

Montology: A Research Agenda for Complex Foodscapes and BioCultural Microrefugia in Tropical and Temperate Andes

Fausto Sarmiento^{1,*}, José Tomás Ibarra^{2,3}, Antonia Barreau², Carla Marchant⁴, Juan González⁵, Manuel Oliva⁶ and Mario Donoso^{7,8,9}

¹Neotropical Montology Collaboratory (NMC), Department of Geography, University of Georgia, USA; ²Center for Local Development, Education and Interculturality (CEDEL), Villarrica Campus, Pontificia Universidad Católica de Chile; ³Center for Intercultural and Indigenous Research (CIIR), Faculty of Social Sciences, Pontificia Universidad Católica de Chile; ⁴Institute of Environmental and Evolutionary Sciences, Faculty of Sciences, Universidad Austral de Chile; ⁵Institute of Ecology, Fundación Miguel Lillo, Tucumán Argentina; ⁶Research Institute for the Sustainable Development of Ceja de Selva (INDES CES) of the Toribio Rodríguez of Mendoza National University of Amazonas (UNTRM-A), Chachapoyas, Peru; ⁷VLIR-IUC Program on Migration and Local Development, University of Cuenca - Flemish Universities; ⁸Economics and Administrative Sciences, University of Cuenca, Ecuador; ⁹Engineering, Industry and Construction, Catholic University of Cuenca, Ecuador

Abstract: There is a growing trend for inclusion of the food sovereignty dimension as a driving force of biodiversity conservation in mountain production landscapes. This is particularly important when dealing with agrobiodiversity in the tropical and temperate Andes, whereby complex agricultural systems and domesticates have incorporated ethnographic overtones in food production and consumption. One segment of this new imperative relates to foodstuff associated with rituals or religious practices and community-based observance of heirloom varieties and recipes of Andean food staples. These foods include specialty corn staples, potato races, quinoa varieties, rare lupines, and a collection of tropical fruits, seeds and fibers, including plants and animals, as former elements of a continuous forest cover that has now been reduced to patches amidst the herbaceous matrix of the Páramo, Jalca, Puna and temperate highlands. By using case studies of mountain foodscapes of the tropical and temperate Andes, changes to the foodscape narrative for vernacular culture-nature sustainability are suggested, making specific reference to field observations and research projects conducted in these regions. As global environmental change lures closer in the mountain development horizon, the stewardship of heirloom practices should be highlighted, and the cultivation of respect and observance of Andean traditions with syncretic undertones, found in historical and contemporary foodscapes of the tropical and temperate Andes, must be observed. For this, using the Montology framework as a way to fuse Western science (WS) with Traditional Ecological Knowledge (TEK), new research agendas are devised via transdisciplinary applications in the complex socio-ecological production landscapes (SEPLS) of the Andes, concluding the need of managing them as foodscapes deserving protection as biocultural microrefugia.

Keywords: Heirloom, sacred food, sacred transition, foodhub, agrobiodiversity, mountain foodscape.

INTRODUCTION

We advocate "food sovereignty" rather than "food security" as scholarly terms. Food sovereignty asserts the rights of people to define their own food systems in ecologically, socially, economically and culturally appropriate ways according to their unique circumstances (Nyéléni 2007). In contrast, food security refers to resource availability for meeting daily dietary needs. According to Rojas (2011), the concept of food sovereignty has evolved to comprise a broader set of dimensions (e.g. accessibility, affordability, utilization, stability, among others) such as those interacting in the mountainscapes of the tropical and temperate Andes.

The strengthening of food sovereignty has been identified as one of the most important efforts of the

development agenda for the world (UNDP 2014). The realization of such a critical challenge has often been guided by statistics of food production and consumption of staple grains and other plant and animal protein sources in traditional agricultural practices (Eldeman *et al.* 2014). These practices have generated stable societies because of their observance of communal purposes guided by policies affected by the ability of what to produce and consume locally, how to produce it within reasonable safety margins for both humans and their environment, and why to emphasize one cultigen or heirloom variety instead of others (Zimmerer 2002). In a pragmatic vein, the issue associated to the availability of food via agricultural intensification, energy intensive storage and distribution methods, sale and final ingestion of mass produced foodstuff have been linked only to socioeconomic indicators of the modern world, particularly Western societies (Von Brown *et al.* 2008). A clear dilemma has been sketched by the binary of locally grown, extensive, organic food products and the mass-made,

*Address correspondence to this author at the Neotropical Montology Collaboratory (NMC), Department of Geography, University of Georgia, USA; E-mail: fsarmien@uga.edu

intensive, agrochemical and bioengineered, genetically-modified organisms that are now used in most of the world (Holdridge *et al.* forthcoming), particularly in mega-diversity countries (Figure 1).



Figure 1: A panoramic view of the Andean farmscape of today, where the implications of political ecology decisions of the past have imprinted a variegated physiognomy of the Imbakucha lake and a syncretic mountainscape of the Imbabura volcano watershed, where the *Utawallu runakuna* people maintain ancestral practices of foodscape management. Photo: César Cotacahi.

The future of the species used for food from mountain areas is indeed at a crossroad (FAO 2015). Andean indigenous traditions have gradually been lost, from the colonial era with the introduction of Catholicism (MacCormack 1993), the implementation of garb to uniform ethnic communities in different valleys (Phipps *et al.* 2004), the popularization of the Spanish language (Ramírez 1998) and the increasing presence and influence of the Pentecostal Church in rural areas (Guth *et al.* 1995). Nowadays, indigenous communities have modernized due to road construction (Harvey & Knox 2008), electrification (Kyle 2000) and mobile phone and Internet networks (Salvador Agra & Suárez 2017). Associated with this modernization, for example, young people in indigenous villages and dispersed peasant populations are losing *Kichwa* (for the Kichwa people) and the Mapuzungun (for the Mapuche people) as their mother tongue (Hornberger & King 2001). Because of Market commodification, there is a trend for not considering nature as sacred, as well as the products obtained from it (Huber 2002), placing food sovereignty on top of the agenda for sustainable mountain development.

Concomitant with changes in food systems due to industrialization and globalization, there is a clear tendency to return to the basics of food production, noticed mainly with the young generation of citizens and suburbanites who claim for a healthier, safer, and

fairer food system for the future (Zimmerer & de Hann 2017). Sustainability scientists are just now incorporating the spiritual and mental fulfillment as a condition of progress towards a better future; climate scientists are just recently emphasizing the human dimension of environmental change and claim the need to understand the vagaries of weather and climate also with social science inputs. Furthermore, geographers of late are incorporating both the physical and human dimensions to understand changing mountain landscapes, as exemplified with the acceptance of the transdisciplinary science of Montology (Klein 2008).

In this paper, we seek to create a geographical portrait of food sovereignty for the Andes Mountains, based on traditional ecological knowledge (TEK) of indigenous peoples and accumulated wisdom of agriculturalists. We highlight that these peoples and their associated systems of knowledge, practices and belief have developed a mixed cultural landscape with both native and imported Mediterranean practices that created the syncretic foodscapes of today (Sarmiento 2017) in both tropical and temperate Andean regions. We conceive the appropriated use of local food resources as both a continuation of ancestral practices with ancient food staples, and the inclusion of novel usages that respond to colonial influences, substituting vernacular with foreign foodstuff as a means of building resilience in Andean foodscapes subjected to the pressures of globalization and environmental change, including global warming.

In our understanding of foodscape dynamics and the risk of diminished food sovereignty for mountain communities, the search for integrative approaches for a sustainable stewardship of mountain socio-ecological systems (SES) has led to a increasing interest in Montology, aiming to integrate both the “interdisciplinary study of the physical, chemical, geological, and biological aspects of mountain regions” and the “study of lifestyles and economic concerns of people living in these regions” (OED 2002). The transdisciplinary nature of montology allows for holistic views of complex mountain foodscapes.

FOODSCAPES AND MONTOLGY

It is in the mountains that ancestral societies domesticated the majority of the food staples used by the world today, whether be wheat, rice, corn, potatoes, beans, peppers, and many more cultivars (Janick 2013). Older descriptions of mountains described these foods as simply there, facilitated by the specific

conditions of orographic rain, temperature and catenary soil conditions (Wezel et al. 2018). Newer descriptions of mountainscapes describe sacred foods as a manifestation of the intricate relation of nature and culture, a symbiotic and time-tested interaction that has been able to secure the best possible nutrition with the best possible crop as *per situ* conditions. Many mountainous countries do hold in pride their food staples, such as registering them as AOC (from Appellation d' Origine Contrôlée), branding them as specific mountain products with DGTG (Denominación Geográfica Típica Garantizada) or by legally controlled trademark by zones and harvest times. Other mountainous countries in South America have gone one step further, by recognizing “sacred grain” of *Kinwa* –*Chenopodium quinoa*– (or quinoa in the English version) in Bolivia; the “sacred vine” –*Banisteriopsis caapi*– or *yagué* (*ayahuasca* in the Castilianized version) in Peru; the “sacred seed” of *ngülliw* or piñón –*Araucaria araucana*– (*Pewen* in the Mapuche language, *Mapuzungun*) in Chile; the “sacred drink” *chicha de kura* –*Zea mays*– big yellow corn beer) in Ecuador; the “sacred root” or *chuñu* –*Solanum tuberosum*– (freeze-dried potato in Quechua version) in Peru, and the “sacred fruit” or Parchita –*Passiflora edulis*– (Maracujá in Portuguese) of northern Argentina. Moreover, the “sacred leaf” of the *kuka* plant –*Erythroxylum coca*– or coca, is being recognized as an identity marker in the Andean imaginary of the food collective, not only in the ‘cocaleros’ guild of Peru and Bolivia (Salomon 2018).

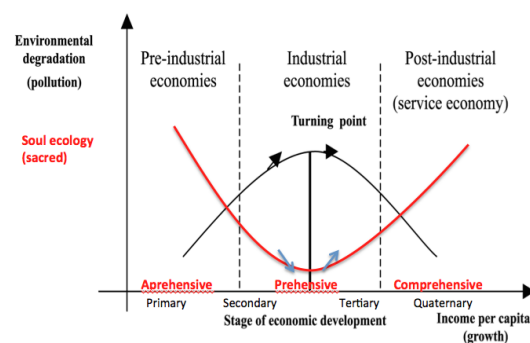
Many of the foodstuffs derived from tropical and temperate mountain farming are hybrid cultigens and many are wild edibles with high nutritional values, either as a complete meal, or as individual components of the diet. For instance, the concentration of calcium in *tarwi* –*Lupinus rastreris*– is greater than in cow’s milk. The concentration of protein in *kinwa* is between 12–28% and includes all amino acids available for a complete human diet, unlike other foodstuffs like wheat or corn, not to mention its saponins that could be used with a multitude of purpose. The protein digestibility of *purutu* –*Phaseolus vulgaris*– is second to none. The flavor and medicinal properties of the “sacred drink” –*Passiflora tripartita*– (*Curuba*, the national fruit of Colombia) is without equal. The relative high anthocyanin content of the maqui berry (*Aristotelia chilensis*) may make it a strong antioxidant (Escribano-Bailón et al. 2005). The consistency of sugars in the “sacred dessert” –*Vasconcellea x hellboni*– *babacu*, the unique Ecuadorian mountain papaya, is unpaired, as it

is the high concentrations of alkaloids in the legendary and revered fruit of the *Inka*, the tree tomato or “tamarillo” –*Cyphomandra betacea*– from the cloud forest belt. Lastly, even botanists recognized the sacred dimension of cacao from the flanks of the Andean/Amazonian crescent that its scientific nomenclature (*Theobroma sp*) literally means the “Food of the Gods.”

Sacred Transition Requires Sovereignty on Sacred Foods

The recognition of these montological trends for transdisciplinarity is depicted in the new tendency towards the spirituality associated with the affluence level, in what is known as “the sacred transition” (Figure 2). Just like the demographic transition, or the forestry transition, where the effect of the country’s wealth could correlate with either the number of births –demographic transition– or the number of timber being cut –forestry transition–, much of the deleterious impact of food production is directly related with the level of economic development exhibited by a country and as matter of scale, whether they are 1) solidly functioning as “banana republics” with the primary sector, or 2) actively producing manufactured goods in the secondary sector, or 3) intensively favoring tourism and other service areas in the third

Inverse BioCultural Kuznet Curve Earth Stewardship



Source: Panayotou (1993)

Sarmiento, F. & S. Hitchner, (Eds). (In Press). Indigenous Revival and Sacred Sites Conservation in the Americas. New York: Berghahn Books.

Figure 2: Representation of an inverse biocultural Kuznets curve of the sacred transition, (in red), where the transformation of resource exploitation in the environment shifts while civilizations mature through stages of economic development (in black). The turning point of the transition is present during industrial economies. Note how intense spirituality is manifested in pre-industrial and post-industrial societies.

sector, or finally, 4) those in the fourth sector happily using the rent of annuities, stock and bonds to use the interest generated by accumulated capital that does not diminish into the future. The difficulty of developing food sovereignty agendas for mountain regions within these countries is that there are a variety of levels where the mountain communities could fold into, from the subsistence agriculturalist, communal productions for local consumption or localvory, to extensive harvesting, intensive monocropping or industrial intensive extraction for global consumption or globalvory (Caspi et al. 2012). Thus, generalizing a development strategy of food sovereignty demands not only situated knowledge and localized agency, but also scaling and dimensionality of the “glocal” sphere. It also implies contentious power relations between those mass-producers, often GMOs, versus the specialty, often-organic certified foodstuffs.

As depicted in Figure 2, the sacred transition observed in the richest countries of the post-industrial economy, is a reflection of the need to include sacred food production in our understanding of the mountain futures. Just like scriptural interpretation of biblical faith-based myths of food delivery, when “*manna*” came down from the heavens to feed the Israelites in their desert crossings, other exegetic interpretations of sacred texts call for respect of sanctified food sources available to their followers. These interpretations include times for which certain foods are either forbidden outright, allowed for ceremonial intake or for sharing of those with the hungry masses (Sarmiento 2017). Sometimes, active ingredients of plants, such as the Amazonian flagship *Ayawaska* or *Yagué* (*Banisteriopsis caapi*) requires a semiology ritualized by the hallucinogenic effects of the entheogenic “sacred” plants of the shamans throughout Amazonian collines; something that in the past was a treasured sacrament is now converting tourists into fans of quick “highs” in extreme jungle experiences. The inverse Kuznets’s curve for environmental degradation depicts how the sacred transition is graphed with a quadratic equation, showing the highest concentration of spirituality and localvory in both the animistic religions of the primitive societies (such as the non-contacted Amazonian tribes) and the naturalistic religions of advanced societies (such as the new-age, Hinduists, Buddhists or Shintoists) that appear to be more visible now throughout the Brazilian Amazon or along the Andean Amazon flank. Specific case studies are given from the temperate and tropical regions to elucidate the agenda for food sovereignty in the Andes.

The Foodscape of Socio-Ecological Systems in Temperate Andes

A better interpretation of the syncretic nature of sacred practices and foodscapes in the temperate Andes, arise from the Mapuche’s consumption of the seeds of the monkey-puzzle tree (*Araucaria araucana*), *ngüilliu* (in Mapuzungun) or *piñones* (in Spanish), and other wild edible plants in the mountains of the La Araucanía Region, southern Chile. Here, the restricted access to communal forests due to land-grabbing and strict biodiversity preservation projects, have halted the practice and endangered the ritualized consumption of the seeds of the *Pewen* (Barreau et al. 2016). Just like with some grains of the altiplano, the *ngüilliu* collected from tree, is considered a “sacred food” and consumed with respect to the ancestors and spirits of nature, along with a fermented drink or *muday* made with dried *ngüilliu* collected in the high altitude monkey-puzzle tree forests. Often considered ceremonial consultation with the oracle of the *Mapuche*, the revelations offered via a medium or *Machi* using the local language or *Mapuzungun*. As traditional healers trained in the art of using sacred foods and other medicinal plants to treat disease, *Machis* used to operate out of rustic huts called *Rucas*, complete with prayers and chants that often recall geographic highlights, in particular the sacred mountains of the La Araucanía. Trips to high-elevations in order to gather piñones are instances for learning and interacting with each other (Figure 3). Some Mapuche people remember that elders would tell stories (*epew*) or historic narratives (*ngütram*) as a way of teaching children about life and especially how to behave in these forests, teaching philosophies of respect and values for other life-forms (Barreau 2014).

Recently, an increased number of people from the city of Temuco and even from the national capital of Santiago in Chile often visit *Machis* in intercultural hospitals, seeking interventions to treat their ailments. Sacred foods are given powerful and lasting cures, due in great part to the generally accepted “Mapuche wisdom” still practiced in large part of the La Araucanía Region.

Tropandean Examples: The Imbakucha Watershed and the *Utawallu runakuna*

As exemplar of food sovereignty predicaments currently observed in the tropical Andes we include a case study of Imbakucha (Mantilla 2012). Located in northern Ecuador, the *Imbabura* province is known for the many Andean lakes that justify its moniker “the



Figure 3: Monkey puzzle trees or *pewen* (*Araucaria araucana*) are the only trees capable of growing at high altitudes with harsh winter and volcanic conditions; they survive in the higher peaks forming the tree line in the southern Andes. Mapuche people that lived relatively close to *araucaria* forests have, for centuries, temporarily moved to these forests during the fall with enough provisions to stay a week or more. The fall season is the time when families got ready to take a trip to the mountains looking for *piñones* or *ngüilliu*, the relished and highly nutritional seeds of monkey puzzle trees. Gathering *piñones* used to be a not-to-miss social event that lasted for days and, for some, weeks. These were also instances for collecting other useful plants only found in the high Andean forests. The loss of *piñonear* should be read beyond the mere fact of not eating *piñones*, as it may also deeply affect social cohesion and the maintenance of traditional ecological knowledge through generations.

Switzerland of Ecuador". The largest and most densely populated lake is *Imbakucha*, known in the past with the name of 'San Pablo' Lake. This change in appellation is symptomatic of the indigenous revival and political clout of the *Utawallu runakuna* people, part of the *Kichwa* nation, who make the vernacular a proud character (Figure 4). Known with the Castillianized name of 'Otavaleños', they represent one of the most successful entrepreneurial ethnicity in the world. Since prior to the Spanish conquest, and all through colonial times, Otavalo's handcrafts were marketed by traveling merchants (*mindala*) throughout the late *Inka* Empire and colonial Andean towns. Well-versed in textile making, basketry, reed works, and many other handcrafts, 'Otavaleños' are often seen around the world, in the central plazas of the main capital cities, selling their man-made goods. In fact, Otavalo city holds the largest indigenous (thriving) market of South America; it draws international tourism to Ecuador in masses, only second to the Galapagos islands. No visit to the country is complete without touring the *Imbakucha* watershed and getting to know the *Utawallu runakuna* (Carter & Sarmiento 2011).



Figure 4: An "Otavaleño" family returning from the market on a dirt road with their loads of foods or *watu*, walking by the side of a corn stand or *chakra*. Note the traditional garb exhibited by males and females exemplifying the syncretic nature of the biocultural heritage: a fedora hat and "alpargata" shoes of European origin, with the *punchu* and *anaku* made with fine dyes, cotton, and wool from the Andes. Photo: César Cotacachi.

Despite three centuries of Spanish colonial rule and almost two centuries of political life as a republic, Ecuador has just recently made gains in relation to the rights of indigenous people and has also insisted in revaluing native belief systems and religious practices. Most people in the watershed are Catholics, although the effectiveness of the evangelicals in its various denominations inserted themselves into the fabric of 'Otavaleño' lifestyle is notorious. Many in the area now are protestants and the youth is increasingly non-practicing Catholics. Several indigenous scholars have achieved prestige and conducted indigenous affairs at the governmental level. Some have obtained advanced degrees and a few are pursuing graduate studies in the USA or Europe. Despite efforts of the 'Instituto Otavaleño de Antropología' over decades of research, the story of the *Utawallu runakuna* is still to be deciphered. Unfortunately, now with technical colleges and a local university, the young generation of 'Otavaleños' is slowly being lured by the mainstream modernity, speaking only Spanish and consuming fast food, spending time in 'cyber cafés', watching Hollywood movies and listening to music played on YouTube.

Applying the trilemma of Andean identity, we conclude that it is responsibility of the grandparents as TEK guardians, maintaining the foodscape that is the basis of their "Andeanitude". For instance, by revaluing the consumption of guinea pig or *kuy* that becomes a preferred animal protein to integrate their healthy diet

of *sara*, *kinwa*, *chuchu*, *papa*, and *ulluku* (Figure 5). Of a sample of medicine men working as *Yachaj* in the town of Illumán, with the highest concentration of ‘curanderos’ and wisemen in Northern Ecuador, almost 82% were older than 50 years of age. None younger than 25 was identified therein. In spite of clear gains in relation to their garb and physical appearance (i.e. showing “Andeanity”), and their political activism and self-governance (i.e. showing “Andeaness”), it is clear that their Andean identity markers are losing the trifold of sustainability: many *Utawallu* are losing the connection to the mountainscape in an spiritual level (i.e., showing “Andeanitude”).

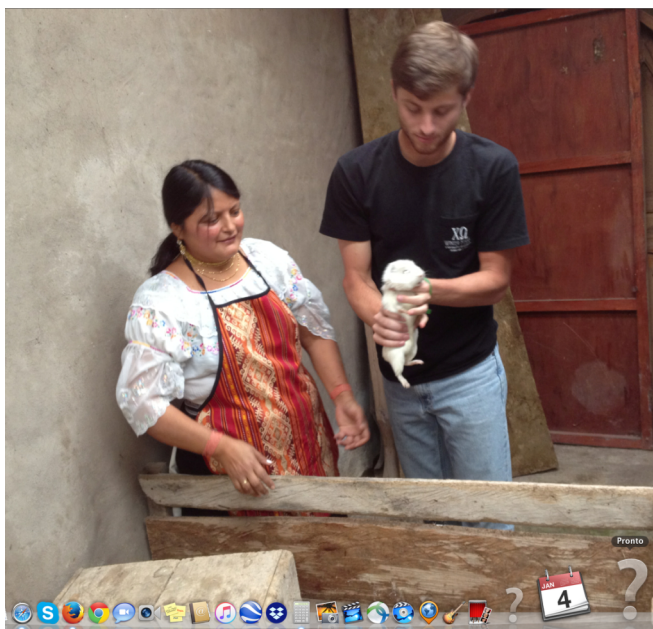


Figure 5: A young Otavaleña proudly explain to a foreign student about the practice of *Kuy* rearing, which combines the notion of having the animals as pets and helpers in the cleaning of their houses, and also as a coveted concoction of local delicacy. Photo: Fausto Sarmiento.

SACRED FOODS OF THE OTAVALO

Practices associated with the syncretism of Catholic rites and vernacular beliefs persist in a few cases. For instance, in the celebration of the Day of the Dead, the visit to the cemetery and the preparation of the corn beer or *chicha* “morada,” by using purple corn and blueberries or ‘mortiño’ (*Vaccinium meridionale*) collected in the nearby páramo, could still be catalogued as “sacred food”, as it is only prepared to pay respect to death on November 1st of each year. Another staple in the “sacred food” category is the preparation of the *chicha* de *kura* and the *llapingachukuna* or potato patties made with fresh cheese and red coloring from *achiuti* (*Bixa orellana*) to consume during the celebrations of the solar solstice or

Inti Raymi each June. Although not as strongly felt as in Bolivia or Peru, the preparation of *kinwa* as a “sacred grain” is evident in some families who keep the tradition of having *kinwa* soup or *kinwa* salad as a Sunday food, after returning from mass. Moreover, the red dye obtained from the coating of dark Quinoa (whether black, blue, maroon, brown, or yellow) often is used to give coloration to the belts (*watu*) or other textiles that decorate the altar’s statuettes. With the advent of ecotourism and ethnotourism, many have incorporated healthy recipes to prepare ‘empanadas’ made out of *kinwa* flour filled with organic vegetables directly harvested from the house garden and served in colorful arrays with hot sauce (*ají* or *rukutu*) and ‘encebollado’ (Figure 6). Another element of the sacred foodscape is the preparation of dried, fried corn kernels (*saramishki* or ‘tostado’) and fresh, boiled lupinus beans (*tarwi* or ‘chocho’) that are eaten together in a symbolic consumption of the dark with the light, the dry with the wet, and the old with the new in a satisfying snaking throughout the day (*kukayu*), particularly after laboring (*chaucha*) in the fields nearby (*chakra*). In the ceremony of the *chaya* or ‘pagamento’ blessings are sought for starting a new job, with a tribute to compensate the good will in favor of the soon-to-start



Figure 6: A modern version of an “empanada”, prepared with a fusion of Andean ingredients and a pan-Andean design of a flour patty, with an Italian gourmet appeal. Instead of wheat or rice, they are now using *Kinwa* flour and the filler includes fresh organic ingredients from their house gardens. Tailoring the taste buds of tourists and foreign nationals (amenity migrants) that are choosing to live in the Imbakucha area is but one of the strategies to reaffirm their indigenous identity in an increasingly competitive agrodiverse market. Photo: Fausto Sarmiento.

project: the corn beer (and increasingly nowadays with a potent moonshine alcohol) is ceremoniously thrown to the ground, sharing with mother Earth (*Pachamama*) to make good wishes for the success of the enterprise.

Conversely, after an arduous trail or a difficult project is concluded, the *wasishka* or 'pagamento' or payment for allowing a good conclusion is required. In most cases, after finishing the daily tasks at hands, some bread made with the flour of dry sap from the *Pinllu* tree. This species is key in the pantheon of the local mythology of the *Imbakucha* watershed. Growing strongly in the highest point of the interior valley, dividing the actual lake area with the periurban and exurban areas of 'Otavalo', and nested between the telluric presence of the two tallest volcanoes (*Tayta Imbabura* and *Mama Kutacachi*), the Otavalo's sacred gum tree, known as '*pinllucruz*' or 'lechero' (*Euphorbia latifolia*) stands atop of the *pukara* of 'Reyloma', a hilltop fortress made out of blocks of hard tuffa or *cangawa*. The white sap of the gum tree is considered a mythical symbol of renewal, sanitation and purity, making it a key pilgrimage place for couples to be wedded, or newlyweds, to pray for good fortune for their marriage and healthy, robust (and numerous) progeny. 'Pagamentos' to the sacred tree were made in form of coins inserted into the bark of the old tree, until they discontinued this practice after sacrileges and stolen tokens. However, the burial of birth-labor byproducts, including placentas and other bloody materials, sometimes even fetuses and dead pets were respectfully deposited around the sacred tree (Figure 7). At present, the sacred tree has attracted tourists who enjoy a half-day trek atop of the pyramidal *pukara*, visiting the sacred waterfall of *Piguchi* along the way. Also, the ubiquitous 'eucalipto' trees (*Eucalyptus globulus*) have obscured the preeminence of the gum tree. Now, distracted hikers have started fire pits on 'Reyloma' even at the base of the tree. This is a flagrant risk onto the spiritual dimension of the mountainscape of the *Utawallu runakuna*, who luckily stopped an effort from the non-indigenous municipality of the city of Otavalo to install a series of communication towers (cell-phones and radio/television antennas) slated to be placed on top of the *pukara* of Reyloma or another effigy of Christ crucified, instead of the tree.

The *Kañary* of Southeastern Ecuador

The '*Kañary*' people settled in southern Ecuador. This ethnic confederacy inhabited much of today's Azuay province (Rojas 2003). The presence of



Figure 7: The sacred tree of the *Utawallu runakuna* on top of *pukara* of Reyloma, overlooking Imbakucha and located strategically in the shadow of the *tayta Imbabura* volcano. As iconic symbol of the spirituality of the Otavaleños, the area in the hilltop has become a favorite stop in the touring of the "Valley of the Awakening" or Otavalo. Photo: César Cotacachi.

'*Kañary*' in Ecuador dates from the Regional Development period (3000-1500 BP) to the arrival of the Europeans in 1532. The *Kañary* nation had capitals in *Hatun Kañar* (currently, *Ingapirca* near the city of Cañar) and *Shabalula* (currently, city of *Sigsig*). They appeared at the time of the *Inka* conquest, after an alliance of the *Wankabamba*, and *Palta* ethnic groups and the *Saraguru* who were brought from south of Cuzco to populate these newly gained territory for the Inks. Since the *Kañary* were first reported, they were already presented as a formidable indigenous nation centered on their capital city of *Guapondelec*, the site that was bloodily conquered and transformed into the *Inka* city. Thus, the *Kañary* allied with *Waskar*, the *Sapa Inka* heir from Cuzco, to oppose *Atawallpa* the *Sapa Inka* heir from *Kitu* in the northern *Tawantinsuyu*. The kingdom of *Kañar* was largely equated to that of 'Quito' (or *Kitu*), in the sense of a confederation of some twenty-five indigenous tribes (González-Suárez 1878, in Oberen 1981). With the *Inka* alliance and the

primacy it acquired, *Guapondelec* was improved and fortified as an *Inka* capital, *Tumipampa*, known as the “Second Cuzco.”

At present, the indigenous of Cañar and Azuay provinces reflect consequences of different historical processes that modified their social and cultural composition under hegemonic colonial powers. The Spaniards built on the ruins of *Tumipampa* and constructed a magnificent Andean town, the royal entitled city ‘Muy Noble y Muy Leal Ciudad de Santa Ana de los Cuatro Ríos de Cuenca’ which with such a noble origin by royal decree from Spain, demonstrated the important hierarchy of such indigenous settlement at the time of the European colonization. Now, UNESCO declares the city of Cuenca a World Cultural Heritage Site. However, their ancestral roots have not yet cracked their cosmological relationship with their territory. The *Kañary* made páramos a production landscape and manufactured an anthrome with rich biocultural heritage. Their products vary between potatoes (*Solanum tuberosum*), melloco (*Ullucus tuberosus*), uca (*Cucurbita maxima*), mashua (*Tropaeolum tuberosum*), quinoa (*Chenopodium quinoa*), beans (*Phaseolus vulgaris*) and corn (*zea mays*). All these products were and are the base of dietary traditions. Maize is also called by the *Kañary* as “*mama sara*” and constitutes their favorite sacred grain. In some *Kañary* villages, when corn is sprouting, people walk slowly because they believe that the land is pregnant (Quinde 2001). They are socio-ecological production landscapes that help conserve biodiversity (Sarmiento et al, 2018).

THE FOODSCAPE OF THE PEOPLE OF THE CLOUDS

Reflecting the wealth of foodstuff produced along the elevational gradient of the Andean Amazonian flank, an important ethnic group developed in the cloud forest belt of northeastern Peru. The presence of monumental architecture, such as the fortress of *Kuelap* in Chachapoyas, Amazonas, Peru, bears witness to adaptations of people who domesticated a variety of plant and animal species and allowed large urban complexes on mountaintops. Archaeologists have been deciphering the lifestyle of the residents of Chachapoya centers (Orloff & Moseley 2009).

The culture of Chachapoyas or *Sachapuyu*, which derives from Peruvian Quechua for “men of the clouds”, was developed between 2800 and 3570BP, over an extensive territory of the Andean flank in

northwestern Peru, reaching its maximum apogee until the year 1440, when the *Inka* invasion began. The main activity of the inhabitants of these cloud forests was agriculture, positioning ridge-top settlements with circular dwellings embellished with stone sculptures and masonry mosaics (Guengerich 2014) and a complex funerary mausoleum-like structures built into cliffs where decorated sarcophagi have been discovered with more than 200 mummy bundles retrieved from the site of ‘Laguna de los Cóndores’ (Matthews-Bird et al. 2017). Mountain farming on the slopes by constructing platforms and terraces at heights between 2400 and 3800 m above sea level along the Marañón and Huallaga River valley divide. Their main staples for cultivation on the sloppy areas were tubers, such as potatoes (*Solanum tuberosum*), mashua (*Tropaeolum tuberosum*), oca (*Oxalis tuberosa*) and olluco (*Ullucus tuberosus*) and diverse grains including *kinwa* (*Chenopodium quinoa*) and *Kiwicha* (*Amaranthus caudatus*), which satisfied the food demand for the population, whose great majority were (Church & von Hagen 2008).

The Road Ahead: Transitions Towards Amenity Migration and the Imposition of Foreign Diets in Andean Mountainscapes

If all the foodstuffs originate in the primary sector, it is evident that this sector has a transcendental importance in the economy (Anderson et al. 2006). This occurs in developed countries (Bale & Lutz 1981) such as the United States, members of the European Union (Rizov et al. 2013), Japan (Mulgan 2013), Australia (Chisholm 1992), and some developing countries like China (Gale et al. 2005) and Brazil (Clover 2003). These countries maintain different types of subsidies to companies that extract or exploit natural resources, in order to guarantee food security of their population, in addition to reducing the cost of raw materials at the origin of the production and distribution chains. However, for the poorest countries of the planet, such as most of the nations of sub-Saharan Africa (Clover 2003) and South Asia, it is impossible for them to subsidize the primary sector, since agricultural activities are too high a percentage of the population with their low GDP (World Bank Group 2012), because their populations are still mostly rural (Angel 2012) and it becomes impossible to use the low amounts of taxes collected (Auriol & Warlters 2005) in weak industrial sectors and tertiary sectors, characterized by underemployment and informality in both commerce and services, to subsidize primary sectors (characterized by smallholdings, microfundia and low

productivity) that constitute close to 50% or more in their economies. An interesting case study of a place where the locals are emigrating but the retired expats are fleeing to is presented in Donoso & Sarmiento (2019).

We note that both large estates, smallholdings and micro-funds are serious socioeconomic problems, since large 'haciendas' generate poor distribution of rural land (Griffin *et al.* 2002); while small property often corresponds to subsistence agriculture (Clark & Haswell 1964), generating low levels of income and profits (Binswanger *et al.* 1993), which are primarily destined for family survival. On many occasions there is absence of property titles and access to credit is more difficult and generally very limited (Gilbert 2002), so there is low re-investment in inputs, technology and infrastructure. Although there is a group of authors (Bardhan 1973, Berry & Cline 1979, Cornia 1985, Ghose 1979, Taslim 1989) that show that, in some developing countries, the smaller the size of the property, there is greater productivity. What is clear is that, the medium property tends to have similar productivity (production per hectare) (Gardner 2009) than the large Agricultural Production Units (APUs), since in both cases, productivity depends on biological cycles of growth of animals and plants, and both medium and large UPAs, by having more access to capital (either by income or credit), can buy better animals and seeds, food and fertilizers, pharmaceuticals and chemicals to counteract diseases and pests, buy machinery or other agricultural technologies and build infrastructure for its proper functioning. Based on the above, it is recommended that agrarian reforms be carried out (expropriating and compensating the large and small owners) aimed at generating an agrarian structure based on medium-sized UPAs for reasons concerning social justice and improving productivity. Obviously, it is necessary to indicate that what is considered medium property will depend not only on the size of the plots of rural land, but rather on the average profits generated by the different crops or land uses per hectare; Thus, for example, one hectare of roses could theoretically generate profits similar to five hectares of banana or twenty-five hectares of cattle. It should also create laws similar to those that occurred in many states of India (Mearns 1999) from 1956 to 1986 (Land Reforms Acts) and Nepal (Regmi 1976) (Land Act 1964) aimed at preventing fragmentation (Niroula, & Thapa 2005), as well as laws similar to those enacted in Japan (Hayami 1988) (Land Law 1962) and Taiwan (Tai 1974) (Land

Act 1953) to avoid the serious consequences of a subsequent unification of plots.

Tools for Promotion, Conservation and Equitable Use of Andean Seed Banks

The Andes have been and continue to be a source of genetic wealth that has yet to be valued in its entirety. If we take only the genus *Chenopodium* as an example, there are 16,422 specimens deposited in 59 seed banks in the world. Inasmuch as food sovereignty and security, it is clear that while 88% of those collections reside in Andean countries, the rest is distributed in other countries, including Norway, Brazil, Canada, United States of America, Uruguay, Germany, Austria, Slovak Republic, Spain, Hungary, Czech Republic, Portugal, United Kingdom, Sweden, Turkey, Romania, Ethiopia, Kenya, Lesotho, Zambia, South Africa, India, Japan, Jordan and Australia. Not only this germplasm is distributed around the world, but also many improved varieties adapted to diverse climates have been obtained. Without a doubt, the preservation of the genus *Chenopodium*, and particularly of *Ch. quinoa*, have to be tackled with international legislation or agreements that ensure tangible benefits return to the Andean world. Notwithstanding this recommendations being applied to other species, whether for their nutritional value or for other multipurpose as source of dyes, basic pharmaceuticals, ethnomedicinal icons, fodder for Andean livestock of llamas and alpacas, and their intangible symbolic and religious value. In this sense, these agrobiodiversity promotions via rescuing TEK, or via strategic alliances for ecophysiology and genetic research, or via the legal framework of protective legislation against biopiracy, are educational tools for a better use of the Andean foodstuffs to be assured for their sustainability through time.

Towards a Research Agenda of Montology in the Andes

We highlighted the importance of food geographies in the tropical and temperate Andes to develop management practices based on sound scientific understanding of mountain food hubs, the application of food sovereignty in mountain farmscapes and the conservation of biocultural heritage. By maintaining the practice of respect for the sacred landscape features of the *Imbakucha* watershed, the possibility is assured for a likely sustainable future of heirloom practices associated with food production and consumption of the sacred foods of the mountainous communities of

Northern Ecuador, particularly of the *Utawallu runakuna*. As a manifestation of the changing patterns of the socioecological system of the tropical Andes, and most iconic in the territory of the Otavaleños (*Utawallumanta*), keeping the sacred foods associated with the indigenous identity is the best management practice to favor food security for the mountain people, as it will help in promoting a more enjoyable eco and ethno-tourism experience for those coming to visit, and a more flexible cash flow and subsistence agricultural practices for those living therein (Figure 8). These approaches will aim towards having multifunctional agriculture becoming the model for sustainability in the tropical and temperate Andes (Sarmiento *et al.* 2013).



Figure 8: Teaching about the lifescapes of the *Utawallu runakuna* to visitors and the young generation will validate the efforts of some conservation oriented indigenous leaders that see food security as one of the most important targets of the sustainability of *Utawallumanta*. Photo: Fausto Sarmiento.

An adequate agrarian reform is only the beginning of what should be done; it is also necessary for governments to help the primary sector in the following ways: 1) generating credit lines with low long-term interest rates (Yaron 1994) and subsidizing inputs, technologies, energy and transport (Alston 2007) so that the market prices of food and raw materials are as low as possible; 2) Another alternative to achieve this goal is the setting by governments of minimum reference prices that intermediaries or industrialists must pay for goods from the agro-livestock and mining sector, as happens with export products such as bananas in many countries of the world (Donoso 1996), thus guaranteeing sufficient profits for the shareholders of companies or families, and the existence of capital to re-invest in technologies that increase productivity. Obviously, these higher prices will affect the industries and households that consume these products, which is

why the government must subsidize consumers (merchants, industries and households) of primary sector goods (Schwartz & Clements 1999). Either of the two alternatives will generate food security in the countries that decide to implement these policies, in addition to increasing productivity and reducing prices at the beginning of the production and distribution chains, which translates into greater purchasing power for consumers. Regarding imported products, if these are subsidized by another country (it will depend on the percentage of the price of subsidies), it may be convenient for a poor nation to take advantage of the high productivity and low price of these goods and allow their importation without tariffs.

In short, it is advantageous for an economy to have low active interest rates, high productivity and subsidies to production and transport factors, primarily at the beginning of the production and distribution chains, that is, to companies in the primary sector. High productivity accompanied by subsidies helps to reduce the costs of productive processes, while competition (when there are many suppliers) decreases profit margins (Blattberg & Wisniewski 1989). On the other hand, it is important that workers or employees are well paid, in order to maximize the purchasing power of families (Carroll & Summers 1991).

CONCLUSION

The significance of transdisciplinary approaches for understanding complex foodscapes has been highlighted. Accordingly, changes in the direction of research projects are anticipated, mainly to understand CAS and SEPLs of mountainscapes as policy framework to foment heirloom polycrops cultivation instead of massive monocropping of transgenic varieties. Particularly in Latin America, the notion of food sovereignty shall be pursued as a trend to protect intangible heritage and recover the resilience of past landscapes affected by the food security mode of the WS modern world (Redman & Kinzig 2003). The basic premise of integration towards transdisciplinary research would require a dialogue of knowledge between global WS and local TEK, in horizontal or rhizomic participatory approaches, using multi-method foci for integration and observing respect of this diversity of views and knowledge production forms (Sarmiento *et al.* 2013). Agrobiodiversity conservation, preservation of seed banks, revival of rearing practices in rural settings, appraisal of farmscape transformation, etc. are part of the development toolbox suggested by

the International Satoyama Initiative (Satoyama 2016) to secure productive mountain landscapes.

We also suggest increasing funding for mountain research associated with discovery of principal agents of plant and animal products often used in TEK and their potential applicability as non-traditional market innovations to promote local adaptations to climate change, as with the Field Schools of the TESAC project in Colombia (Ortega 2017) and farm-to-table approaches of late, wherein chefs, trained in the culinary arts of fusion cuisine, are becoming the teachers of sustainability to the hungry crowds of localvores and organic food seekers in the expensive and trend setting restaurants of the global north. Soon, a lot more indigenous foodstuff will be part of the menu of choice in sophisticated foodscapes worldwide, for the benefit of all.

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NOTE

Ethnic names (mostly *Kichwa* and *Mapuche*) and scientific notations are given in italics. Spanish names are given in single quotation marks. Emphasis or contested meaning is given in double quotation marks.

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