

Original Article

Valuing varietal diversity: indigenous Canela horticulture in northeast Brazil.

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Abstract

Indigenous societies in lowland South America have an integrated view of ecology, sociology, and cosmology, as demonstrated in numerous studies. The relationship of this view to gardening practices and varietal diversity maintenance has received little analytical attention. This paper addresses the gap in the ethnobotanical and anthropological literature through an exploration of biodiversity and gardening activities in the Jê-speaking Canela indigenous society of northeast Brazil. It demonstrates how the Canela cultivate multiple varieties of many crop species for combined ecological, nutritional, socioeconomic, social-cultural, cosmological, and aesthetic reasons. A particular focus is given to Canela ethnobotanical classification of socio-culturally significant crop species and varieties, including maize, manioc, yam, squash, and beans, as well as other non-native species that have been incorporated into the modern Canela garden. An examination of indigenous horticultural techniques, ritual activities, and conceptualizations of human-plant engagements is also included. The results are based on twelve months of fieldwork carried out in 2011 and 2012-2013 in the Canela village of Escalvado (Maranhão). The original ethnobotanical classificatory lists are the first of their kind for Escalvado village, and constitute 'living' documents that will undoubtedly change over time, just as Canela gardens are dynamic and fluid spaces where a series of meaningful human-plant encounters occur. The data examined in this paper show how valuing biodiversity and varietal diversity in particular is central to the Canela worldview, in which society and ecology form a holistic whole.

Introduction

Over the past three to four decades, the lowland regions of South America have become the focus of an increasing number of anthropological and

archaeological studies on human-environment interactions. Archaeological research reveals that pre-Columbian indigenous societies vastly modified and in some cases permanently transformed their environments through a variety of landscape management techniques (Rostain, 2013; Heckenberger, Petersen and Neves, 1999; Wüst and Barretto, 1999). Numerous ethnographic studies demonstrate how modern-day indigenous societies engage with their environments in various ways, including but not limited to ritual activities, mythic storytelling, agricultural techniques, and ethnobotanical classification (cf. Ellen, 2006 for an overview of ethnobiological research in anthropology). There are few studies, however, that approach human-environment relationships in lowland South America through an analysis of gardening practices, and fewer still through an examination of varietal diversity maintenance (cf. Rival, 2001; Clement, Rival and Cole, 2009; Ewart, 2005 for exceptions). This paper seeks to understand the relationship between indigenous conceptualizations of the environment and varietal diversity maintenance in the Canela society of Northeast Brazil.

Indigenous communities throughout the world tend to exhibit multiple and overlapping reasons for conserving biodiversity at the local level, and environmental conservation can be an unintended result of traditional ecological practices (Massey, Bhagwat and Porodong, 2011). In the Canela society, gardeners cultivate multiple varieties of many species for interconnected reasons that are simultaneously ecological, social-

cultural, socioeconomic, cosmological, and aesthetic. The aesthetic appreciation of diversity is a key reason the Canela maintain multiple varieties and will be a central focus of this paper. The paper will also demonstrate how Canela conceptualizations of society are inseparable from ecology and cosmology. Not only do crop species and varieties form an integral part of the Canela creative ecological landscape, but they also take part in Canela society as the 'children' of female and male gardeners. Thus, understanding varietal diversity maintenance necessitates an examination of the human-plant relationships that are central to Canela gardening experiences. Through an analysis of the multiple ways Canela gardeners engage with crop species and varieties, the paper addresses a gap in the literature on indigenous relationships with the environment in lowland South America and throughout the world.

Living in the legally demarcated Kanela Indigenous Territory (TI Kanela) in the interior of Maranhão state, northeast Brazil, the Ramkokamekra-Canelai speak a Timbira language that belongs to the Macro-Jê linguistic stock. Jê communities live primarily in central and northeast Brazil and are known for certain socio-cultural traits including an elaborate annual ritual cycle, matrilineal residence patterns, and a concentric circle village organization with a ceremonial centre (Heelas, 1979). Over 1,800 indigenous Canela live in the TI Kanela, the majority of whom occupy the main village of Escalvado (cf. IBGE, 2010:198). The population density of Escalvado makes it one of the largest single indigenous villages in Brazil and

in lowland South America. There are two large concentric circles of houses surrounding the ceremonial-political centre, and the family structure of each household is usually a husband and wife with their adult daughters, sons-in-law, and grandchildren. Women own the houses and gardens, and both women and men cultivate garden crops. Men participate in the political life of the village (from which women are generally excluded), and the leadership council is comprised of a male chief, vice-chief, and other established male elders.

The TI Kanela comprises around ten percent of the land originally occupied by the Canela prior to sustained contact with Brazilian colonists at the beginning of the nineteenth century (Crocker, 1994). The modern-day territory incorporates the village of Escalvado, smaller permanent and semi-permanent settlements, and areas for garden plots, hunting, and fishing. Over half of Maranhão state belongs to Brazil's 'Legal Amazonia' region, and the state includes high dense Amazonian forests as well as cerrado (savannah) ecological zones. The cerrado includes diverse biotopes such as gallery and dry seasonal forests, grasslands, woodlands, and swampy palm areas (Felfili et al., 2004). It has a wealth of biological diversity and is being deforested at a more rapid rate than the Amazon region (Klink and Machado, 2005). Documenting the region's ecological diversity and understanding the role of indigenous communities in maintaining this diversity is therefore of the utmost importance. The Canela utilize many areas of the cerrado landscape and classify nine eco-regions in their territory, including various forest zones, sandy chapada areas, fertile riverbeds,

and old gardens. Historically, the community was semi-nomadic and relied more on hunted game and gathered forest products than garden produce, which accounted for an estimated one-fourth of total nutritional intake (Crocker, 1994:95). Modern Canela, however, are subsistence horticulturalists who live in permanent settlements and periodically reside in temporary shelters near their gardens. The annual garden cycle begins with coivara, or slash-and-burn plot preparation, during the dry season in August and September, then planting during the rainy season from October to January or February, and harvesting at the end of the rainy and beginning of the dry season from March to June. Garden crops form the majority of the Canela diet and hunting wild game is a rare occurrence. Meat is mostly supplied through fishing and raising livestock, and is occasionally purchased from local cattle ranchers.

While the Canela society has been the focus of intensive anthropological research, most notably by Nimuendajú (1946); Nimuendajú and Lowie (1937), and Crocker (1982; 1990; 1993; 2004), this study represents the first comprehensive ethnobotanical research undertaken in Escalvado village. To date, there is still a dearth of knowledge regarding lowland South American ethnobotanical classification systems, particularly for those communities living outside of the Amazon region. Two notable studies in central and northeast Brazil are the research of Posey (Posey, 1998; Posey and Plenderleith, 2002) on the Jê-speaking Kayapó and of Balée (1994; 2000; 2010) on the Tupi-Guaraní-speaking Ka'apor. This research draws from the work of Posey, Balée, and

other recent ethnobotanical studies conducted in the Amazonian region (cf. Rival and McKey, 2008; Clement et al., 2010; Arroyo-Kalin, 2010). A number of studies have focused on manioc due to the crop's nutritional and sociocultural importance in many communities, particularly those of the northwest Amazon (Hugh-Jones, 1979; Rival, 2001; Heckler, 2004). Examining the indigenous cultivation of a single species is analytically useful, as it encourages greater depth of analysis at the ecological, historical, archaeological, and ethnographic levels.

A major focus of the current research is the role of maize in Canela society because this crop is especially valued in ritual activities and mythic storytelling (Miller 2010, 2011). Throughout the fieldwork, however, it became apparent that many crop species and varieties are valued in Canela rituals, myths, ecology, economy, and society. Thus, this article examines a number of cultivated crop species and varieties, with a specific emphasis on varieties of maize, manioc, and yam. These crops are highlighted over others due to the level of varietal diversity each exhibits, as well as the conceptual significance of each species and its varieties in Canela society, ecology, and cosmology. Canela gardens include varieties of many other species as well, including sweet potato, squash, and common bean, and species such as rice and fava beanii that are not native to the Americas. The community also cultivates varieties of fruit trees native to the Americas and to the cerrado region in particular, including bitomba, bacuri, and babaçu, among many others. Although these crops are also essential to Canela classification and human-plant

relationships, for the sake of brevity their ethnobotanical lists are not included in this article. For the complete Canela crop classification schema, see Miller (forthcoming).

The hypothesis of this study is that Canela gardeners maintain varietal and species diversity in their gardens for a multiplicity of reasons. The research has three main objectives that address this hypothesis: 1) to understand the multiple and overlapping reasons for biodiversity maintenance and loss in Canela gardens; 2) to document the ethno-classification of all crop species and varieties grown in Escalvado village in Canela, Portuguese, and English; and 3) to gain a deeper understanding of Canela relationships with their environment, especially with the plants they cultivate.

Methods

Anthropological fieldwork was conducted in the Canela village of Escalvado, Maranhão state, Brazil, from April 2012 to March 2013, with an initial research visit in July 2011. The data were collected through interviews and quantitative surveys with indigenous informants as well as through participant observation of gardening activities. Interviews were conducted in Portuguese, including Canela vocabulary, with more than twenty female and male adult Canela gardeners. A bilingual member of the community simultaneously translated responses from Canela into Portuguese for participants who only speak their native language. Fourteen interviewees also completed quantitative surveys documenting all known varieties of crop

species currently growing in their garden plots, and all known varieties of seeds or cuttings that were currently being saved (or had been saved in the last few years) for the following planting season. The principles of ethnobotanical research methods, including the ethnobotanical “freelisting” method, were employed (Quinlan, 2005; Martin, 2005; Albuquerque and Lucena, 2004), particularly the emphasis on encouraging participants to name all known cultivated varieties and species. Unlike freelisting, however, the survey participants were given a pre-composed list of varieties that was compiled by the author with the assistance of one female and three male expert Canela gardeners. This was (and remains) a ‘living’ list, with new participants questioning the data available and adding previously unrecognized data to the list.

During the interviews, Canela informants were asked to discuss their planting, tending, and harvesting techniques, garden plot layouts and locations, seed saving practices, seed exchange with family members, neighbours, and other indigenous communities, and culinary and ritual activities involving the garden and its produce. Interviews typically lasted multiple sessions, especially with the four primary Canela gardeners. Participant observation involved visiting garden plots and surveying the crops and cultivation techniques; documenting planting, harvesting, and food processing activities; and participating in and documenting ritual singing, dancing, and feasting. The data were collected through audio recordings and written notes of interviews and surveys, and through photography and audio-visual recordings of crop species and varieties,

gardens, and ceremonial events. All interviewees were informed of the research outline and goals prior to their participation, and signed and/or verbally agreed (in an audio recording) to a prior informed consent form written by the author in Portuguese and approved by the University of Oxford’s Central University Research Ethics Committee (CUREC).

Results

Canela ethnobotanical classification: an overview

Varietal diversity in the village of Escalvado has never received focussed analytical attention, yet this study demonstrates that it is a central feature of Canela gardening practices. Maize is a prime example of a crop whose diversity in Canela gardens has been previously unrecognized. Crocker (1990:95) documented four varieties of maize in the early 1960s, but it was unclear whether these had survived after the 1963 messianic movement that resulted in a four-year relocation of the Canela community to the neighbouring Tupi-Guaraní-speaking Guajajara territory. While the relocation did result in the loss of some crop varieties and the borrowing of others grown by the Guajajara, it does not appear to have had an overarching negative effect on maize varietal diversity. Table 1 shows that there are currently nine varieties of maize that are commonly grown in Canela gardens, as well as four new varieties that were recently acquired at a government-sponsored seed exchange with other neighbouring Jê communities in Pará state in September 2012. The varieties are morphologically classified by physical characteristics such as the

colour and size of the maize kernels and stalk.

Manioc varieties, on the other hand, are categorized less according to colour, and more according to the size and shape of the tuber, vine, and leaves (see Table 2). The Canela divide manioc into three categories: sweet, of which there are seven varieties; two half-sweet/half-bitter varieties; and bitter, of which there are nine varieties. Bitter manioc contains high amounts of toxic cyanogenic-glucoside in the tuberous roots and must be processed to be safe for human consumption (Elias, Rival and McKey, 2000). Sweet manioc, on the other hand, contains low enough amounts of the toxin that it does not require processing prior to consumption. What is particularly interesting about Canela manioc is the existence of Waiputre and Kwÿr Xenti, the two varieties classified as half-sweet/half-bitter. They both contain enough cyanogenic-glucoside to require processing, but not enough to be considered 'truly' bitter or poisonous. The indigenous cultivation of half-sweet/half-bitter manioc varieties is not well documented, and the Canela are perhaps one of the few, if not the only, community to grow and maintain these varieties.

A number of both sweet and bitter manioc varieties are named after plants and animals they resemble, and this is even more apparent with yam varieties (see Tables 3a and 3b). Of the eighteen known Canela yam varieties, eleven reference animals or animal and human body parts, such as the jaguar's or dog's head (Krêrô Rop-krã), the deer's liver (Krêrô Carãmpa Caxwÿn Tatap-ti), and

the female breast (Krêrô Kàjakêñ). Other yams refer to plants or insects, and one variety, Krêrô Kaj-re, references a type of basket that is used in everyday and ritual activities. Encoding ecological and sociocultural knowledge within ethnobotanical naming is common among many indigenous communities throughout the world (Balée 2000; 2010), and the Canela are no exception. Many fava bean varieties (not listed here) also reference local knowledge and customs, particularly ritual body painting and use of ceremonial masks.

Another important feature of Canela ethnobotanical classification is the addition of the word *pej* to many varietal names. *Pej* or *impej* signifies that which is 'good,' beautiful, original, and/or true in the Canela language. In most cases, one variety of the species is classified as *pej*, such as Põhy *Pej-re*. Yams are unique, however, in that an entire subcategory is categorized as *Krêrô Pej*, or 'true/original yam.' These yams are said to be more beautiful and more original to Canela society than the other category of *Krêrô*, or 'regular yam.' Yams were divided into these two categories by the 'ancestorsiii,' who deemed *Krêrô Pej* as more authentically Canela than the other yams. Whether this means the regular yams are not native to the region or were not historically grown by the Canela is unclear. According to modern-day Canela, the 'ancestors' devised the classification of most species and varieties, except for those that have been recently introduced into Canela horticulture. Varieties originating outside the village are usually linguistically coded as such. Kwÿr

Mĩnêr, for example, is clearly labelled as ‘macaxeira mineira,’ i.e. sweet manioc originating from the state of Minas Gerais in southeast Brazil.

It is worth noting that all the cultivated crop species in Escalvado are classified into multiple varieties. Most species are divided into between five and twenty varieties, including gourd (six varieties), squash (seven), sweet potato (fifteen), and common bean (sixteen). Rice and fava bean, however, have an impressive twenty-eight and fifty-two documented varieties, respectively. What constitutes a ‘variety’ is dependent on Canela conceptualizations. Therefore, the varieties listed here are phenotypically distinct (as determined by Canela gardeners), but it is not known whether all the varieties are genetically distinct as well. Further anthropological and plant genetic research is needed to determine genetic varietal distinctions.

Cosmological aspects of varietal diversity: origins and shamanic experience

The origins of crop cultivation and varietal diversity are explained in the Canela myth of Caxêtikwÿj or Star-Woman. There are many variations of this myth, but the overarching themes remain the same: Star-Woman comes down from the sky and falls in love with Tyc-ti, a Canela man. She shrinks herself and hides in a gourd until Tyc-ti’s sisters or other family members discover her, and she then shows the entire community which plants are edible and teaches them how to cultivate crops. In the most common version, Star-Woman specifically shows the Canela that maize growing on a tree near a bathing hole is edible, and demonstrates how it should be grown, harvested, and consumed

(Wilbert, 1978:211). Other versions recorded by the author include Star-Woman teaching people to grow other crops such as sweet and bitter manioc, sweet potato, bean, and native buriti fruit, and a few even mention Star-Woman revealing the varietal diversity of maize and other species as well. The origins of most species and varieties are attributed to Star-Woman, except those that are specifically known to originate in other indigenous communities or come from the non-indigenous Brazilian population. Prior to her arrival, according to the myth, the Canela ate rotten wood and were not aware that edible plants existed in their village.

While all varieties attributed to Star-Woman’s visit are conceived as aboriginal to Canela gardens, some are directly linked to her and are known as *impej*, including all types of sweet manioc, the two kinds of half-bitter/half-sweet manioc, the ‘true/original’ yam varieties, and all but one variety of maize. Still others that are even more closely associated with Star-Woman are known as *impeaj* (an augmentative of *impej*). These include Põhy Pej-re, Krêrô Pÿp-re (Fish Yam), Krêrô Tekâjkâj/Rorti (Anaconda Yam), Arÿihy Caprêc-re Kênpei (Small Red Fast-growing Rice), and Arÿihy Caprêc-re Kênpôc (Small Red Slow-growing Rice). All types of bitter manioc are associated with Tyc-ti, Star-Woman’s husband, and are known as *ihkên*, or ugly, untrue, and fierce/dangerous. One variety, Kwÿr Tyc-ti (Black-Hair Bitter Manioc), is *ihkêân-re* (a diminutive for *ihkên*) and is even uglier and more dangerous than the rest. According to the myth, Tyc-ti (literally ‘big and black’)

is an especially ugly Canela man and is in effect Star-Woman's opposite.

The concepts *impej* and *ihkên* are essential to Canela society. In the origin of humankind myth, Sun creates *impej* people in his likeness to inhabit the western side of the village, while Moon creates *ihkên* people to live in the eastern side (see Panet, 2010:68-69 for another variation of this myth). Categorizing aboriginal crop varieties in this way demonstrates the interconnectedness of ecological and sociocultural concepts. Both types of people are necessary to the harmonious functioning of Canela society, and the same is true for crops growing in the garden plot. All varieties, whether 'beautiful' or 'ugly,' are maintained because it is the entire spectrum of diversity that is valued. By showing this diversity to the Canela, Star-Woman also taught the people the importance of maintaining these varieties throughout generations.

Maintaining varietal diversity requires developing intimate relationships with every crop species and variety. In Canela cosmology, a variety of nonhuman beings possess agentive capacities and are able to speak and express emotion. Some shamans, known as *kay* in Canela, can converse and interact with these nonhuman beings, including supernatural entities, animals, some objects and artefacts, and plants. Shamans must undergo intensive food and sex prohibitions known as *resguardo* to develop various abilities, including curing illnesses, transforming into animals or plants, and communicating with nonhuman beings. Those who have refined their ability to communicate with plants describe their

experiences as interactions with 'plant-people.' Each species and variety has its own 'Plant-Man' and 'Plant-Woman' with whom the shaman engages. Maize, for example, appears to the shaman as a species-wide Maize-Woman and Maize-Man, and has variety-specific incarnations as well. All of these 'plant-people' have unique characteristics that usually correspond to their physical appearance as plants. Maize-Woman is beautiful with long, shiny hair and perfect teeth, perhaps a reference to straight rows of kernels. *Põhy Pej-re-Woman* has long white hair, similar to the white tassel on this variety, while *Põhy Caprêc-ti-Woman* has red hair like the red tassel it develops while growing. One type of Maize-Woman is described as being very small, which presumably is *Põhy Kyri-re-Woman*.

These 'plant-people' typically tell the shaman how they should be cultivated, and express any grievances they may have. Maize-Man, Sweet-Potato-Woman, and Sweet-Manioc-Woman, for example, all remind the shaman where they are living in the garden so the shaman remembers to interact with them. While women own the gardens, both the husband and wife typically create and tend to the plot, and consider themselves the 'father' and 'mother' of the growing crops. If the couple is not taking sufficient care of the crops, however, the plant-people will complain to the shaman. Growing maize will cry out if its 'parents' ignore it, and manioc and potato will express pain if left in the ground for too long. Since only the shaman can hear these cries, he serves as the intermediary between the plant-people and Canela gardeners. He should inform the gardeners of their crops'

unhappiness before they physically relocate to another couple's plot. Growing crops will move to a more desirable garden if they are being especially mistreated, and the shaman will see them walking away in a single-file line similar to how Canela people walk in a group. The stalks and vines remain in the original plot, but the 'fruits' will relocate and not return during the same growing season. Through communicative engagements with the plant-people, therefore, the shaman is valuing and seeking to maintain varietal diversity. Each plant-man and plant-woman is unique and requires its own special attention by the shaman, who happily obliges. While Canela gardeners cannot converse with plants on this level, the next section examines the many ways they engage with their plant 'children.'

Gardener parents and plant children: the social garden

Female and male gardeners conceive of themselves as the 'mother' and 'father' of their plant children, and this relationship closely mirrors that of Canela parents and their human children. Just as having a large family with many children is valued in Canela society, so too is maintaining a large garden with many species and varieties. Parents will undergo similar *resguardo* restrictions for both young children and growing crops, both of which demonstrate the embodied connection between Canela parents and human and plant children. From pregnancy until the child is around six months old, the mother and father must not consume heavy foods, including most meat and fruit, and should refrain from having sexual intercourse. Similar food and sex

prohibitions are required for gardeners growing specific crops such as yam, peanut, and fava bean. These restrictions are thought to prevent pollutants from entering the bodies of the couple (cf. Crocker, n.d.:3) and by extension, of the baby and growing crops as well. As the child grows, the bodily connection between parent and child lessens, and the same is true for the plants in the garden. Once harvested, crops are no longer seen as children; rather, they are 'mature' and have reached the natural end of their life-cycle.

A bountiful garden is one in which the relationship between the gardener and his or her plant 'children' is constantly cultivated and maintained. The plot must be kept clean and well-managed, and only respectful behaviour is permitted such as talking quietly and refraining from arguments. The gardener-crop relationship is especially solidified through singing and food-sharing rituals. While there are many ritual songs for the planting, growing, and harvesting seasons of certain species such as maize, these are primarily sung by a male lead singer during public ceremonial events. In the garden, however, singing is highly individualized and largely depends on personal preference. A gardener who has a larger crop of a certain species such as fava bean or squash will sing songs particular to these species and their varieties. Other gardeners may prefer to grow large amounts of sweet potato, for example, for which there is another specific ritual song. The overarching theme of these songs is to encourage plant growth and keep the growing crops 'happy.' Often the gardener will remind the crops she is their mother

and will take care of them while they grow. Although it does not appear that there are specific songs for individual varieties, the ritual song for each species is intended for all its varieties. Crops are said to 'listen' to the songs and respond to them by producing an abundant harvest.

The food-sharing ritual is another way to appease the growing plants and ensure a good harvest season. In it, the gardener couple and their extended family will eat hunted game or purchased meat in the garden. The crops are said to share in the feast, eating the meat alongside the humans. All the species and varieties will benefit from eating meat, and the sweet manioc varieties in particular are said to 'need' meat to grow abundantly. While this ritual is performed with less frequency than in the past, some families continue to enact it every annual growing season.

The above examples demonstrate how growing crops are incorporated into Canela family structure and society. In addition, crop species are thought to have their own forms of social organization that mirror that of Escalvado village. Yam social organization, for example, has a hierarchical leadership structure akin to the Canela male elder leadership council. Two of the varieties, Krêrô Pÿp-re (Fish Yam) and Krêrô Tekâjkâj/Rorti (Anaconda Yam), are the 'chiefs' of all the yam varieties, and the 'vice-chiefs' or leadership council consists of all four varieties of true/original (Pej) yam (see Tables 3a and 3b). The two 'chief' varieties are planted in the middle of the entire yam crop to strengthen and protect the others and help them grow.

It is said that Fish and Anaconda Yam also organize festivals and activities for all the yam varieties, in order to make them happy and promote a harmonious yam 'society.' Creating societal happiness (alegria in Portuguese) and harmony through ritual festivities is integral to Canela village life, and the leadership council manages the annual ritual cycle to ensure the appropriate ceremonial events occur. It appears that creating 'ecological happiness' is central to plant life as well, and that this is achieved through human intervention (as seen in ritual events and cultivation practices), and through crop species and varieties' own agentive capacities. A 'happy' garden, therefore, is one in which biodiversity flourishes, with many species and varieties co-existing peacefully with the assistance of their gardener parents.

Practicing biodiversity maintenance: cultivation and exchange

The ecological aspects of Canela varietal diversity maintenance are closely tied to sociocultural and cosmological ones. As mentioned above, gardener parents must keep their plots clean, orderly, and tended in order to please their crop children and have an abundant harvest. The primary way the Canela promote and sustain biodiversity is through intercropping, a practice that is common among indigenous horticulturalists and is known to reduce the risk of pests and diseases that target one species (cf. Tuxhill and Nabhan, 2001:184). In an average rectangular garden plot, maize and fava bean, two species that are ecologically complementary, are planted next to each other in vertical rows. Rice, squash, and watermelon lie in parallel

rows, and yam varieties are placed between them. Common bean usually grows around the edge in a horizontal row next to manioc, which is always placed at the edge of garden plots. Peanut and sweet potato varieties require their own separate mini gardens because their roots will interfere with other species in the main plot. Another way to maximize varietal and species diversity is to cultivate more than one plot per year. Some families maintain one plot in the main forested area and another near the riverbank. Since each area has a distinct soil composition and slightly different growing cycle, a family with two plots can grow a wider variety of crops over a longer period and thereby reduce the risk of hunger throughout the year.

Varietal diversity is maintained year after year through the saving of seeds and cuttings, which is primarily a female activity. Certain varieties are often passed down from one generation to another within the extended matrilineal family unit. Women can usually identify which seeds and cuttings they received from their mothers, aunts, and grandmothers, and take care to save these varieties over the years. Gardeners also obtain new varieties or ones they have lost through exchange within and outside Escalvado. Varieties obtained through exchange with neighbouring indigenous communities are often linguistically coded as such. Kwÿr Cahkrit-re, for example, literally means 'Stranger/Foreigner Sweet Manioc,' and the 'stranger' refers to a man from the nearby Jê-speaking Apaniekra community who gave this variety to someone in Escalvado (see Table 2). There is also a type of bean named Pàt Juhtòì-re Pàràre/Pryjĩ, with Pryjĩ

referring to the Tupi-Guaraní-speaking Guajajara community. The Canela obtained this variety during their four-year resettlement on Guajajara territory in the mid-1960s, and they continue to cultivate it today. Obtaining new varieties from nearby indigenous societies has been a consistent aspect of Canela gardening throughout history, although it most likely took the form of raiding enemy groups' garden plots prior to the establishment of peaceful relationships in the twentieth century (cf. Posey, 2002:24-27). Modern-day exchange is done on an individual basis and through government-sponsored seed exchange fairs, such as the one that took place in Pará state in September 2012. The Canela also obtain new seeds and cuttings from local non-indigenous Brazilians, with whom they interact frequently. These new species and varieties are given Portuguese-inspired Canela names, such as Mac for mango (manga in Portuguese), Bacat for avocado (abacate in Portuguese), and the previously mentioned Kwÿr Mĩnêr sweet manioc variety.

Canela gardeners' participation in these forms of exchange demonstrates the value placed on crop diversity. Gardeners actively maintain existing varieties and seek out new ones in order to increase the diversity of their garden plots. While it is clear that maintaining varieties originating from mythical Star-Woman is particularly important, the varietal diversity of more recently introduced species is also pursued. For example, some fruit trees have only been introduced to Escalvado over the past few decades, but there are already nine varieties of banana and mango and four of papaya that are commonly grown in the village. Canela society

respects and admires a gardener who maintains a bio-diverse plot. One woman who is known as an expert gardener explained how other Canela come to visit and admire her garden, and how the biodiversity makes their 'hearts beat quickly.' This excitement over biodiversity is common in Escalvado. People will often sort seeds and harvested crops in front of their houses, inviting others to view and comment on the varieties they have. New and different varieties, especially colourful patterned varieties of fava and maize, are particularly admired for their beauty. The next section will further examine this aesthetic appreciation of specific varieties and of biodiversity as a whole.

Canela multi-sensory aesthetics

A constant feature of maintaining so many varieties is the aesthetic value attributed to varietal diversity. The distinct colours, shapes, and designs of certain varieties are commented on and appreciated for their beauty. People are constantly commenting on the beauty of fava bean varieties, especially those with intricate designs that resemble Canela body painting and/or human physical characteristics. Five varieties of fava bean resemble the designs on ritual masks used during the mask festival, and the swirled markings are seen as particularly striking. Many types of fava are admired for their likeness to specific categories of people. Pànkryt Pyhti ('fava urucum/annatto') is likened to a woman who paints her body with red annatto prior to visiting her garden while menstruating. Another variety, Pànkryt Mēhkra Tãmtuw, is said to

resemble the messy, disorganized body paint design for a mature woman who has already birthed two or three children. There is also a type known as 'old-person fava' (Pànkryt Mēhkàa) that looks like the skin of elderly Canela, and a variety called 'white woman fava' (Pànkryt Cupēkwỳj) that is said to have red 'lipstick' on it. Other crop varieties are appreciated for their vibrant colours, including most varieties of maize (see Table 1), annatto, and some types of squash. Additionally, varieties that resemble animals are thought to be interesting and beautiful, such as 'jaguar fava' (Pànkryt Kroro-re) and 'jaguar common bean' (Pàt Juhtōi-re Kroro-re), both of which have a spotted pattern. The unique patterns and colouring are what set these varieties apart from others, as well as their resemblance to people and animals thought to be beautiful and distinctive.

What is valued above all else, however, is not particularly beautiful varieties but rather the entire spectrum of biodiversity. Gardeners will line up many different varieties of fava bean or maize seeds in a row, for example, to admire the diverse range of varietal possibilities. Part of this overarching aesthetic appreciation of biodiversity is a desire to increase crop varietal diversity, as seen in seed exchange and in experimentation with existing varieties. While distinct varieties are planted separately to maintain varietal integrity over time, there are instances where crossbreeding occurs unintentionally. Instead of discarding these mixed varieties, some Canela gardeners save the 'new' seeds and plant them the following season. An expert gardener explained that she chose to save the

crossbred seeds that ‘appeared’ in her garden in order to increase its overall diversity, which she and her family highly valued.

It is important to note that the Canela aesthetic appreciation of diversity is not limited to the visual realm, but rather incorporates all the senses in an embodied way. Canela gardeners engage with and appreciate plant species and varieties through a series of meaningful, embodied multi-sensory experiences. In the garden, the Canela engage with crops through singing, sharing food, and cultivation techniques. Once harvested, the species and varieties are appreciated for their visual appearance, taste, and smell whilst cooking. Canela aesthetic appreciation also has a moral component. As previously mentioned, the Canela word *impej* or *pej* signifies not only that which is beautiful, but simultaneously that which is ‘good,’ true, or original. Thus, Canela multi-sensory aesthetic appreciation is directly linked to moral judgements of what is ‘good’ or ‘true.’ Biodiversity conservation is therefore a morally positive decision that is intimately tied to human-plant engagements enacted in the garden space.

Conclusion

The numerous examples above demonstrate how varietal diversity maintenance is central to Canela cosmology, society, ecology, economy, and a multi-sensory conceptualization of aesthetics. While the myriad reasons for biodiversity conservation are separated into these categories for analytical purposes, the Canela make no such distinctions. Canela ‘society’ incorporates human and nonhuman

beings, including plants, animals, most objects and artefacts, and cosmological entities. All of these beings interact and engage with one another in an integrated society-ecology-cosmology. Human-plant relationships in particular take a variety of forms, including a shaman conversing with a plant-man or plant-woman, a gardener singing to her growing crop children, or a family planting a newly-acquired variety. There are times when a supernatural entity such as *Star-Woman* serve as a mediator between humans and plants, assisting with the development of these relationships. Plants also interact with each other, such as the yam leaders who organize festivals for their yam ‘community.’ Canela gardeners desire and seek out interactions with their garden crops because these plants are their children and form part of Canela ‘society’ in a holistic sense.

Within this integrated society-ecology-cosmology, the environment is conceptualized as series of multi-sensory, embodied engagements among a variety of human and nonhuman beings (cf. Ingold, 2000; 2007; 2011 for a further discussion of a phenomenological understanding of the environment). Thus, maintaining human-nonhuman relationships is at the heart of environmental conservation efforts. In the case of varietal diversity, each variety is engaged with in a distinct way and forms part of a bio-diverse ‘family’ that is understood as *impej*—both ‘beautiful’ and morally correct. Canela varietal diversity maintenance centres on the conservation of these human-plant relationships, and the forming of new ones to expand the garden family.

This article has shown how examining Canela ethnobotanical classification, cosmological beliefs, cultivation practices, and ritual activities leads to a further understanding of human-plant relationships in the TI Kanela. The value of varietal diversity is demonstrable in the myth of Star-Woman and the origins of horticulture, in shamanic experiences with plants, in food sharing and singing rituals in the garden space, in cultivation techniques such as intercropping, and in seed and cutting exchange within and outside Escalvado. It is also clearly seen in the detailed classification of crop species and varieties, which highlights the importance of ecological knowledge and human-plant engagements. The extensive knowledge of other animal and plant species, for example, is encoded in some varietal names, whereas others demonstrate the close relationship between gardeners and crops. The lists themselves show how Canela gardeners carefully maintain many varieties and remember their names and origins. This has traditionally been an oral history of ethnobotany, and the lists themselves are therefore subject to fluidity over time as some varieties are lost and others are acquired through exchange or 'appear' due to unintentional crossbreeding. Conceptualizing ethnobotanical classification as a 'living' project connects it back to Canela gardening, which is itself a dynamic process of multi-sensory, embodied human-plant engagements that occur over time. While the preferred varieties growing in Canela gardens may change throughout the years, the preference for and value placed on varietal diversity as a whole

will undoubtedly remain a key part of Canela environmental management.

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1 The Ramkokamekra-Canela are related to, but distinct from, the neighbouring Apaniekra-Canela indigenous community. While the two groups speak the same language and exhibit similar socio-cultural traits, each community considers itself a distinct ethno-linguistic group and inhabits its own legally demarcated territory. In this paper, 'Canela' refers only to the Ramkokamekra-Canela society.

The Canela refer to one species of bean as 'fava' in Portuguese, which would belong to *Vicia faba*, a genus that originated in the Levant (Hanelt and Mettin, 1989). It is as yet

unclear if these beans are in fact a non-native species or if they are a slightly different variation within the *Phaseolus* genus which is native to the Americas. For the purposes of this article, this class of beans will be referred to as ‘fava,’ which according to the Canela are categorically distinct from the regular ‘bean’ varieties (*feijão* in Portuguese).

‘Ancestors’ is a rough translation of the Portuguese word *bisavós* (literally ‘great-grandparents’), which the Canela use when referring to Canela historical or mythical figures, and often a combination of the two. Canela society does not have any form of ancestor worship or descent by lineage; thus, the term ‘ancestor’ should only be understood in this limited context.

TABLE 1.

Varieties of maize (Zea mays L., Poaceae) in Escalvado

<i>Canela name</i>	<i>Translation</i>	<i>Description</i>
Põhy Pej-re	True/original maize	Small, white kernels
Põhy Caprêc-ti	Large red-yellow maize	Large reddish-yellow kernels; produces a large harvest
Põhy Kror-ti	Large mixed colour maize	Kernels have mixed colours of white, brown, and black
Põhy Tyc-ti	Large black maize	Large black kernels
Põhy Tohrom-ti	Large mixed colour maize	Kernels are mixed purple and white
Põhy Kryi-re	Small maize	Yellow kernels and has a short stalk; ‘friend’ of Põhy Pej-re
Põhy Jaka-ti	Large white maize	Large white kernels
Põhy Jĩre	Hairy-tail maize	Has a hair ‘tail’ that grows off the end of the ear; not very tasty
Põhy Caprôô-ti	Large bright red maize	Large red kernels the colour of <i>urucum</i> (annatto, <i>Bixa orellana</i> L., Bixaceae)
Põhy Tåtà-re*	Small yellow-brown maize	Yellowish-brown kernels
Põhy Tep-re*	Small red maize	Reddish kernels
Põhy Jiproh-ti*	Large grey maize	Grey kernels
Põhy Tatap-re*	Small bright yellow maize	Bright yellow kernels the colour of cotton flowers

*Acquired at government-sponsored seed exchange with other Jê communities in September 2012

TABLE 2.

Varieties of manioc (Manihot esculenta Crantz, Euphorbiaceae) in Escalvado

Sweet manioc (*macaxeira*)

Kwÿr Cahkrit-re	Stranger/outsider sweet manioc	Comes from a strange man from the Apaniekra village of Porquinhos; use to make <i>beribu</i> (manioc-meat pie baked in earthen oven)
Kwÿr Caprêc-re (Kwÿr Kryi-re Japy)	Small red parrot-tail sweet manioc	Leaf resembles parrot’s tail; has red skin and white pulp; use to make juice

Kwỳr Kàntep-re	Red sweet manioc	' <i>Macaxeira cacai</i> '; has grey skin, white pulp, and red membrane/cytoplasm
Kwỳr Xa Jòkôn-re	Curved-vine sweet manioc	Vine winds around itself
Kwỳryre Hòhpore	Long-leaf sweet manioc	White skin and tasty
Kwỳr Mìnêr	<i>Mineira</i> sweet manioc	' <i>Macaxeira mineira</i> ' – comes from Minas Gerais state; has white pulp
Kwỳr Mēhcapôt	Baby/child sweet manioc	Resembles chubby baby's arm; use to make <i>farinha seca</i> (type of toasted flour – staple of Canela diet), <i>beiju</i> (pancake-like food item) and <i>beribu</i>

Half-sweet/half-bitter manioc

Waíputre	Hugging vine manioc	Vines wrap around each other; is unique variety that can remain in ground for five years; tapioca has poison but pulp does not
Kwỳr Xenti	Not-bitter manioc	Has a little bit of poison in pulp; use to make <i>beribu</i>

Bitter manioc (*mandioca*)

Kwỳr Hêhtyi	Strong vine bitter manioc	Takes 3 years to grow and use to make <i>farinha</i>
Kwỳr Tyc-ti (Kwỳr Krã Jimoctyc)	Black-hair bitter manioc	Has black hair on its 'head' like the Canela
Kwỳr Pakran-re (Kwỳr Caprân Jũkee)	Tortoise-arm bitter manioc	' <i>Mandioca babuzinha</i> ,' resembles tortoise arm; has short vine
Kwỳr Caprêc-ti	Large red-yellow bitter manioc	Makes beautiful reddish-yellow <i>farinha</i> but is not very tasty
Kwỳr Awari	Cobra bitter manioc	' <i>Mandioca naja</i> ,' pulp resembles flesh of cobra (<i>naja</i>); makes beautiful, tasty yellow <i>farinha</i>
Kwỳr Xatyc-re	Small black vine bitter manioc	Red skin and makes beautiful white <i>farinha</i>
Kwỳr Pytêc Jòkrekà	Rooster wattle forest tree bitter manioc	Resembles rooster's wattle and the Pytêc tree; makes yellow-red <i>farinha</i>
Kwỳr Mãã Tehkà	<i>Ema</i> shinbone bitter manioc	Resembles shinbone of <i>ema</i> (<i>Rhea americana</i> , species of large bird native to South America)

Kwÿr Cacôhti	'Bitter manioc of the water'	' <i>Mandioca d'água</i> '; very watery pulp
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TABLE 3A.

Varieties of true/original yam (Dioscorea L., Dioscoreaceae) in Escalvado

<i>Canela name</i>	<i>Translation</i>	<i>Description</i>
Krêrô Pej Caxwÿn Jaka-ti	Large white-'membrane' true/original yam	Violet and grey-coloured skin with white pulp and 'membrane'
Krêrô Pej Caxwÿn Kukum-ti	Large brown-violet-'membrane' true/original yam	Brown-violet-coloured 'membrane'
Krêrô Pej Caprân Cre-re	Tortoise egg true/original yam	Shaped like a tortoise egg; has grey skin and white pulp
Krêrô Carâmpa Caxwÿn Tatap-ti	Deer liver bright yellow-'membrane' yam	Shaped like a deer liver; has bright yellow pulp and 'membrane'

TABLE 3B.

Varieties of regular yam (Dioscorea L., Dioscoreaceae) in Escalvado

<i>Canela name</i>	<i>Translation</i>	<i>Description</i>
Krêrô Pÿp-re	Fish yam	'Yam of the water;' shaped like <i>poraquê</i> fish (<i>Electrophorus electricus</i> , electric fish native to Amazon basin region); white-coloured, long and thin; more true/original than others
Krêrô Tekâjkâj / Rorti	Anaconda yam	Circles around itself similar to an anaconda; white-coloured; also a 'yam of the water' and more true/original than others
Krêrô Xa Jÿ-re	Spiny/hairy yam	Vine has spiny/hairy; yam is very large and has yellow pulp
Krêrô Parpóhti	Long foot yam	Round and has 'toes;' grey-skinned
Krêrô Kâhcaprôti	Red-pink-skinned yam	Red/pink-coloured skin
Krêrô Pytixwa	<i>Dente de prego</i> yam	Resembles insect that burrows inside the skin; has grey skin

Krêrô Teamjijapê (Krêrô Tum Pram)	Yam that multiplies / Grouped yam	Many yams grow together in a cluster on the vine
Krêrô Rôrxô	<i>Babaçu</i> yam	Round and shaped like <i>babaçu</i> fruit (<i>Attalea speciosa</i> Mart., Arecaceae)
Krêrô Kryi-re	Small yam	Small with white pulp and grey skin
Krêrô Crehô	Pubic hair yam	Has small hairs on it that resemble pubic hair; grey skin and white pulp
Krêrô Kajakên	Breast yam	Resembles a human breast in shape; white pulp
Krêrô Kaj-re	Small basket yam	Resembles a small Canela basket (<i>kaj</i>); has white pulp
Krêrô Rop-krã	Jaguar's or dog's head yam	Round and resembles jaguar's or dog's head
Krêrô Crô Cre	Pig testicle yam	Round and resembles a pig's testicle

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