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Limited Fertility, Limited Land: Barriers to Sustainability in a Chilean Agrarian Community

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<http://dx.doi.org/10.5772/intechopen.75210>

Abstract

There is an ongoing debate within the field of agroecology about the importance of socio-economic context as a causal factor of agricultural unsustainability. The ultimate thesis of this paper is that the causes of unsustainability cannot be fully grasped without understanding historical trajectories of land use and land tenure. I investigate a community of indigenous smallholders in southern Chile who have expressed a desire to find an ecological alternative to the input-intensive commodity cropping system they currently practice. What factors motivate them, and what are the key barriers holding them back? Interviews with 38 individuals and 3.5 months of participant observation reveal a complex causal chain. A key barrier to an alternative, more sustainable agricultural system is a deficiency of organic animal manure, of the animals which produce it, and of the land base on which to sustain sufficient numbers of livestock. But these factors can only be understood in the context of the historical dispossession of Mapuche territory by the Chilean state over a century ago, which led to socioeconomic marginalization by pushing them onto the poor soils and steep hillsides they currently occupy. I close by emphasizing that the path to agricultural sustainability must combine both sociopolitical and agronomic considerations. Land access and land tenure are as important to achieving sustainability as land management.

Keywords: Chile, land tenure, manure, Mapuche, organic, political agroecology, repeasantization, soil fertility

1. Introduction

Prior to the arrival of Spanish colonists in the sixteenth century, the modern-day country of Chile was inhabited by a variety of indigenous groups stretching from the arid deserts in the

north to windswept Patagonia in the south. The Spanish arrival resulted in the rapid deterioration of indigenous populations via genocide, illness, and forced displacement. One group, however, famously resisted the Spanish and retained a large autonomous territory in the south even after Chile established independence from Spain: the Mapuche, called *araucos* by the Chileans, namesake of the present-day region of Araucanía.

This autonomy ended in the mid-1800s, when the Chilean government embarked on a military campaign to “pacify” a people they deemed an impediment to the advance of civilization and modernity. A sequence of military incursions eventually defeated the Mapuche, a population that had numbered around 1 million at the time of first Spanish contact now reduced to some 150,000 [1]. It is what happened after pacification, however, that had the most profound impact on succeeding generations of Mapuche.

The Chilean state wanted to encourage agricultural settlement of the fertile but densely wooded Mapuche homeland, so they encouraged Chilean and immigrant colonists (*colonos*) to push south, clear the forests, and establish homesteads. A Chilean writer in 1848 described the “phalanx of peaceful immigrants, of industrious settlers” establishing farms in the south ([1], p. 94), while a Dutch settler is quoted, “Each family received a pair of oxen and a cart, an ax, and a rifle to defend themselves from the indigenous people” ([2], p. 239). Between the 1850s and the 1870s, an estimated 14,000 *colonos* settled in Mapuche territory ([1], pp. 94–95). By the end of the century a travel writer could note the extensive clearing of land: “I rode through green fields with stumps scattered through them, all the way from Concepción to Temuco. Men were cutting farms out of the woods, and here and there the wheat was growing among the burned timber” ([3], p. 90).

The Mapuche were deeded parcels by the state, but “unscrupulous land-grabbing at the expense of the Mapuche was an altogether predictable feature, and remained so for the next few decades” ([1], p. 96). Meanwhile, the government set up the equivalent of North American reservations (*reducciones*) for the Mapuche, diminishing their historic territory by 95 percent ([2], p. 46). Communities were forced east to the mountains and west to the marginal lands of the Pacific coast, where, no longer able to migrate across a large territory with their animals, they took up farming on small household plots. When Green Revolution practices (commercial seed varieties; synthetic fertilizers; chemical pesticides) arrived and seemed to promise an immediate increase in yields, they were promoted heavily by the government and adopted enthusiastically by rural communities – particularly the cultivation of commercial potato varieties as a commodity crop for primary income generation.

The site of my fieldwork is one such community, called Llaguepulli. With the exception of two individuals who have married in, the entire population of Llaguepulli is Mapuche. Many of its residents have migrated away in recent decades, seeking employment in the regional or national capital. Of those that remain, nearly everyone lives the life of an agrarian smallholder: cultivating home gardens, tending small flocks of animals, and growing staple crops on small acreage using conventional, agrochemical-dependent methods.

Llaguepulli is rural, poor, and resource-deprived; in that sense it is like every other Mapuche community in the region [4]. But in another sense it is unique: its main leaders as well as a large portion of its members have expressed an explicit interest in finding an alternative

agricultural path to the high-input, low-value commodity crop system in which they are currently immersed. With a progressive leadership and the support of a community-based development NGO they have made progress, including the establishment of a culturally-oriented tourism program, an agroforestry project, and a savings and microloan program run entirely by community members [5]. Yet nearly all the farmland in the community is devoted to basic commodity crops (chiefly potatoes and wheat) fed with synthetic fertilizers, even as the farmers themselves lament this fact. Many barriers to sustainability remain, and the central inquiry of this paper is what those barriers are.

Hovering in the background of that question is a broader one of significance to the field of agroecology. How carefully do we need to consider social, political, and historical forces – which have traditionally been considered outside the scope of agroecology – in order to understand the sources of an unsustainable agricultural system? My broader thesis is that the biophysical and technical causes of unsustainability that have traditionally been the focus of agroecologists are *interlinked with sociopolitical and historical causes*. One set of forces cannot be understood without the other, for they form an interwoven causal chain. I begin the literature review by elaborating on this thesis.

2. Literature review

I break the review of the literature into two parts. First I will discuss the scholarly debate over the incorporation of social considerations into the field of agroecology. Then I will move to the field of agrarian studies and describe recent discourse on the idea of “repeasantization”. Ultimately my intention is to draw a link between the two and argue that a process of resurrecting sustainable peasant livelihoods can only take place by giving sufficient attention to the politics of land access among smallholder and indigenous populations.

2.1. Social considerations in agroecology

Open the pages of many agroecology texts and you will find research that could belong in a journal dedicated to the larger field of ecology. *Agriculture, Ecosystems and Environment*, the highest ranking agroecology journal [6], prioritizes research “at the field, system or landscape level” and “data-based biophysical modeling” focused on “biological and physical characteristics of agroecosystems” and “relationships between agroecosystems and the natural environment”. The journal’s Aims & Scope page does mention sustainability, global environmental change, and land use, but only in abstract terms, with no mention of humans, societies, economics, or political systems. Agroecology is framed as simply “the application of ecology in agriculture” ([7], p. 2).

On one hand this is unremarkable. A field dedicated to the quest for a more sustainable agriculture must be rooted in the science behind sustainable production techniques. On the other hand this exclusion of social, political, or economic components from the field’s top journal is troubling. As scholars we are fundamentally interested in *causality*, and to think of agro-environmental problems only in terms of technical or ecological parameters is to narrow one’s

vision, for the causes and solutions to problems of agricultural unsustainability are nearly always *rooted in social conditions*. Agriculture is not merely a biophysical endeavor but “a complex socio-ecological system”, conceived of and carried out by humans embedded within an economic-political-cultural matrix ([8], p. 6).

The question of what role “the social” should play within the field of agroecology has been under intense discussion for the better part of a decade, with roots going back even further (e.g., [9]). For the first half of its near century-long development as a field, agroecology tended to “emphasize the crops and not the people who grew them” ([10], p. 22), but the social sciences have become increasingly integrated in order to “better understand the complexity of agriculture that emerges from unique sociocultural contexts” ([8], p. 3), from the “wider social formations in which [farmers] are embedded” ([35] p. 12).

The more recent advance is not merely to study social forces, but to advocate for *social justice* for small farmers. Two prominent agroecologists explicitly frame agroecology as a “revolution” whose purpose is to “ensure food sovereignty and empower peasants” [11]. La Via Campesina ([12], p. 15), a global network comprising the world’s largest peasant advocacy movement, does not mince words: “Agroecology is a struggle to liberate ourselves from the global capitalist system and attain food sovereignty and autonomy of the people”.

And how is this struggle to be carried out? Put simply, since “the sustainability of an agroecosystem is not just the result of a series of physical and biological properties, but also the reflection of power relations,” the “practical dimension of agroecology requires politics” ([13], pp. 46, 50). Without a political component focused on achieving food sovereignty for peasant households, agroecology is “just a technical fix” [14]. This paper does not pretend to identify a comprehensive solution to agricultural unsustainability, but it proceeds from the assumption that socio-political factors must be considered in order to identify both a problem and its remedies.

2.2. Repeasantization

As the Results section will show, what the community leaders and inhabitants of my field site of Llaguepulli desire is to regain some of the autonomy over their farming systems that they traded in when they began following a conventional, input-reliant form of agriculture decades ago. They might do this by converting from conventional to organic practices, by growing alternative crops, by developing new market channels, or some of the other strategies peasant groups around the world are using to find alternatives to the Green Revolution model. They thus hope to join a process which has been given the term “repeasantization”.

The scholarly discourse on repeasantization links to earlier debates about “depeasantization,” and to a century-long discussion of “the agrarian question” before that. It is voluminous, and I do not aim for a comprehensive treatment; recent works have accomplished this with skill and lucidity (see [15, 16]). Rather my goal is to sketch out the parameters of the topic as they apply to the situation in Llaguepulli. I will structure my discussion around a set of linked questions: What is driving the process of repeasantization; what forms does the process take; and what are the main impediments it faces?

2.2.1. *What is driving the process of repeasantization, and what forms does it take?*

The elements of a formal social movement advocating for repeasantization are powerful and manifest on a global scale. La Vía Campesina has grown from a loose collective of 47 peasant and rural worker organizations in 19 countries in the early 1990s [17] to a network of 164 member organizations in 73 countries today [12], and is “considered by many to be the most important transnational social movement in the world” ([17], p. 150). An ever-expanding body of case studies spanning every continent indicates that a growing number of farmers, villages, cooperatives, and peasant groups is seeking an alternative way to produce, distribute, and consume food (see [18]), and what makes the case compelling is the reasons that underlie these efforts.

The basic agricultural system that peasants have either willingly or been forced to adopt in the second half of the twentieth century has core features that are nearly ubiquitous, regardless of crop or geography: it is “a high external input, fossil fuel based, export oriented, monoculture cropping system” ([10], p. 24). In other words, small farmers the world over switched from a “peasant mode” of agriculture, based on growing a diversity of crops, exchanging them within local markets, and prioritizing food security, to a conventional mode based on growing a limited set of commodity crops for external markets using agrochemicals. This switch weaves smallholders into the fabric of global capitalism, where they are subject to the whims of market forces (via input costs and market prices) and placed at a distinct disadvantage relative to the scale of the agro-industrial complex (competing against large, often state-subsidized commodity growers). “The global profitability of farming activity has been progressively declining ... as a consequence of the unequal relationship of exchange between the agrarian sector and the industrial and service sector” ([13], p. 48).

Hence, there is a set of conditions whose effects on peasant livelihoods have accumulated for decades, leading to a shared sense of aggrievement towards the capital-intensive agricultural model. So, to the degree that we are witnessing a repeasantization movement, it is not that peasant agriculture is naturally superior to large-scale capitalist agriculture, but that the industrial system has failed to meet the needs of smallholder households. “When the political-economic arrangements upon which entrepreneurial farming is grounded begin to erode, ... peasant agriculture re-emerge[s] again as a far more resilient and economically effective alternative” ([35] p. 13).

Corrado [36] argues that the “new peasant condition” is formulated around three poles: the centrality of food to the peasant lifeway; an economics of self-sufficiency and pluriactivity; and the importance of “territory,” by which she refers to both the set of local natural resources (soils, seeds, etc.) as well as localized social relations. These three poles would seem to be backed up by the public face of the movement – for example, La Vía Campesina’s most recent annual report makes an impassioned call for food sovereignty, greater economic and political freedoms, and peasants’ struggle for territory. Van der Ploeg’s book and article in *The Journal of Peasant Studies* are the most thorough attempts to theorize the repeasantization process [16, 35]. He describes six major “avenues” along which repeasantization takes place:

1. *Land* is perhaps the single, central resource of concern for peasants. It is crucial as the basis for both food sovereignty and ecological capital. This has not changed much from peasant struggles of decades ago, but there are now renewed options for the use of that land.
2. *Self-provisioning*, which combines the idea of control over one's own food supply (food sovereignty) with control over the resources needed for the continued (re)production of the household.
3. *Proactive market integration*, meaning not that peasants always immerse themselves fully in circuits of capital, but that they have greater power to choose their degree of integration into or distantiating from markets.
4. A greater emphasis on *agroecology*, or the effort to improve a household's ecological capital, or what Van der Ploeg calls the "co-production of humans and nature".
5. *Proactive resistance* against the agro-industrial complex, not via political measures but via alternative production practices and market networks.
6. *Alternative markets* for the distribution and sale of food.

Van der Ploeg can be accused of being overly optimistic about the potential for peasants to take control of their fields and their fates in the face of powerful countervailing forces, and indeed there are scholars who remain skeptical of the power of a movement framed around food sovereignty [19]. Though Van der Ploeg's aim is not to advocate but to describe the general contours of a varied movement, the skeptical view hints at the need to consider the more critical question of what barriers stand in the way of repeasantization.

2.2.2. *What are the main impediments to the repeasantization process?*

If it is true that new possibilities exist for peasant producers to reclaim autonomy and use ecological capital to build new rural livelihoods, it is also true that an array of powerful forces run counter to their efforts. For example, many peasant communities are located far from city centers and linked to them via dirt or gravel roads, increasing transaction costs and opportunity costs. In the absence of direct market access, marginalized smallholders' only option for selling their crops may be the one intermediary servicing the community, who can pay low prices due to a lack of any other buyers [20]. As we will see below, in Llaguepulli the intermediary potato buyer acts as a monopoly agent with control over the price offered farmers.

If farmers cannot provide the nutritional needs of their family, and if they cannot generate income by selling their products for lack of market access, they may have little other recourse but to seek out wage labor, either in the agricultural sector or in nearby cities. Fairbairn et al. [21] identify this "blurring of rural-urban relations through hybrid livelihoods" as one of the four most relevant themes in the field of agrarian change, while for the Mapuche specifically, Bengoa informs us that land limitations and modernization processes have compelled a constant process of migration away from rural communities, leaving behind a "remnant population" ([22], p. 75). So we encounter another set of barriers to achieving a more sustainable farm system: how far away is the labor opportunity, how often must one journey off the farm to access it, and how much does it pay? [20].

If access to agricultural markets and access to labor markets are two critical factors in peasant livelihood sustainability, they are joined by a third and arguably the most critical of all: access to land. Fairbairn et al. [21] name land and resource dispossession as perhaps the most prominent commonality across four decades of agrarian scholarship. Similarly, Amin's [23] recent theoretical dissection of food sovereignty and the peasantry zeroes in on land, land tenure, and land access as "central to debates on the future of agricultural and food production [and] peasant societies".

The very term "smallholder" hints at one component of the land problem. The World Bank defines the term as someone farming less than 2 ha of land, an amount that the International Fund for Agricultural Development labels as "often too small to ensure the nutritional well-being of the household" – and especially so if we consider the need to produce protein for a family ([24], p. 26). In addition to size, due to their socioeconomic status and their exclusion from mainstream processes of development, peasants are often "forced onto unproductive land ... located in difficult environments for agriculture (arid, steep hills, etc.), often with poor soils and without access to irrigation" ([25], p. 25). This describes with eerie precision the village of Llaguepulli, with its steep hillsides, thin soils, and a virtually nonexistent irrigation infrastructure.

A final barrier worthy of note is the state, which has the power to "create favorable or *adverse conditions* for ... the productive capacity of an agroecosystem" ([13], p. 53; emphasis added). A centralized government holds power over financial resources (availability of subsidies or credit), infrastructure (roads, bridges, market infrastructure), and regulations (land titling, vendor licensing, prerequisites for obtaining loans) that are crucial linchpins in a community's ability to create ecological farming systems. This has certainly been the case in Chile, where Mapuche smallholders have been actively marginalized by a state apparatus that viewed them as impediments to progress [2], and in Llaguepulli specifically, where good credit, paved roads, and clear land title have all been obfuscated or delayed according to many of my respondents.

This list of barriers is brief and far from exhaustive. I have highlighted several of the key constraints that will prove to resonate with the situation among the smallholders of Llaguepulli, in order to bring us back to the field of agroecology. All of the barriers mentioned – access to markets, to wage opportunities, to infrastructure, to credit, and, most of all, to land – can be classified as access to *resources*, and "if farmers cannot access the resources they need, ... they cannot continue to maintain or develop sustainable agroecosystems." An agroecologist, therefore, must "move beyond the farm-scale to consider the ... complex challenges, both social and ecological, that smallholders face in the transition towards sustainability" ([8], p. 12).

3. Research question

My fieldwork takes up this challenge by posing the following question: **What are the ecological and social conditions that motivate and that constrain the move towards a more sustainable agroecological system in a community of indigenous smallholders in southern Chile?**

4. Research site and methodology

Llaguepulli is a village consisting of approximately 40 households¹ spread out across a series of hills and valleys at latitude 38.9 degrees south, along several small bays of the undulating coastline of Lake Budi, a salty lake measuring approximately 120 km² in area [26]. It is part of the commune of Teodoro Schmidt in La Araucanía, the 9th region of Chile.

My introduction to the community occurred over several stages. First I established contact with a community leader during a visit in 2013, then with two employees of MAPLE Microdevelopment, a NGO that has been working closely with Llaguepulli on community-based development projects since 2012 [5]. In 2014, at a community-wide meeting, a letter I had written explaining my research intentions was presented to the community, which resulted in a written invitation from the community leadership to come and conduct a study of farming livelihoods and sustainability. My family and I arrived in November 2015 and lived there for 3.5 months, through the middle of February 2016.

I began by collecting a list of names and phone numbers of interested individuals at the first community meeting after our arrival, and after meeting with these individuals my sample grew through the “snowball sampling” technique, which consists of asking interviewees for the names of other potential respondents. Each family visit consisted of a walk around their property, followed by a semi-formal recorded interview. In total I conducted interviews with 38 individuals representing 25 households in the community (63% of households). This sample consisted of 21 adult males and 17 adult females, with an age range of 26–76 and an average age of 52. Of the 25 households, one does not engage in any agriculture – neither farming nor gardening – while the other 24 either garden or cultivate a larger acreage, or both (see **Table 1** below). Visits lasted on average 90 minutes, including the interviews which took approximately 1 h each.

In addition to interviews, I engaged in participant observation throughout the 3.5 months, which consisted of many distinct acts: attending monthly community meetings, at which the key issues facing the community are discussed at length; working with various individuals, including my two collaborators from MAPLE, to establish several community garden plots and give workshops on ecological gardening practices (see [27]); volunteering to help families plant and harvest crops, weed gardens, cut firewood, etc.; and attending semi-monthly meetings of a community-based banking group initiated by MAPLE, where community savings accounts and a microloan program are discussed. This immersion in a community’s daily life exposes one to its rhythms and brings with it a distinct set of observations and insights. Before taking on the research question itself, I will present a descriptive snapshot of the community focusing on its agricultural resources and practices.

¹The figure is imprecise due to some inhabitants splitting their time between the village and nearby cities for work, and the inherent seasonal fluctuation of the population.

	Yes	No	Other	Total
Plow	12	12	1 ^p	25
Oxen	13	12	0	25
Livestock	22	3	0	25
Field Crops	20	5	0	25
Home Garden	22	3	0	25
Greenhouse	16	8	1 ^g	25

^p An elderly couple owns a plow but no longer cultivates beyond their garden.

^g An elderly respondent has the structure of a greenhouse plastic is so shredded from age that it is nonfunctional.

Table 1. Agricultural resources owned by household (n = 25).

5. Description of the community

5.1. Landholdings

Llaguepulli is truly a community of smallholders. The average landholding per household is 2.2 ha, with a range of <0.5–7 ha, and 11 of the 25 households (44%) holding 1 ha or less.

5.2. Resources

Table 1 displays ownership of key agricultural resources by household, revealing several patterns of note. Every household except three (88%) features a home garden in which a large proportion of the family's vegetables are grown, along with a variety of flowers and herbs. Similarly, every household except three (88%) has some livestock (other than oxen for draft power), ranging from poultry to pigs to sheep, and a few households with meat cows. No households have dairy animals. A slightly lower number of households (80%) have enough arable land to cultivate field crops – most with a plow but some, on the smallest acreages, with hand tools. Just under two-thirds of households (64%) have plastic greenhouses (built by hand with locally cut wood). In terms of more basic equipment, just under half of households (48%) possess an iron plow and just over half (52%) possess a pair of oxen. The latter is a notable fact, as land is the agricultural resource in shortest supply, and maintaining a pair of oxen requires considerable space for pasture and hay. The households who do not own a plow or a set of oxen either do not have enough arable land for field crops, or they work the soil by hand, or they pay someone from outside the community to plow with a tractor.

5.3. Agricultural practices

I turn now to specific agricultural practices, and in particular those that have some bearing on sustainability. First there is the issue of growing organically. As I will discuss below, many community members mention a strong desire to free themselves from the use of chemical fertilizers and pesticides, but their ability to do so is split sharply by the scale of their cultivation. **Table 2** displays the breakdown of organic practices at two scales: the field scale (staple crops, notably potatoes and wheat and, to a lesser degree, oats and peas) and the garden scale. Of the 22 households who manage a home garden, 18 use strictly organic practices (animal manure as fertilizer, manual weed cultivation, and in some cases spreading ashes to combat blight in potatoes). At the field scale, the story is entirely the opposite – only a single family grows its field crops (potatoes, beans, and quinoa) using only composted manure, which they purchase from another community member. 17 of the 20 respondents with field crops (85%) use both conventional fertilizer and chemical pesticides for managing potato blight, while two have recently been experimenting with mixing conventional fertilizer and manure together, with an eye towards becoming all organic. The reasons for this discrepancy will be made clear later in the paper.

Aside from organic, my interviews revealed an impressively long list of other innovative techniques, listed in **Table 3**. One might assume that the list is accounted for by a small handful of innovative or entrepreneurial households, but this is not the case. Of the 25 households surveyed, fully 20 of them (80%) are represented on the list. To give another metric, the six techniques at the bottom of the list, practiced by just one household each, are spread across five different households. So there seems to be a high level of agricultural innovation oriented towards sustainability in the community.

5.4. Food self-sufficiency

There are five crops grown at scales larger than home gardens: potatoes and wheat dominate, oats are third, and peas and fava beans are a distant fourth and fifth, in terms of total acreage planted. Oats are almost exclusively grown as animal feed, while the other four are grown for human consumption (with small quantities of wheat fed to animals) or to sell; but the distinction between household consumption and market sales is critical. Almost all families make bread every day or two, and almost all of this wheat comes from their own fields. The same is true of potatoes, which are both the dominant commercial crop and a staple starch in the community's diet.

Table 4 reports the breakdown between consumption and sales for these five crops. Of the 20 households who grow potatoes and the 11 households who grow wheat, only a single

	All Organic	Hybrid*	Not Organic
Field crops organic? (n=20)	1	2	17
Home garden organic? (n=22)	18	3	1

* A mix of chemical fertilizer and organic manure

Table 2. Crop and garden management by household.

Compost Pile	14
Grow Quinoa	8*
"Manure Infusion" as Foliar Spray	5
Vermicompost Pile	4
Grow Native Potato Varieties	4
Grow Other Alternative Crops**	3
Raised Beds in Garden	2
Terraced Vegetable Beds	2
Raise Heritage Chicken Breed	1
Living Fence (trees)	1
Sprinkle Ash as Pest Deterrent	1
Use Rock Mineral Powder	1
Plant-Based Pesticides	1
Ventilation System in Greenhouse	1

* 3 of these 8 grew quinoa in the recent past but no longer did at the time of our interview.

** Includes lentils, chickpeas, jerusalem artichoke, ginger, salad greens.

Table 3. Agricultural innovations by number of household (n = 25).

household for each (the same household) reported growing the crop exclusively in order to sell it. Most of the others grow for some combination of self-consumption and market sale, and nearly half of the households report *only* growing the crop in order to consume it. For oats, peas, and fava beans the numbers are even more striking: no households grow them exclusively to sell, and over half grow them exclusively for consumption.

This striking level of self-consumption underscores the ongoing existence of the “moral economy of the peasant” [28]: the prioritization of household food security, even at the expense of turning down off-farm work that could produce more income (see [29] for a recent discussion). This in a sense provides empirical backing that the inhabitants of Llaguepulli are not merely rural residents but are peasants in the more conceptually important sense. One of my respondents articulated this relationship elegantly: “Everything that I harvest, the first priority is leaving enough for the rest of the year. Wheat, for bread. And potatoes too, I also store them to eat them. And when I need a little money, I sell something else – potatoes, or a little animal ... But the first priority is leaving enough for the year.” Another linked this not just to

	Potatoes	Wheat	Oats	Peas	Fava
Grow for consumption only	7	5	5	8	7
Grow primarily for consumption, sell only surplus	8	4	3	5	2
Grow for both consumption & sale	4	1	1	2	1
Grow for sale only	1	1	0	0	0
Total interviewees growing	20	11	9	15	10

Table 4. Field crops grown for consumption versus market sale (n = 20).

being a *campesino*, but an indigenous one: “A Mapuche wants to have a little bit of everything. For example, sheep for wool. Pigs for their meat. And other animals from time to time – for example cows to sell.”

With this agricultural portrait of the community providing some background context, I turn now to the empirical research question. I break the following section into two parts, corresponding to the two halves of the query: **What are the conditions that (a) motivate and (b) constrain the move towards a sustainable agroecological system in the indigenous smallholder community of Llaguepulli, Chile?**

6. Results

Motivating factors are primarily two-fold: a deep frustration with the constant cycle of debt incurred by commodity crop production, and a strong attraction to the idea of organic farming. Constraining factors are more complex. They begin with the loss of traditional agroecological knowledge, then metastasize in the form of a lack of manure for use as organic fertilizer and a lack of animals for producing it. This insufficiency of animals stems from severe land constraints, which links all the way back to historical land dispossession by the Chilean state. In this section I will expand on each of these factors in turn.

6.1. Motivating factors

My interviews revealed one major “push factor” (an element of the current system that respondents were dissatisfied with) and one major “pull factor” (an element of an alternative system that they were drawn to) that served as motivators for seeking an agroecological alternative.

6.1.1. Push factor: cycles of debt

From an economic point of view there are two basic aspects of any farming system – costs and revenues – and on this point the agrarian studies literature is unequivocal: peasants are damned at every turn. They are often located far from primary markets, making the costs of purchasing inputs and of transporting their products higher. They are small in scale and cannot produce in volume to take advantage of the meager profit margins for commodity crops. They are economically marginalized and rarely have surplus capital or savings, making them

dependent on debt for financing a given year's production. And compounding all of the above factors, they are often at the mercy of a single intermediary for supplying their inputs or purchasing their crops, or a single lender able to charge usurious interest rates [23]. Let us use the responses of community members to consider each of these three elements: costs, revenues, and indebtedness.

My very first interviewee put the matter most bluntly: "We are not happy with farming because there is no profit". I asked him and his wife if they have noticed any rise in prices, and they responded:

Husband: For potatoes, no. But for fertilizers, yes they go up a lot.

Wife: Fertilizers increase a lot.

Husband: A farmer is left in debt if he sows a lot of potatoes. Because potatoes demand a lot. You have to give it a lot of fertilizer. Then in order to control disease you have to buy all kinds of remedies. So in the end, it doesn't pay to sow a lot. And then after, you have to find a worker to help you harvest the potato. So, a lot of costs.

Confirmations of this trend were universal among those who spoke to the cost of inputs. One farmer related that roughly 10 years before, a 50 kg sack of potato fertilizer cost 5000–6000 pesos, but by 2016 the cost had more than tripled to 20,000+ pesos (USD \$27+ at the time of the research). Other respondents' recollections matched this, for example one quoting a price of 20,000 and another 22,000 for a bag of fertilizer. And this is not to even mention pesticides, which have become nearly required for growing potatoes (due to the entry of late blight into the community) and which, according to one man, "are almost more than the original chemicals for fertilizing."

Meanwhile, the costs received by the farmers are stagnant. One reason is a simple fact of economic geography: there are more fertile, flat, and well-irrigated fields elsewhere in the country where crops such as potatoes can be produced at much higher volumes and much lower cost, forcing these smallholders to lower their prices in order to compete. A second reason is more a fact of agronomy: the vast majority of potato growers in Llaguepulli are cultivating the same variety and planting it at the same time, which means it is ready for harvest at the same time, which means supply surges and the price plummets at harvest.

The main harvest window for the standard variety of potatoes stretches from mid December to late January. Earlier, in the middle of November, one woman told me that potato prices were high because most varieties had not matured yet, but she predicted that by mid-December the prices would drop "and they would not come back up again". Her husband informed me that new potatoes were selling for 30,000 pesos per 50 kg sack. Another grower told me that the first potatoes to come out of the ground (the "new potatoes" or *papas nuevas*) had been bringing 40,000 pesos per sack. At a community meeting in early December someone noted that just recently the price had dropped from 30,000 down to 22,000. On December 8 I encountered a farmer who had just sold a load of potatoes to an intermediary for the price of 15,000 per sack. On January 13 another campesino informed me the price had dropped to 8000, and by the end of January several people told me that potatoes were now selling for 5000 pesos a sack. No one I interviewed keeps careful accounting records, so it is impossible to say with certainty, but my informal calculations indicate that at a price received of 5000 pesos, a farmer is losing money on every sack sold.

And so, with farmers caught between the constant squeeze of rising input costs and stagnant farm gate prices, they are forced into a system of debt in order to fund the annual production cycle. There are only two sources for financing: a local bank, if they will lend to a Mapuche campesino, or INDAP (Institute for Farm and Livestock Development), an agency under the government's Ministry of Agriculture dedicated to the support of small-scale farmers and ranchers. Both come in for equal scorn from the inhabitants of Llaguepulli.

One interviewee said bluntly, "The banks bleed the peasant farmers" (*Los bancos desangran a los campesinos*), describing how a loan for 1 million pesos must be paid back at 30% interest, and all at once rather than month-by-month. Few farmers have this much net revenue all at once, the interviewee said, so they must request an extension, in which case the 1.3 million peso debt suddenly balloons to 2 million pesos. A 30% interest rate turns into a 100% rate. Though this narrative seems hard to believe, it was echoed by others, who noted that the moment one defaults on a payment, the interest rate skyrockets.

According to another respondent, who has actually served as an extension agent for farmers in several local communities, INDAP may not charge such blatantly usurious interest rates, but the end result is effectively the same, because after a farmer sells their crop, "the profit margin they have, they have to give it to INDAP. So, generally, they continue on in this circle. And it's too difficult to innovate or change." Much of the time an elderly peasant spent talking to me was consumed with discussing the many years during which he had labored under a debt burden to INDAP.

I would be remiss if I painted the debt problem as strictly a structural one: as with any complex issue, there is an interplay between structure and human action. One respondent, a younger woman who lives in the community part-time and has witnessed her parents' struggle with debt, expressed frustration with the way in which the agronomic conservatism of the peasant contributes:

It's illogical, because the inputs for growing potatoes – for example, the variety most used around here, the seeds are super expensive! And I think that no one – not even my parents, who are truly potato producers – gives concern to the costs or to whether they ultimately get any profit. I don't think they make that calculation. How much they spend, like, I don't know, 3 million [pesos] to grow the crop, and then afterwards they get 3 and a half million, it's hardly a profit. But then along comes March, and they do the whole thing over again. (emphasis added)

What is notable is the way in which the smallholder feels yoked into the system, lacking the resources (capital, education, mobility) to leave or envision growing anything different. One pair of commentators, a widowed female landowner and her younger male farmworker, bitingly captured this sense of entrapment:

Respondent 1: We have to pay the debt we have. At times there isn't even enough to pay oneself. Because if the harvest is bad, and if the price is low, there isn't enough to pay oneself. And you're left short.

Respondent 2: You have to buy the input to sell [the crop] just to pay the loan off. You're left with very little for your [household] costs. That's the reason the campesino goes no further. We can't get ahead ... That's the reason the campesino is indebted. The campesino can't get ahead in any way, because the costs are large.

6.1.2. The pull factor of organic

The "push factor" of debt is made more powerful when paired with some notion of an alternative, and my interviews revealed a strong draw towards the idea of not just sustainable

agriculture generally, but organic farming in particular. It begins with the recognition that there is another way possible. Some stated it as simply as that – “We know there is an alternative – growing organically”, said a middle-aged female respondent. Others framed the desire specifically as a yearning to return to an earlier form of farming, the kind practiced by their ancestors. Here are a sampling of responses from three different interviews, with the key words italicized for emphasis:

It would be sensational to be able to return to [organic methods] – that would be ideal. Then we would be eating more natural food.

We have given a lot of thought, gone round and round, on how we can reclaim, on a small scale, our organic agriculture. With potatoes for example, we want to grow them for our own consumption, to go back to having healthy potatoes [grown] with nothing but organic compost.

I feel that the land has become so tired, is so miserable, is sick, so if we get back to farming with products that are natural, with compost, like they farmed in the old days, I think that the land can be a good. It's like giving it medicine.

Much of this seems tied to remembering farming in the “old days”, as numerous respondents told stories of how their parents or grandparents cultivated plants using only animal manure as a fertilizer, or recalled how good the harvests were or how healthy the plants were before the arrival of agrochemicals. Members of 14 households specifically made such comments, even though I never asked a specific question about how their parents farmed. One respondent, probably the most well-traveled and well-educated in the village, made a link not just to his ancestors but to indigeneity:

It's very important because I think it can rescue the traditional ways of organic, agrarian production that Mapuche families practiced before the arrival of Occidental peoples to the South American continent – that they had been practicing since forever ... Before, they didn't use pesticides, fungicides, not even chemical fertilizers.

But respondents did not have to reminisce about a past – real or imaginary – in order to conjure the appeal of going organic. In line with the data above (see **Tables 2 and 3**), most of them have experience raising an organic vegetable garden, and some of them with growing organic crops at scale. And here the response is unequivocal. Many spoke of the superiority (in terms of both production and quality) of organic methods in the home garden. One man noted that whenever they have extra animal manure left over after fertilizing the garden they use it on the field potatoes:

And they give good potatoes! They're the best potatoes you can harvest. Because they live healthily. They don't come with chemicals. Super healthy. They're delicious to eat too. The difference is huge, the difference between chemicals and animal manure.

The benefits extend beyond mere production and taste. An elderly woman related how last year she and her husband sowed beans with nothing but manure as fertilizer, and even though there was a terrible drought, they produced a “great harvest” – no doubt due to the enhanced water holding capacity that higher organic matter levels bring. And others display an insightful understanding of the mounting negative effects of agrochemical use, including the persistence of certain compounds in the soil, the unintended killing of beneficial insects and worms, and what is referred to in the sociology of agriculture as the “pesticide treadmill”. One farmer, one of the most innovative in terms of experimenting with alternative crops such

as lentils, noticed that late blight in his potatoes only seemed to be getting worse, rather than better, with the increased use of fungicides, and referred to it as a “cycle” that the peasant becomes trapped in.

A final quote serves to bring both the push and the pull factor together. Note how this elderly female campesina neatly ties together the stress from high input costs with the growing desire to farm organically:

If you could farm organically, experiment more with organic, it would be better. It would be more peaceful. You wouldn't be thinking, I have to buy who-knows-how-many sacks of fertilizer, and how much is it going to cost me. You could leave those thoughts to the side. Instead, to work with your own manure and your own thoughts, that would make you more calm, more at peace.

All told, if we consider the number of individuals who commented on the disadvantages of farming with agrochemicals or the desire to farm organically, 30 out of 38 interviewees (79%), representing 22 of the 25 households in the study (88%), expressed this broad sentiment. This, then, brings up the obvious question that will occupy the remainder of the paper: what is holding them back? If agricultural innovations are already being practiced by a large majority of households; if there is growing dissatisfaction with the debt loads and chemical use of conventional agriculture; if there is a strong and growing desire to farm organically – what impedes Llaguepulli's smallholders from realizing this goal? The answers are neither as simple nor as obvious as they may at first appear, though they do boil down to the most basic farming resource of all: land.

6.2. Constraining conditions

6.2.1. The entrance of agrochemicals and the loss of organic farming knowledge

We might start by asking the converse question: why did the campesinos of Llaguepulli switch *away from* organic practices with the arrival of agrochemicals in the 1970s and 1980s? It is worth quoting one respondent at length, because in answering this question it he also sets the stage for later discussions:

Ever since the Green Revolution, people began applying chemical fertilizer. Before, it was all organic. I remember when I was a boy, 8 or 10 years old, we sowed potatoes with nothing but animal manure... Then came the famous Green Revolution, and from that point the people who had a little more money bought chemical fertilizer and applied it. And they saw that the results were fantastic. And when they saw this, they said 'Wow' and they bought more... In time there were special mixes of fertilizer for potatoes, for wheat, for oats...

Older folks who used to collect, pile, and spread manure with their parents recalled the tremendous amount of physical labor to “make your own organic fertilizer”, and when fertilizers in a bag came along, as an elderly woman said, “People became so enthused with it, and soon everyone was working with chemicals.” Another effectively finished her thought: “And that's how it went, little by little, we entered that area [of agrochemical dependency]”. So complete was the fertilizer transition that multiple respondents commented that the crops and even the soil itself had become “accustomed to” (*acostumbrado*) the chemicals. The oldest man I interviewed, who had been one of the earliest adopters of agrochemicals (and, it should

be said, of borrowing on credit in order to purchase those chemicals), told me in plain terms, "If you don't apply fertilizer, you won't harvest anything."

The move away from "organic-by-default" farming in the span of less than a generation caused many of these techniques to fade from the collective knowledge base. One man related how, "In the old days, the old guys had corrals, where they kept all of their animals. And in these enclosures they gathered all of the manure, made big piles of it – they dedicated themselves to this... The old guys were intelligent!" But now, he went on, "the animals are just out in the fields. And the manure is lost." Speaking of composting more generally, another young farmer related, "Me personally I don't know how to make a compost pile. We're kind of at the most basic level. I imagine that there is a whole process involved, but I, at least, do not know how to make compost." A woman in her 70s told me when I first met her that she needed help with composting, and later when the discussion turned to the proper treatment and use of her own sheep pellets, said with resignation, "I don't understand much about any of that".

This lament over the loss of traditional forms of knowledge was not limited to talk of manure and composting. One woman discussed her general ignorance about soil: "We don't have the clarity – how to find the balance, what the land needs. And since we don't do soil tests, we know even less! We are working blindly." A middle-aged man related:

In regards to natural insecticides and pesticides, I don't have an expertise about which products I can use to control insects. I know that they exist, I know that it's possible to make a mixture of plants, herbs, and a few other products, but I don't know what the ingredients are, and what quantities to use.

Another, younger man, when discussing the irony of having insecticides kill not only the target insect but also beneficial insects that may have eaten the pests on their own, noted, "There are so many things that one isn't able to recognize what one is doing. You think you're doing good for your soil, but actually you're doing bad."

6.2.2. Lack of animals and lack of manure

One of the questions I asked each interviewee was what they thought most impeded the community from reaching its agricultural sustainability goals. In my very first interview a peculiar theme began, as an elderly man said simply, "There aren't [enough] animals. You have to have sheep, cattle, in order to have organic manure. They used to have animals. Sheep, cows, all kept in a corral. And you gathered together all the manure. But now there aren't animals". Then, just two interviews later the same theme was echoed: the community was impeded by a lack of animals and, consequently, a lack of animal manure. Then a third interviewee reported that the thing he would *most like to do* on his farm, given the resources, would be

to go back to how it was before. From the animals I have, from them to get manure. And then with that same manure – because from chickens comes such a good manure! If you have poor land, you spread that manure on it ... To store up manure from chickens, from geese, from ducks, from hogs – you put all that together and you make fertilizer.

Over and over the theme returned: All told, the specific subject of (a lack of) organic fertility due to (a lack of) animal manure came up in 15 of the 25 interviews (60%).

So what accounts for the lack of animals? There seems to be a complex set of immediate reasons. Certainly one is the reason mentioned above: a fading familiarity with and interest in rearing animals and handling manure, especially on the part of the youngest generation of farmers. Members of the older generation frequently recounted how their parents or grandparents enclosed their animals in corrals each night, and over the course of a year collected large amounts of manure. Said one elderly respondent:

When agricultural chemicals had not arrived yet, all of our parents had corrals, where they kept the ox, some cows, and the sheep. The sheep, along with the cow's manure, makes a super-strong compost, super.

Said another:

We collected it from the animal corrals where we enclosed the cows, the sheep, and the oxen, and when harvest time came, we put it in a cart and applied it... It was a lot of work but that was how we worked, because there was no other way of fertilizing.

But this work came at a physical and time cost, as a third man noted:

You have to pile the manure up in the corral, different piles in the different corners, then let it sit for awhile until it's ready to use, then cultivate the land, then put all the manure in a cart, and then leave it out in the fields in little piles, and then when we went to sow the crop go along and pair the manure with the seeds. And it tired you out.

As one older man put it, "People don't want to get their hands dirty. The work [of handling organic manure] is super dirty, they say." An older woman echoed these words almost exactly: "Now no one uses manure. They find that it's too much of a pain, it's too heavy to spread, it gets your hands dirty." And so, as a farmhand put it, "What has happened with the campesino, he has pursued comfort – regarding the question of fertilizing with fertilizer, he buys. It's easier."

The causal chain then gets more complex. With a steady loss of animal rearing and the entry of chemical fertilizers, manure becomes less valuable; the basic infrastructure of keeping animals (fences, pens) deteriorates, and in time the few animals left in the community simply stay out in the pasture. Here are three respondents from three separate interviews, all sketching in elements of this story:

After chemicals came along, the people did not concern themselves with keeping the animals in at night. There was no longer the necessity.

We have lost the manure, we have lost that custom of closing in our animals at night. And these days, since there are hardly any anyway, we just leave them like that, free range.

The animals now, day and night they are out in the pasture, so we don't gather any of that manure. But if we could close them in, for example right now at this hour of the day, by tomorrow morning we would gather a lot of manure.

There is a final element we have not woven in yet, and that is the question of demographic pressure. When respondents referred to an older time when animals were kept and manure

was collected, they were usually speaking of their grandparents – who were also some of the first Mapuche to settle these lands. Those men and women had large families – stories of 10 and more children were not uncommon – which necessitated subdividing the land so that each child could have a parcel. And those children themselves had multiple children, which has led to the situation of today: a severe land shortage. So little land, in fact, that it is virtually impossible to keep a herd of animals of a suitable size to produce manure sufficient for growing crops organically.

6.2.3. *Insufficient land*

The point is driven home by my interviewees. If answers to the question about what is impeding the community's path to sustainability were most often framed around the question of manure, the answers to a later question are even more telling. Towards the end of each interview I would ask, what does the community most need to help solve its main problems, and the answer was not "more animals", but rather, as one man put it, "Space. Fields. Land." (*Espacio. Campo. Tierra.*)

This man was one of 10 children. His parents had owned 10 ha – a considerable amount, enough to raise a family. But they divided their land equally among their children, meaning this man and his wife, who make their entire livelihood from the land, have a single hectare to farm. They have three children, the oldest of which, at 18 and just graduated from high school, would like to farm himself. As his father said: "When he is, say, 20, maybe he'll get married. He's going to have to go to the city, far away. But our idea is that no one has to live far from the family, but should be here, close by. But we can't make that happen. We need land."

And he is far from alone. One man of 48 related how his paternal grandparents farmed 24 ha – the entirety of a large hillside. That man had eight children and split the land equally among them, meaning that my respondent's father received 3 ha. His father then split the land among his own children, so my respondent farms less than 0.5 ha and manages to crowd together a small potato patch, a large vegetable garden, and a poultry pen onto a small but steep slice of hillside. That respondent's older cousin farms a similarly-sized tract of land at the bottom of the same hillside. He has six children, all but two of whom live in cities in the region. I asked if he wanted them to come back to the community and farm, and he replied simply: "No, there's nowhere to do that. I have just this little space and no more. That's why they went to the cities to work. Very little land."

Stories of agronomic constraints imposed by land limitations were a common theme in interviews. Recall what a staple crop the potato is – yet an older man, a campesino all his life, is hardly able to devote any of his land to growing them. "Those who have plenty of land, they sow lots of potatoes. Here, no." As we walked inside another man's hog enclosure, he remarked that he would love to have a market garden right there, and would be able to produce lots of vegetables. But then he would not be able to have the hogs. He must choose between the two. A younger woman and her husband decided to cease growing wheat, as they could no longer justify growing on land they needed to feed their oxen.

Oxen, the only source of field traction in the community, play a role in several others' stories of land constraints. An older couple, farmers their whole lives, related that they have to board their oxen on a property outside the community and buy hay, at a cost of 7000–8000 pesos per month (USD \$10–11 at the time of the research) per animal. "By contrast, if we had sufficient land, we would have the animals on our own pasture. Or we would have them penned in, and we would have manure that we could gather." Another man, who does raise a small flock of sheep and a handful of hogs, cannot own oxen and thus must hire a man from a neighboring community to till his cropland: "Oxen I do not have... I don't have the land, the space, in order to grow the forage to feed them." He went on:

Many families in the community don't have oxen, for the same reason. I mean, you could have animals, but if you don't have hay stored up for the winter, what do they eat? They suffer from hunger, they get too skinny.

The same man returned to the theme later in the interview and astutely linked the situation faced by campesinos in Llaguepulli to the socioeconomic status of the peasant smallholder more broadly:

The category we find ourselves in in this community is that of subsistence agriculture. A category that is very basic. We can't really even say that we're small farmers. A small farmer is someone who sows 10 hectares of potatoes – 15, 20 hectares, 50, 100. Those are small farmers. But us, no – with luck, one hectare... So if we want to be farmers in the real sense, it depends on land.

I will leave it to one of the community's main leaders to make the final linkage, because he does it so eloquently, wrapping together the land limitations faced by the community, with the inability to subsist as a true land-based campesino, with – ultimately – the slow diminishment of the cultural identity of being Mapuche:

If there is not land there are no sheep, and if there are no sheep there is no wool, and if there is not wool there is no poncho (manta), there is no way to clothe yourself, we slowly lose ourselves culturally. As long as we don't have sufficient space to work the land, we seek out other options.

And thus we come full circle, back to the theme introduced at the beginning of the paper and a hard historical truth. The Mapuche of Llaguepulli, just as virtually all Mapuche in Chile, do not own sufficient land for keeping herds of animals because they were dispossessed of their land over 100 years ago by a wave of homesteaders flocking to the Araucanía region, aided and abetted by the Chilean government. Indeed, the very word for the parcels of land which the Mapuche were deeded – often translated into English as "reservations" due to the parallel practice in North America – is more insightful if we translate it literally: "reductions" (*reducciones*). The historical Mapuche territory was "reduced" by 95% ([2], p. 46), initiating the century-long causal chain that led to the present situation.

7. Discussion and conclusion

We are tempted to look for answers to questions of agricultural sustainability in current practices and techniques and even socioeconomic circumstances, but sometimes history holds the greatest clues. A late nineteenth century traveler in Chile wrote admiringly of the *colonos* settling around the southern city of Valdivia: "They were true pioneers, who chopped

down the forests, built log cabins, and planted wheat fields and orchards in their clearings. They opened up a large part of the region, and made many fine farms" ([3], p. 87). And what became of the Mapuche forcibly displaced by these settlers? The historian Florencia Mallon describes their fate, and the fate of their descendants, most incisively:

By reducing the amount of land and other resources controlled by the communities, the state forced the Mapuche to transform themselves from semi-migratory livestock herders into small peasant producers. The size of the original land grants ... generated dramatic impoverishment by the second and third generations. Ironically, because they did not have the necessary expertise to develop intensive agriculture, Mapuche peasants ended up contributing to the degradation of their own land. ([30], p. 238)

Apart from several of Llaguepulli's leaders, who are involved in political fights to reclaim some of their ancestral territory, no residents that I spoke to mentioned this deeper history. And yet, whether conscious of the historical roots of land dispossession or not, they made elegant links between land limitations, the cycle of agrochemical farming, and the constraints against sustainability. One offered insights into the fertilizer treadmill, how the degradation of the land forces campesinos to apply even more fertilizer than before because they are "obligated" to "squeeze the value out for their business." Another demonstrated with clarity how land limitations work directly against the adoption of organic practices:

I analyze the situation this way: If these days the space [that we have] is so reduced, and these days we have to provide food for our families, then we have little choice but to seek out chemical fertilizer, which is more secure. Some farmers in the community have tried to grow organically. [But] nowadays seeds are accustomed to chemical fertilizer. If you wanted to truly manage your land organically, you would need to adopt other techniques, for example you would need to rest your land. Rest your land, apply manure... And in order to do that, you need extra land at your disposition.

But it was arguably the single poorest and most land-deprived of all my respondents who made the most impassioned cry for land. He farms approximately 0.5 ha of very steep land. He grows food only to eat it but generates no income from his land and must sell his labor outside the community to earn any revenue. When our talk turned to the issue of solving the community's most pressing needs he stated:

My solution would be the land. The most fundamental for me. Because it is on the land where man maintains himself. I have wanted to be a farmer since I was little, since I knew anything ... I love farming, I love planting ... You have to work, have to work the land. It is the mother of all of us, the land – yes! The mother of all of us! Because it is what feeds us.

Two final caveats are in order. First, the historic deterritorialization experienced by the Mapuche has not gone uncontested. There has been a concerted effort in recent decades on the part of Mapuche communities – sometimes edging into violence – to reclaim the lands that they consider stolen [31]. And the Chilean state has recognized its historical role in Mapuche displacement and enacted reforms. Article 20 of the country's Indigenous Law established a Fund for Indigenous Land and Waters, which subsidizes the purchase of land for individuals or communities "when the area of land [currently held] by such communities is insufficient" [32]. This fund has resulted in the transfer of more than 187,000 ha to indigenous groups or individuals [33]. However, as the anthropologist Di Giminiani [34] points out, this process circumvents the ethical and political basis of Mapuche land claims, rendering them in strictly legalistic and topographical terms. More to the point, given the complexities of buying land

on the private market and the limited funds available, only a small minority of applicants have actually benefitted from the fund, as “most claimants have seen their hopes for ancestral land restoration crushed” ([34], p. 490).

Second, it is not true that the inhabitants of Llaguepulli are completely without options, even in their land-deprived state. Efforts are currently underway to create possibilities for more sustainable livelihoods, with the ultimate goal of achieving a “distinctly Mapuche agroecological transition” (Krell, personal communication). These include the resurrection of traditional forms of indigenous land management appropriate to smaller spaces, such as the cultivation of adapted varieties of quinoa, the use of locally sourced seaweeds as foliar fertilizers, and processing of alternative crops such as the native *maqui* berry – as well as incorporate unique forms of economic solidarity such as community-managed microloans to encourage and support such initiatives [5]. As the readers of this volume know, agroecological solutions are possible, indeed are necessary, in land-constrained situations.

But a true process of repeasantization – that is, opening the possibility for an entire community of smallholders to once again be able to control their own agricultural fates outside the cycles of debt and agrochemical dependence – requires sufficient access to land, and such access will not simply appear with patience, nor can it be created by altering agronomic techniques. It is a solution whose realization is by its nature political: it requires a reallocation of lands formerly taken from the Mapuche. If we wish to clearly identify the causal chain that creates agro-environmental crisis, and the actions that can ameliorate it, then Naranjo’s dictum [20], p. 243, is not just a social or political statement but an agroecological one: “Equitable and comprehensive land reform that benefits peasants is imperative for food sovereignty.” That is how the inhabitants of Llaguepulli, and countless Mapuche communities like it in the south of Chile, will be able to feed themselves, raise their own animals, spin their own wool – in a word, reclaim the full extent of their moral economy.

Acknowledgements

I extend a heartfelt thank you to Ron Severson for deep conversations about community development and to Alison Guzman and Ignacio Krell for helping guide and provide crucial insights into this project before, during, and after fieldwork. I would also like to thank Jorge, Emilio, and Mauricio for their unwavering support in championing the project, and all the inhabitants of Llaguepulli for welcoming me into their community and homes. ¡Chaltumay kom pu che!

Research funding

Funding from the Henry Luce III Fund for Distinguished Scholarship at the College of Wooster helped make this research possible.

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