a very long period of time, with later cultural influences from both Mesoamerica and northern South America being the results of gradual cultural diffusion rather than of large-scale infiltration or replacement (Barrantes 1990; Cooke 1986). What this suggests is that agriculture may not have been brought to the lower Central American indigenous groups by other cultures to the north and south, but rather expanded by such contact.

The earliest accounts of Spanish explorers in the 1500s indicate the important role of agriculture in Talamancan and neighboring indigenous societies. The Bribri were not called “Bribri” by early explorers, but rather the Coen (since they live near the Coen River), the Viceita, the Biceita, or the Talamanca when grouped together with the Cabecar (Stone 1962). Tierra Adentro and Veragua are old names for the Talamanca area used in conquest literature. Many more indigenous groups existed in Costa Rica and Talamanca than survive today (Fernández 1918). A map of Talamanca dated 1527 shows the Viceitas (today the Bribri) living in approximately the same area they do today (see Fernández 1974).

In 1502, on his fourth voyage to the Americas for Spain, Italian-born Christopher Columbus became the first European to discover Costa Rica and specifically the area known today as Talamanca. However, he did not travel inland so he would not likely have encountered the Bribri or the Cabecar. In late April 1540, though, Spanish conquistador new Governor of Veragua Hernán Sánchez de Badajoz founded a city (Badajoz) and a port at the mouth of the Tarire

River (Fernández 1913:141). Sánchez de Badajoz soon thereafter arrived in the fertile valley of Coaza (where the Bribri live today), “which contained a considerable population, great fields of maize and cacao [*Theobroma cacao*], and many avocado [*Persea americana*], **mamey** [*Mammea americana*] and peach palm [*Bactris gasipaes*] trees” (Fernández 1913:144). Though it is recorded that the valley was then inhabited by “a colony of Mexican Chichimecas that had mixed with other tribes” (Fernández 1913:252), the listed species and others tend to be mentioned in same-period accounts of the wider Talamanca indigenous groups as will be described below.

In a 1563 epistle to King Felipe II of Spain describing an area slightly southwest of today’s Bribri area of Talamanca, Juan Vasquez de Coronado describes two belligerent indigenous groups and describes both as having an abundance of agricultural products. Of the first he says, “Truth be told, a thing rarely seen among them; they do not get themselves drunk; they have much gold and clothes, great abundance of food, corn, beans [*Phaseolus vulgaris*], calabash [*Crescentia* sp.], cotton [*Gossypium* sp.], cassava [*Manihot esculenta*], plantains [*Musa* sp.], **zapotes** [*Pouteria sapota*], and all other kinds of fruits that exist in this region”³ (Fernández 1908:46). The second group “has much food, maize, beans, all kinds of fruit, much meat from wild pigs [*Pecari tajacu*, *Tayassu pecari*], tapir [*Tapirus bairdii*], and deer [*Mazama americana*, *Odocoileus virginianus*]; many fish in the rivers, especially trout [*Cynoscion* sp.] and **sabalos** [*Megalops atlanticus*]]” (Fernández 1908:50). He mentions with wonder that women in this group plant, work, and go to war alongside their husbands using arms (Fernández 1908). In a 1565 memoir written specifically about the Talamanca area, Coronado describes it as “highly populated with natives” and “extremely fertile with cotton, cacao, and corn and the rest of the fruits that in Yndias have been found, and of good sky, earth, air, and water, for populations and plants, and seeded land” (Molina 1946:21).

In 1610, missionary Fray Augustín de Ceballos (Fernández 1918:10) observed:

From the Tarire [Telire] River to the Escudo of Veragua are 70 leagues of very pleasant land, and although hot, not such that it gives excessive hardship, with lovely waters and full-flowing rivers, fertile land that produces with advantage all the seeds and plants of this region, like corn, cassava, potatoes [*Solanum tuberosum*], **oyamas** [term no longer in use, perhaps sweet potatoes], plantains, and all kinds of fruit; the land is of such benevolent temperament that in all the months of the year maize can be sown and collected. Cacao abounds and is of the highest quality and quantity in the kingdom; much honey and beeswax, **pita** [*Agave* sp.], **zarpaparilla** [*Smilax* sp.] and **cabuya** [*Furcraea cabuya* Trel.].

In 1697, almost a century later, Fray Francisco de San José refers to the Cavecaras, Talamancas, and Terrábas as growing little food, including only small quantities of maize and plantain (Fernández 1918:14). In this regard it is plausible that depopulation from exposure to European-brought diseases precipitated a marked decline in agricultural production in some locales. Nevertheless, this characterization of “growing little food” runs counter to the accounts above. Based on reports of Spanish military personnel and missionaries (presumably the accounts cited here), it has been asserted that Talamanca’s small independent chieftaincies depended on hunting, fishing, and gathering for survival. Agriculture is assumed to be less important than other activities, or at least of no greater importance (Borge and Villalobos 1995). Fray Francisco’s account appears to support this assumption, but evaluating all of the accounts together, one might be more inclined to view agriculture as a documented, essential component of Talamancan indigenous life since at least the 16th century.

Missionaries were heavily involved in reporting on efforts to convert during the 1700s, and the next mention of agriculture in the historical literature does not occur until 1763 with Fray Manuel de Urcullu, who mentions that the Talamanca Indians eat and drink from leaves, live in round houses, and do not raise domestic animals (Fernández 1918). They hunt deer, agouti, and other quadrupeds in nearby areas and remove and smoke their tripe under *Calatea insignis*

leaves (a practice still common today). He says the mountains produce “plantains in abundance, peach palms, guavas [*Psidium guajava*], cassava, sweet potatoes [*Ipomoea batatas*], potatoes, and much maize, because it is planted year-round. Of meat there are only wild boars, zahinos [*Pecari tajacu*], deer, goats [probably *Capra aegagrus hircus*], and other quadrupeds. Birds that occur in these mountains include curassows [*Crax rubra*; *Crax* sp.], turkeys [*Meleagris gallopavo gallopavo*], wild chickens, eagles and other species of birds” (Fernández 1918:18).

Don Juan Fernández de Bobadilla, Governor of Costa Rica in 1775, asked half a dozen people to recount their experiences in Talamanca under oath to discover if the remaining indigenous groups could be easily conquered. One respondent, Marcelo Salazar, explains that “there are no paths, because where you travel a man can scarcely fit, and this is from palenque to palenque, and thus they use Indian guides; there are no haciendas, the pagan Indians plant cassava fields, plantain fields, and interplanted corn, beans and squash and, in Bisaita, although it is populated, the distance between homes is often more than half a league and on hills” (Fernández 1907:43).

These sparse and scattered descriptions make Bribri history and the history of their agricultural production difficult to reconstruct. It is significant that agriculture was consistently mentioned and worth considering that these European explorers and missionaries may not have known how to identify cropping patterns or recognize and label many of the New World species. Furthermore, their focus was not on agriculture, but rather they mentioned crops as part of a general impression of people they met but with whom they did not have intimate contact or significant ability to communicate. In light of this, it is not trivial that in these documents a total of 16 crops⁴ were mentioned by name, many of them with more than one variety, in addition to the numerous unnamed fruits and herbs to which several accounts alluded (Fernandez 1918).

TWENTIETH CENTURY DRIVERS OF AGRICULTURAL CHANGE AMONG THE BRIBRI

Most agricultural change theorists identify population fluctuations and changing markets as the strongest drivers of agricultural change (Boserup 1965; Netting 1993). New technologies also influence agricultural production, as do changing environmental constraints and new crop preferences (Goldman 1995; Netting 1993). Socio-cultural, political, economic, and environmental shocks and stresses also gradually alter agriculture and land-use practices. While not traditionally classified as such, shocks—described as major unforeseen events—have also been key precipitators of agricultural change. Sometimes they reset an agricultural or economic system by devastating it, and other times they force communities to re-examine advantages and opportunity costs before continuing along the same trajectory (Goldman 1995).

As a largely subsistence-oriented group not historically challenged by high population growth and concentration, shocks provide a better organizing model for most of Bribri agricultural history than do markets or population pressures. The shock model, which explicitly encompasses both socio-economic and natural events, allows for and requires one to see nature as a key player in history, as the Bribri do. Traditional healer Remigio Rodríguez asks, “How can we speak of our history mentioning only human beings if other elements such as water, air, rocks, forests, and animals also intervene in it? They all play a decisive role in our survival” (Borge and Villalobos 1995:x). Noteworthy catalysts for change seem to have primarily been socio-political shocks and extreme weather events up until the late 20th century when stresses, pressures, and new opportunities derived from greater outside connectivity emerged.

The early shocks of warfare, epidemics, and enslavement by conquistadors were followed by fights for autonomy with the newly independent Costa Rica

throughout the 19th century. The Provincial government in the late 1700s saw Catholic cultural repression as a tool for conquest (Fernández 1907:219) and, though the Bribri were largely successful in resisting this, by the 1800s intensified efforts on the part of authorities did have an impact on some Bribri (see Bozzoli 2010 for more detailed discussion of external cultural impacts). The next text to address Bribri agriculture emphasizes the importance of corn, plantains, and cacao, and also describes the dibble stick for planting (Gabb 1875:520-525).

At around the dawn of the 20th century, in a very short and dramatic space of time, Bribri land and leadership were forcibly taken away by the United Fruit Company, and most of the Bribri fled to the mountains. Away from the valley, they continued their agricultural and land-use practices in a far less forgiving environment characterized by exceedingly high rainfall and steep slopes. Meanwhile, the United Fruit Company deforested the lower valley and planted it in sweeping banana monocultures. Although some of the above could be viewed as processes, most can almost be more appropriately understood as events, since they occurred in a short time frame and had sudden, decisive impacts on the Bribri. Skinner (1920) reports that, around this time, plantains continued to provide the staple of Bribri diets and that red, white, blue, yellow, black, and purple corn were cultivated. He also mentioned sugar cane (*Saccharum officinarum*), beans of various kinds, cabbage palm (*Sabal palmetto*), peach palm, greens, cacao, banana (*Musa* sp.), lime (*Citrus aurantifolia*), yampi (*Colocasia esculenta*), calabash, and cotton. From the 1940s to the 1960s, the Bribri that had previously found refuge in the mountains started to return and re-settle the valley. Some remained there, working for The United Fruit Company, although the pattern was to work for a few months of the year and go back to their farms for the rest of the year. Some people always lived and stayed in the higher areas of the mountain range. The take-over of Bribri land, the severe alteration of valley ecology, and the murder of their most important leaders took a

serious toll on their lives, culture, and agriculture (Borge and Villalobos 1995).

The difficult conditions soon became compounded by environmental disasters including raging floods and crop diseases such as monilia pod rot in cacao which appeared in 1978 and destroyed the Bribri's income base of 40 years (Borge and Castillo 1997:60). The RECOPE petroleum company came in right on the heels of the monilia epidemic, to prospect for petroleum deposits throughout the reserve at a time when the Bribri were most vulnerable. RECOPE shook the Bribri literally with dynamite explosions and heavy equipment for prospecting oil, and nearly overnight RECOPE monetized the rural economies of the Bribri, paving the way for commercial banana sale and altering forever many of their customary social practices relating to agriculture. With RECOPE, the shock model finally gives way to stresses, pressures, and the more widely known population and market models of agricultural change toward intensification or extensification. Shocks however never fully disappear, as evidenced in the shattering 1992 earthquake and heavy floods, which significantly impacted the Bribri outlook on appropriate and stable forms of agriculture and highlighted the value of their traditional risk-reducing, diversified approach.

BRIBRI BELIEFS RELATING TO AGRICULTURE AND RESOURCE STEWARDSHIP

Historically and presently, many Bribri agriculture and land use practices have been influenced by the Siwá system of knowledge, which the Bribri regard as knowledge from Sibö or God. Gabb (1875:503) also appeared to speak of this when he referred to "a series of ideas or beliefs [among the Bribri] which affect their daily lives and are never lost sight of." Anthropologists Borge and Castillo (1997: xvi) say that Talamancans translate the word Suwá or Siwá as wind, wafting, or knowledge and

Bribri Lisandro Díaz Díaz (in Borge and Castillo 1997:xii) elaborates:

In order to protect the Earth and all the marvelous things it contains, [Sibö] left the knowledge, our science called Siwá, which is expressed through stories, legends, and traditional practices. The Siwá contains spiritual teachings that have governed our relationship with nature. ... Sibö left us, the Bribris and Cabecars, as guardians and protectors of the natural diversity. For thousands of years, we have cared for our Mother Earth and during the next thousands of years, we will continue caring with the same zeal as our elders. ... A profound interrelation between the society and nature has existed, thanks to this principle, we can still encounter the great natural diversity in Talamanca.

Numerous Bribri and Cabecar stories and legends emphasize the importance of natural diversity and the role of the Bribri and Cabecar as its stewards. In Bribri cosmology, Sibö created the universe full of plants and animals, water and mountains. Sibö then grew indigenous peoples from seeds and gave them the mandate to tend his creation (Borge and Castillo 1997; Palmer et al. 1993). A number of accounts say that the Bribri came from corn seeds (see Stone 1956). Pittier (1904) also provides more insight into the significance of corn in Bribri culture, including for counting. The Bribri explain that Sibö has set down rules and limits for the Bribri and Cabecar, including laws pertaining to the use of natural resources (Borge and Castillo 1997:xx; Palmer et al. 1993:41). In this regard, Ramos and Del Monte (2004) clarify that according to traditional beliefs, the environment is divided into two parts, the "near" and the "far." The near space, which is the indigenous, humanized space, can be modified and shaped, while the far space, or natural, primary forest space, is seen not to belong to humans and can only be used by observing strict rules. Families and communities inevitably differ; some are relatively more traditional while others are increasingly involved with outside ideas, products, and possibilities offered by a market economy.

BRIBRI AGRICULTURAL PRACTICES TODAY

As rural agriculturalists, the Bribri have evolved agriculture and land-use systems to fulfill changing needs and to help them cope with periodic and often combined sociopolitical, economic, and physical challenges. Bribri agriculture and land use involve three major tiers of risk minimization to handle shocks and disruptive events. First, careful stewardship of the soil to retain the services of beneficial insects, pollinators, and soil organisms helps ensure that crop plants remain productive, renewable resources far into the future. Secondly, forested areas that are maintained by the Bribri protect them from many shocks and provide hunting and gathering opportunities to offset complete dependence on agriculture. Thirdly, the range of species cultivated in polyculture parcels reduces risk of overall crop failure, deters pests, enhances synergistic growth of plants, and fills a range of domestic needs year-round. The Bribri agricultural system is sometimes known as an agropastoral system, meaning that in addition to growing plants, families tend to own livestock of some kind, including chickens (*Gallus domesticus*), pigs (*Sus* sp.), cows (*Bos primigenius*), and horses (*Equus caballus*). Dogs (*Canis familiaris*), cats (*Felis catus*), and turkeys are also occasionally owned.



FIGURE 1. Bribri fishing net and arrows for hunting.

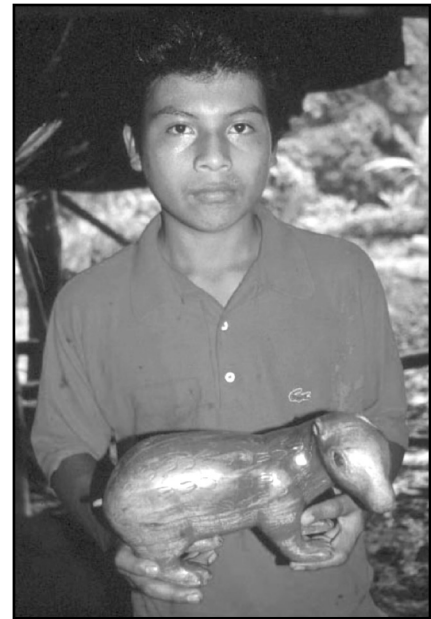


FIGURE 2. Carving of a tapir which has special significance in Bribri culture and is not supposed to be hunted.

Groundwater, surface water, and seasonal rains are integral parts of agricultural as well as social construction of Bribri life. Groundwater needed for plant growth is sometimes managed by planting outward around large trees which draw water and provide shade, and by consideration of lunar influence on groundwater. Bribri communities tend to be located near rivers and streams, which may be relied upon for everything from cleaning and transporting agricultural produce to potable water, food preparation, fishing (including with nets shown in Figure 1), bathing, and other activities. Hydrological management and awareness is also important as seasonal flooding can impact soil fertility and pest populations, while late or early rains can dramatically influence performance of crops, including cash crops. Average annual rainfall in Talamanca ranges from 3,400 to 6,200 mm per year, and 75 percent of precipitation falls during Talamanca's rainy season which extends from May through December, leaving 25 percent to fall during the "less rainy" season from January to April (Borge and Castillo 1997).

The Bribri traditional system of agriculture is composed of subsystems of indigenous polyculture (agroforestry) and itinerant agriculture (fallow), according to Borge (1997). The Bribri system of fallows and crop rotation is more involved than can be succinctly explained here. Further information on these topics can be found in Vargas (1990) and Borge and Villalobos (1995).



FIGURE 3. An adolescent girl carrying home firewood in the traditional way using what Skinner (1920) calls a burden strap.



FIGURE 4. Several forest-gathered materials, including the *suita* (*Goenoma congesta*) roof, *jira* (*Iriarte gigantea*) walls, and bag woven from plant fibers.

All photos: Paula J. Posas

The other subsystems are plantain and banana monoculture, plantain and banana polyculture, forestry, and livestock raising (Borge 1997). Several researchers have documented these subsystems extensively, even including analysis of family labor hours (Borge and Castillo 1997; Vargas 1990).

Ramos and Del Monte (2004) distinguish between a “near” indigenous space and “far” natural space in classifying the subsystems. An informant in my fieldwork identified four parcels in the traditional Bribri farm system. These were: 1) a parcel for rice (*Oryza* sp.), beans, maize, banana/plantain, and short-lived vegetables and tubers; 2) a spiral garden, spiraling out from a large tree, like some kind of fig (*Ficus* sp.), for crops and medicinal plants; 3) wild forest for hunting, gathering (Figures 3 and 4), and environmental services; and 4) an enriched area, which includes medicinal plants and fruit trees for wild animals (Posas 2001). Regarding this last item, the Bribri have hunting rules and taboos, including against hunting certain animals such as the tapir (as shown in the carving in Figure 2). Nevertheless, the importance of hunting—and how it is done—varies between communities (Whelan 2005), and hunting is placing pressure on certain animal populations (Harvey et al. 2006).

Bribri planting arrangements for cultivated species tend to reproduce forest architecture: much shade (which suppresses weed growth and prevents

the soil from drying out), decomposing tree trunks whose roots retard erosion, and high accumulation of organic matter that maintains soil fertility and facilitates

nutrient cycling (Vargas 1990). Citing concerns for the maintenance of the soil and soil organisms, human health, clean waterways, and cost-effectiveness, some communities predominantly prefer organic farming methods (Posas 2001; Whatley 2008), though others do not (Barazza et al. 2011; Polidoro et al. 2008). When sold as organic, a higher price is fetched for the Bribri's main commercial crop of Gros Michel bananas (Figures 6 and 7). Some Bribri also sell organic cacao as a commercial crop (Orozco et al. 2008), and researchers see such organic cacao farms as having important biodiversity conservation potential (Dahlquist et al. 2007; Somarriba and Harvey 2003).

The Bribri control disease (to an extent) and plant pests by pruning, intercropping, allelopathic tree species, and maintaining distance between plants. Though the climate generally necessitates a slash-mulch approach to



FIGURE 5. Small bananas and plantains for domestic consumption being carried home from a farm on the back of a horse.



FIGURE 6. Bananas being ferried downriver to intermediaries.



FIGURE 7. Intermediary truck filled with Gros Michel bananas, the primary commercial crop of many Bribri.

All photos: Paula J. Posas

field clearing and preparing during much of the year, fields are sometimes prepared with a slash-and-burn strategy, which may reduce populations of insect pests, rodents, and other organisms (Vargas 1990) when done continuously. Whatley (2008) reports that some Bribri burn fields only for cash crops—not for subsistence crops—while Ramos and Del Monte (2004) report specific details on when and where the burning is done and how a slash-and-burn plot site is chosen (Figures 8-10).

Among the Bribri, land has traditionally been held as a form of clan property in which anyone linked through the maternal line of the clan (including husbands of the women of that clan) could use these lands. Clan membership is inherited through the mother, as is the right to land ownership; settlement patterns among the Bribri are matrilineal (Borge and Villalobos 1995). Land is usually retained for the life of an individual and then divided among children. It is sometimes sold in small parcels, even to children, sometimes for a large swine. Today, families rather than clans typically own land and agricultural parcels, sometimes with mothers and fathers possessing both common and individual farms (Posas 2001). A researcher commenting on this paper shared that when land is owned outside indigenous zones it falls under the public system, which follows patrilineal organization. On occasion, families are divided over privately owned land that would under indigenous law be passed to the mother's daughters or nieces if no daughters were available. This is a major problem for many groups as they attempt to resolve land disputes over farmable areas. Also reported is that there are still cases in which land is communally owned and managed by a tribunal indigenous leader.

Studies indicate that average Bribri farms have been known to maintain 80-150 cultivated species of plants (Borge and Castillo 1997), while Ramos and Del Monte (2004) found the average Bribri and Cabecar diet to be based on 84 species. My field interviews indicated that the number of cultivars per farm may be up to 200 (Posas 2001). Age/generation is a factor that most accurately predicts the

crop diversity a family is likely to have (Borge and Villalobos 1995), a characterization also supported by my research (Posas 2001). Field observations and communications have also indicated that species diversity is impacted negatively by the availability of salary income, the general market orientation of the family group or neighborhood, and closeness to accessible roads (Posas 2001). Even in the much less diverse home gardens, the presence of high intra-species diversity and multiple varieties was found to be common (Zaldivar et al. 2002). In addition to works published prior to the year 2000 (see indicative bibliography by Fabre 2005), there have been at least five master's theses (Armero and Burgos 2005; Posas 2001; Trujillo 2004; Whatley 2008; Whelan 2005) and two Ph.D. dissertations (Orcherton 2005; Winowiecki 2008) written on Bribri agriculture and closely related topics.

Many Bribri, particularly the older generations, use the moon phases as a basis for decision-making on when to plant, transplant, prune, and harvest crops (Posas 2001). It is said that first the Bribri take into account the season and weather, next they consider the phase of the moon (Posas 2001). During the new moon, they do not sow seeds and instead thin or remove unwanted trees, because “the plants don’t receive water” at that time. The waxing moon is considered a good time to plant anything, because there is water, the land becomes fertile, and “if you cut open the plantain trunk you will see it green and healthy, no worms.” The Bribri regard the full moon as the best time to work on large trees and fruit trees, for example to trim the rising part of the branches to make them grow laterally (Posas 2001:102). This pruning may be done to promote greater shade cover or easier access to fruits. Consistent with Bribri ethnosciences (Rist and Dahdouh-Guebas 2006) about plant water uptake during different phases of the moon, Brown and Chow (1973) identified synodic (moon phase) monthly variation in water uptake by pinto beans being investigated under laboratory conditions. Other explanations for lunar influence are also possible (Endres and Schad 2002), including the moon’s influence on insect behavior, which



FIGURE 8. Row of caña linda (*Cordyline terminalis*), an eye-catching fuchsia-leaved cane, separating one farm from another, with the farm on the right having a poly-culture arrangement of bananas, corn, and other crops.



FIGURE 9. Banana and other trees on a farm.



FIGURE 10. A field that has been partly burned with banana and other tree species in the background.

All photos: Paula J. Posas

is particularly significant in the tropics where insects and plants have developed strong evolutionary relationships (Vogt et al. 2002).

DISCUSSION AND CONCLUSION

Traditional Bribri agricultural parcels (parcel for rapid use, spiral garden, forest, and enriched forest area), soil maintenance methods, and other practices rest upon hundreds of years of crop cultivation experience. The Bribri capitalize on locally available plants for fertilizers and pesticides, plant-plant interactions for mutually enhanced growing, and leguminous trees, leaf litter, and fallows to rejuvenate the soil and maintain its productivity and mineral balance. In so doing, they demonstrate an understanding of ecological processes consistent with agroecology (Altieri 1995) and some of the best theoretical prescriptions for humid tropical regions (see for example, Altieri and Merrick 1988; Ewel 1986; Raintree 1987). To the present, Bribri agricultural systems and practices have helped hedge against risk and shocks, while meeting basic needs and contributing to the conservation of crop and natural diversity.

It must be acknowledged that there is presently concern among some Bribri about the continuance of cultural traditions (including those pertaining to agriculture) in the face of outside pressures (Borge and Castillo 1997:xii; García Segura 1994:xi). There are indeed multiple pressures on Bribri ways of life and agricultural practices that must be addressed by the various communities. These include shifting priorities and aspirations of the younger generations, greater population pressures, and alcohol abuse. Castro et al. (1995) identify potential future threats to the Bribri way of life as coming from the construction of hydroelectric dams, oil and gas pipelines, roads, and refineries as well as from ranching, agricultural plantations, logging, and mining. Floods and earthquakes also present ongoing risks. Lying at the confluence of the Cocos, Caribbean, and Nazca plates, Talamanca has averaged a major earthquake

every 2.25 years since records began to be kept over 325 years ago (Castro et al. 1995). Climate change has also become a concern and a growing factor in Bribri agriculture. Several Bribri cultivators have mentioned the irregularity of weather patterns and the increasingly inconsistent climate (Palmer 1983; Posas 2001).

Today, Bribri use commercial crops of bananas, plantains, cacao, and more traditional farm parcels together to provide income and to help meet daily needs including firewood and medicines. Forested areas, livestock, and home gardens supplement the farm yield to provide a wide variety of goods and services alongside occasional hunting and fishing. In addition to agricultural and cultural practices, other factors are increasingly able to help the Bribri be resilient to shocks and capitalize on opportunities, including: government programs in education (Herrera Sánchez 2002), health, electrification, and transport; outside employment; small businesses such as in-house shops selling basic staple goods; collective efforts in ecotourism and sale of handicrafts (Fariña 2012; Talamancan Association of Ecotourism and Conservation 2013); and non-governmental organization collaborations and other social networking. The Bribri are open to new ideas and supplemental practices and technologies in agriculture and otherwise. They have expressed through an indigenous non-governmental organization CODEBRIWAK (Commission for the Defense of Indigenous Rights in Talamanca) the desire to appropriate the best aspects of outside influences but sift these through their cultural filter (Posas 2001).

The Bribri contribute to locally and internationally important biodiversity conservation. Research by Harvey and González (2007) and Harvey et al. (2006) indicates that Talamancan agricultural and forested landscapes have significant conservation value for (at least) birds, bats, terrestrial mammals, and dung beetles (*Canthidium* sp.) at a time when agricultural landscapes in the tropics are increasingly regarded as essential components of any conservation strategy (Perfecto and Vandermeer 2008). The traditional

ecological knowledge and practices of the Bribri offer potential new principles to agroecology and a productive, biodiverse alternative to conventional agriculture in some landscapes (Altieri 1995; Smith and Wishnie 2000). Taken together, the Bribri outlook, strong traditional ecological knowledge base, resilience-promoting agricultural and land-use practices, and emerging support structures and efforts at income diversification, give optimism about the Bribri's continued cultural survival and evolution.

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NOTES

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1. Traditional ecological knowledge is defined as "a cumulative body of knowledge, practice and belief, evolving by adaptive processes and handed down through generations by cultural transmission, about the relationship of living beings (including humans) with one another and with their environment" (Berkes et al. 2000:1252).

2. Eight Holdridge life zones have been identified in the areas specifically occupied by the Bribri and Cabecar (García-Serrano and Del Monte 2004).
3. Where cited texts are in Spanish, English translations have been done by the author.
4. Beans, cabuya, cacao, calabash, cassava, corn, cotton, guava, peach palm, pineapple, pita, plantain, potato, sweet potato, sapodilla, zarzaparrilla, and all manner of fruits and herbs. Judging from the lists and extensive varieties in present day farms, it would be likely that they used at least two varieties each of corn, bean, peach palm, plantain, and potato.

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