

Socio-Environmental Impacts of Argentine Yerba Mate Cultivation:  
*“El Problema es el Precio Bajo”*

By  
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Adam S. Dohrenwend  
B.A., State University of New York, College at Geneseo, 2017

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Chair: Dr. J. Chris Brown

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Dr. David Aagesen

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Dr. Kelly Kindscher

Date Defended: 17 April 2019

The thesis committee for Adam S. Dohrenwend certifies that this is  
the approved version of the following thesis:

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Chair: Dr. J. Chris Brown

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## ABSTRACT

### ***English***

Consumption in today's globalized economy makes it difficult to understand the consequences of our actions across the globe. A political-ecological lens, informed by the work of Robert Sack and Ian Cook, can help guide an analysis that geographically reconstructs supply chains and reveals the realities of consumption. This thesis applies this approach to study the externalization of cost under capitalism in the production of Argentine yerba mate, an infusion with stimulant properties long-used by indigenous peoples. The use of yerba mate has become a cornerstone of Argentine society and identity, and yerba mate processors are working to expand exports globally. In Argentina's Misiones province, the heart of yerba mate production, the true costs of production are borne by the children, the impoverished laborers, and the environment of Argentina's Atlantic Rainforest. These consequences of modernity, along with the efforts of an NGO to remedy them, are presented and assessed.

### ***Español***

La forma de consumo en el contexto de una economía globalizada dificulta el entendimiento del alcance que tienen nuestras acciones en el resto del mundo. Una perspectiva político-ecológica, basada en el trabajo de Robert Sack e Ian Cook, puede ayudar a guiar un análisis que reconstruya geográficamente las cadenas de suministro y revele las diferentes realidades de consumo. La siguiente tesis aplica la perspectiva mencionada para estudiar la externalización del costo bajo un sistema capitalista en la producción en Argentina de yerba mate, una infusión estimulante tradicionalmente utilizada por pueblos indígenas. El consumo de la yerba mate se ha constituido como piedra angular de la sociedad argentina y de su identidad frente al mundo, y sus productores trabajan para aumentar su exportación. En la provincia argentina de Misiones, el corazón de la producción de yerba mate, los verdaderos costos recaen sobre niños, trabajadores adultos precarizados y el ecosistema del Bosque Tropical Atlántico. El objetivo de este trabajo es exponer y abordar las consecuencias derivadas de esta forma de producción moderna junto con los esfuerzos que realiza una ONG para remediarlas.

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## Chapter Outline

<b>1. Introduction and Methods</b>	<b>1</b>
<b>2. Overview of Yerba Mate</b>	<b>5</b>
<b>3. Theoretical Framework</b>	<b>25</b>
<b>4. INYM, Prices, and the Argentine Yerba Mate Food System</b>	<b>36</b>
<b>5. Socio-Environmental Consequences of Low Margins</b>	<b>45</b>
<b>6. Conclusions</b>	<b>59</b>
<b>Statistical Appendix</b>	<b>65</b>
<b>References</b>	<b>66</b>

## TRANSLATION REFERENCE GUIDE

*Bombilla* — Straw

*Hoja canchada/seca* — Dried yerba mate

*Hoja verde* — Green leaf

*Molino* — Industrial firm

*Oro verde* — Green gold

*Secadero* — Drier

*Tarefero* — Migrant agricultural worker

*Yerbal* — Yerba mate field

*Yerbatero* — Yerba mate primary producer

## 1. INTRODUCTION

Yerba mate, a cornerstone of Argentine culture for centuries, has been thrust on the global commodification stage in recent years. With the vast majority of Argentines already consuming the caffeinated infusion, the industry seeks a new global market through which it can increase profits. In order to accomplish this, a context has been constructed and harnessed to define both the market and the product. This context seemingly defines yerba mate by its benefits to the consumer in mind, body and spirit; however, this narrative does not completely match reality. Today's global economic landscape, riddled with complex production chains, obscures social and environmental realities driven by consumption and makes the assessment of marketed contexts much more challenging. This is not unique to yerba mate. At a national supermarket chain, try asking the butcher where the ground turkey or pork chops come from. Where does the shrimp come from? What about the corn that makes up the bulk of the cereal aisle? They may not even know the country of origin, let alone the local contexts of productions.

As consumers become more disconnected with the increasingly complex networks of hyper-specialized places of production that fulfill their desires of consumption, understanding the consequences of one's consumption can become seemingly impossible. When one consumes in today's economy, they enter a vast network of relationships, both with the people and the environments of countless places. Furthermore, to achieve low consumer prices at the end of a production chain, these often-obscured relationships can become increasingly problematic. This represents the externalization of cost onto producers, their neighbors, and the environment. These processes are not unique to yerba mate, rather they are a product of globalized place-making spurred by consumption.

In the realm of specialty food products from South America, many other examples are seen beyond yerba mate, including açai and quinoa (Keiles, 2017; Romero & Shahriari, 2011). However, perhaps the most striking example involves cell phones. In a recent physical geography lecture on minerals, I began a brief discussion of so-called “conflict minerals”. After showing the class the social and environmental realities of coltan (an ore that yields critical elements in the production of consumer electronics) extraction in the Congo Basin, I asked the students to raise their hand if they have been previously aware of these issues. Few raised their hands. Then I asked them to raise their hands if they owned a cell phone. Now the landscape of hands looked quite different. Every hand in the classroom of almost 200 was raised. Does the average American understand the resources that go into their consumer electronics? Are they aware of the conditions under which coltan is mined and integrated into the global economy? Do they understand that a physical piece of Africa is sitting in their pockets and on their desks? Are we, as consumers, unknowingly complicit in any of the unjust or questionable social and environmental processes that are part of the system that allows so many of us to have cell phones? How might corporations benefit from consumer ignorance? If consumers knew, how might that impact the meaning of the product and their consumption of it? Most importantly, what consequences would be spurred by a consumer market more aware of the realities of their consumption?

All these are questions that we as consumers may consider. Put succinctly, this thesis seeks to answer the following question: How does the pressure to minimize costs in the yerba mate supply chain impact the northeastern region of Argentina, both socially and ecologically? Using a theoretical framework based on the work of geographer Robert Sack, this thesis will examine the way in which the yerba mate industry defines the product,

contrasting that narrative to the social and environmental realities of its production. The narrative paints yerba mate as a product with a long history filled with mutually-beneficial relationships between humans and nature. However, with the effort of yerba mate industries to make as much profit as possible, those with the most influence over pricing (the industrial sector) seek to push the price of *hoja verde* (green leaf) down. This forces the actual social and environmental costs down the production chain to those who can, more often than not, afford them least and suffer them most—smallholders. To adapt, I argue that these marginalized smallholders often resort to socially and ecologically destructive practices in hopes of just barely eking out a living. This represents an externalization of both the social and environmental costs of production. The existence of political-economic choices is nothing new to yerba mate. By utilizing an emerging and rather unconventional commodity as a case study, the effects of the evolving geographies of consumption on Argentina’s Atlantic Rainforest region and industry’s definition of what yerba mate “is” will be assessed through a political-ecological lens imbued by the work of Sack.

### Methods

In the case of yerba mate, the social and environmental consequences I focus on include poverty among primary producers, child labor, occupational hazards from herbicide use, and soil erosion that is exacerbated by herbicide use. Consumers often do not directly feel these consequences and, oftentimes, have no awareness of them. By utilizing Ian Cook’s “follow the thing” approach, and therefore activating Sack’s surface/depth loop, researchers and consumers alike can unshroud the mysteries of the



impacts of consumption, allowing for a more accurate understanding of the “good”. In this way, Cook’s methods allow us to better “see through to the real”.

I conducted fieldwork over a two-week period in Misiones during July 2018. I was based out of the city of Posadas along the banks of the Río Paraná. I conducted a series of seven semi-structured interviews with diverse stakeholders representing different parts of the production chain and greater society. These stakeholders included people involved in growing, drying, packaging, and marketing yerba mate. The participants were secured mostly through Patricia Ocampo of *Un Sueño para Misiones* (A Dream for Misiones—an NGO seeking the elimination of child labor in the yerba mate production chain). Her assistance was instrumental in my fieldwork. Though the potential for biases in results can arise when working with an NGO, participants represented diverse viewpoints that often did not completely line up with the positions of the NGO.

This method was utilized, as outlined in my approval from the University of Kansas’ Institutional Review Board (IRB), as it allowed for much more flexibility than structured interviews would have. Though armed with a set of questions at the beginning of each interview, our conversations often drifted to other issues that were not addressed by my pre-written questions. Interviews were recorded and audio files were stored on an encrypted hard drive. Identities of interviewees were anonymized unless stated otherwise.

The purpose of these interviews was to utilize a “boots on the ground” approach to identifying the existence of social and ecological threats posed by yerba mate production. Semi-structured interviews allow for much more flexibility, while still following the basic guidelines of the prepared interview questions (Hay, 2005). Additionally, as I had never been to this region of Argentina before my fieldwork, I felt it was important to allow for

discussion to go in the direction it was led by interview participants. As yerba mate is not the best-studied agricultural commodity, this information is not always readily available or current.

*Those interviewed include the following:*

Interviewee #1: Patricia Ocampo, *Un Sueño para Misiones* (child labor NGO founder)

Interviewee #2: Male, A marketing manager

Interviewee #3: Male, A *secadero*

Interviewee #4: A family of organic yerba mate producers

Interviewee #5: Male, Executive Director of an industrial firm

Interviewee #6: Male, A large producer

Interviewee #7: Male, An agricultural engineer specializing in yerba mate

## 2. OVERVIEW OF YERBA MATE

### 2.1: Consumption and Production

Consumption of mate, the drink made with the processed leaves of the yerba mate (*Ilex paraguariensis*) tree, is concentrated in South America, specifically in Argentina (6.5 kilograms per capita), Brazil (.8 kilograms per capita), Paraguay (2.5 kilograms per capita), Uruguay (8.64 kilograms per capita), and Chile (.4 kilograms per capita) (Barry, 2016; Emiliano, 2016; Statista, 2018). Though the figure for Brazil appears low, consumption is comparable to that of Argentina and Uruguay in certain provinces, particularly along the Uruguayan, Argentine, and Paraguayan borders. In terms of total consumption, Argentina is first in the world, followed by Brazil and Uruguay. As previously mentioned, the highest consumption per capita is seen in Uruguay (Barry, 2016). Outside South America, the only

widespread consumption is seen by the Druze people of the Syrian and Lebanese Levant (Folch, 2010). Consumption among this group has its roots in the immigration of the Druze to Argentina in the late 19<sup>th</sup> century and early 20<sup>th</sup> century. After arriving in Argentina and quickly gaining a taste for yerba mate, many Druze returned to the Middle East, bringing the Argentine custom with them.

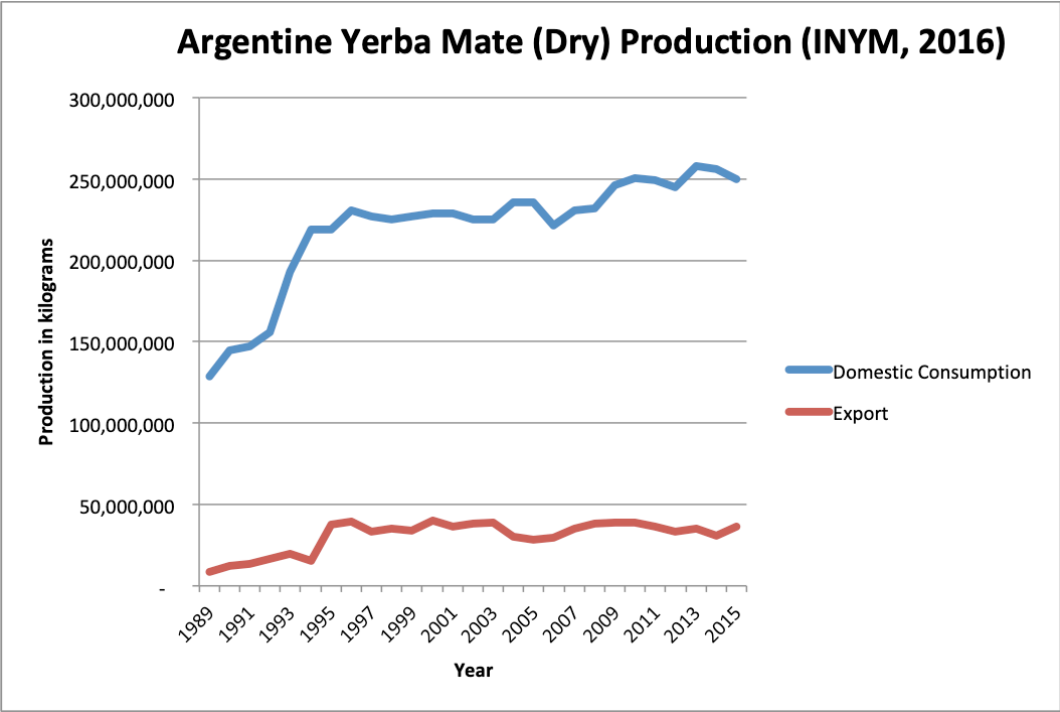
In addition to being the largest total consumer, Argentina is also the largest producer of yerba mate, with most of the country's production (90%) located in Misiones province in the far northeast of the country (Rau, 2009, 51). The remaining 10% of domestic production comes from neighboring Corrientes province (Rau, 2009, 51). Roughly 60% of global yerba mate production occurs in Argentina (BILA, 2017). In total, Argentina has just over 165,000 hectares devoted to the cultivation of yerba mate, with 144,000 of these hectares located in Misiones and the remaining hectares in Corrientes (INYM, 2016). Of Misiones' departments, Oberá is the clear leader, with over 21,000 hectares of yerba mate cultivation within its borders. In recent years, the area of cultivated land dedicated to yerba mate has remained stable (Interviewees 2, 3, 4, 5, 6, & 7, 2018).

The table shown in Figure 1 on the next page shows Argentina's total output of dried yerba mate, separated out by domestic consumption and export. A large increase in production for domestic consumption is shown, with a spike in the early-mid 1990s. It may be worth noting that this large spike occurred concurrently with a significant change in the structure of the Argentine economy, the introduction of the Argentine convertible peso that had a value fixed to the US dollar.

On the 165,000 hectares of cultivation are around 30,000 farms operated by around 18,000 producers. Of these, 15-16 thousand are small producers, 3,000 are large

producers, and around 150 are extremely large producers (Interviewees 2 & 3, 2018). Thirty percent of the producers are responsible for roughly 70% of production, while the remaining 70% of producers are responsible for the other 30% of production (Interviewees 2 & 3, 2018). Though only 20-30% of total production is by large companies, this figure is much higher when factoring in reliance on contract growing (Interviewee 3, 2018). There are just under 250 *secaderos* (driers) and several dozen large companies in the industrial sector (Interviewee 3, 2018). Of these companies, five hold control over roughly 50% of the market (Interviewee 3, 2018).

Figure 1: Argentine Yerba Mate (Dry) Production - 1989-2015 (INYM, 2016)



Though a bit dated, Rau provides information based on INDEC data indicating that 52% of holdings with yerba mate were five hectares or smaller, making up 17% of the total land area devoted to yerba mate (Rau, 2009, 52). Holdings between 5.1 and 25 hectares made up 42.5% of the total, accounting for about 49% of the total land area (Rau, 2009,

52). Holdings greater than 25 hectares made up just 5.5% of holdings but contained about 35% of total area of yerba mate cultivation (Rau, 2009, 52).

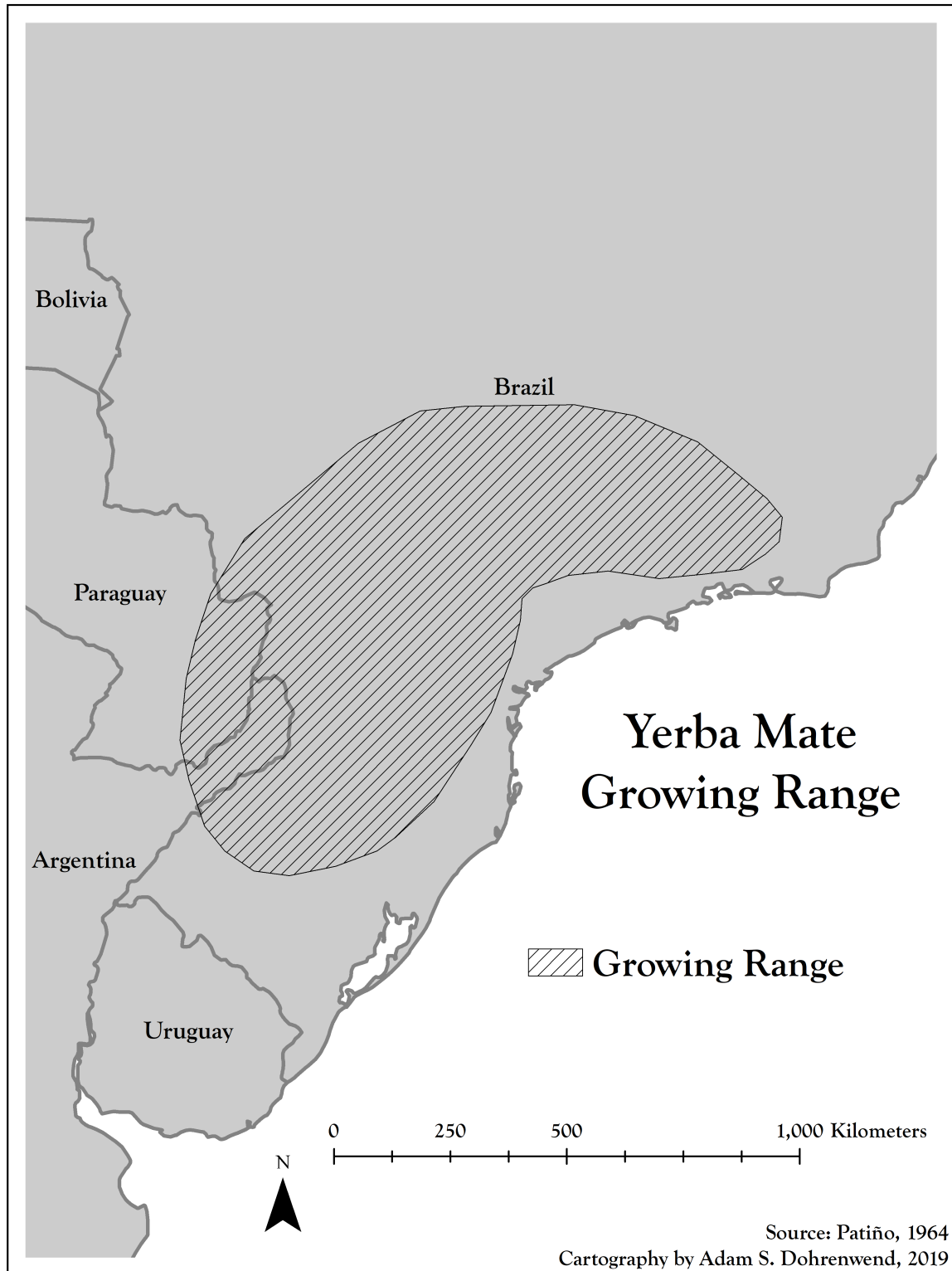
To prepare mate, the dried and cut leaves are traditionally placed in a dried gourd or similarly shaped vessel. The name “mate” stems from the Quechua word for this vessel, *mati* (Folch, 2010). From here, hot water is added and the leaves are briefly steeped. The resulting concoction is then drunk with a straw, referred to as a *bombilla*. In tropical latitudes, much yerba mate consumption takes the form of *tereré*, a cold infusion often mixed with herbs or fruit juices. Yerba mate contains a significant amount of caffeine, along with other compounds, and has been hailed in much medical research to have numerous health benefits (Cuelho et al., 2015). Though the spatial extent of large-scale consumption is geographically confined, where consumption does occur, it is generally quite heavy.

## 2.2: Botany and Biogeography of Yerba Mate

*Ilex paraguariensis* is one member of the *Ilex* genus in the Aquifoliaceae family. The Aquifoliaceae family contains about 400 species of holly (which grow on every continent but Antarctica) almost all of which are part of the *Ilex* genus (Porter, 1950).

There are many *Ilex* species in the region and it is estimated that roughly one-third have been used in infused beverages (Porter, 1950). *Ilex paraguariensis* was classified in 1822 by Augustin Saint-Hilaire, a French botanist. This is where the most common variety gets its common identification as St. Hilaire (Peckolt, 1883). He identified three varieties: *obtusifolia*, *acutifolia*, and *angustifolia* (Porter, 1950).

Figure 2: Range Map (adapted from Patiño, 1964)



The tree can grow to heights of 20-30 meters tall in the absence of human disturbance, however with frequent leaf harvesting the plant's growth is deliberately stunted to make for a shrub of just 4-6 meters in height (Porter, 1950). As harvest is manual, it is important for producers to ensure their trees do not grow too tall. The species generally lives for around 100 years and is dioecious, meaning that each individual is either male or female (Gottlieb, 2010; Porter, 1950). It is believed that the two different sexes yield final products of different flavors and different caffeine levels (Rakocevic et al., 2012).

The leaves of *Ilex paraguariensis* are perennial, 3 to 20 centimeters long, 2 to 9 centimeters wide, and an olive green color. Flowers are generally greenish-white and have four petals and four stamens. These flowers appear in spring (September to November in Argentina) (Porter, 1950). The fruit is an elliptical drupe that is about 6.5 millimeters by 5.5 millimeters (about the size of a peppercorn). Each fruit contains four seeds and matures in summer (December to March) (Porter, 1950). Few seeds are viable (Patiño, 1964).

The tree's habitat is found between 18° S and 25° S latitude in the areas drained by the Paraná, Paraguay, and Uruguay Rivers (Porter, 1950). According to Patiño (1964), the best area for growth is in the northeast part of Paraguay on the banks of the Paraguay River. The tree prefers sloping areas with highly weathered, red, acidic, low-fertility Ultisols. This makes cultivated areas especially susceptible to erosion and nutrient degradation (Piccolo et al., 2008). The area's climate features an annual average temperature of 21°C and over 2000 millimeters of rainfall each year (SMN, 2019). With respect to seasonal variation, winter average temperatures hover around 16°C while summer average temperatures are around 25°C (SMN, 2019). The region does not

experience a dry season, however precipitation reaches its peak in summer and autumn (SMN, 2019).

### 2.3: History of Yerba Mate

This narrow growing range along the Paraná-Paraguay River system was home to the Guaraní people (Rosin, 2004). During pre-Hispanic times, the Guaraní harvested leaves from wild stands of yerba mate (Jamieson, 2001). This wild harvesting was the predominant mode of collection as recently as the late 1890s (Jamieson, 2001). To consume the leaves for their known medicinal and stimulant effects, the Guaraní simply chewed them, similar to the use of coca leaves, or drank a concoction created by steeping the leaves and stems in hot water (Girola, 1915). The primary medicinal use was to help establish contact with spirits through the work of shamans (Cooper, 1949).

Though only grown in the Guaraní area, traces of yerba mate have been discovered in Inca territories to the northwest (Folch, 2010). Other tribes known to have consumed yerba mate include the Charrua (largely inhabited modern-day Uruguay), Caingang (Southern Brazil), and the Chamacoco (modern-day northern Paraguay) (Cooper, 1949). This suggests that a trade system must have been established to move yerba mate between the Guaraní territories and lands of other tribes as far off as the Andean highlands (Garavaglia, 1983).

The Spaniards encountered and developed a taste for yerba mate almost immediately upon their 1537 entrance to the region (Folch, 2010). Building off the legends surrounding the plant, the Guaraní used yerba mate as a “sign of hospitality” towards the arriving conquistadors (Oberti, 1979).



The Spanish encounter with yerba mate provides an early example of narrative building by outsider Spaniards to stimulate yerba mate's global commodification. According to colonial lore, the Spaniards first encountered yerba mate when Paraguay's *Criollo* (Latin American born of full or almost full Spanish descent) governor, "searched the looted bags of indigenous Guaraní defeated in a military campaign," he found *ka'a* (the Guaraní word for yerba powder) (Folch, 2010). Several centuries later, with yerba mate sales floundering in Europe due to competition from coffee and tea (largely due to the shared mode of yerba mate consumption which was viewed as unsanitary), this story of colonial domination was used as propaganda in hopes of spurring consumption (Folch, 2010). This interpretation of history seeks to alter the social construction of what mate is in order to heighten consumption and profits for the global agro-industrial sector, a pattern evident in today's industry marketing scheme. This will be outlined later.

The Jesuits serendipitously came across the basis for their economic clout through their introduction to yerba mate. Lacking abundant mineral resources like Bolivia, much of the land surrounding the Paraná-Paraguay River system had very little value to the Spanish Crown at first (Folch, 2010). This meant that giving the land to Jesuits for their missions would not threaten income to the Crown.

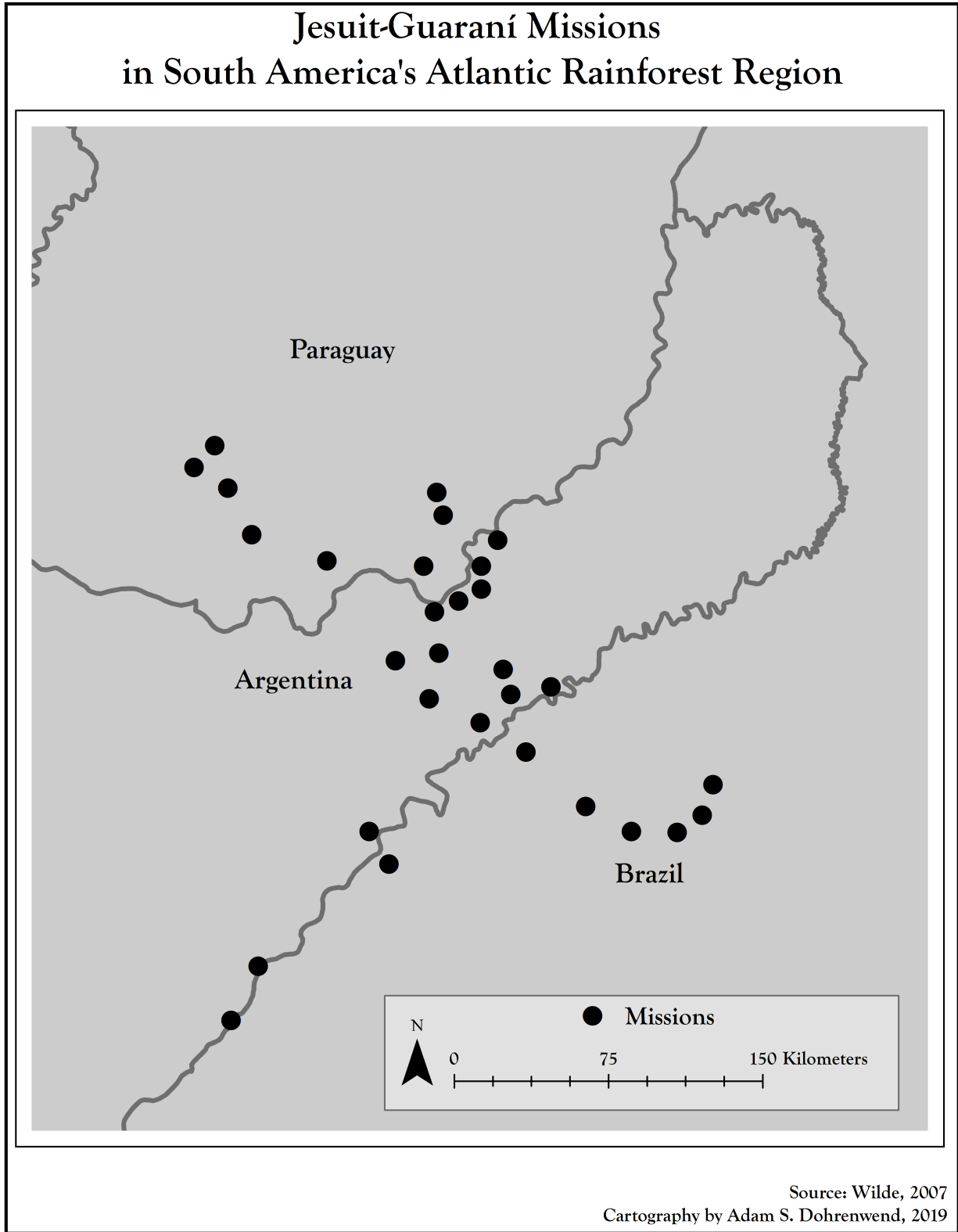
On this land, the Jesuits established 32 missions, many more than they would have liked (Sarreal, 2013). They quickly learned, however, that having fewer, larger missions would result in conflicts between rival Guaraní groups (Sarreal, 2013). A map of Jesuit missions in the region is seen in Figure 3. In areas outside of Jesuit occupation, the conquistadors continued the less profitable method of harvesting leaves from wild tree stands. Under this regime, Guaraní men harvested yerba mate under the *encomienda*

system (Rosin, 2004). Under this system, colonial elites were entitled to the labor of their indigenous subjects. As the Crown learned of the plant's value, it began to treat it the same way mineral resources were treated (Rosin, 2004). The Spanish crown's policies required individuals to apply for a mining concession in order to exploit the wild yerba mate groves of the region.

Though a form of conquest, a hallmark of Jesuit occupation was to avoid using force against the indigenous (Métraux, 1949). The Jesuits sought to "cooperate" with the Guaraní (Whigham, 1986). They conducted much of their missionary activity in the native Tupi-Guaraní languages and provided fairly decent food rations and clothing to their subjects (Barreto, 1989; Métraux, 1949). This spirit of stated cooperation was the critical factor in their eventual success in cultivation. Claiming that their secular contemporaries abused the indigenous peoples as a means of profit, the Jesuits' gentler hand nudged the missions towards mate extraction, using the product as a funding source for their activities (Folch, 2010, 13).

Yerba mate had long been used by the Guaraní, so they had developed keen indigenous knowledge about tree characteristics that related with leaf quality (Jamieson, 2001). With forced Guaraní labor, the Jesuits transplanted trees from the wild stands to their mission sites and started the evolution towards plantation agriculture (Whigham, 1986). As pioneers of yerba mate cultivation, the Jesuits utilized many tricks to assist with growth largely by exploiting the Guaraní's indigenous knowledge (Jamieson, 2001). Some included only harvesting seeds that have aged until purple in color, soaking them in water to eliminate the non-viable seeds, and then letting the seeds pass through the digestive systems of birds, commonly toucans (Folch, 2010; Patiño, 1964).

Figure 3: Jesuit Missions in the Yerba Mate Region (adapted from Wilde, 2007)



Once cultivation was firmly established, the Jesuits began trading large quantities of yerba mate across the Viceroyalty of the Río de la Plata and the Viceroyalty of Peru (Crocitti, 2002). The product was not viewed by the Jesuits as a product for export overseas (Crocitti, 2002). Eventually, strong followings for Jesuit mate were developed in cities like Tucumán, Potosí and Lima (Crocitti, 2002; Patiño, 1964). Mate sold in Lima fetched a price four to five times higher than in Buenos Aires (Crocitti, 2002). The shipping of yerba mate to these other locations was undertaken by the Guaraní as well. Bands of them would often move by *balsas* or *itapas* (river-boats) with the finished product (Crocitti, 2002).

The structure of the yerba mate plantation system was communal in nature, taking place on the *tupambae*. The *tupambae* refers to “God’s acre” and was designated as the best land on the mission (Métraux, 1949). This land was cultivated communally under a land tenure regime adapted by the Jesuits from traditional Guaraní practices (Métraux, 1949). The Guaraní provided virtually all of the agricultural labor. Once trees matured, the harvest took place annually for 3-4 months. Harvested mate was processed and distributed amongst all residents of the mission twice daily and the remaining product was exported across the continent (Métraux, 1949).

In addition to work on the communal *tupambae*, each family in the mission received a small parcel of land for their own staple crop cultivation for several months each year (Crocitti, 2002). Work was organized in the following way: of each week’s six workdays, four were set aside for the Guaraní to work their own land. The remaining two workdays were for work on the *tupambae* (Crocitti, 2002). When the growing season ended, all Guaraní were assigned other tasks to support the mission’s solvency.

While the Jesuits' success was dependent on the coercion of the Guaraní and the secretiveness of their practices, it also led to their downfall and the collapse of the plantation system. Yerba mate is extremely difficult to transplant (Jamieson, 2001). Only the Jesuits and their Guaraní subjects knew how to cultivate the crop and the Jesuits sought to keep it this way, leading to Jesuit domination over yerba mate and drawing the ire of surrounding colonial powers (Folch, 2010; Whigham, 1986). Once the value of yerba mate was understood by the Spanish Crown, the Jesuits had already developed their plantation system. In areas outside of Jesuit occupation, the conquistadors continued the less productive method of harvesting leaves from wild tree stands.

As the Crown learned of the plant's value, it began to treat it the same way as mineral resources, dubbing the leaves "*oro verde*" ("green gold") (Rosin, 2004, 92). Eventually, these tensions came to a head and the Jesuits were expelled in 1767 (Whigham, 1986). As they had not shared their trade secrets, significant cultivation of yerba mate disappeared with them (Folch, 2010). Though attempts to cultivate yerba mate in Argentina again were made, they were not met with success until 1903 largely due to difficulties with getting the seeds to germinate (Folch, 2010). Juan José Lanusse, then the Governor of Misiones, sought help from Carlos Thais, of the Botanical Garden of Buenos Aires (INYM, 2014). Thais discovered that germination could be achieved if the seeds were treated with hot water, and this technique was publicized by Governor Lanusse (INYM, 2014). The first commercial plantation was founded in 1903 in San Ignacio, along the Río Paraná.

Since consumption had skyrocketed due to prior abundance under the Jesuit plantation regime, royal authorities had to find a new way to supply the region's literal

addiction to yerba mate. To the royal administrators, the Guaraní were nothing more than slaves, a slight change in attitude from the Jesuits (Whigham, 1986). This effectively led to refusal to share the secrets of the Jesuits to their new rulers. Since cultivation was not possible without the Jesuit and Guaraní knowledge, royal authorities reverted to the exploitation of wild stands (Jamieson, 2001). The difference now was that exploitation was much more intense in order to fulfill higher demand. In this way, it can be argued that the political-economic decision to expel the Jesuits led directly to the environmental degradation of the forests and the much harsher treatment of indigenous groups. The forests had been so severely degraded that their yields were not capable of fulfilling domestic demand. This was due to intense pruning methods that removed much of the tree's branches (Rosin, 2004). This limited the tree's ability to regenerate.

After the region's independence movements of the early 1800s, newly formed Argentina had millions of mate drinkers but no domestic source of production, at least until the War of the Triple Alliance (Rosin, 2004). The war, fought between 1864 and 1870, was based on territorial and resource concerns in the Southern Cone and involved Argentina, Brazil, Paraguay, and Uruguay.

Argentina had a direct interest in gaining control over a sliver of land in yerba mate's narrow growing region, as it would be able to domestically fulfill the country's demand for yerba mate. Without that land, Argentina would be at the mercy of hostile neighbors to fulfill their internal demand (Rosin, 2004).

The war was instigated by tensions related to Argentine and Brazilian influences on Uruguayan democracy. Indirectly however, yerba mate played a role. In response to Brazil's meddling in Uruguay, Paraguay invaded, crossing through Misiones, an area

disputed by Argentina. In response, Argentina, Brazil, and Uruguay (the Triple Alliance) joined together and decimated the Paraguayan forces (Rosin, 2004). The war's toll on Paraguay was severe both in terms of loss of life and of territorial extent; two-thirds of Paraguay's male population was killed and the Misiones area was ceded to Argentina (Rosin, 2004). It is also worth noting that this war and Argentina's participation, largely over territorial influence and control, were particularly hard on the region's indigenous peoples. With Misiones under its jurisdiction, Argentina finally had territory within yerba mate's natural growing range and could secure self-reliance in production.

Once cultivation returned, Argentina quickly moved to consolidate production in the mate-growing zone that was acquired through the War of the Triple Alliance, the new Argentine provinces of Misiones and Corrientes (Rosin, 2004). Argentina, the largest consumer, choked off imports from Paraguay and Brazil and developed significant government support programs to foster production increases (Rosin, 2004). This led to the country becoming the largest producer as well, with 90% of this domestic production occurring in the narrow Misiones province (Rau, 2009).

Starting in 1910, the Argentine government began directly subsidizing plantations and later established a government research institute for yerba production, in hopes of fulfilling the goal of self-sufficiency (Rosin, 2004). This institute, called the Instituto Nacional de Yerba Mate (INYM) in its current form, is located in Posadas, the capital city of Misiones located on the banks of the Río Paraná. INYM is "a non-state entity of public law with jurisdiction throughout Argentina" that was organized in 2002 by a vote of the legislature (Ley Argentina 25.564, 2002). INYM represents the interests of Argentine yerba mate growers and processors. It was formed in order to help stabilize prices for the

purpose of protecting farmers (Interviewees 2 & 3, 2018). Its governing board consists of 12 members: one appointed by the President of Argentina, one each appointed by the Governors of Misiones and Corrientes (the provinces where mate is grown), two from the industrial sector, three from the primary grower associations, two from the agribusiness sector, one from the dryers, and one to represent rural workers (Ley Argentina 25.564, 2002). All yerba mate produced and sold in Argentina is under the auspices of INYM, with each package bearing a stamp and serial number.

#### 2.4: Production Process

Today, yerba mate is largely cultivated through plantation agriculture. The plantation landscape is reminiscent of an apple orchard. The process begins with submerging the seeds in water for around nine days. After, the seeds are dried for one to two months before they are planted. After roughly a year of growth, the developing *plantitas* (juvenile plants) are sold to *yerbateros* (small producers) and are then planted in rows with 1.5-3 meters of space in between each individual. Typically, one hectare can accommodate 1,650 plants. Plants enter production at between two and four years after planting when they undergo the first trimming (Interviewee 3, 2018).

Harvest generally occurs between April and September (Argentina's fall and winter), as yields are higher during this time. From April to September, this value hovers between 34-37%, while harvest during the spring and summer months yields between 29-32% (Montechiesi, 2016). This means that the period from April to September provides the most efficient harvest, as it takes less *hoja verde* during this time to produce a kilogram of *hoja seca*. These data show that it takes between 2.7 and 3.5 kilograms of *hoja verde* (green leaf) to produce one kilogram of *hoja seca* (dried plant material).



Figure 4: A newly planted *plantita*, Oberá (photograph by author)



With most of the production occurring during the more favorable months, the average is 2.857 kilograms (Montechiesi, 2016). These percentage values are calculated by dividing the weight of the *hoja seca* by the weight of the *hoja verde* and then multiplying the quotient by 100 (Montechiesi, 2016).

Figure 5: An Organic Yerba Mate Farm, Oberá (photograph by author)



Harvest frequency varies by individual producer. The three most common harvest regimes are every year, every year and a half, and every other year. Harvesting every other year allows for a more complete regeneration of the tree's leaves and up to 30% higher yield over yearly harvest (Montechiesi, 2016). Though harvest every other year generates sustained revenue for farmers over time, many feel economic pressure to harvest as often as possible to get by (Interviewees 3, 4 & 7, 2018). Cultivated land-use in the area is diverse, with many farmers producing more than one crop. Some common cultivars in the area include citrus species, eucalyptus, pines, tobacco, tea, and tung (Interviewees 3, 4, & 7, 2018)

In most cases, harvest is manual and is often assisted by scissors or small saws. Because of this, trees are pruned frequently from a young age in order to stunt their vertical growth, in favor of radial growth, creating what was referred during an interview as “*árboles gordos*” (“fat trees”) (Interviewee 4, 2018). Manual harvest becomes difficult if trees are allowed to grow too tall.

From the *yerbales* (yerba mate farms), the *hoja verde* is transported to a *secadero* to be dried. The yerba arrives at the drying facility within 24 hours of harvest and here direct fire is applied (a process called *zapecado*). After about 90 seconds, the leaves lose 30-40% of their water content and much of the enzymatic and biological processes are halted. From here, the leaves go through the primary drying process in which hot air from furnaces is applied to them as they pass repeatedly along a conveyor belt (Montechiesi, 2016). The furnaces were historically powered by wood from the surrounding forests. In recent years this has shifted to the use of pellets produced as a by-product of paper and lumber production (Interviewees 3 & 7, 2018). After drying, the plant material is ground up and put into 50-kilogram burlap sacks for aging. During this period, the yerba mate develops flavor and color. Historically, this process took 6-24 months, however, accelerated methods have been developed that can shorten the period to under 2 months (Montechiesi, 2016).

### 2.5: Marketing, Global Proliferation, & INYM

Yerba mate has a long tradition of not catching on at the global scale, starting with attempted introduction to Europe. Its prospects were limited by two main factors. First, other stimulant beverages from exotic lands (coffee and tea) had already been introduced. Second, the European market found the shared nature of the beverage unappealing for sanitary reasons. In the Southern Cone, consumption involves the shared use of a single

*bombilla* by the entire group, leading one to confess, “it was unpleasant to put into my mouth the unclean tip of the pipe-like stem through which the mate drink was sucked” (Albes, 1916, 11). This illustrates the lack of comfort Europeans still in Europe had with the traditional indigenous method of consumption, methods that persist today throughout the Southern Cone.

In this way, yerba mate consumption draws a distinct dissimilarity with consumption of other stimulant beverages. Coffee and tea are consumed individually and caught on while the social significance of consuming yerba mate in a group is seen by others as “unsanitary”. It is rather ironic that the New World’s disease vectors (Europeans) responsible for the epidemics that decimated indigenous populations during the early colonial area were the ones concerned about catching a virus or spreading bacteria by following indigenous practices.

The Argentine consumer market is saturated in terms of yerba mate consumption and the industry has begun seeking new markets for its product in the industrialized world. At the center of yerba mate’s global marketing campaign is INYM and its trade publications. From here, pro-mate rhetoric is proliferated globally through their English-language website and through the marketing of international companies.

When perusing INYM’s website, its trade publications, and the marketing of yerba mate companies directed at their desired markets, several patterns are evident. First is the picture that yerba mate is consumed around the world. In INYM’s 2015 annual report, a list of trade shows with the association’s presence is provided. Cities included in the list of junkets are Dubai, Seoul, Ho Chi Minh City, New York, Lima, Santiago, and Paris (INYM, 2015). In each of these locations, INYM’s representatives pledged support to help

commercialization and preached that their product was 100% natural, “*desde la planta hasta ser envasado*” (from plant to packaging), had numerous nutritional benefits deriving from high concentrations of antioxidants, vitamins, and minerals (INYM, 2015). The product is also versatile, allowing for numerous methods of consumption including cold preparations and being blended with fruit (INYM, 2015). The industry’s marketing campaign can be summed up as the following: “consuming yerba mate is good for mind, body, and spirit—as well as for those in the growing area”. The global nature of yerba mate is shown by export figures from INDEC found in the statistical appendix.

Is it true that, in the words of INYM, “Mate means friendship, sharing, and connecting with yourself and others” (INYM, 2017)? Is yerba mate the quintessential natural product? Is a blogger’s intuition correct when they describe their experience trying a handful of yerba mate products by writing, “...consuming these products instills a feeling of being Mother Nature’s favorite child” (Smith, 2010)? It certainly seems that way on the websites of Guayakí, and Taragüi, two of the largest brands in global yerba mate distribution. The marketing employed implies that consuming yerba mate improves yourself and the environment, as well as provides a decent living for those involved in the supply chain.

Guayakí, whose name is very similar to Guaraní, claims that its mission is, “to steward and restore 200,000 acres of South American Atlantic Rainforest and create over 1000 living wage jobs by 2020 by leveraging our Market Driven Restoration Model” (Guayakí, 2017). They also claim that consuming their products actually reduces one’s carbon footprint, that their work makes the environment and farmers thrive, and that their product “provides a joyful experience that helps [consumers] discover and embrace the

cultural traditions and spirit of sharing that is at the core of the healthy yerba mate lifestyle” (Guayakí, 2017). One of the taglines of a recent marketing proposal was “Uncap the Rainforest”. Guayakí’s website is completely in English and the company is based in California (Guayakí, 2017). While US beverage companies do sell traditional yerba mate sold loose, their main focus is a large array of bottled yerba mate drinks, now even including energy shots (Guayakí, 2017).

Taragüi’s website also has its share of content to increase its global appeal. It asserts, “Mate is unique and everyone should try it,” featuring photographs of Pope Francis drinking yerba mate, and the site even has a “Which mate suits your personality?” BuzzFeed-style quiz (Taragüi, 2017). The company is based in Corrientes, Argentina and its website provides full versions in English, Spanish, Korean, Italian, French, Dutch, Polish, and Swedish (Taragüi, 2017).

While the validity of these companies’ bold claims deserves examination, this thesis seeks simply to compare this discourse with some of the social and environmental realities experienced in Misiones. These include the effects of monocultures on soil degradation and erosion and sustained poverty.

### **3: THEORETICAL FRAMEWORK: POLITICAL ECOLOGY IMBUED BY SACK**

#### ***3.1: Political Ecology***

Political ecology is a framework that politicizes and analyzes human-environmental interactions (Rosin, 2004). The lens has its roots in cultural ecology, a theoretical approach popularized by anthropologist Julian Steward in 1955 (Gunn, 1980; Robbins, 2012).

Cultural ecology is defined by Castree et al. (2013) as, “the study of the relations between

humans and their environment, paying particular attention to processes of adaptation through cultural means". By the 1980s, critics of cultural ecology in geography contended that the framework ignored the underlying political-economic structures and pressures of a globalizing world (Robbins, 2012). In response, Blaikie published the 1985 seminal work on political ecology in geography: *The Political Economy of Soil Erosion in Developing Countries* (Rosin, 2004; Blaikie, 1985). Two years later, Blaikie and Brookfield published a second work: *Land Degradation and Society* (Blaikie & Brookfield, 1987). Their work focused on erosion in Africa and Asia, setting the stage for the framework's general focus on the Developing World (Zimmerer & Bassett, 2003).

Blaikie and Brookfield's ideas sought to tie environmental change to the processes governing the global political economy, arguing that external political factors such as state policy played a significant role in landholders' land use decisions (Robbins, 2012). Their work was filled with diagrams and flowcharts to illustrate chains of explanation (Robbins, 2012). In constructing these chains of explanation, Blaikie and Brookfield utilized the human ecology principle of progressive contextualization (Vayda, 1983). This principle implores researchers to not view processes in isolation. Rather, they ought to seek out answers about a seemingly never-ending series of related events operating at different scales of human organization (Vayda, 1983).

Today, two of the most influential geographers utilizing political ecology in their work are Karl Zimmerer and Paul Robbins. Both have published widely-used texts on the framework, in 2003 and 2004, respectively. Zimmerer states, "Geographical political ecology focuses on socio-natural scaling which occurs in the fusing of biogeophysical processes with broadly social ones" (Zimmerer, 2000, 153). He is particularly concerned

with the role of scale, focusing on local-global processes, or “glocalization” (Zimmerer, 2000, 153). This centrality of scale is critical, as it illustrates the reciprocal, multiscalar interplay between natural, political, and market forces at global, regional, and national levels with local processes. Zimmerer’s sustained interest in biogeophysical processes is particularly apparent in his former advisee Rosin’s comprehensive work on yerba mate as a means of analyzing MERCOSUR, a political and trade bloc including Brazil, Argentina, Paraguay, Uruguay, and Venezuela (currently suspended) (Rosin, 2004).

Robbins provides a different perspective that has spurred significant criticism of political ecology. Rather than defining the framework in specific terms, Robbins’s approach defines political ecology as a community of practice and as “something that people do” (Robbins, 2012, 4). Robbins’s writings focus much more on the political than on the ecological. This is a common trait among other prominent political ecologists, like Michael Watts (Perrault, 2011). This trend has led some to disparage political ecology as “politics without ecology” (Zimmerer & Bassett, 2003, 103). Walker examined this claim and, though finding it rather dubious, he acknowledges that it exemplifies the overall trend in the field (Walker, 2005). He argues that though many political ecologists pay much less attention to ecological principles than during the years of Blaikie and Brookfield, claims of “politics without ecology” are “premature” (Walker, 2005, 78).

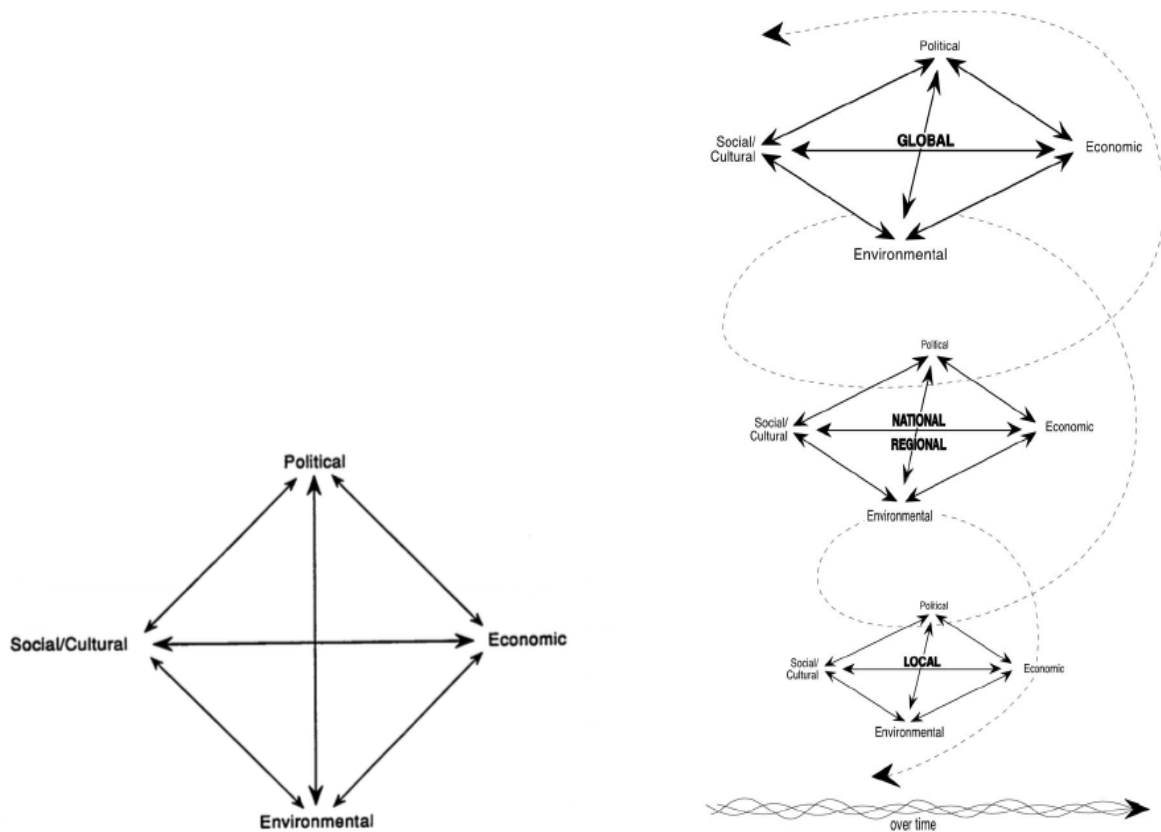
Vayda and Walters (1999) echo the sentiment that political ecology has become “politics without ecology”. They argue that the founding of political ecology was a response to the lack of attention to “political dimensions” by human ecology when examining interactions with the environment—so-called “ecology without politics” (Vayda & Walters, 1999). The most troubling aspect of political ecology, according to the authors, is that it



assumes that the wider political-economic system is “always important” and often the single most important factor, leading researchers to discount ecological principles and interactions (Vayda & Walters, 1999). Using Vayda’s own foundational principle of progressive contextualization should lead researchers to acknowledge all potential realms involved in change across scales. Though outside socio-political factors may be paramount in one context, this should not be set as a general rule as it has been in much of political ecology.

Though there are different perspectives on what political ecology is, an effective model that can be inclusive of these different viewpoints is captured in the model of the Kite, as proposed by Campbell and Olson (1991). They propose a diamond (the points of the Kite) with different categorical variables at each of the four points: economic, social-cultural, political, and environmental (Campbell & Olson, 1991). All four points are connected to one another through the frame, consisting of scale, space, power, and time (Campbell & Olson, 1991). This framework visually represents the basis of the political-ecological lens: the interactions between humans and their environment viewed in a politicized manner that recognizes temporal and scalar implications. Figure 6 shows this visualization (Campbell & Olson, 1991).

Figure 6: Visualizations of the Kite (Campbell & Olson, 1991)



### 3.2: Robert Sack and the Construction of Place

Applying the ideas of geographer Robert Sack is a relatively straightforward goal when constructing a political-ecological lens to examine yerba mate. To spur consumption, a context must be constructed for consumers to decide to buy mate instead of something else (coffee, tea, juice drink, etc.). As Sack argues, the symbols and representations of the commodity become the commodity. Though people purchase the material object, it can be argued that the real purchase is what the product means for them. People purchase a product not for the material it is, but rather, for both what it can make them and where it can place them. Sack addresses these ideas throughout his books *Consumer's World* (1992) and *Homo Geographicus* (1997).

Sack's conception of place as a force is detailed in *Homo Geographicus*. His premise begins with an assertion in his first sentence: "We humans are geographical beings transforming the earth and making it into a home, and that transformed world affects who we are" (Sack, 1997). People are, by nature, geographical actors, playing a powerful role in the creation of place and its forces.

Sack's writing focuses on places, which weave together three realms: meaning, nature, and social relations. These realms, then, may take on varying degrees of importance in the construction of a given place. For example, Sack describes national parks as being places that emphasize nature, universities as places that emphasize meaning, and prisons as places that emphasize social relations (Sack, 1997).

Places are active, acting as a force. For this to happen, each realm has an associated loop, which when activated, forces a change in the other loops and the particular mix of nature, social relations, and meaning in a place at a particular time. The weave of these interconnected loops is what forms the backbone of a place. Within the realm of meaning is the "surface/depth loop", which involves the questioning of superficial qualities of a place in order to get a better understanding of reality (Sack, 1997). Within the realm of nature is the "spatial interaction loop", involving the movement and interaction of matter across space (Sack, 1997). Within the realm of social relations is the "in/out-of-place loop", which has to do with the rules about what should and should not occur or exist in a place (Sack, 1997).

In later work, Sack applies this foundational empirical framework to examine how place can lead us to an understanding of the good (Sack, 2003). Sack introduces two kinds of morality, instrumental and intrinsic, and argues that in order to steer clear of the traps of

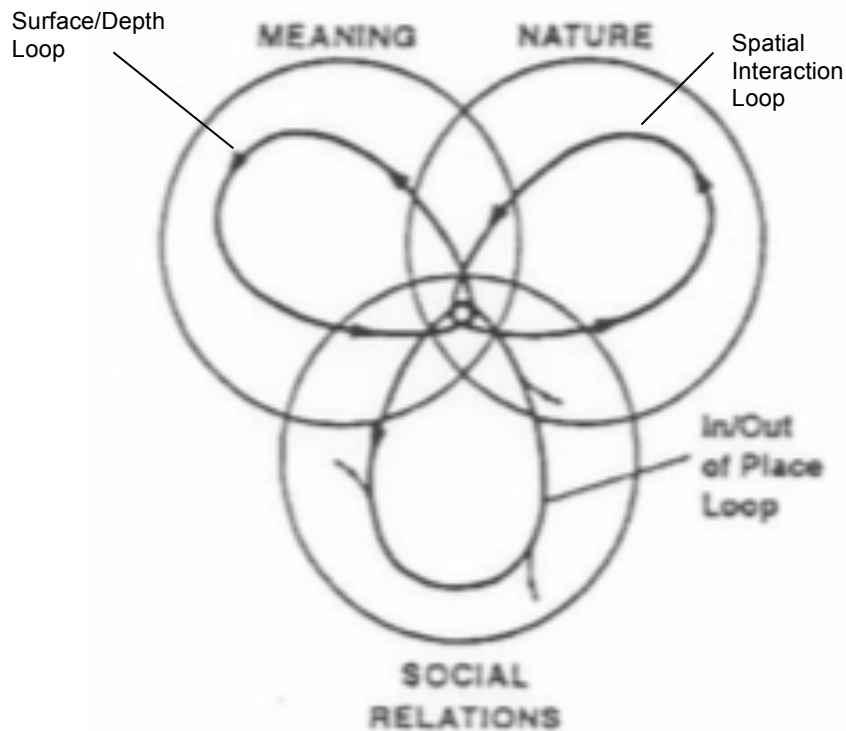
relativism and absolutism, intrinsic values must take precedence. Without the favoring of intrinsic values, we are left with only instrumental judgments, which allow for arguing that Auschwitz was a moral place, based solely on the notion that it was very effective at achieving its instrumental goal. The two intrinsic values of a moral place are that it allows for a better understanding of reality (what Sack calls “seeing through to the real” and which heavily relies on the principle of questioning inherent to the surface/depth loop) and that it increases variety and complexity of reality (Sack, 2003). These two criteria often check each other, as both must be met. For example, if a policy is desired by a state to foster or protect biodiversity in an at-risk area, but can only be achieved through authoritarianism, it would not make for a more moral place, because a culture of questioning would be stifled. In this case, a better understanding of reality would not be promoted.

The thin places of our hyper-connected global economy can obscure the consequences of our actions. According to Sack (2001), thin places are those that are hyper-specialized, limiting the prospects of developing shared experiences in the construction and maintenance of places. On the other hand, thick places are those in which many different activities occur together in a multi-layered fashion, for example, a pre-modern hunter-gatherer may have a campfire in which political discussions, entertainment, education, and meals all occur (Sack, 2001). These thick places are imbued by layers of shared experiences.

Sack argues that the thinning of place is a major characteristic of modernity. Places of production now largely consist of highly specific activities, with each place designed to add value to a given end product. As flows among places become more impersonal and segmented into hyper-specialized places of production to add value, the risk of consumers

losing touch with the spatial flows that make their consumption possible is augmented. This ignorance can serve as an unknowing endorsement of unsavory social and environmental impacts of consumption in these distant hyper-specialized places of production. Knowing this, geography can serve as a means of reconstructing these spatial flows.

Figure 7: Sack's Conceptual Diagram of "Place as a Force" (Sack, 1997)



In *Place, Modernity, and the Consumer's World*, Sack argues that through advertising and pop culture, companies construct new realities for their consumers (1992). It is advertising that motivates product to be produced, moved, and consumed. Why consume yerba mate over the countless other products on the market? Advertising implants the answer.

Products now mean much more than their direct function as social contexts intertwine to define them. According to Sack, “each ad becomes an idealized picture of how commodities empower us to create contexts” (Sack, 1992). In the case of yerba mate, the consumers are lured into purchasing the constructed meaning of mate and how it translates into their own reality, rather than the material itself. Furthermore, consumption can be spun to make consumers connect with locations and nature.

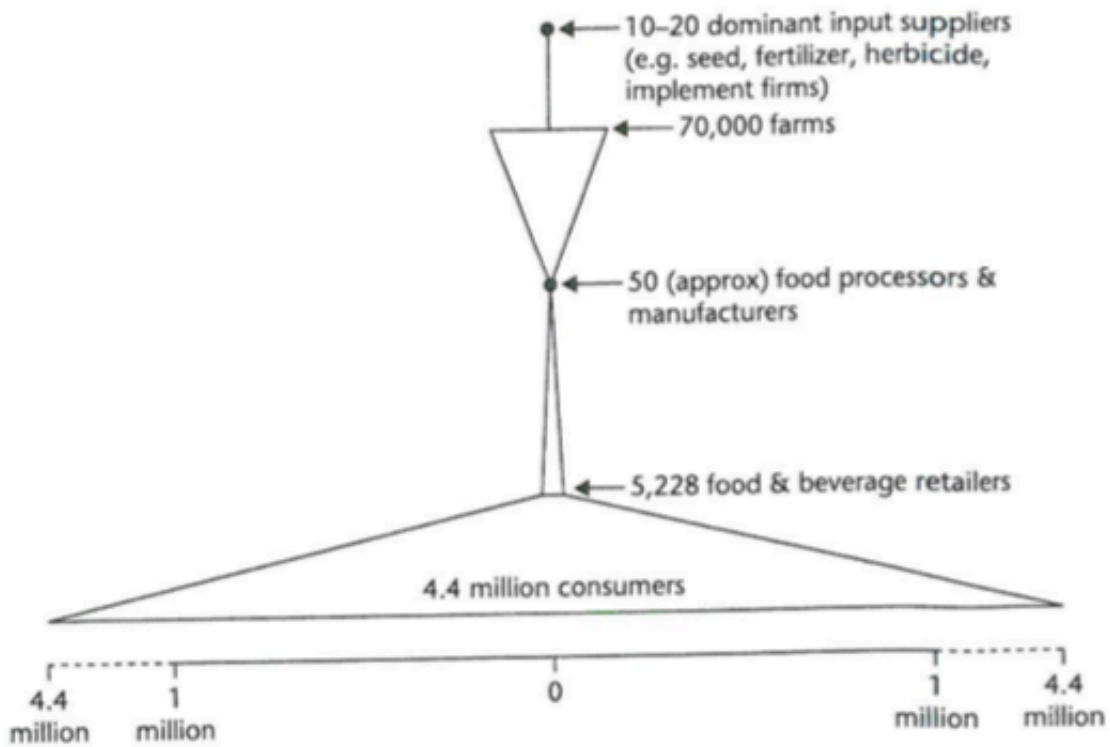
Sack provides two particularly relevant examples with a General Motors advertisement for its GMC Jimmy truck model and an advertisement for Royal Doulton China. The GM advertisement shows a couple at a table in the middle of a field dominated by wild grass-cover. Their GMC Jimmy is seen in the background with mighty mountain peaks towering behind it. This allows the consumer to construct social and locational contexts. Owning a Jimmy makes the consumer an adventurer, allowing them to explore and understand the untouched wild landscape (Sack, 1992). The Royal Doulton ad features a teacup and saucer set in a picturesque setting with a luxurious cabin and a tranquil lake. “One romantic setting deserves another” is written across the well-manicured grass. This ad suggests that owning china “empowers” the consumer to create a new setting, “one that differentiates us from other people” (Sack, 1992).

### 3.3: Michael Carolan and Food System Concentration

The work of Carolan, a rural sociologist, can also be incorporated into a political-ecological lens with regard to yerba mate. In his 2012 book, Carolan introduces the “food system hourglass” to visualize market concentration in agricultural supply chains (Carolan, 2012). An example of New Zealand’s “food system hourglass” is seen in Figure 8. In his book, Carolan provides an example of the US “food system hourglass” that is strikingly

similar to what is seen in New Zealand. This model illustrates the chokepoints that occur with a concentrated market. In the US example, over 2 million farms feed over 300 million consumers, but the products are funneled through far fewer intermediaries on its journey from farm to table (Carolan, 2012).

Figure 8: The “Food System Hourglass” in New Zealand (Carolan, 2012)



The existence of a strong buyer’s market is difficult to avoid when sellers far outnumber buyers, affording buyers increasing market power as their numbers increasingly dwindle through corporate consolidation. Furthermore, the entire hourglass hangs by a thread, representing the dozen or so dominant input suppliers, providing seeds, agrichemicals, and machinery (Carolan, 2012). In this way, primary producers are squeezed from both ends, having very few choices for the purchase of and inputs and having relatively few choices of buyers for their outputs. As input suppliers raise prices or

further consolidate, costs are forced onto primary producers who then sell to processors and manufacturers demanding as low a price as possible. Simply put, fewer large firms have much more negotiating power, resulting in a concentrated food system.

### 3.5: Putting it all Together: Political Ecological Lens Imbued by Sack, Cook, and Carolan

In the case of yerba mate, purely economic forces to keep costs down across the supply chain “take place”, bringing these choices into play in the construction of place within the three realms, meaning, nature, and other sectors of social relations. The places generated by production are impacted by power across the supply chain, as illustrated with the ideas of Carolan.

Geographer Ian Cook’s “Follow the Thing” methodology, as introduced in his 2003 article examining the papaya supply chain, serves as a particularly effective means of activating Sack’s surface/depth loop, which again allows us to scratch at the surface and see the depth, or reality.

In his article, Cook first explains the basis of his “Follow the Thing” methodology that has since become a dominant theme of his career. His approach employs the use of people who are “(un)knowingly connected to each other through the international trade in fresh papaya,” to illustrate an, “entangled range of economic, political, social, cultural, agricultural and other processes” (Cook et al., 2004). In this way, Cook engages with Harvey’s “call for radical geographers to ‘get behind the veil, the fetishism of the market’, to make powerful, important disturbing connections between Western consumers and distant strangers whose contributions to their lives were invisible, unnoticed, and largely unappreciated” (Cook et al., 2004). Though this work focuses mostly on consumption of a product from the Global South by residents of the same country, it shows that the obscure



nature of complex production chains can extend to products largely consumed in their country of origin.

Do the relationships and places constructed by consumption fulfill Sack's criteria of an intrinsically good place (increasing diversity and allowing people to see through to the real)? In our "thin," globalized world, too often the negative consequences of a consumer's economic choices (driven by consumption) are obscured. By combining ideas from across Sack's career and applying them to Cook's "Follow the Thing" approach, we can begin scratching away at the surface of the imagined places constructed through yerba mate advertising, and examine the true reality, in hopes of building a more accurate understanding of distant place-making spurred by consumption, or, in Harvey's words, to "get behind the veil" (Harvey, 1990).

#### 4: INYM, PRICES, AND THE ARGENTINE YERBA MATE FOOD SYSTEM

##### 4.1: Current Socioeconomic Contexts: Argentina & Misiones

Misiones lags much of Argentina socioeconomically, making the province among one of the country's poorest. According to a 2016 report, 37.7% of Misiones' population lives in poverty, the highest of all Argentine provinces (IADER, 2016). This figure places Misiones' poverty rate more than three times higher than what is seen in the city of Buenos Aires (IADER, 2016). Due to currency devaluations since the report was issued, these figures are likely even higher now as wages lag behind consumer prices. Though official statistics from INDEC suggest a recent decrease in poverty in Argentina, poverty figures from INDEC should be viewed as suspect at best due to manipulation for political reason. In fact, from 2013 until 2016 the government (then led by populist President Cristina Fernández de

Kirchner) stopped publishing these statistics after claiming a nationwide poverty rate of just 5%, lower than that of Germany (Squires, 2018).

A more recent report published by UCA (Catholic University of Argentina) shows poverty among urban Argentines increasing to 33.6%, a jump from just over 28% a year before (UCA, 2018). Considering that over 90% of the Argentine population is classified as urban, UCA's figures are especially striking (World Bank, 2018).

At the time of this writing in March 2019, 1 USD was equal to 40 Argentine Pesos (ARS) (Bloomberg, 2019). One year ago, this exchange was 1 USD to 19.5 ARS, representing an over 100% drop in value over one year's time (Bloomberg, 2019). In February of 2015, before the election of President Mauricio Macri, the exchange rate stood at roughly 1 USD to 8.5 ARS (Bloomberg, 2019).

In 2018, consumer prices in the country rose 47.6%, the fifth highest jump globally and the second highest in Latin America, behind only Venezuela's more than 1,000,000% inflation rate (Otaolo & Garrison, 2019). Though there are many reasons concurrent reasons for Argentina's current economic problems, some of the major causes relate to the national government's monetary policy, as well as the failure of much of 2018's soybean crop (an important source of hard currency due to its export value) (Cohen, 2018).

With respect to median monthly salary in the private formal sector, Misiones also ranks poorly among the other provinces and the city of Buenos Aires, ranking 23<sup>rd</sup> out of 24. Using 2012 exchange rates Misiones's value of 4,342 ARS was roughly equal to 950 USD per month (IADER, 2012).

In terms of other socioeconomic indicators, Misiones consistently ranks near the bottom of Argentine provinces. The Human Development Index (HDI), published by the

United Nations Development Programme, is a composite index out of 1.0 that takes into account life expectancy, education, and per capita income indicators. The province's HDI is 0.829, ranking 20<sup>th</sup> out of 24 (including the city of Buenos Aires) (UNDP, 2018). The countrywide HDI is 0.848, while the city of Buenos Aires scores a 0.885 (UNDP, 2018).

Unfortunately, the HDI does not take inequality into account. To deal with inequality, a new metric called the Inequality-adjusted Human Development Index (IHDI) was introduced in 2010 (UNDP, 2018). Also unfortunate is that this index is not available at the provincial scale. Most countries perform significantly lower in this index, as opposed to the more traditional HDI. Argentina's countrywide IHDI score is a 0.707 (tied with Iran at 47<sup>th</sup> place out of the 151 country's with published calculations) (UNDP, 2018). Misiones would likely place significantly lower if data was calculated at the provincial scale.

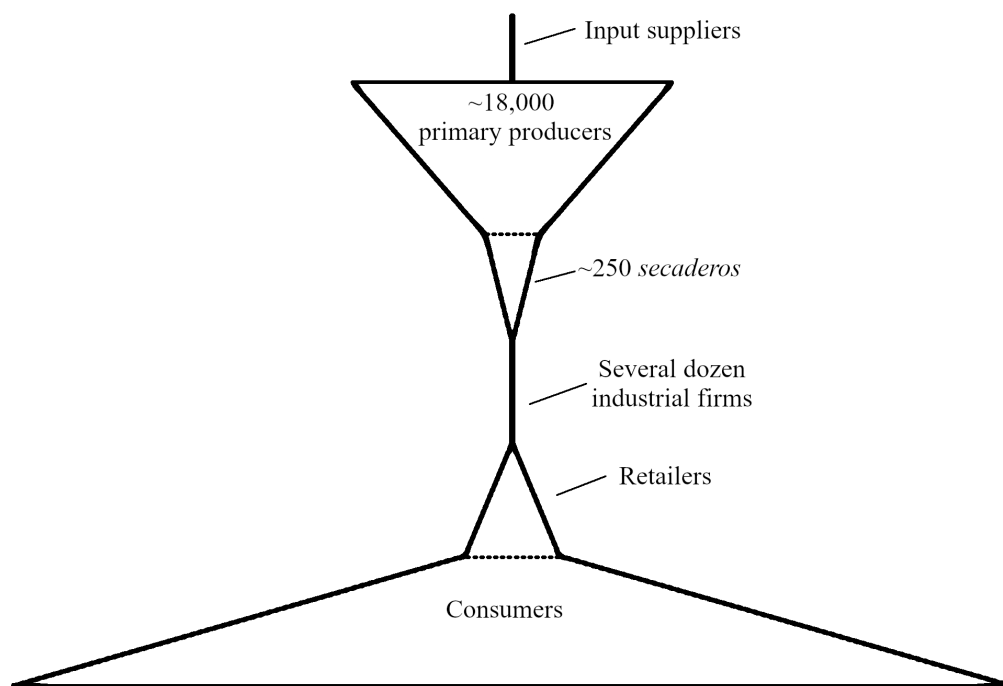
#### 4.2: The Argentine Yerba Mate Food System

Utilizing Carolan's model of visualization of concentrated systems lends itself nicely to an examination of Argentina's yerba mate food system. An adaptation of his model for this context is shown in Figure 9. The CR4 model (four-firm concentration ratio) is a method to determine a level of concentration within a system. Utilizing the CR4 model to illustrate market concentration within a food system helps illustrate chokepoints along the supply chain. This supplements a political-ecological approach because market concentration in the industrial sector allows for that sector to exert much stronger pressure on those placed earlier on the supply chain. The CR4 examines the combined market share of the four largest actors within a market and determines levels of concentration. Values of 20-39% indicate a concentrated market and values of 40%-59% indicate a highly concentrated market (Carolan, 2012).

As stated previously, the five largest firms in the yerba mate processing industry represent over 50% of the consumer market (Boerr, 2018; Interviewee 3, 2018). The CR4 value calculated for 2017 utilizing INYM data is 48.7%, clearly surpassing the threshold for a highly concentrated market (Boerr, 2018). According to these data, just one company alone, Las Marias, rules 19.5% of the total consumer market in Argentina (Boerr, 2018). This means that this one company, by itself, is just below (by .5%) the consumer market share threshold to denote a concentrated market. The value for Las Marias was 21.1% for the previous year, surpassing the 20% threshold that year by itself (Boerr, 2018).

In the following figure depicting market concentration in Argentina's yerba mate sector, the phenomenon is clear and paints a picture similar to other commodities across the globe. With roughly 18,000 producers, of which the vast majority are small producers with just several hectares or less in production, there are around 250 driers to sell to.

Figure 9: The Domestic Yerba Mate Hourglass (not drawn to scale) (adapted by author from Carolan, 2012)



The other complication lies in the increasing levels of vertical integration in the Argentine yerba mate industry. A significant amount of yerba mate producers grow on contract for one of the dominant companies involved in the supply chain (Interviewees 3, 4, & 5, 2018). This means that these companies are able to vertically integrate to a degree. These contracts can lead to further issues. When contracts are signed, they are based on the value of the Argentine peso at the time, however, with today's volatile value of the peso, when the contract is paid out to the primary producer, sometimes months later, the value of the pesos has often plummeted further (Interviewees 3 & 4, 2018). This can make the situation for small producers even more precarious.

Furthermore, over the last 30 years, concentration in ownership of land has grown for companies (Interviewee 3, 2018). Land prices are generally very low in Misiones, with a hectare selling for around 1,500 USD. Push-pull factors, lie at the center of the decreasing number of small producers over the last several decades. The theoretical basis for push-pull factors was introduced in *A Theory of Migration* by Everett Lee (1966). A push factor is one that pushes residents out of a place, while a pull factor is one that attracts people elsewhere. In the case of yerba mate, push factors push people away from the *yerbales*, while pull factors pull them elsewhere. The push factors lie in the poor conditions and quality of life for *yerbateros*, while the pull factors center around the allure of urban, modern life. "The sons see their parents, old and sick. They don't want that livelihood" (Interviewee 4, 2018). Instead, the children of many *yerbateros* (producers) long for a life in the city, "*Ellos quieren WiFi, ellos quieren bailar*" — "They want WiFi, they want to dance" (Interviewee 3, 2018). This phenomenon of a decreasing percentage of rural residents in the yerba mate growing region is shown in Gortari (2007).

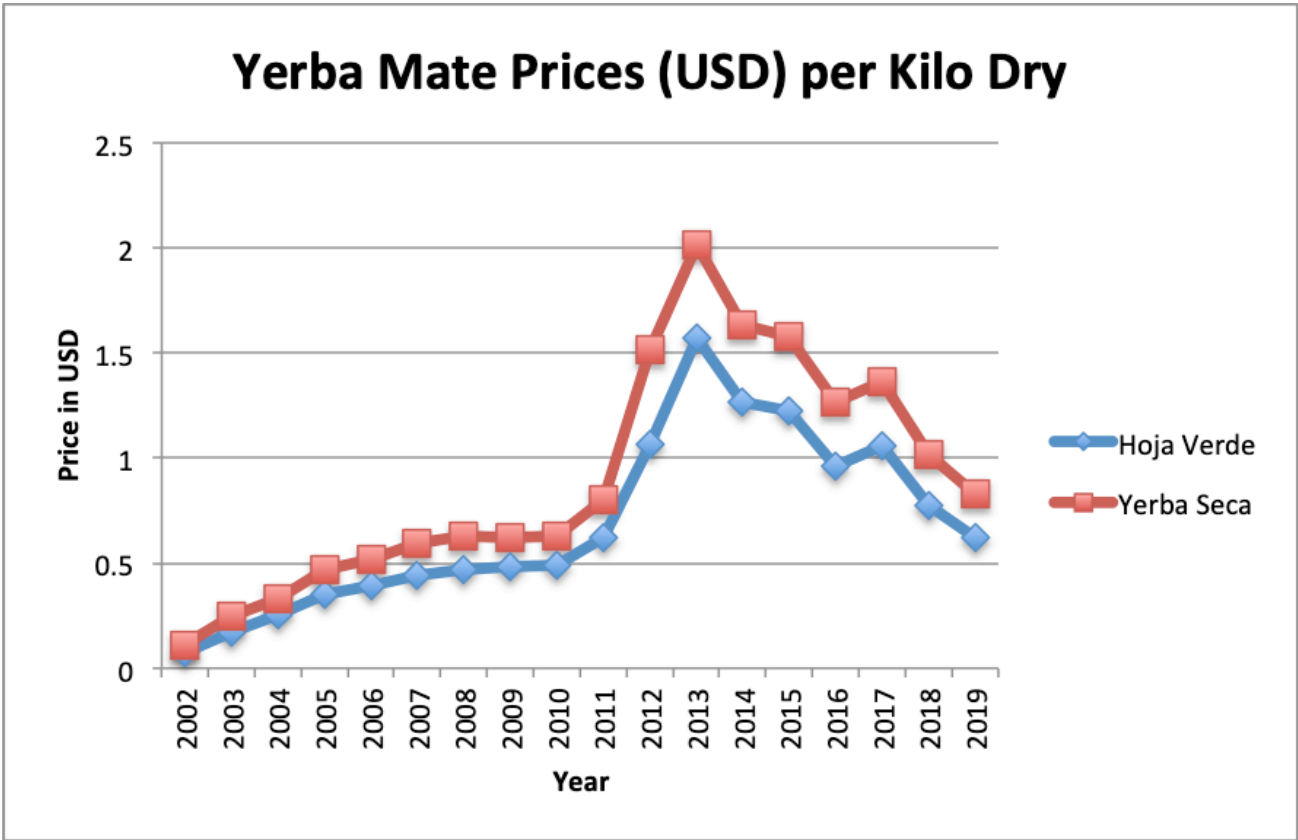
Furthermore, if land is owned and passed down to children, that land would be subdivided amongst the children, potentially making it impossible to make a living for the younger families (Interviewees 3 & 4, 2018). At one point, farms averaged over 20 hectares per family, however this number has dropped precipitously as land is split between children (Interviewee 7, 2018). Because of this, people are not necessarily “forced” off of their land. It is a “choice”, but that choice is influenced by the already mentioned factors, among others. As producers vacate their land, “big companies can just buy; they have plenty of money” (Interviewee 4, 2018). These companies are not just limited to players in the yerba mate industry, as the forestry industry in the region has grown immensely in recent years (Interviewee 4, 2018). Some farmers who remain on their land often change their livelihood in favor of other crops, such as tobacco and pines (Interviewees 3 & 4, 2018).

#### 4.3: Pricing Regime

The most common complaint from producers is the low price paid for *hoja verde*. The following graph shows prices set by INYM’s Board of Directors for yerba mate from 2002 (when INYM was founded) up to the current year. Prices for *hoja verde* and *hoja canchada* are set by the board twice yearly, in March and September. March prices take effect each April and end each October when they are replaced by the new negotiated price. Prices in ARS were compiled from INYM publications as well as from Roberto Montechiesi, a local agricultural engineer who is very influential in the yerba mate supply chain in Misiones. From there, the prices per kilogram in pesos for each category were converted to their equivalent in dollars during the year they were established. The two prices for *hoja verde* and *hoja seca* each year were averaged. The monthly ARS to USD exchange rates were

also averaged for each year in order to obtain a single exchange value for each year. The average values for each kind of yerba mate were multiplied by the corresponding average exchange rates yielding an average price per kilogram in US dollars for each year. Because of the change in mass caused by the drying process, both categories were examined by the value of their dry weight, meaning that to calculate the amount of money generated for a primary producer per kilogram of yerba mate, the per kilogram rate for *hoja verde* was multiplied by 2.857 (the average amount of kilograms of *hoja verde* required to yield one kilogram of *hoja canchada*).

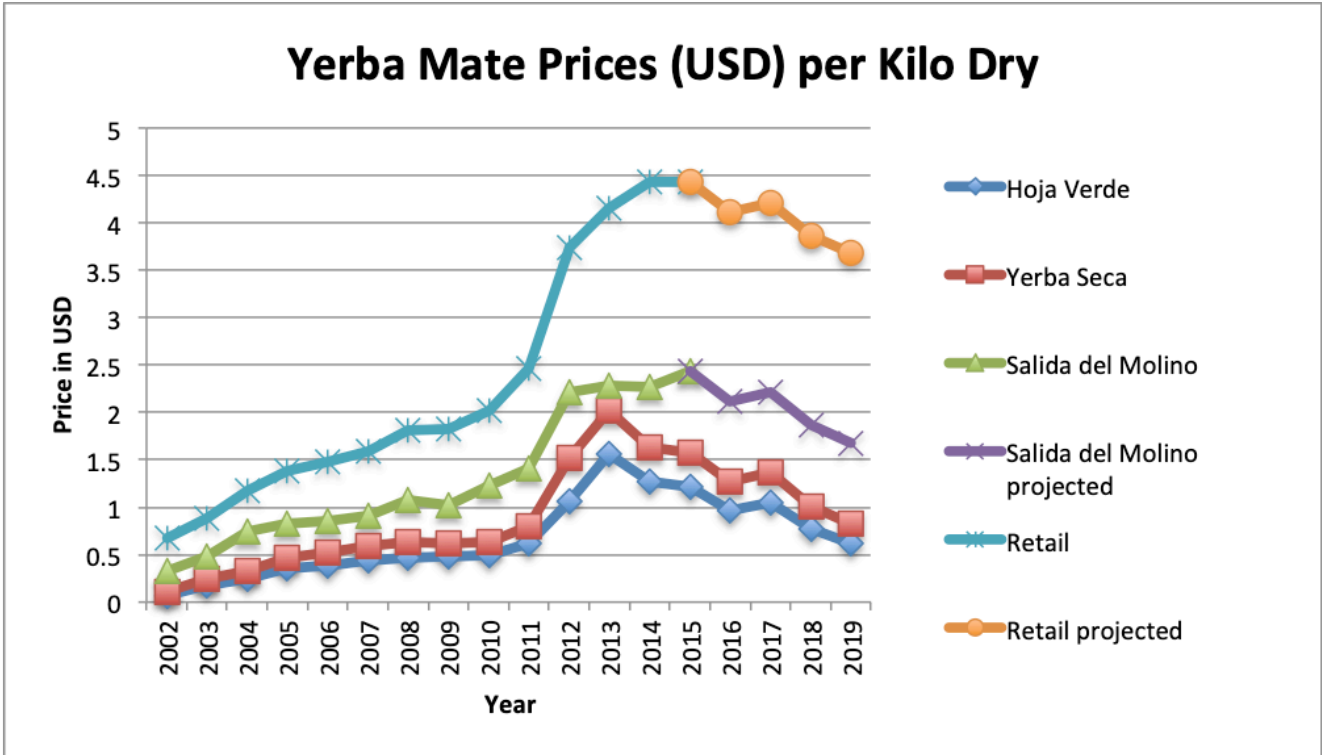
Figure 10: INYM-set prices for yerba mate (adapted from Montechiesi, 2016)



The graph shows steady growth in price from 2002 (the year Argentina floated the peso) until about 2008, followed by several years of stagnation. Starting with the prices set

for 2011, prices for both categories increased rapidly until 2013, when the *hoja verde* required to yield a kilogram of dried yerba mate was set at 1.57 USD. At this time, the per kilogram price paid to primary producers for *hoja verde* was .55 USD. The dry price per kilogram was 2.01 USD, meaning .44 USD of value was added by the drying process at the *secadero* as compared with the value of *hoja verde* required. This value remains with the drying firm, but about .10-.15 USD is profit that remains after expenses such as fuel, labor, and infrastructure are accounted for (Montechiesi, 2016).

Figure 11: INYM-set prices for yerba mate combined with prices for yerba leaving the mill and retail



The second graph expands on the first by adding in estimated prices of yerba mate once it leaves the mills and at retail establishments. These data are available from 2002 until 2015 from Montechiesi (2016). Though values were not available after 2015, these values were simulated by maintaining the 2015 differences in price between them and *hoja*



*canchada*. When adding these published values, in addition to the projected values, it is clear that even with the downturn in prices since 2013, both the industrial sector and the retail sector have significantly increased the difference between what they sell for and what is paid to primary producers and *secaderos*. Though prices in USD have dropped as inflation rages, it appears that these sectors are more insulated from the crisis than other segments of the supply chain.

A typical yield per hectare for a small producer averages around 4,000 kilograms per hectare, translating to total revenue of 33,600 ARS at the current 8.4 ARS/kilogram price set by INYM (Interviewee 3, 2018). At the current exchange rate, this equals 840 USD. A typical smallholding is between 5 and 10 hectares, meaning that in revenue, a smallholder might be expected to generate 4200-8400 USD per harvest over their entire holding. Though it is possible to yield as much as 12,000 kilograms of *hoja verde* per hectare with each harvest, this is out of reach for most for a few reasons. Many of the *yerbales* are very old and feature quite low fertility after their many years in production. Furthermore, education programs and extension projects are limited in the area, limiting the amount of training small producers can obtain. Additionally, as small producers seek to harvest as much plant material as possible, overharvesting occurs frequently (Interviewee 7, 2018). Overharvesting interferes with the tree's photosynthesis and limits the ability of the tree to regenerate sufficiently for the following harvest (Interviewee 7, 2018). While yielding more money for the producer at first, overharvest limits yields and revenue into the future for farmers among the most vulnerable in the yerba mate supply chain.

## 5. SOCIO-ENVIRONMENTAL CONSEQUENCES OF LOW MARGINS

### 5.1: Land Concentration and Tenure

A significant issue in the region's agricultural landscape is the concentration of land in relatively few hands, which are often foreign entities. Current Argentine policy under President Mauricio Macri seeks to attract foreign investment in the country with the easing of foreign land ownership regulations, among other strategies. A significant example of this is illustrated by the acquisition of nearly 1 million hectares of land in Patagonia by the Italian fashion brand Benetton. Benetton is among the largest landowners in all of Argentina, owning almost 1 million hectares that they acquired in 1991 (Trouillet, 2017).

This land is heavily disputed by Indigenous activists in the region as the land was gifted to the British in 1889 after they helped finance the *Conquista del Desierto* several years earlier (Trouillet, 2017). This military campaign virtually annihilated Argentina's indigenous populations in Patagonia. In 1991, Benetton purchased the British firm with title to the land and became the new owner, now using it as an area to produce wool for their products (Trouillet, 2017). Other significant examples are seen in British ownership in Bariloche and Chilean ownership in Misiones's forestry industry (Interviewee 4, 2018; Long, 2009).

In 1881, most of Misiones province (2 million hectares) was sold to 29 investors, with one of these investors receiving a tract of 600,000 hectares (Sawers, 2000, 21). The average tract size was 70,000 hectares (Sawers, 2000). This high concentration of land in such few hands was alleviated during the 20<sup>th</sup> century due to government programs encouraging smallholder mate production (Sawers, 2000).

More recent history has been characterized by the rise of large agribusiness holdings. According to the most recent agricultural census (2008), 30% of Misiones's agricultural land is held by corporations (INDEC, 2008). Further analysis of INDEC data shows that each of the 132 corporate holdings is an average of 4,088 hectares (INDEC, 2008). When looking at the individual department level, inequalities become evident.

In the Iguazú department, a particularly sensitive area containing Iguazú Falls (one of the seven natural wonders of the world), there were 286,833 hectares of agricultural land (INDEC, 2008). Of these 262,865 (91.6%) were held by corporations and 266,502 (92.9%) were in holdings greater than 1000 hectares (INDEC, 2008). At the same time, the Guaraní department's 165,509 hectares of agricultural land was only 8.6% corporate and 15.9% locked up in holdings of greater than 1,000 hectares (INDEC, 2008). The underlying reasons for this geographic disparity deserve significant further work.

The rise in corporate control is not to say that smallholders were good stewards of the environment. As Sawers points out, since many smallholders do not have clear title to their land, there is little incentive to provide adequate caretaking and preserve fertility (2000). Though fertility loss can be remedied by fertilizer application, this would represent additional costs to smallholders. Smallholder cultivation here has largely been characterized by slash and burn practices that transform dense forests into barren land in as few as two years (Sawers, 2000). This illustrates that corporate land control may be more an issue of resource concentration than of environmental degradation.

The vast majority of producers own the land they cultivate, however, many do not have clear title to the land they own (Interviewee 3, 2018). In the area, land typically sells for about 1,500 USD per hectare (Interviewees 3 & 4, 2018). Upon purchase, many

landowners obtain a *boleto de compraventa* (a bill of sale) or *permiso de ocupacion de las tierras* (an occupation permit) (Interviewee 3, 2018). The current structure of yerba mate production developed in 1926 when Argentine President Marcelo T. de Alvear's government offered provisional titles to farmers who planted between 25-50% of an area of land with yerba mate within two years of delivery (Rau, 2009). This resulted in average increases in yerba mate cultivated area of about 5,000 hectares per year over the following decade (Rau, 2009).

### 5.2: The Plight of the Tareferos

Like most farmers, the *yerbateros* operate at incredible difficult margins. Farmers must continuously seek methods to reduce costs in order to continue operating. These strategies to adapt to the ever-present pressure imposed by low margins can lead to serious social and environmental consequences. Low margins directly relate with a lesser ability to hire staff for field maintenance and harvest. They also make it enormously difficult to purchase, maintain, and fuel field equipment like tractors. It takes roughly 3-4 days to "clean" one hectare of a *yerbal* (yerba mate field) (Interviewee 3, 2018). Cleaning the field refers to routine maintenance, largely controlling weed. Specifically to yerba mate, many producers utilize Roundup or other glyphosate-based herbicides in order to avoid the costs of cleaning the fields manually (Interviewees 3, 4, 6, & 7, 2018).

In the fields, the primary species of weeds include both grasses and bushes. Grass species include *Poa pratensis* (bluegrass) and *Cynodon dactylon* (Bermuda grass); species of bushes include *Senna obtusifolia* (sicklepod), *Manihot esculenta* (manioc), and *Solanum granuloso-leprosum*, (*fumo bravo*, a species endemic to the area) (Interviewee 3, 2018).

At around 20 USD per day, this represents 60-80 USD per hectare (Interviewee 4, 2018). With revenue of roughly 840 USD per hectare, this represents 7-10% of the total each time the field is cleaned. In addition to labor costs, producers also must pay for equipment and fuel, making the process of cleaning the fields even more expensive.

The harvest also represents a potentially significant expense for small producers. Often undertaken by low-paid, contract-less *tareferos* (those that harvest yerba mate), the job can be backbreaking. Armed with hand clippers, *tareferos* begin work between 4am and 5am and continue until after dark (Pérez & Brito, 2019). The bags, when fully loaded, are extremely heavy and if equipment is not available, they must be carried by hand (Interviewee 3, 2018). Wages are paid according to the amount of plant material harvested. The strongest *tareferos*, those able to collect and carry the most plant material (around 500 kilograms in one day), can expect typical wages between 150-200 USD per month (Pérez & Brito, 2019). This is far below the province's median monthly salary. Many of these *tareferos*, numbering in the thousands, work informally and live in informal settlements in the interior of Misiones. During the peak harvest season, the *tareferos* become migratory, living outdoors in informal settlements with their families, with nothing more than a tarp keeping their heads dry during the frequent precipitation events (Ocampo & Kordi, 2016; Pérez & Brito, 2019). Photographs of a typical *tarefero* living situation can be seen in Pérez & Brito (2019).

### 5.3: Child Labor

In order to reduce costs, low margins often leave smallholders and their families responsible for these tasks, unless they are willing to rely on informal labor coming from migrant families that would greatly increase their costs of production. This has led to a

significant problem with child labor in the industry, with yerba mate landing on the United States Bureau of International Labor Affairs' 2016 list of Goods Produced by Child Labor or Forced Labor (BILA, 2016). A 2017 report from the same entity reported that children as young as five years old work in fields helping their parents harvest yerba mate, with these young children sometimes carrying heavy loads (BILA, 2017). Child labor's pervasiveness in the industry extends to both the families of primary producers, as well as the families of migrant *tareferos*. Though large companies, such as Las Marias, claim to not use child labor on the land they cultivate themselves, many of their contracted suppliers do (Interviewees 1, 3, & 5, 2018).

It is estimated that roughly 16% of children in Misiones have never attended school, mostly working in the agricultural sector instead (Vera, 2017). Though possible for a smallholder to eke out an adequate living for their family, this is dependent on very good management (which is often lacking) and significant effort by the entire family, making it difficult for the children to receive an education (Interviewees 1 & 3, 2018).

In the past, the phenomenon of child labor in the yerba mate harvest was largely unknown to most Argentines in distant Buenos Aires, Córdoba, Rosario, and Mendoza. A 2015 accident, however, spurred significant activity among activist groups seeking to raise awareness. A truck headed for yerba mate fields was holding 17 child laborers when it overturned—killing Fernando (13), Lucas (14), and Edgard (17)—as well as Fernando's father who attempted to use his body as a human shield to protect his son (Kordi, 2014).

At the center of the campaign to end of child labor in yerba mate is human rights and literacy activist Patricia Ocampo, founder of *Un Sueño para Misiones* (a non-governmental organization based in Posadas, the provincial capital) (pictured with the

author in Figure 12). Ocampo described the campaign in a 2017 interview with *La Nacion* as “*Es una campaña que nace del dolor y la muerte, ya que surge luego de que tres niños murieran al desbarrancarse un camión en el que viajaban rumbo a un yerbal*”—“It is a campaign born from pain and death, since it arises after three died when the truck they were traveling to crashed on their way to a yerba mate plantation” (Ayuso, 2017). She is quoted later as saying, “*...es una situación que aún es desconocida por muchos Argentinos, por lo cual resulta fundamental seguir concientizando*”—“It is a situation that is unknown to many Argentines, so raising awareness is essential” (Ayuso, 2017).

The NGO has coined the phrase “*Me Gusta el Mate Sin Trabajo Infantil*”, Spanish for “I Like Mate Without Child Labor” (this is seen in Figure 13). In 2015, the NGO, in cooperation with Posibl. Media (an Argentine media company), released a documentary film bearing the NGO’s slogan as its name (Ocampo & Kordi, 2016). The film, available for free on YouTube, documents the struggles of farmers and their families and was screened at the Cannes Film Festival in 2017 (Vera, 2017).

In addition to the documentary film, the NGO maintains a change.org petition that has received over 85,000 signatures as of 2019 and has been featured in media outlets like the BBC and CNN, with an estimated reach of 60 million people worldwide (Kordi, 2014; Vera, 2017).

At its center, the NGO’s main goal has been to promote policy at the national and provincial levels, advocating for a bill that would create a certification system that would help discourage the use of child labor in yerba mate cultivation and harvest. Though voluntary, companies that bear the certification on their packaging would be able to charge a higher price for the final product (Cámara de Diputados de la Nación Argentina, 2017).

The extra money would be allocated to an increase in wages for harvesters, with the understanding that without wage increases, the elimination of child labor would decrease family earnings (Cámara de Diputados de la Nación Argentina, 2017). Without an increase in wages for harvesters, the bill would hurt the very children it is meant to help.

Figure 12: Photograph of Patricia Ocampo with author, Posadas, July 2018 (photograph by author)



Ocampo's quotes illustrate exactly what is described by Sack as the activation of the surface/depth loop, as discussed earlier. By raising awareness, she is scratching away at the surface of a landscape to reveal the consequences of consumption that are often obscured in our thinned-out global economy. In her own words, "*Hoy no existe la trazabilidad – los procedimientos que permiten seguir el proceso de un producto en cada una de sus etapas*", "Today, there is no traceability, the procedures that allow us to follow the process of a product in each one of its stages" (Ayuso, 2017).



Figure 13: "Me Gusta el Mate Sin Trabajo Infantil" Logo (Kordi, 2014)



Figure 14: Image depicting a child literally shackled by the yerba mate harvest (Caltaneo, 2018)



#### 5.4: Health-Related Hazards Associated with Chemical Inputs

Another example of a method to reduce costs is to utilize chemical inputs in the fields, most commonly herbicides. Glyphosate, the active ingredient in Roundup was developed by Monsanto (defunct since Bayer's 2018 acquisition) and is the most commonly used herbicide in the world (Perry et al., 2019). Its use in Argentina is no exception. Between the years of 1994 and 2010, as the area of cultivated land grew by 45%, the amount of herbicides used increased from 19,376 metric tons of active ingredients to 227,185 metric tons, an increase of over 1000% (Livingstone, 2016). More recent data show that Argentina is now using 240,000 metric tons of glyphosate (Avila-Vazquez et al., 2018). Specifically to yerba mate, the majority of producers utilize Roundup or other glyphosate-based herbicides in order to avoid the costs of cleaning the fields manually as previously outlined (Interviewees 3, 4, 6, & 7, 2018). The ubiquity of glyphosate-based herbicides has now manifested itself through the contamination of the province's rivers, which are a major source of drinking water (Avigliano & Schenone, 2015).

Glyphosate is a non-selective, broad spectrum herbicide absorbed mostly through foliage that is used to control unwanted broadleaf plants and grasses that might compete with crops (Henderson et al., 2010). The chemical interferes with the shikimate pathway, which is used by plants to biosynthesize critical amino acids (Henderson et al., 2010). In Argentina, glyphosate sells for around 5 USD per liter (not inclusive of government-imposed taxes) and, according to the manufacturer's guidelines, the standard rate of usage is 5 liters per hectare (MERCOSUR, 2017; Monsanto, n.d.).

In 2015, the World Health Organization's International Agency for Research on Cancer determined that glyphosate, along with some other agrochemicals, was "probably

carcinogenic to humans” (IARC, 2015). The organization acknowledged the existence of evidence of carcinogenicity in humans for non-Hodgkin lymphoma shown in studies of exposures in agricultural settings from the United States, Canada, and Sweden (IARC, 2015). Furthermore, strong evidence exists for the carcinogenicity of glyphosate in laboratory animals and it has been shown to cause DNA and chromosomal damage in human cells, with one study showing “increases in blood markers of chromosomal damage after glyphosate formulations were sprayed nearby” (IARC, 2015).

Beyond the impact of the active ingredient, there is burgeoning attention being given to “inert” compounds in the final formulations of glyphosate-based herbicides. A compound in an agrochemical that is defined as “inert” is simply one that does not kill pests or weeds, regardless of toxicity (Gammon, 2009). One such chemical is POEA (polyethoxylated tallowamine). This chemical was found to be 3450 times more toxic than glyphosate itself (Defarge et al., 2018). Additionally, heavy metals such as arsenic, chromium, cobalt, lead, and nickel were found in assessed agrochemicals (including 11 glyphosate-based formulas) (Defarge et al., 2018). These toxic compounds are known endocrine disruptors and have been shown to have impacts at levels below what is required for cytotoxicity (Defarge et al., 2018).

Glyphosate-based herbicides and their suspected health effects have been recently put on trial in the United States. So far, over 11,000 lawsuits related to Roundup have been filed, but only two have gone to trial (both in California) (BBC, 2019). The first was in August 2018, when a state court jury found Roundup caused a man’s cancer (BBC, 2019). The second trial, held in San Francisco, ruled unanimously in the same fashion in March

2019 (BBC, 2019). After the ruling, Bayer's stock price immediately plunged by 12% (BBC, 2019). A third trial is scheduled for March 2019 (BBC, 2019).

In Argentina, significant attention has been drawn recently to the impacts of glyphosate-based herbicides, especially after the publicizing of the work of Dr. Damián Verzeñassi and his medical students at the National University of Rosario. Though not published in a scientific article, their findings were well-reported in the media (Ortiz, 2017). Verzeñassi and his team from the university conducted an epidemiological study in rural Argentina where herbicides are heavily applied showing very similar community health profiles that are uncharacteristic for Argentina as a whole (Ortiz, 2017). Twenty-six communities were examined in total, and 80% of the total 87,382 residents lived fewer than 1,000 meters from fumigation fields (Ortiz, 2017).

On the national scale, most deaths in Argentina are caused by cardiovascular problems, however, in the communities examined, cancers were responsible for most deaths (Ortiz, 2017). Beyond that, high rates of endocrine disorders (like hypothyroidism) were exhibited across the communities (Ortiz, 2017). Nationally, there were 217 cases of cancer per 100,000 residents in 2012 (Ortiz, 2017). In the communities examined, this figure was 397.4 (48.7% higher) (Ortiz, 2017). When confronted with Verzeñassi's findings by a French journalist, an agrochemical lobbyist shrugged them off, however, when asked by the journalist if he would be willing to drink a glass of the herbicide, lobbyist responded, "I'm not stupid" (Ortiz, 2017).

Another recent study examined the relationships between glyphosate exposure and reproductive issues in Monte Maíz, a typical Argentine agricultural village. 650 metric tons of glyphosate are applied per year in the area and glyphosate was present in village soil and

in grain dust in the area (Avila-Vazquez et al., 2018). The study was undertaken due to concerns from medical professionals in the area about increasing rates of miscarriage and congenital defects (Avila-Vazquez et al., 2018).

The researchers found that miscarriages occurred at triple the national rate (10% vs. 3%) and congenital abnormalities occurred at double the national rate (4.3% vs. 1.4%) (Avila-Vazquez et al., 2018). The authors note that, though they demonstrated a correlation between glyphosate exposure and reproductive issues, further work is needed to demonstrate causation, similar to their findings in a previous study that demonstrates a geographic link between glyphosate exposure and increased frequencies of cancers in Argentine agricultural settings (2-3 times higher than the national rate) (Avila-Vazquez et al., 2017).

Perhaps the most striking quote from Verzeñassi in El Diario's profile is the following: "*¿Cuánto crecimiento de PIB de un país justifica la leucemia de un niño? ¿Cuánto crecimiento justifica un niño nacido con malformación, el desarrollo de cáncer, de hipotiroidismo en una persona? ¿Cuánto cuesta nuestra salud? ¿Quién y cuándo decidió que la vida se puede medir en términos económicos?*"—"How much growth of a country's GDP justifies a child's leukemia? How much growth justifies a child born with a malformation, the development of cancer, of hypothyroidism in a person, how much does our health cost? And when was it decided that life can be measured in economic terms?" (2017).

#### 5.5: Environmental Harm Associated with Chemical Inputs

In addition to the potential impacts on human health, herbicide use also exacerbates soil erosion. Much of the land is hilly with persistent rainfall, so soil erosion already presents a significant issue even without taking herbicide use into account. The reasons for

increased rates of soil erosion are due to the inability to maintain a system of cover-cropping when producers rely on broad-spectrum herbicides. Since the applied herbicide would kill a cover-crop in place, significant use of cover-cropping has become uncommon in yerba mate cultivation (Interviewees 3 & 4, 2018). Cover-cropping has numerous benefits, including the limitation of soil erosion, increased biodiversity, and improvements to soil fertility (SARE, 2007).

With respect to soil erosion, there are several reasons why cover-cropping is helpful. First, roots help hold the soil together when faced with water erosion (Curell, 2015). Second, above-ground vegetation cover limits wind erosion through friction by slowing wind speed (Curell, 2015). Third, the above-ground growth provides a canopy that helps shield the ground from rainfall splatter that can displace soil (Curell, 2015).

In yerba mate cultivation, research by Casas et al. (1983) suggests the loss of 25 metric tons of soil per hectare each year under monoculture operations. This means that on a plantation of 10 hectares, 12,500 metric tons of soil would be lost over the course of 50 years of yerba mate monoculture production.

In addition to issues of soil erosion, the loss of fertility in the old *yerbales* deserves attention. The highly weathered Ultisols of the tropical periphery are not fertile to begin with, losing what little organic matter they have quickly (Piccolo et al., 2008). In order to demonstrate the degradation caused by yerba mate plantations, Piccolo et al. collected and analyzed soil from a yerba mate monoculture, a field cross-planted with *Pennisetum purpureum* (elephant grass), and from a typical natural forest in the area (Piccolo et al., 2008). The monoculture soil's C content was one-third that of the forest while its N content was half (Piccolo et al., 2008). While promise has been seen in the use of elephant grass to

limit soil degradation and erosion, this has not been largely adopted by the industry (Piccolo et al., 2008).

Dealing with declining fertility is critical in order to improve the livelihoods of small producers. If a nitrogen-fixing cover crop is not possible, producers may turn to fertilizers. Though fertilizer use is not nearly as common as herbicide use, applying fertilizer to increase yields represents another cost on small producers. Declining fertility in the *yerbales* reinforces rural poverty among small producers. Though promise has been shown with agroforestry techniques, these practices have not been widely adopted by the industry (Ilany et al., 2010).

Though an organic movement does exist in the Argentine yerba mate industry, it is not widespread due to several key challenges faced by organic producers. First, in order for a producer to certify their yerba mate as organic, inspectors from OIA in Buenos Aires (*Organización Internacional Agropecuaria*) must be brought to the distant places of production, which contributes to the high costs of certification (Interviewee 4, 2018). Second, because of the nature of organic production, organic yerba mate must either be processed in dedicated organic-only drying facilities or be processed at the start of the season, otherwise the organic yerba mate will be contaminated by drying facilities that have already processed non-organic yerba mate that season (Interviewee 4, 2018). Additionally, prices for different grades of yerba mate are not established by INYM, meaning that if organic yerba mate is sold into the industrial system, higher prices to compensate for the potentially higher costs of production are not guaranteed (Interviewee 4, 2018). This encourages organic producers to vertically integrate, meaning that the

primary producer oversees the full production process for their yerba mate, something that may be organizationally-daunting and out-of-reach financially for small producers.

## 6. CONCLUSIONS

### 6.1: Future Work and Limitations

Many unanswered questions arose over the course of this work, particularly during the fieldwork period during July 2018. Perhaps the most significant involves the growing trend of deforestation in Misiones.

At first, I expected yerba mate plantations to be rapidly encroaching on the region's remaining pristine rainforest. This was not the case, as confirmed through the interviews conducted with individuals across the production chain (Interviewees 1-7, 2018). The area's cultivated area dedicated to yerba mate has been in place for decades and has remained relatively stable for decades (Interviewees 2, 3, 4, 5, 6, & 7, 2018). This does not mean deforestation was not occurring in Misiones, however. The culprit appears to be the cultivation of pine and eucalyptus in the region for paper production, which just so happens to be exactly what Chilean interests had done to their own temperate forests before turning to Argentina's Atlantic Rainforest. During drives and bus rides across the area, the landscape showed itself as dominated by vast tree plantations. Several interview participants cited the growing influence of multinational firms in this major and growing threat to the last significant expanse of South America's Atlantic Rainforest (Interviewees 3, 4, & 7, 2018). This issue is introduced in the discussion of land concentration in Misiones, even though the statistics are not specifically about yerba mate cultivation.



The most significant limitation faced was a lack of cooperation from INYM after fieldwork was conducted. Several pieces of critical data were requested, however, INYM declined to provide the data, citing producer privacy, despite the fact that no personal information was requested and the stated goal was simply to examine general trends in land ownership and production statistics. Rather than just showing the realities of production as they are now, these data would have provided a much clearer quantitative picture of how the production chain and the power distributions over its course have been changing over the last few decades.

As these activities do not occur in isolation from one another, fruitful future work could involve the examination of relationships between production and land-use choices among the area's rural population. If yerba mate does not hold financial promise, perhaps producers may turn to other cultivars, or even sell their land to a large firm whose activities may end up being even more socially and environmentally destructive.

In addition, the narrow scope of this work reflects the majority of yerba mate produced in Argentina, but not all of it. Though companies like Guayakí may have merit in some of their advertised claims in the Global North, this work does not seek to specifically examine them. Rather, the constructed meaning of yerba mate from this marketing was assessed in terms of the majority of Argentine yerba mate. Future work could involve closer assessment of meanings of yerba mate and their assessment's application to products destined for the Global North. This work could examine production specifically for the export market and a discussion of both Brazilian and Paraguayan involvement would be incorporated.

## 6.2: Closing Thoughts

The global yerba mate industry is valued at 1.339 billion USD and is projected to grow to 1.65 billion USD by 2025 (Value Market Research, 2019). As this growth occurs, several questions must be raised. Is yerba mate a friend or foe of the environment in which it grows? What about to those who grow it? How will this growth exacerbate current trends and how will this additional future valuation be distributed across yerba mate's production chain?

Before drawing too many conclusions, it is important to harken back to Sack's first sentence in *Homo Geographicus*: "We humans are geographical beings transforming the earth and making it into a home, and that transformed world affects who we are" (Sack, 1997). Again, humans are, by nature, geographical actors. This means that the choices consumers make are in a constant and dynamic interplay with both social and the earth's biogeophysical processes and realities across multiple spatial scales, standing true with Zimmerer's definition of geographical political ecology (Zimmerer, 2000).

Though the focus on the externalization of social and environmental costs is not novel and the phenomenon is not unique to yerba mate, this work serves as a case study through which several theoretical lenses can be combined to form a unique framework to better understand the consequences of consumption that often occur large distances away from the place of final consumption. This allows the newly formulated lens outlined in this thesis to be applied to other consumer products in a similar fashion. Though Sack and Cook each provide powerful standalone frameworks, the combination of the two allows for a more holistic examination of modern consumption and a quite-stinging assessment of the often far-flung places of production constructed as a result. This case study, along with

numerous other political ecological examinations of commodities, is consistent with Sack's geographic view of modernity.

Under a capitalist system that maximizes profit by externalizing cost, the case of yerba mate is consistent with Sack's theory. Hyperspecialized places of both production and consumption have become so thinned out, the only way to connect them is through marketing. Yerba mate has become one of many "new things" under capitalism that are spreading to the Global North, following the lead of other plants, like quinoa and açai, with long indigenous histories in their native growing regions deep in South America. In fact, these indigenous histories help provide a basis for the marketed contexts in the Global North. The distant geographies of these products lend an exotic flair, however, there is nothing "new" about them other than their in-progress inclusion into the globalized capitalist market. This phenomenon seeks to spur consumer interest in order to create demand through the creation of context. While these parts of yerba mate's story in South America are amplified by the globalized capitalist market, the consequences of consumption manifesting in the region are often quietly ignored.

Though Sack's work lends itself more obviously to the most globalized spatial commodity flows, it also fits well within the domestic yerba mate in Argentina. Ignoring the global aspect, for a moment, Patricia Ocampo's experiences in child labor awareness and activism are evidence that these processes can occur even without a globalized economy, solely in trade across Argentina, as illuminated from her quotes discussed previously. The thinned out places of urban landscapes like in Buenos Aires, Córdoba, Mendoza, and Rosario have little to no understanding of their consequences on rural environments and peoples in Misiones and Corrientes almost one thousand kilometers away.

Furthermore, Patricia Ocampo's work can be assessed by Sack's inextricably-linked theoretical assertions. Though having never read Sack, Ocampo's quotes sound as if they were plucked directly from the pages of a Spanish translation of *Homo Geographicus*. In the current prevailing situation, Ocampo's goal is to generate awareness among consumers, chiefly in Argentina, where the vast majority of Argentina yerba mate consumption is occurring. The recent proposals that have made it in front of Argentina's national legislature provide an example. By creating a certification system, though voluntary, against child labor and affixing seals to in-compliance yerba mate packages, consumers will have more of a connection with places of production.

Turning to INYM, a complete discussion must acknowledge that before it was established, the situation was even more precarious. Extremely volatile pricing regimes before INYM's oversight contributed to an unstable boom-bust cycle in which farmers were at the mercy of the global market and those at the higher links of the production chain. Though imperfect, INYM's intended collaborative nature provides a seat at the table for small producers that might not have existed otherwise.

Under Sack's framework, consumers cannot make truly autonomous decisions without awareness, so a certification system could help address the hyperspecialized nature of both the places of production and consumption. If consumers purchase something that helps build more just places of production, they are also making a conscious decision against purchasing the alternatives, which do not help build more just places of production. Though the voluntary nature of the proposal may seem imperfect on its surface, the existence of a voluntary system could help amplify the differences between

mate produced with and without child labor, creating an area for discussion and reflection among consumers that would also be consistent with Sack's theory.

The way in which yerba mate is defined by the global market does not reflect the realities of the vast majority of yerba mate production in Argentina. The nature of the production chain spurs vast social inequities that, as seen by the involvement of children, reinforce themselves over time. Furthermore, as costs are externalized on the environment, the ecological underpinnings of the industry begin to fray, which may threaten the ability of farmers to make an adequate living into the future.

Yerba mate's manifestation on the global stage checks numerous boxes for instrumental "goodness" under capitalism, as theorized by Sack. Yerba mate can be "bought low" and "sold high," generating profit along the supply chain. Yerba mate can also inspire a feeling of "togetherness" and benefit the health of its consumers. However, if profits, feelings of "togetherness," and health benefits are built on obscured social injustice and leukemia diagnoses in distant places, they are not consistent with Sack's theorized criteria of intrinsic morality.

Today's global commodity flows and marketing strategies can make these questions difficult for the average consumer to answer thoughtfully. Consumption sets into motion a vast network of social and environmental relationships that often span the globe. Modernity comes at a cost, and that cost is being borne by the children, impoverished laborers, and environment of Argentina's Atlantic Rainforest. By utilizing a political-ecological lens imbued by the work of Robert Sack, this work aims to "Follow the Thing" in order to address questions like these and add to the body of work on commodities and the consequences of consumption in our globalized economy.

Statistical Appendix: Argentine Yerba Mate Exports in kilograms (INDEC, 2019)

<b>Country</b>	<b>2002</b>	<b>2007</b>	<b>2012</b>	<b>2017</b>
Australia	62,270	24,220	109,443	54,234
Bolivia	198,086	167,955	160,180	29,777
Brazil	11,477,268	5,952,000	171,630	246,916
Canada	79,442	73,435	81,594	124,583
Chile	3,384,419	3,480,157	4,784,581	3,657,078
China	9,500	2,054	47,372	129,962
Colombia	no data	6,522	10,706	11,260
Costa Rica	3,625	6,511	11,420	8,400
Czechia	235	323	2,540	8,140
Ecuador	7,646	11,972	no data	6,228
France	85,739	179,009	225,986	470,346
Germany	21,273	105,667	124,063	200,056
Hong Kong	146	295	4,233	2,376
Israel	104,145	132,875	112,990	252,350
Italy	117,935	130,442	89,136	85,460
Japan	5,901	14,884	48,062	11,392
Jordan	no data	no data	no data	11,700
Lebanon	961,885	859,489	1,376,793	774,483
Malaysia	5,000	23,000	15,600	16,470
Mexico	43,727	58,316	78,487	81,470
Netherlands	3,979	139,172	24,050	14,094
New Zealand	no data	no data	4,976	13,034
Norway	no data	no data	3,940	15,634
Paraguay	no data	36,268	83,695	19,903
Peru	no data	8,180	5,850	20,284
Poland	9,827	36,310	56,871	98,218
Russia	no data	92,840	36,114	9,985
South Africa	no data	949	1,943	2,743
South Korea	1,718	22,712	214,454	73,992
Spain	469,378	838,538	534,960	427,790
Sweden	8,202	2,160	7,774	33,895
Switzerland	6,446	6,512	962	1,276
Syria	16,296,150	19,925,180	24,287,540	20,335,704
Turkey	no data	no data	20,000	312,304
UAE	61,088	89,564	72,671	87,040
United Kingdom	no data	8,509	16,490	24,873
United States	812,542	696,656	556,613	663,210
Uruguay	4,228,932	1,939,473	880,797	34,715
Venezuela	56,160	56,080	47,036	25,200

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