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Authors: Barreau, Antonia, Ibarra, José Tomás, Wyndham, Felice S., and Kozak, Robert A.

Source: Mountain Research and Development, 39(1)

Published By: International Mountain Society

URL: https://doi.org/10.1659/MRD-JOURNAL-D-18-00015.1

Mountain Research and Development (MRD)
An international, peer-reviewed open access journal
published by the International Mountain Society (IMS)
www.mrd-journal.org

MountainResearch
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Shifts in Mapuche Food Systems in Southern Andean Forest Landscapes: Historical Processes and Current Trends of Biocultural Homogenization

Antonia Barreau[1], José Tomás Ibarra[1,2], Felice S. Wyndham[3], and Robert A. Kozak[4]

** Corresponding author: abarreau@gmail.com*

[1] ECOS (Ecology-Complexity-Society) Laboratory, Centre for Local Development, Education and Interculturality (CEDEL), Villarrica Campus, Pontificia Universidad Católica de Chile, O'Higgins 501, Villarrica, Chile

[2] Centre for Intercultural and Indigenous Research (CIIR) & Millennium Nucleus Centre for the Socioeconomic Impact of Environmental Policies (CESIEP), Pontificia Universidad Católica de Chile, Avda. Vicuña Mackenna 4860, Macul, Santiago, Chile

[3] School of Anthropology and Museum Ethnography, University of Oxford, 51/53 Banbury Rd, Oxford OX2 6PE, United Kingdom

[4] Faculty of Forestry, University of British Columbia, 4040-2424 Main Mall, Vancouver BC, Canada V6T 1Z4

Mountain communities that use local foods are more likely to be food secure over time. However, historical and contemporary policies have largely homogenized food systems by replacing diverse local foodstuffs with less diverse market-based foods. These transformations often mean that nutrition-related chronic diseases increase. We explored current and past food systems of families living in Andean landscapes in Mapuche territory, Chile. We recorded local community perceptions of food system transformations using participant observation, informal and semistructured interviews, and weekly food diary elicitation. Older participants agreed that food systems have shifted drastically since their childhoods. Food items have changed, as has the way food is procured and prepared. Perceived drivers of these changes include shifts in children's food preferences (associated with schooling and the National Food Program), the loss of cooking spaces and utensils, lack of time and temporary migration, and a decreasing production of local grains and vegetables. Food diaries (n=170 meals) collected during summer's abundance period showed that locally produced ingredients comprised 55% of families' total intake and market-based foods 45%. However, during seasonal scarcity participants reported that proportions of market-based foods increased. Rice and noodles have replaced traditional foods such as locro, soplillo, *and* quinwa. *Participants reported an increase in diet-related chronic diseases such as type 2 diabetes, obesity, and hypertension. The Mapuche food system is facing a process of biocultural homogenization with an increase in nutrition-related chronic diseases. One major recommendation is to restructure the National School Food Program to better serve cultural particularities in Mapuche territories and to engage local experts in this rethinking. By developing new frameworks for culturally appropriate and healthy eating habits in school, children could have more access to local foods, thus strengthening traditional food systems.*

Keywords: *National food program; nutritional transition; temperate forests; traditional food systems; traditional knowledge; Chile.*

Peer-reviewed: *February 2019* ***Accepted:*** *March 2019*

Introduction

Despite increases in food production worldwide, we face a global food crisis (Rosin et al 2012). With 1 billion people undernourished, 2 billion malnourished, almost 1 billion suffering chronic hunger, nearly 2 billion overfed, and food prices continually rising, globalization has impacted food systems and food sovereignty at all levels (FAO 2009; Rojas 2009; Alexandratos and Bruinsma 2012; World Health Organization 2014; Ibarra et al 2019). The prevailing economic model has pervasively transformed social–ecological systems and landscapes, leading to a wave of biocultural homogenization of food systems (ie loss of both diversity and quality of local food-related practices and foodstuff, which are increasingly replaced by less diverse market-based foods) (Rozzi 2003; Kuhnlein et al 2009; Anderson 2010; Ibarra et al 2011). These transformations often result in nutrition-related chronic diseases (Kuhnlein and Receveur 1996; Uauy et al 2001). International sustainability goals such as the 2020 Aichi targets highlight the importance of recognizing and valuing indigenous and local knowledge systems, biodiversity conservation practices, and information and power-sharing to strengthen sustainable local foodways

 http://dx.doi.org/10.1659/MRD-JOURNAL-D-18-00015.1

(Turner and Turner 2007; Turreira-Garcia et al 2015), secure land tenure, health, and wellbeing (Jack et al 2010; Phondani et al 2013; Che Lah et al 2015; Catarino et al 2016), and increase ecological resilience (do Vale et al 2007; Leonard et al 2013).

Mountain ecosystems are a vital source of biocultural diversity for communities in highland rural areas and, as such, impact people's food, health, socioeconomic wellbeing, and belief systems in fundamental ways (Ingold 2001; Herrmann 2005; Arnold et al 2011; Laird et al 2011). Communities that use local food, including both wild and home-grown edibles, are more likely to be secure in terms of food provisioning and more resilient to food system homogenization (Delang 2006; Arnold et al 2011; Ibarra et al 2011; Ibarra et al 2019). However, people's food choices are multifactored and contextualized in space and time, depending on availability, accessibility, cultural acceptability, and localized traditional ecological knowledge, including resource use techniques and know-how (Kuhnlein and Receveur 1996; Ladio 2001; Myers et al 2004; Turner et al 2011; Berkes 2012). For many indigenous groups that have long depended on local resources, historical and contemporary processes such as land grabbing, displacement, forest degradation, and changes in land use have limited their access to wild edibles (Barreau et al 2016). Simultaneously, processes of cultural shifts, migration, and lifestyle changes have replaced home-grown nutrition with industrialized foods that carry the "prestige" of progress, modernity, and development (Kuhnlein and Receveur 1996; Uauy et al 2001; Delang 2006).

Here, we explore local perceptions of current and past food systems of Mapuche families living in forested and mountainous Andean landscapes of southern Chile. We ask: What food systems transformations do people perceive in their lives and communities? How has the use of home-grown foods changed? This research was planned as a contribution to Menetue, a Mapuche mountain community interested in re-rooting their food system and revitalizing their traditional knowledge and self-determination. We hope to underscore the importance of community access to mountain forest resources for sustained ecological knowledge, food sovereignty, and long-term health of mountain communities.

Study area and ethnographic context

This study was carried out in the Mapuche community of Menetue or Rayen Lelfun (39°19′S, 71°43′W), which is located in the Pucón Municipality in the Villarrica watershed, Andean zone of the La Araucanía Region of southern Chile (Figure 1). The climate is temperate, with a mean annual precipitation >2000 mm. Elevations range from 300 to >2850 masl, with mountainous topography. Deciduous forests are dominated by *Nothofagus obliqua* (*hualle* or *pellín*) at lower altitudes and mixed deciduous with conifer forests at higher altitudes (Gajardo 1995). At high elevations, Andean forests are dominated by the conifer *Araucaria araucana* (*pewen* or *pino araucaria*) and the broad-leaf *Nothofagus pumilio* (*lenga*), which extend to the treeline at approximately 1500 masl (Veblen 1982; Gajardo 1995). Temperate forests cover about 29% (908,501 ha) of the La Araucanía Region and are largely protected in national parks and reserves (304,990 ha, 9.6% of total region) and private protected areas.

The landscape is characterized by valleys, where agricultural fields, variously sized native forest fragments, shrublands, exotic tree plantations, lakes, and rivers constitute a heterogeneous mosaic in the lowlands. These plains give way to increasingly forested slopes with increased elevation. Mapuche farms and communities are interspersed with *fundos* (large farms owned by non-Mapuche) characterized by cattle (or deer) ranching. The indigenous population makes up 29% (~6500 people) of the total inhabitants (22,168) of the municipality (INE 2005). In Pucón, land is distributed unequally: ranches or *fundos* occupy several hundreds or thousands of hectares, while a majority of the rural population owns very small properties (Söhn 2012). In Menetue, most Mapuche residents own small farms (<5 ha) near 2 large *fundos* owned by non-Mapuche outsiders that divide the community and interfere with its social fabric.

The community under study comprised 15 families. The average age in the community was 46 years old, and the average household was made up of 3 people. Most families were related to the *Lonko*, the eldest man, who represents the community in traditional events and religious ceremonies and acts as a (nonlegal) representative, along with the community president, in municipal affairs and politics. Most households had a home garden for growing vegetables in the spring and summer, as well as a *chacra* (field) that mostly yields potatoes and a *quinta* (orchard) for fruit. Both non-Christian Mapuche religious practices and Christianity are important. There is a *pampa* or *nguillatwe* (arena) for celebrating the *Nguillatun* (Mapuche religious celebration) and a Mapuche cemetery in the lowlands.

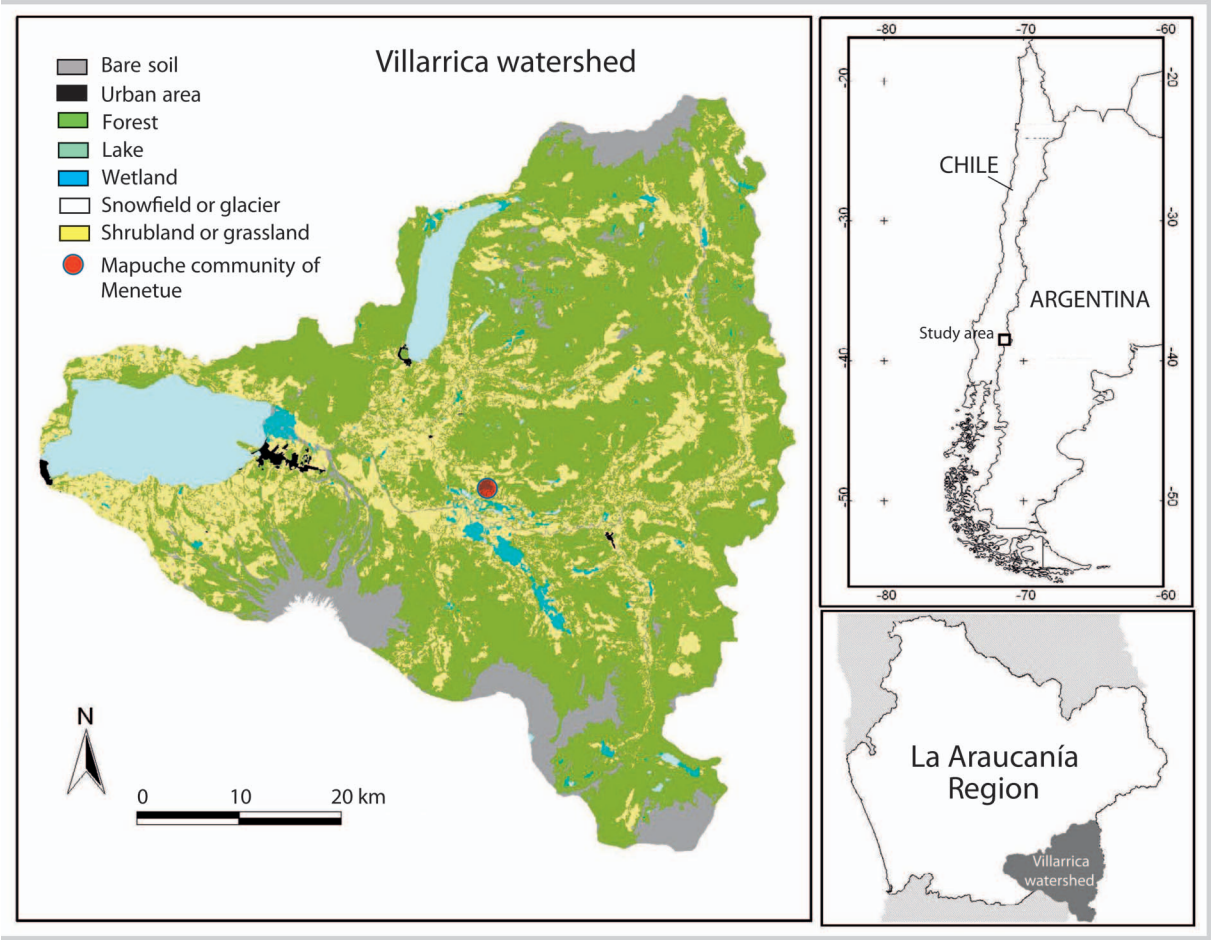
Methods

Because this research dealt with family-based knowledge and the community population is relatively small, we recruited participants by successive-referral sampling. Studies based on nonprobability sampling are highly credible (have high external validity) when supported with ethnographic data (Bernard 2011), which was the case in this study.

Most of the research discussed here was undertaken over a 6-month period with 38 participants, including women, men, and children. However, mostly women participated in the study because they are at the center of household food production, acquisition, and preparation

http://dx.doi.org/10.1659/MRD-JOURNAL-D-18-00015.1

FIGURE 1 Study area in the Villarrica watershed of the La Araucanía Region, Andean temperate landscapes of southern Chile. Bare soil areas correspond to high-elevation zones and, in most cases, are volcanoes. (Map by Consuelo Gálvez)



for the Mapuche people (Bengoa 2014). We interacted with 12 of the 15 families in Menetue and with 8 individuals in communities nearby. Before beginning research, we obtained educated free prior informed consent. Over 6 months (October 2012 to March 2013) Antonia Barreau and José Tomás Ibarra participated in and observed agricultural, food gathering, cooking, and ceremonial activities and also made 3–5 visits per year to the community between 2013 and 2018. To explore local perceptions, narratives around food and food procurement, personal stories, and memories about foodscapes were recorded in informal and semistructured interviews (Bernard 2011). To get a sense of families' current eating habits at home and to measure the inclusion of local foods (wild edibles) in diets, weekly food diaries were conducted in 7 households by a designated and trained family member (n=170 meals). All the ingredients or food items contained in the meals were registered and classified according to their origin: produced locally or market-based. Then the relative frequency of the different foods items was calculated. In order to have information on participants' health conditions, they were asked if they were diagnosed with any diet-related chronic disease (a list was reviewed with them) through a structured interview. This information was later checked with the Municipal Rural Medical Team, with the consent of the participants.

We qualitatively analyzed our field notes and interviews (Braun and Clark 2006), extracting emergent themes and insightful or representative quotes. The drivers of change discussed below are presented in order of importance for participants or "space of presence" (according to how much they delved into each driver of change) across the dataset, more than at the frequency at which they occurred within the data (Braun and Clarke 2006).

When researching dietary patterns, Kuhnlein et al (2006) and McCune and Kuhnlein (2011) recommend conducting a full year's assessment, especially in places with marked seasonality. Diets can vary significantly depending on time of the year and resource availability, particularly in societies with subsistence economies. A year-long field season was not possible for us, and this can be considered a limitation. However, the aim of this

research was not to provide a detailed nutritional description of familial food patterns; rather, it was to have an overall idea of the community's foodways and how these have changed through time. Our food diary data represent a summer "abundance period," as many informants described it, from January to March in 2013.

Results and discussion

> "A lot has been lost because now only a few of us cook this stuff [referring to Mapuche preparations]. Many of my sisters do not cook them anymore because most are married to Chileans. And the other thing is that because now people are very laid-back and they do not have a *fogón* [traditional cooking space]." (P.A. ♀ 41–50. Quotation attributions are given with initials, gender, and age group).

According to all of the adult community members interviewed, the Mapuche food system has drastically changed since their childhoods. The items eaten have changed, as well as the way food is procured and prepared. Though food systems constantly evolve and adapt to new realities, the factors driving these changes are diverse and complex and may or may not be interrelated (Uauy et al 2001; Pyle 2003; Kuhnlein et al 2004; Pilgrim et al 2010). For most families in Menetue, making a living on a few hectares is considered increasingly difficult. Historical processes of land grabbing and associated reduction of land per household has driven changing social dynamics: young people's futures are less certain because they do not have enough land to be agriculturalists. Resulting youth migration to urban centers has meant further loss of traditional food systems and shifting tastes. These have also been impacted by the formal school system, as we describe below. The issues presented and discussed below are based on the participants' perceptions and are presented in the order of importance to them.

"From school they bring many things, even the bad habits …": Changing food preferences of youth

> "Children today eat pure junk; that is why there are so many sick children. Besides, they see some crap in town and they want to eat it. They try it, like it and they [parents] keep buying those things for them" (E.F. ♀ 61–70).

Today, children's food tastes differ significantly from their parents', and seem to be one of the most important reasons for the observed transitions in food systems. According to elders and adults, this trend is primarily associated with the formal schooling system and the National School Food Program (*Programa de Alimentación Escolar*, *PAE*) initiated in 1964, which has not been culturally sensitive (Clark 2011; Altman 2013). Food attitudes are shaped early in childhood and are reinforced by a combination of familial, social, and cultural influences, which makes food habits one of the most malleable of all habits (Rozin 1990; Schnettler et al 2013).

Mapuche children in Menetue spend most of the day at school in Chilean curricula, which impacts their construction of identity and attitudes toward their own ethnicity and traditional foods (Appendix 1, Supplemental material, http://dx.doi.org/10.1659/MRD-JOURNAL-D-18-00015.S1). The PAE was designed by the National Board of Student Aid and Scholarships (*Junta Nacional de Auxilio Escolar y Becas*, *JUNAEB*) under the Ministry of Education of Chile and applied to the entire country as a national solution, without consideration of regional and cultural differences (Contreras 2003; Aburto and Taibo 2010; Clark 2011; Ortega 2015). PAE provides free breakfast, lunch, and a midafternoon meal to students. Sometimes dinner is given at boarding schools or to those in "vulnerable" situations as a means of preventing dropout. Ironically, children in rural areas receive more processed foods than students in urban areas due to the sourcing system established for PAE providers. Although the program tries to ensure that children have the minimum nutritional requirements during the school day, it has generated changes in children's food preferences, thus accelerating a transition toward a diet based on nonlocal, processed foods (Clark 2011; Altman 2013; Barreau 2014).

According to participants' assessments, the change of tastes and acculturation occurs most aggressively for youth who move to boarding schools in urban centers after sixth grade. The ongoing processes of "gustatory subversion" (Lewis 1988) leading younger generations to prefer market foods as status markers has been widely reported (Cruz-García 2006) and results in lower quality diets and economic dependence. One community member articulated this process: "In the countryside, the change in the diet is felt as well; because now children leave at a very early age then they take those customs of that place and lose the ones of this place. And it is because of school, it is something mandatory, not something voluntary … and from there they bring many things, even the bad habits" (P.A. ♀ 41–50).

Most mothers reported that their children became accustomed to nonlocal, processed foods that differed from what was offered at home and started refusing traditional preparations made of local, healthier, and fresher ingredients. As mothers tried to please their children, they tended to prepare fewer traditional foods, leaving younger siblings with no chance to try traditional foods. This clearly demonstrates children's agency in influencing family food practices (Joassart-Marcellini and Bosco 2017). The fact that children today do not like many Mapuche preparations has accelerated the loss of traditional cuisine as mothers are not cooking these meals anymore. Additionally, since the Mapuche pedagogy is oral and *in situ*, the formal school regime and the lesser time spent in the community have been reported as

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FIGURE 2 Traditional Mapuche cooking artifacts or utensils. (A) Women winnowing wheat using a *llepü*; (B) a *chaigüe* full with recently cooked *mote* in an iron *challa* sitting beside; (C) a round wooden *batea;* (D) *kudi* and *ñumkudi* for preparing wheat *catutos*. (Photos by Antonia Barreau)

interrupting the transmission of environmental knowledge and skills, as new generations are not learning what the elders once learned (Barreau et al 2016).

"They have forgotten how to make Mapuche meals …": Changing cooking spaces and habits

The lack of traditional culinary utensils emerged as an important reason for changes in the food system. Handmade Mapuche cooking utensils are hard to find nowadays as there are few artisans who make them, and those that can be found are unaffordable for most families (Figure 2). The presence of a *fogón* or *kütralwe*, the traditional cooking space, and some key cooking utensils, tells much about how attached a family is to traditional Mapuche cuisine. According to some elders, the *fogón* was not only where food was cooked and stored in the past, but it was also where social life occurred within a family (Caro 1990). Many remembered that the family would gather around every meal to chat, tell stories, eat, and drink *mate* (*Ilex paraguariensis* infusion). Everyone would sleep inside on animal skins surrounding an always-burning fire that cooked and smoked food and also kept everyone warm, especially during cold winters. The role of the *fogón* has changed somewhat for subsequent generations, becoming primarily a cooking space. Adults described growing up in a house separated from the *fogón* where, depending on the economic situation, many would also have had a small kitchen with a cast iron firewood stove for everyday cooking. Today few families have a *fogón* due to space restrictions or have converted it into a storage area. Women who married a *winka* (non-Mapuche) man often no longer had a *fogón* (Figure 3).

These problems are exacerbated by the fact that the cooking habits of Mapuche women are changing, contributing to something of a feedback loop: traditional cooking utensils and spaces are no longer needed if traditional foods are no longer prepared. Mapuche women are becoming increasingly reticent to prepare traditional meals, which are seen to be more energy- and time-intensive than their modern counterparts. Women in our study described how their mothers used to begin

FIGURE 3 Mapuche woman preparing *mote* (wheat peeled with ashes) in her *fogón*. (Photo by Antonia Barreau)

preparing lunch very early in the morning, and, immediately after lunch, they kept cooking to prepare supper. Every meal was prepared from scratch with homemade ingredients. According to most women participants, it seems that today, they are not willing to make such an effort everyday as there are market foods available that require less time and effort to prepare. Fry (2000) reported that the perceptions that traditional foods are inconvenient and time-consuming are the main reasons for a shift in diets in Mapuche families in Makewe in southern Chile. Lack of time was also reported by people from different indigenous communities of the Puget Sound in the Pacific Northwest as a barrier to accessing traditional foods (Krohn and Segrest 2010). Today, in Mapuche communities, traditional preparations are often reserved for special events such as the arrival of guests, holidays, heritage fairs, or ceremonies such as the *Nguillatun*.

Migration was also mentioned as a determining factor in the decline of the preparation of traditional meals: "What happened is that many women in my community went to Santiago to work at a very young age, and when they returned they had forgotten how to make many Mapuche meals" (P.A. ♀ 41–50).

After primary school, most women in our study migrated to a city to work as housekeepers. While working, they had to learn to cook what the *winka* family wanted. For those who spent several years away from home, it was hard to go back to traditional ways of cooking and preparations, as their preferences and food habits had changed. Similarly, when a Mapuche woman

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married a *winka* man, she changed her cooking habits to suit her husband's preferences.

"People sowed a lot of wheat . . .": Shifts in production of grains and vegetables

> "Before, people sowed a lot of wheat and went to the mill in Huepil. People went in oxcarts. That [harvest] lasted all year. We didn't use [chemical] fertilizers; we just used sheep manure" (C.C. ♀ >81†).

Wheat was and is a staple food, present in most Mapuche dishes, from the basic flour for homemade bread to more elaborate preparations. This cereal was brought by the Spanish and can be considered one of the first signs of cultural exchange; it was rapidly assimilated and has been an important constituent of Mapuche people's daily diets for centuries (Guevara 1908; Bengoa 2000; Torrejón and Cisternas 2002; Toledo Llancaqueo 2006; Montalba and Stephens 2014). After Spanish arrival, wheat quickly replaced maize in most places as a Mapuche staple. Other traditional crops and wild grains that were cultivated before the Spanish arrived, such as *quinwa (Chenopodium quinoa)*, *mangu (Bromus mango)*, *teka (Bromus berterianus)*, *madi (Madia sativa)*, potatoes, pumpkins, peppers, and green beans, began to disappear as they were replaced by exotic species like barley, wheat, and oats (Gumucio 1999; Torrejón and Cisternas 2002; Pardo and Pizarro 2005; Coña and de Moesbach 2010; Eyssartier et al 2011).

Most adults recalled that as children, they helped their parents sow large quantities of wheat, maize, oats, rye, flaxseed, and barley interspaced with long rows of peas, beans, various potatoes, beans, and broad beans. Most grains started slowly disappearing from the landscape as farms shrank, but wheat remained longest. Legumes, maize (mostly one variety, called *mapunwa*, has mostly disappeared), and potatoes have today been relegated to a few rows in *chacras*. As one *Lonko* remembered: "Before, there was a lot of Mapuche maize, the one with different colors. It had blue, red, and yellow kernels all mixed in the same cob. Now those are hard to see, almost no one grows them" (G.A. ♂ >81).

Women frequently complained that purchased wheat was lower in quality compared to home grown wheat. However, locally grown wheat is simply no longer available. According to participants this is due largely to lower soil productivity, restricted spaces for agriculture that prevents rotations between crops and pastures for livestock, a lack of threshing machines, a higher presence of agricultural pests, and the absence of fallows and excessive use of agrochemicals. Indeed, agrochemical use and other intensive agriculture practices have been widely incorporated by Mapuche communities as a result of governmental indigenous policies, subsidies, and external agents' interventions (regional programs and initiatives) designed to convert indigenous peasant producers into capitalist farmers (Clark 2011). This has not only washed out soils, but, more profoundly, has disrupted local livelihood strategies and food systems and eroded traditional ecological knowledge (Clark 2011; Eyssartier et al 2011). In Menetue, pesticides and artificial fertilizers were introduced by national and municipal programs to "support" small farmers. Rather than supporting local agricultural methods such as field rotation, animal manuring, and local seed-saving, these programs have pushed families to incorporate concepts and techniques designed for intensive agriculture (Clark 2011).

Shifts in the production of grains and vegetables are occurring alongside shifts in agricultural practice itself. Agricultural work like sowing or harvesting was historically collaborative in nature, based on reciprocity rather than remuneration. Families used to turn to their kin, neighbors, and friends for help in what is called a *mingako*, a festive space for collective work which allowed the family seeking help to share large amounts of food and drink to compensate their guests for their labor (Caro 1990). As stated by some participants, Mapuche people now seem to be more individualistic as agricultural activities have become more of a personal and less a collective concern.

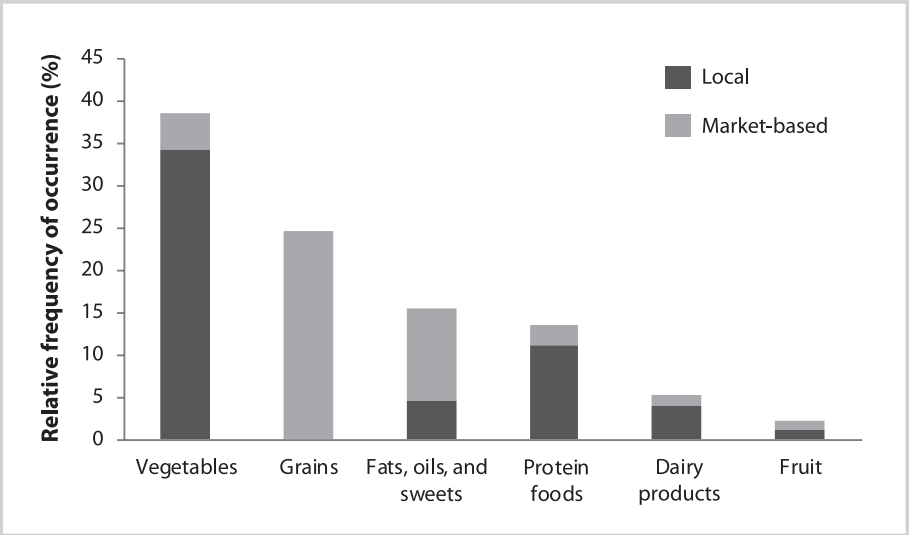
"Sausages . . . I do not eat that stuff": From traditional to modern foods

> "I believe that as people changed, so, too, the entire Mapuche food [system] changed. Now people no longer know how to cook if it's not noodles, pasta, all that bought stuff. But I don't much like all that noodles and rice, I am tired of them" (E.F. ♀ 61–70).

Food diaries from each of seven households recorded 170 meals, a sample of a summer diet. In this season, home gardens, orchards, and *chacras* provide abundant vegetables, fruit, eggs and milk products, and animals can be butchered. Wild fruits, like berries, ripen, and orchard fruits are ready for preparing *chicha de manzana* (apple cider). According to the Mapuche worldview, the *walüng* is the summer or sun's time, which brings the harvest, abundance, and benefits of work carried out.

According to the food diaries, locally produced ingredients comprised 55% of total family intake, compared to 45% market-based foods. Wheat and wheat-based preparations such as bread, though locally prepared, were classified as market-based as the flour was bought, not sown. We would expect that the proportion of market-based foods during seasonal scarcity (usually winter and spring, seasons that were not considered in our food diaries) would be greater than 45%. Indeed, during fall, families buy most of the food they will need for winter when the routes to buy groceries become impassable and local production of food slows down. For some of the women interviewed, fall is their most expensive season.

FIGURE 4 Relative frequency of occurrence of food groups in meals recorded in food diaries during the "abundance period" ($n = 170$ meals).



Dried legumes, potatoes, and maize were stored for winter consumption but current agricultural yields could not sustain families for an entire year.

When sorted by food groups, vegetables made up 38% and grains 25% of summer diets (Figure 4). Grains were consumed in the form of homemade bread and *sopaipillas* (fry bread), both made with white flour and rice, comprising 73% of all grains consumed. White flour and white rice are refined, processed carbohydrates that have replaced traditional grains like *quinwa*, *lokro*, whole wheat, and rye flour. Homemade bread was recorded in 46% of all the meals, which, compared to our observations of its ubiquity, seemed low. Ibarra et al (2011) similarly found that homemade tortillas were not salient in foodstuff freelists but were present in 99% of meals in the Sierra Chinanteca, Mexico. In Menetue, both bread and *mate* (drunk after and between meals) were likely taken for granted as they are omnipresent, like a plate or a glass of water.

Fats, oils, and sweets represented 16% of all food items, mainly as butter, instant coffee, jams, and honey. Sweets included processed drinks with high sugar content, such as sodas, powdered juices, instant coffee, and tea, to which refined sugar is added. Butter and margarine, both purchased nowadays, were the most frequent food items in this category, ever-present for cooking and eating bread. The low dairy consumption (5%), mostly cheese, is probably due to few milking cows owned per family and to expensive market dairy products. The great variety of orchard fruits are generally used to prepare jams, conserves, and *chich*a to store for the rest of the year, rather than for fresh consumption. Thus, fruits represented only 2% of all foodstuffs recorded. Many participants reported that consumption of vegetables and fruits diminished even further during the winter, as did dairy consumption.

Foods such as tomato sauce, mortadella, sausages, margarine, and children's processed breakfast cereals were considered "new foods" by participants, incorporated into family diets in recent years. Rice and noodles, although long known, were called "recently incorporated foods," as they were too expensive for many families to buy in the past and, thus, rarely consumed. Over time, they have replaced traditional foods like *locro*, *soplillo*, and *quinwa* as they have become less expensive and easier to prepare. According to Schnettler et al (2013: 251), "the multiplication of means of transport and road construction during the 1980s and 1990s allowed foodstuffs and related products (*mate*, sugar, oil, pasta, rice, etc) to be brought from the cities and introduced into the communities, and these have now become essential in every family's diet." Caro (1990) described how introduced foods like rice and noodles gave some Mapuche individuals a sense of prestige, as *winka* food is associated with modernity. Fry (2000) recorded the perception of traditional foods as "old fashioned" in the Mapuche community of Makewe, a factor hastening their replacement by industrialized foods. Instant coffee (coffee and barley-based), tea, powdered juices, long-life milk, and carbonated beverages were also mentioned as newly incorporated foods. Nowadays, carbonated drinks are purchased for special occasions like celebrations or when receiving visitors. These "new foods" were rarely consumed or even known by most adults during their childhood, and most of them are rejected by elders, who request traditional preparations. For them, the new foods are not even considered to be food. As the local chief told us: "my grandchildren eat those things called sausages . . . I do not eat that stuff. For me, [real] food is prepared" (G.A.

http://dx.doi.org/10.1659/MRD-JOURNAL-D-18-00015.1

TABLE 1 Percentage of community members reporting a chronic health condition diagnosed by the Municipal Rural Health Team that visited the community every 2 weeks.

Community members	Overweight/obesity	Type 2 diabetes	Hypertension	Hypercholesterolemia
Percentage of women ($n = 19$)	63.2	5.3	21.1	15.8
Percentage of men ($n = 19$)	31.6	15.8	10.5	10.5
Percentage of total ($n = 38$)	47.4	10.5	15.8	13.2

♂ >81). The rejection of "new foods" by elders is a common pattern among indigenous groups around the world (Kuhnlein and Receveur 1996; Fry 2000; Kuhnlein et al 2004; Krohn and Segrest 2010; McCune and Kuhnlein 2011).

"Now, everything is artificial and so people die early …": Increasing prevalence of chronic diseases with changing diets

Shifts in local foodways are inevitably linked to improvement or deterioration of people's health. When study participants talked about these changes, discussion of the prevalence of chronic disease in the family commonly emerged. Diet-related chronic disease among indigenous groups has been widely studied (Kuhnlein 1995; Uauy et al 2001; Kuhnlein et al 2004; Myers et al 2004; Damman et al 2008; Powell et al 2011). For example, type 2 diabetes is considered to have reached epidemic proportions among Inuit (Myers et al 2004), Australian aboriginals (Burns and Thomson 2006), Mapuche (Pérez-Bravo et al 2001), and Northwest Coast Indians (Krohn and Segrest 2010), among others (Diamond 1992; McCune and Kuhnlein 2011).

In our community survey, adults were asked whether they suffered from chronic diseases or conditions such as overweight, obesity, diabetes (mostly type 2), hypertension, hypercholesterolemia, or any cardiovascular disease, and whether they had been prescribed medication. Almost half of the 38 people surveyed reported having been diagnosed as overweight or obese. These were predominantly women, which coincides with the findings of Uauy (2001) and Pérez-Bravo et al (2001) for other Mapuche communities. Just over 10% were diagnosed with type 2 diabetes with a prevalence in men, contrasting with the findings of Pérez-Bravo et al (2001), who reported a higher prevalence of this disease in women of 5 rural Mapuche communities elsewhere. In our study, based on current diagnoses by rural health professionals, almost 16% were hypertensive (over half women) and 13% had been diagnosed with high cholesterol (Table 1). Although the numbers for some conditions may not be alarming, the high prevalence of overweight and obesity is concerning because of correlation with a variety of adverse health outcomes (Uauy et al 2001; Burns and Thomson 2006). Most of these chronic conditions are related, because they have similar modifiable risk factors, including sedentary lifestyles and diets high in saturated fats, cholesterol, salt, and alcohol, and low in fiber, fruits, and vegetables.

Perception of how things were in the past can say a lot about which foodways have been lost. Participants perceived people as generally healthier in the past because they used to die of old age rather than of disease. In Menetue, everyone had a story about relatives who lived over 100 years without ever visiting a doctor or hospital. "Before, everything people ate was natural that is why the ancient lived for a century. Now, everything is artificial and so people die soon" (J.H. ♂ >81). This perception was also reported by Jelves and Ñanco (2002) and Fry (2000) for Mapuche people in Makewe. This notion is also consistent with descriptions by chroniclers such as de Bibar (1558), Nuñez de Pineda and Bascuñán (1673), González de Nájera (1614), among others, who characterize Mapuche people as very healthy, with long life expectancies compared to Europeans, and with rich and diverse food traditions. Chronic diseases and conditions such as people report today were uncommon or nonexistent in the past, according to everyone interviewed. There was a common perception that the high prevalence of these diseases in the community were associated with a processed food diet with too much sugar, fat, and "chemicals" at the expense of natural foods and, relatedly, the loss of natural remedies to treat mild health conditions.

The disappearance of traditional plant-based remedies and their replacement with drugs and pills were also mentioned as important influences on health. In the past, food and medicinal plants were the basis of good health, and people had a wealth of knowledge about their uses. Wild foods were considered to be medicinal, and that was the reason *Chau Dios* (God) left them for people to use. The *fogón* or *kütralwe* was also believed to have an impact on health: its use as a common social space was curative, as it would keep the whole body dry and warm and the bones strong through winter. It is also believed that *tortillas al rescoldo* (bread baked in embers) made on the *fogón* are healthy, providing important mineral ash elements. Cooking in a *challa* iron pot is known to contribute to overall iron intake (Urrutia 1998).

In Menetue, there are links between land dispossession, the loss of food sovereignty, and the prevalence of nutrition-related chronic diseases (Barreau et al 2016). This can be related to historical political

disadvantaging, causing indigenous people to access market-based foodstuffs at the cheapest, and least nutritive, levels. Clark (2011: 169) remarks that "a key outcome of the past thirty years with respect to the food system has been the near-complete loss of food sovereignty and the expanded intervention of markets in the rural Mapuche food system." In addition, although government health programs provide recommendations for healthier lifestyles, the "mainstream nutrition" tenets upon which the recommendations rely have been promoted globally and largely ignore diversity and context (Hayes-Conroy and Hayes-Conroy 2017). This leads to nutritional recommendations and school food programs that are standardized, decontextualized, and reliant on outsider experts, as opposed to local experts who hold place-based knowledge about how food-body-health relations unfold in people's daily lives (Hayes-Conroy and Hayes-Conroy 2017).

Conclusions

Our results show that the Mapuche food system has faced a process of biocultural homogenization. According to community members, both the diversity and quality of local food-related practices and foodstuff have been increasingly replaced by fewer market-based foods. Our study confirms earlier findings showing that formal schooling is key to understanding this process of biocultural homogenization of the local food system and the disruption of knowledge transmission of foodways in the southern Andes. Indeed, the National School Food Program has shifted the acceptability and interest in traditional foods as children receive daily meals that are not culturally appropriate. Children's changing tastes spread to the whole family, as mothers often adjust the entire family's eating habits. In addition, school attendance has resulted in limited knowledge of wild edible plants and native flora, as traditional intergenerational pedagogies are deemphasized and children do not have time to engage in more traditional forms of learning. This has led to younger generations becoming increasingly disconnected from the landscape and distanced from the food systems of past generations.

Additional drivers of change in diets have been marriages with non-Mapuche (*winka*) members and off-farm work of women in *winka* households in cities. This has also contributed to the gradual change in cooking habits and in use of traditional cooking areas and utensils. Shrinking land per household and associated changes in the agricultural system were also reported to have impacted foodways, as some traditional crops and associated practices have been abandoned.

The shift from traditional to market-based foods has led, according to participants, to chronic health conditions for the Mapuche, largely due to changes in food habits towards a modern diet and increasingly sedentary lifestyles. Although government health programs try to inform people about "healthy eating habits," these institutions are frequently uninformed about the nutritional benefits of traditional foods and fail to promote their consumption.

One major recommendation emanating from this research is to rethink and restructure the National School Food Program (PAE) to better serve local and cultural particularities in Mapuche territories and to engage local authorities and residents in this rethinking. By developing new frameworks for culturally appropriate and healthy eating habits in school, children could have more access to traditional foods thus strengthening traditional food systems in mountain ecosystems. We therefore recommend that formal education consider local resources and foodways and incorporate indigenous pedagogies and social institutions in curricula.

ACKNOWLEDGMENTS

We are deeply grateful to the Mapuche people of Menetue who generously participated in this project. This research was supported by the ISE Darrell Posey Fellowship, the Namkoong Family Fellowship, the Rufford Small Grants Foundation, the Mary and David Macaree Fellowship, the VanDusen Graduate Fellowship in Forestry, Vicerrectoría de Investigación (VRI) from Pontificia Universidad Católica de Chile (grant 7512-023-81), and the Centre for Intercultural and Indigenous Research-CIIR (grant CONICYT/FONDAP/15110006). We also thank the Centre for the Socioeconomic Impact of Environmental Policies (CESIEP), which is a Millennium Nucleus supported by the Millenium Scientific Initiative of the Ministry of Economy, Development and Tourism (Chile). AB received a post-graduate scholarship from Comisión Nacional de Investigación Científica y Tecnológica (CONICYT). We thank Consuelo Gálvez for her help with map preparation. AB and JTI designed and conducted the field work and drafted this article; FSW and RAK advised on field design, praxis, and write-up and edited this article.

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Supplemental material

APPENDIX 1 Mapuche traditional preparations that are increasingly forgotten and thus barely consumed, according to research participants from Menetue.

Found at DOI: http://dx.doi.org/10.1659/MRD-JOURNAL-D-18-00015.S1 (20 KB PDF).