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**THE POLITICS OF SEEDS AND THEIR EFFECTS ON SMALL-SCALE
PARAGUAYAN FARMERS**

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A Capstone research submitted in partial fulfillment of the requirements for a Master in
Sustainable Development at SIT Graduate Institute in Brattleboro, Vermont,

USA. PIM 76

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LIST OF ABBREVIATIONS

CONUMARI.....	National Coordinator of Rural and Indigenous Women (<i>Coordinadora Nacional de Mujeres Rurales e Indigenas</i>)
DEAG.....	Agrarian Extension Department (<i>Departamento de Extension Agraria</i>)
GDP.....	Gross Domestic Product
GM.....	Genetically Modified
GMO.....	Genetically Modified Organism
IPR.....	Intellectual Property Rights
IPTA.....	Paraguayan Institute of Agricultural Technology (<i>Instituto Paraguayo de Tecnologia Agraria</i>)
MAG.....	Ministry of Agriculture and Livestock (<i>Ministerio de Agricultura y Ganaderia</i>)
MERCOSUR.....	Common Market of the South (<i>Mercado Comun del Sur</i>)
PRODERS.....	The Rural Sustainable Development Project (<i>Proyecto de Desarrollo Rural Sostenible</i>)
RNCC.....	National Registry of Commercial Plant Varieties (<i>Registro Nacional de Cultivares Comerciales</i>)
SEAM.....	Environment Secretary of the Republic of Paraguay (<i>Secretaria del Ambiente de la Republica del Paraguay</i>)
SENAVE.....	The National Service for Plants and Seeds Quality and Health (<i>El Servicio de Calidad y Sanidad Vegetal de Semillas</i>)
TRIPS.....	The Agreement on Trade-Related Aspects of Intellectual Property Rights
UPOV.....	International Union for the Protection of New Varieties of Plants
WTO.....	World Trade Organization
WIPO.....	World Intellectual Property Organization

ABSTRACT

International corporate seed companies have manipulated Paraguay’s politics and agricultural development since 1995, increasing Paraguay’s use and protection of genetically modified seeds, while also undermining farmers’ control over their production and financial stability by almost eliminating markets for heirloom varieties. Paraguay continues to be excluded from research critiquing the effects of neoliberal policies on global agricultural systems. Therefore, this study aims to illuminate small-scale farmers’ experiences and bring Paraguay into the global conversation on seed sovereignty by critically examining the effects Paraguay’s national seed policies have on small-scale farmer’s development opportunities and resilience to climate change. This question guides the research: *How does the political relationship between seeds and farmers influence the environmental and developmental landscape in Paraguay?*

Influenced by Indigenous, Political Ecology, and Sen’s *Development as Freedom* frameworks, this Capstone took an ethnographic perspective using five case studies with small-scale farmers. Four policies related to seed production, commercialization, quality control and distribution were then analyzed using Baachi’s problematization lens. Interviews with government officials connected to national and regional seed distribution networks informed the creation of a seed map, highlighting disparities of accessibility between hybrid, genetically modified and heirloom seeds. The main themes that emerged from analyses highlighted issues related to seed access, quality, and control, demonstrating how the manifestation of colonial development has affected every step of farmers’ production process. It is hoped that this research can act as a catalyst for future research on the topic of seed sovereignty in Paraguay, specifically research including indigenous populations and employing strong feminist theoretical orientation.

Key Words: Paraguay, Seed Sovereignty, Development as Freedom, Climate Change

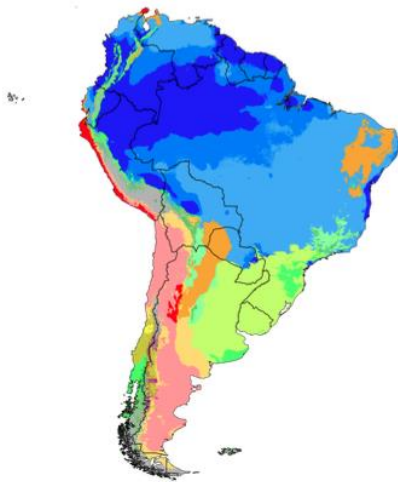
INTRODUCTION

Farmers have been fighting for their right to save seeds and protect genetic diversity for 60 years, but their fight has only recently been given an international stage. Seeds are now recognized as a necessary step towards food sovereignty, environmental protection, basic human rights and resisting imperialistic strategies of development (Riquelme, 2016; La Via Campesina, 2010; Kloppenburg, 2014; Shiva 2016). As a student of sustainable development, food systems and climate change, learning about the impacts seed policies have on developing countries has put my education into context. Having been a Peace Corps Agriculture Volunteer serving in Paraguay from 2017-2019, I also found myself in a unique position to look at seed policies in the context of development in rural Paraguay.

During my time as an Agriculture Extensionist volunteer, I learned about the realities of small-scale farming and was able to develop strong professional connections within Paraguay’s agricultural sector. My role was to work directly with farmers to help them implement sustainable farming methods, specifically the use of cover crops, to improve their soil quality. Working to connect farmers to cover crop seeds and running into access barriers sparked my interest in pursuing this topic with the hopes that shedding light on this issue could improve farmers’ accessibility to heirloom seeds. I met with leaders of government offices, directors of domestic agroecology organizations, and leading academics at the National University in Asuncion. Attending meetings and trainings I would have otherwise not had access to provided me with a unique perspective on Paraguayan development strategies. My daily interactions with community members on their farms allowed me to understand the limitations farmers have to participate in those conversations. These connections have shaped my research questions and

piqued my interest in the role seeds play in those spaces. I hope that the relationships I built also aided in centering the voices of those I lived with and listened to during those two years.

Paraguay



Climate map of South America (Beck, 2018)



Paraguay with Caazapa in grey (Tatiana53, n.d.)

Paraguay is a land-locked South American country located between Brazil, Argentina, and Bolivia with a population of seven million people. It is considered the most underdeveloped country in South America while maintaining extreme economic disparities (the majority of land owned by less than 3% of the population) (Tutasig, 2020). Paraguay was once the richest country in South America, and the first to have a national rail system. However, during its transition to a democracy in 1992, the economy took a turn for the worse. Paraguay went from a surplus of \$164 million dollars to a deficit of 1.378 million due to a drastic decrease in market accessibility for their two main exports: soybeans and cotton (Paraguay, 1997). As an attempt to remedy this, Paraguay joined the World Trade Organization (WTO) in January of 1995 (Paraguay, 1997). Since then Paraguay has participated in free trade and protected corporate interests by promoting the privatization of commerce and deregulating developing sectors. This allows large seed

companies like Monsanto to monopolize the agriculture sector, shift domestic policy, and drastically impact small-scale farming communities.

For my service, I was placed in the department of Caazapa, one of the poorest departments in the country. Caazapa has a population of 150,910, 82% of which live in rural areas with 57% of the population living in poverty (Landini, 2012, pp.130-139). Of the families living in rural areas, 73.3% have electricity, 7.2% have running water, 1% has access to trash management, and 88.1% of the population is illiterate (Indicadores Socioeconómicos, 2002, Table B). The entire department has very poor soil health due to extreme deforestation causing issues with erosion and acidification of the soil (Alex, personal communication, 2019). Caazapa has a sub-tropical climate and is able to support many varieties of crops year-round, but climate projections for the future are not promising. “The rainy season is expected to become shorter and more intense (exacerbating floods)...while overall precipitation is anticipated to decrease... Days of extreme heat are likely to increase from one every three years to 4-16 per year by 2070” (USAID, 2018, p.1). Only 2.1% of farmland in Paraguay is irrigated, making small-scale farms especially susceptible to a decline in productivity in 2060 (USAID, 2018, p. 2-3). With an already acute soil health problem in Caazapa, coupled with continued deforestation, regular use of slash and burn techniques, and seed policies that greatly limit farmers control over their seeds, farmers are going to need more support and resources to be ready for the challenge that awaits them.

Capstone Framework

There has been ample research done on seed sovereignty and its importance globally, but research done in or about Paraguay is very limited. What has been studied and well documented

is the impact of land grabs and deforestation due to the presence of Big Ag, international farming, meat, and logging companies (Holt-Gimenez et. al, 2009; Baumann et. al, 2017). This Capstone attempts to fill some of these gaps of research done in Paraguay by using food sovereignty, seed sovereignty, and environmental, social, and food justice as frameworks to evaluate the impact of Paraguayan seed distribution practices and policies on small scale farmers in the department (or province) of Caazapa. Small-scale farmers' access to and control of quality seed sources is very important as they produce 91 percent of all domestic agricultural goods, while only covering six percent of agricultural land (Riquelme, 2016, p. 26). The main objectives of this Capstone research were to:

1. Create a seed distribution map in the form of a flow chart showing how seeds are moved and eventually accessed by small-scale farmers. The goal was to follow the dissemination of genetically modified (GM), hybrid, and heirloom seeds and critically examine which lines of distribution are most beneficial to farmers while identifying barriers to access. Interviews with farmers and government officials, as well as personal experiences locating seeds have been used to create this map.
2. Critically review the current policies on seed production, circulation, commercialization, and quality control. Policy analysis was carried out by examining the implementation of those policies through ethnographic interviews and whether they inhibit or facilitate small-scale farmers' ability to access quality seeds and participate in the economic benefits of seed commercialization. The seed distribution map is used as a tool in the review process.
3. Critically examine how the process of seed distribution ultimately affects Paraguayan small-scale farmer's security and development. Frameworks identified in the literature review, including Amartya Sen's *Development as Freedom* paradigm, guide the analysis

of the interviews, current seed policies, and personal field notes to reach this critical understanding of how access to seeds affects farmer’s overall stability.

The **research questions** that guided these objectives were: *How does the political relationship between seeds and farmers influence the environmental and developmental landscape in Paraguay? And how does this landscape affect small-scale farmers in the department of Caazapa?*

Ultimately this study crucially looks at how development driven by capitalism affects the relationship between humans and the environment (Robbins, 2012). This connection is looked at in detail in the literature review through the lens of the food and seed sovereignty movements. Vandana Shiva, Amartya Sen and political ecology framework guided by peasant studies and postcolonial theory are used to center the paradigms that guide the analysis of the study. After the methodological framework is discussed, an overview of seeds and Paraguay's history of seed policy is used to put current seed politics into context. The seed distribution map and case studies then demonstrate how current policies translate into everyday life. To attend to the length requirements of the paper the full case studies can be found in the appendix, while the in-text case studies are summaries of the most relevant information. The analysis of the seed distribution map, case studies and supplemental interviews are then discussed along with the effects of climate on the farmer’s production. Global warming greatly affects seeds and quality of production, affecting farmer’s economic stability and nutrition. In this way climate is inseparable from conversations about seed sovereignty, as seed sovereignty is based on the protection of diversity promoting planetary as well as human health. This study ends with suggestions for future research in the hope that Paraguay will continue to be included in the growing academic literature on seed sovereignty and its relationship to development.

LITERATURE REVIEW

The following review is an exploration of four topics: development, food sovereignty, seed sovereignty, and available literature on Paraguayan agriculture. Paradigm and discourse drastically shape the work and analytical process of a researcher, and act as the backbone for methodological frameworks and the lens used to analyze data. I chose these themes to illustrate the theories that have shaped my view of development and sustainability. This allows my perspectives and biases while analyzing my research to be transparent. I also chose these themes to contextualize Paraguayan farmer’s experiences into global movements and conversations that have not been fully accessible to them.

In order to critically look at the effects of seed policies on small scale farmers in Paraguay, an understanding of different development paradigms must first be established. I have chosen Marv Waterstone’s definition of productive justice (Waterstone, 2010), and Amartya Sen’s “*Development as Freedom*” paradigm (Sen, 1999) as my lens for development strategies as well as guides to understand the goals and mission of the food justice movement. DuPuis analysis of food justice (DuPuis, 2012) and Vandana Shiva’s framing of the current challenges posed by the limited access to open pollinated seeds situates the issue of seeds sovereignty into the context of development (Shiva, 2016). As part of the literature of seed sovereignty I examine a critique of intellectual property rights (IPR) and how their use by big seed companies has influenced state policies and impacted farmers globally. These critiques are then applied through my analysis of how seed policies affect farmers in Paraguay, while also providing the context for why the seed sovereignty movement was started.

I then take a critical look at past research done in Paraguay on national farming practices. Similar research done on seeds in other Central and South American countries are excluded from

my literature review, although they have acted as a guide for my methodological framework, as the experience of other countries has little connection to the Paraguayan context. The literature on Paraguay includes indigenous communities in its work, however I do not include their perspectives in my review since I was unable to include them in my study. Peace Corps Paraguay does not allow volunteers to engage with indigenous communities as their relationship with the state is highly politically contentious.

Development

There are many scholarly critiques on the history of mainstream development; however, I am focusing on Amartya Sen’s “*Development as Freedom*” paradigm, as it lends itself to the mission of the food and seed sovereignty movement. Food and seed sovereignty are based on the belief that security and freedom are found in community lead solutions and often require a redistribution of centralized power. Sen’s paradigm is directly related to the issues communities in Paraguay are facing as access to seed is a significant development issue (Sen, 1999).

Historically development has been based on access to resources and distribution, with a heavy focus on three key areas: growth of gross national product, the rise in personal incomes, and technological advances (Sen, 1999, p. 3). This vision of development takes a very top-down approach, working towards industrialization and modernization leaving access to better civil and human rights as an assumed byproduct of commercial gain. However, this strategy maintains and even creates extreme inequalities as it does nothing to address historical and institutional problems like racism, sexism, child rights, and climate change. Traditional development paradigms thus build on those who are already disenfranchised, leaving them to fight for the tools they need to provide a better life for themselves. Sen’s “*Development as Freedom*” lays out a very clear, contrasting development paradigm, stating that

Freedom is central to the process of development for two distinct reasons:

1. The evaluative reason: assessment of progress has to be done primarily in terms of whether the freedoms that people have are enhanced;
2. The effectiveness reason: achievement of development is thoroughly dependent on the free agency of people (Sen, 1999)

Sen’s paradigm is based on the idea that “freedoms are not only the primary ends of development, they are also among its principal means” (Sen, 1999, p. 10).

He lists five distinct types of freedom: *political freedoms, economic facilities, social opportunities, transparency guarantees, and protective security* (Sen, 1999, p. 10). Many scholars have critiqued resource distribution development strategies that focus on expanding national economies as depriving people of these freedoms. Sen, however, does not see market-based development approaches as innately harmful. He recognizes monetary growth and technological advances as ways to ensure access to more freedoms, such as quality education and healthcare, but money and equity do not automatically go hand in hand. Sen argues when freedom as the “ends” to development extends to corporations or markets instead of people, it deprives them of their political and social freedoms (Sen, 1999, p. 6).

The crucial challenges of development in many developing countries today include the need for the freeing of labor from explicit or implicit bondage that denies access to the open labor market. Similarly, the denial of access to product markets is often among the deprivations from which many small cultivators and struggling producers suffer under traditional arrangements and restrictions (Sen, 1999, p. 7)

This is the issue with looking at gross domestic product (GDP) as an indicator for development. Sen gives the example of African Americans in the United States who have more wealth than

people in third world countries but have a significantly lower chance of reaching adulthood (Sen, 1999, p.6) demonstrating just how absurd it is to use GDP as an indicator of development.

However, Sen recognizes that markets “are part of the way human beings in society live and interact with each other (Sen, 1999, p.6), and places importance on the freedom to participate in exchange. He believes public regulations or policies of social exchange need to function in a way that “can enrich-rather than impoverish-human lives” (Sen, 1999, p.7).

Sen’s approach to implementing development strategies is based on people's full participation in the development process, changing the top-down approach to bottom-up. Thinking about development in this way changes not just the means to development but also the goals from capitalist financial security to sustainable security and autonomy for all. This argument is very much in line with Waterstone’s own explanation of productive justice and how it relates to the attainment of freedom.

Waterston’s main argument is that institutionalized disparities are caused by inequitable distribution of resources, causing the need for “development” in the first place. Waterstone states that equity aims to redistribute opportunities, instead of goods, breaking down systems of unfreedoms by giving people the opportunity to break their own cycles of oppression. Sen defines unfreedoms as “poverty, tyranny, poor economic opportunities, systematic social deprivation, neglect of public facilities, [and] intolerance” (Sen, 1999, p.3). Young has her own list of unfreedoms which are “exploitation, marginalization, powerlessness, cultural imperialism, and violence.” (Waterstone, 2010, p.423). To leave these oppressive cycles of unfreedoms, marginalized groups must be allowed to participate in the creation of systems of power and be included in conversations about how to alter the injustices affecting them. Young argues that if

“some groups [are] always and only (that is, systemically) on the receiving end of these distributional processes (even if equitable) it is itself an injustice.” (Waterstone, 2010, p.423).

Here Waterstone introduces the idea of *productive justice* which “is about control over one's own decisions and choices.” (Waterstone, 2010, p. 426). Productive justice is concerned with placing marginalized people in decision making positions, promoting capacity building, communication, and participation to brake systems of oppression. Waterston, Sen, and Young are all saying the same thing here, that development paradigms which do not include the participation of the people receiving the intended benefits of development are not sustainable and are in many instances imperialistic.

Food Sovereignty

The Food Sovereignty movement was started by La Via Campesina in 1996 as an alternative to neoliberal agricultural policies and a desire to find solutions to oppressive systems of development based in unfreedoms (Food sovereignty, 2003). It aims to protect small-scale farmer’s rights to control their local food production and is directly connected to the seed sovereignty movement (Food sovereignty, 2003). DuPuis’s article “*Just Food*” is a good perspective to turn to, to help situate the discussion of development as freedom and the critique of economic development into the conversation about food justice and seed sovereignty.

DuPuis identifies the injustices of our current food system as based in an industrial capitalist system and the individualistic financial competition it creates on both local and global scales (DuPuis, 2012, p. 287). It is believed that these economic practices, extending freedoms to corporations but not people, as mentioned by Sen, produce monopolies of oppressive systems of power. Willard Cochrane described the outcome of this agricultural economic system as *The Technological Treadmill*: a self-perpetuating cycle of technology, debt, exhausted soils,

chemical fertilizers/pesticides, more debt, and rising food prices, leaving farmers powerless and creating systematic exploitation of the most disenfranchised people in society (1996). Food sovereignty situates itself to oppose such exploitation and disenfranchisement arguing that the best way to reach food sovereignty globally is to implement just food systems locally.

La Via Campesina, the world’s largest social movement comprised primarily of grassroots food producers, peasants, and indigenous leaders defines Food Sovereignty as: “the people’s democratic control of the food system, the right of all people to healthy, culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems” (La Villa Campesina, 2010). The core message of Food Sovereignty is that humans have the right to a healthy environment, free of toxins, and pollution, thus establishing a positive and sustainable relationship between consumers and farmers in order to create food security for all (DuPuis, 2012, p. 291). Sen’s development as freedom paradigm and Waterstone’s productive justice can be seen here directly influencing the food sovereignty movement as it responds to both the social and environmental stressors in the industrial food production paradigm. It offers “a stronger critique of capitalism, neoliberalism, systemic racism, and patriarchy” (Slocum, 2015, p. 28), aiming to redistribute access to food, but more importantly, to dismantle the current systems of power through “transformative social change”.

Productive Justice is thus situated within food justice as reflexive, stressing process while taking the global movement into local contexts (DuPuis 2012, p.298). Slocum argues this should be done by changing institutional organizational processes, transforming the way institutions work in community, while not shying away from historical trauma (Slocum, 2015, p. 31). She argues that change needs to happen at every level of the food production process

including the acquisition of “raw materials (seed, livestock), production, packaging/processing, distribution, consumption, and disposal”(Slocum, 2015, p. 29). With this approach, food justice movements use democratic grassroots activism to resist the Technological Treadmill and create new, just systems of food production, distribution, and consumption, or in other words, reshape our current agricultural system by focusing on developing access to freedoms.

Seed Sovereignty

Seed Sovereignty is a movement that fights for farmers rights to save, breed, and exchange seeds that are diverse and open pollinated without penalty. It is situated within the food sovereignty movement as an essential step in repossessing control over agricultural production. It was created in resistance to neoliberal seed patenting laws and aims to reclaim seeds as part of the commons of biodiversity, establishing them as a public good that cannot be controlled or patented by seed giants (Food sovereignty, 2003). Vandana Shiva’s work as a leader in the food and seed sovereignty movements has shaped every aspect of seed sovereignty around the world. She has dedicated her life to the idea that seed sovereignty is the basis of farmer’s freedom and security globally. Her work echoes that of Sen’s development paradigm and Slocum’s productive justice framework, centering seeds as the basis of this work. Without freedom to access culturally and regionally appropriate open pollinated seeds, farmers will firmly remain in spaces of unfreedoms.

Shiva names our dominant agricultural system as the *Industrial Paradigm* made possible by the “mechanistic paradigm of biology and agriculture, and through a reductionist paradigm of the economy” (Shiva, 2016). Shiva provides a heavy critique of our current agricultural paradigm born from the Green Revolution in the 1960’s. The Green Revolution inundated developing countries with hybrid seeds, chemicals, western ideas of land ownership, and

industrial production. It functioned on the goal of producing ‘high yields’ as a way of combating hunger and opening more countries to international markets. Using pesticides and herbicides was forcefully encouraged, affecting human health, causing cancer and neurological disorders as well as damaging soil health. Farmers lost their autonomy and started to acquire extreme debt, which then affected local economies as soil degradation increased. Shiva argues that this was extremely damaging, forcing agriculture to shift to monoculture practices thus eliminating diverse nutritional value to people’s diets and destroying the resiliency of the landscape. The promise of ‘feeding people’ justified these destructive behaviors, but Shiva points out that since the Green Revolution, hunger has grown, with 90% of corn and soy produced globally going to feed livestock (Shiva, 2016).

In the 1980’s the power of industrial agricultural imperialism that started with the Green Revolution was reinforced when Intellectual Property Rights (IPR) were first extended to companies like Monsanto, making it legal to patent genetic traits in seeds. Patenting was made possible through genetic determinism, the belief there is a linear transfer of genetic information to proteins, meaning one gene carries one trait determining one controlled expression of plant behavior through the presence of one carefully located gene (Shiva, 2016). This perspective legitimizes their use of patenting. However, Shiva believes this ideology “come[s] from the idea of control and domination; [arguing] this is a patriarchal ideology, not science” which is driven by corporate greed (Shiva, 2016). She argues that patents extending to seeds were legitimized to appropriate and commodify what Kloppenburg calls the “intangible commons” of naturally occurring genetic proteins (2010). This allowed large companies like Monsanto and Bayer to create political monopolies over what seeds can be distributed in developing countries, all but eliminating heirloom seeds from national markets. To make matters worse IPRs make it illegal

for farmers to save their seeds, eliminating the freedom and autonomy farmers have had for thousands of years, creating what Shiva calls ‘seed slavery’, a global agricultural system based in violence (Shiva, 2016). In response to this violence, Shiva created a nonviolent paradigm for food and farming called Navdanya. The principles of Navdanya are the basis for agroecology with a strong focus on seeds. The principles are:

1. Soil is alive and that its well-being is vital to human well-being
2. Chemical agriculture destroys biodiversity. Ecological agriculture conserves and rejuvenates biodiversity
3. Chemical agriculture depletes and pollutes water. Organic farming conserves water by increasing the water-holding capacity of soils through recycling organic matter
4. Living organisms are self-organizing, self-replicating systems...unlike machines, they cannot be engineered (Shiva, 2016).

Shiva’s work with Navdanya mainly focuses on the fourth principle recognizing that seeds are the basis of agricultural production. The Navdanya paradigm provides an alternative to the current scientific paradigm based on reductionism and biological commodification by condemning the patenting of seeds, affirming “genetic engineering does not create a plant or an organism; it is merely a tool to transfer genes across species” (Shiva, 2016). To support her argument, Shiva cites cutting edge science conducted by Mae-Wan Ho, that states genes are fluid not fixed, meaning one gene can determine many traits in an organism based on its interaction with other genes as well as how it is influenced by its environment. This makes it very difficult to understand and control the outcome and expression of genetic transfers. Biological organisms (seeds) are thus recognized as living and self-actualizing even when humans try to control their genetic expressions.

Based on these findings, Mae-Wan Ho and Shiva believe it should be illegal to patent biological material. Mae-Wan Ho goes on to debunk many myths about the benefits of genetically modified seeds, but ultimately attributes the unfreedoms and violence produced by the Industrial Paradigm to “capitalist patriarchy’s domination and control [which] exerts domination through centralization, monocultures, commodification, and corporate control” (Shiva, 2016). The extreme negative impacts the commodification of seeds genetic makeup has on the environment and farmers livelihoods is explored more in the following section of this literature review while looking at research done previously on Paraguay’s agricultural reality.

Paraguayan Agriculture

Paraguay has been left out of studies researching the connection between seed policy and the development of small-scale farmers. The majority of research on Paraguay’s agricultural sector focuses on issues of land grabs, deforestation, and cattle production. The closest literature on the subject are two studies about the production of genetically modified (GM) soybeans in the northeastern region of the country and the effects neoliberal political leanings have on land consolidation in the same region.

Mario Cardozo’s research “*Soy expansion and the absent state: indigenous and peasant livelihood options in eastern Paraguay*” is based on interviews done with a number of small-scale farmers from two farming communities surrounded by GM soy production. He found that soy expansion causes localized conflicts not just between farmer and soy companies but between farmers who have different views on the legitimacy of the company’s presence (Cardozo, 2016, p. 89). Cardozo attributes the effect soy companies have on small-scale farmers to the absence of state involvement and mandated protections for farmers.

He found that some farmers embrace GM soy production as one of the only legal pathways to financial stability in the region, as it provides enough to fund the health, educational, and nutritional needs of the community, the only other option being illegal marijuana production. Others see GM soy company’s presence as destroying their livelihoods and community health. Farmers have also reported lower productivity and seed discoloration of their crops, which they believe to be directly connected to cross pollination with the surrounding GM soy and corn. They are afraid they will lose their traditional subsistence and cash crop varieties all together (Cardozo, 2016, p. 98). The presence of the GM soy companies and the development paradigm they are a part of is in direct contrast with Sen’s two criteria for development. Their presence is deteriorating farmer’s freedoms as they lose control of their production and financial stability. However, a solution reminiscent of Watersone’s productive justice is possible, as “interviewees said they might not have an issue with growing soy themselves if it were organic, or if soy were grown in a patchwork landscape” (Cardozo, 2016, p. 94-96). Cardozo shows there are environmentally sustainable and community lead solutions available, however, the extreme power disparity between farmers and international soy companies, exacerbated by the absence of a concerned state, can make change feel impossible.

Fernando Wimer’s work “*Las comunidades campesinas e indígenas del Paraguay frente a la concentración y extranjerización de la tierra. Un estudio de caso sobre la historia reciente de los departamentos de Alto Parana y Canindeyu*”, also focuses on the northeastern region of Paraguay. His main objective was to analyze farmer communities and indigenous populations affected by global capitalism expressed in the concentration of centralized industrial agriculture (Wimer, 2019, p. 170). Unlike Cardozo, he has a stronger critique of neoliberal politics in Paraguay, arguing that the wealth disparities in the country are directly related to the justification

of such political leanings. Wimer also disagrees with Cardozo’s image of an absent and simply inactive state, arguing that the state is actively and intentionally protecting the interest of foreign industrial agriculture companies over those of small-scale farmers. He points to Paraguay’s membership in the World Trade Organization (WTO) as an example, as it mandates the elimination of regulations for international companies in order to protect “a free economy”. Wimer thus draws a direct correlation between neoliberal development policies and the devastation of farming communities, criminalization of small-scale farmers, and the continued increase of agrochemicals and GM seeds (Wimer, 2019, p. 187).

Gaps in Previous Research

By connecting policy, or lack thereof, to farmer’s lived experiences, Cardozo and Wimer both provide important perspectives on the reality of rural life in the northeast region of Paraguay. However, neither of them looked specifically at seed policies and the role they play in protecting Paraguay’s corporate agriculture. This is especially surprising since Brazilian companies responsible for land grabs and planting GM soy, corn, and cotton in Paraguay have direct ties to some of the largest seed companies in the world: Cargill, Archer, Daniels Midland, and Bunge (Howard, 2009). The connection between climate change and access to seeds was also only briefly touched on in Cardozo’s study when he mentioned that much of Paraguay’s deforestation is a cause of the expansion of GM soy production (Cardozo, 2016, p. 94). With both studies focused on the northeastern region of Paraguay they only represent the reality of a small population of farmers, leaving a large gap of perspectives from farmers who do not live in the middle of industrial soy areas. “Research in the global South needs to more thoroughly engage with regional politics and navigate its complexities to better reveal the areas in which the

nations-state can hinder and facilitate democratic control over key resources: land, water, forest, seed” (Claeys, 2014, p. 443). I would argue that it is imperative to also examine how policy affects a wider breadth of farmers at the local level so that the full impact of seed policies can be understood in order to find community-lead solutions for farmers in every region of the country.

This Capstone study aims to fill in some of these gaps so that Paraguay may start to become a more prominent part of the international conversation on seed sovereignty. The themes that most influence the rest of this study are as follows: 1. Sen’s development strategies rooted in the attainment of freedoms for vulnerable populations 2. the Navdanya principle that seed genetic makeup is not man made and cannot be controlled and therefore cannot be patented 3. Slocums theory of productive justice as the part of the food sovereignty movement that encourages community lead full systems change, and 4. that in order to best support the freedoms of small-scale farmers in Paraguay the state needs policies that better support farmer’s needs.

METHODOLOGY

Methodological Framework

In preparation for conducting qualitative research as a foreigner from the United States in a historically colonized country, my research methodology has been highly influenced by indigenous ways of knowing and critiques of colonial forms of academic framing. This epistemological orientation guided the emergence of my research questions, and influenced my interview questions, who I chose to speak to, and how I framed the discussion of the findings. I was not able to include indigenous farmers in my work due to limitations imposed by Peace

Corps Paraguay staff, but it is my hope that future research on this subject will not run into the same limitations.

Historically, western research has been used as a tool to assert authoritative views and justify imperialism and colonial actions (Smith, 2008, p. 2). The language “through which the West came to ‘see’, to ‘name’ and to ‘know’ indigenous communities” (Robbins, 2012, p. 60) created hierarchies of knowledge “legitimizing” the West’s claim to ownership over indigenous ways of knowing only to then label indigenous people as irrational and unscientific (Smith, 2008, p.1). This made it possible to dehumanize the research “subjects” and assert colonial power. In the context of peasant farming communities, western research justified the displacement of thousands of people “through redefining land as ‘waste land’ or ‘empty land’ and then taking it away” (Robbins, 2012, p. 68). This history has fixed research in a “us vs them” mentality perpetuating the idea of the “Other” through academic language rooted in colonialism. Thus, it is imperative to intentionally reject colonial language and the idea that western ways of conducting research are the only acceptable scientific or academic methods (Smith, 2008, p.1).

Decolonizing research methodologies are especially important when researching seeds since the seed sovereignty movement is based in indigenous knowledge and understanding of property and ownership (Shiva, 2016, pp. 10-57). It gives voice, legitimacy, and ownership back to colonized people by challenging established hierarchies of knowledge. Thus, a large part of indigenous research methodology includes critically naming the language and perspectives that have influenced the researcher’s thinking instead of minimizing the impact their perspectives have on their research (Smith, 2008, p. 137). My goal with my literature review was to do just that, focusing on theories that have shaped my view of development and sustainability, so that my perspective and biases while analyzing my research are transparent.

As a way to not perpetuate imperialist constructs of knowledge in my own research, I name western ideas of ownership, commodification, privatization, and commercial patents as colonial forces influencing Paraguayan politics and people. As mentioned in my introduction, the relationships that I built during my Peace Corps service influenced the direction I chose for my research. Since I am unavoidably a non-neutral entity and understand I can never fully take myself out of the research process, I have critically analyzed my own process as it relates to the bigger picture of my research. As indigenous research methodologies require (Smith, 2008, 137), I recognize my positioning as a researcher who has privileges beyond those with whom I worked and while not downplaying the privilege I hold I tried to enforce that I was, first and foremost, someone seeking understanding. To attend to this power dynamic, I used an ethnographic research perspective, conducting interviews and participant observation to limit my voice and give the farmers a platform to talk about their experiences in a safe way. I understand that the history of anthropological, ethnographic research has strong colonial ties, however I believe if used intentionally they can complement indigenous research methodology.

Anthropology is a field dedicated to the study of human culture originally designed to “understand” different human behaviors as Europeans started their global exploration looking to expand their territory and wealth. Historically it has been used as one of the most damaging research practices, perpetuating the idea of global white supremacy (Smith, 2008, p.11). However, methods used in ethnographic research are not inherently oppressive. Anthropological research conducted responsibly can break down the barriers of otherness and demonstrate intercultural connectivity without shying away from examining issues of power and privilege. An ethnographic perspective is also useful to fully understand the complexities of social-political spaces as it “captures and records the voices of lived experience...contextualizes

experience...goes beyond mere facts and surface appearances...presents details, context, emotion, and the webs of social relationships” (Jeffery, 2004, p. 536). Anthropological methods provide flexibility that allow the people being interviewed to shape the research outcomes. This distinction is important for my research as I aimed to understand the true impacts of seed policies on small-scale farmers without perpetuating the current academic research paradigm that most commonly presents results as ‘extracted data’ (one of the most damaging parts of the colonial legacy of research) and instead presented examples of complex lived realities through case studies.

Applied Methodological Framework

My research was conducted using an ‘ethnographic perspective’ in an ethnographic “selective intermittent time mode”, meaning it was done between three months to two years (Jeffrey, 2004, p.540). Although this is a shorter time frame than an ideal, full, ethnographic study, it gave me flexibility to follow avenues that were most relevant to my research (Jeffrey, 2004, p. 543), and helped me navigate unforeseen circumstances caused by the impact of COVID-19. It also provided me with the space to separate the work I was doing as a volunteer from the work I was doing as a student. This way I could visit farmers at least once a month in different spaces, whether at their homes, or at their farmers’ organization in informal capacities to build relationships and a greater understanding of what their day-to-day experiences were with their production. Integrating an ethnographic perspective guided my intention to observe and understand from the point of view of the farmers and limit any imposed preconceptions I had.

In order to best address my research question, I created case studies of five individual farmers as well as Paraguay’s seed policies, identifying themes that came out of both. These

individual case studies, oriented through an ethnographic perspective, were used as a tool to center farmer’s voices, as they are of the farmers’ experiences accessing seeds and the effect on their seasonal production. Since case studies are inherently descriptive and inductive, they are a great way to look at everyday occurrences through a critical lens (Rossman, 2017, p. 92). They help illuminate complex circumstances and “may, by analogy, shed light on or offer insight about similar cases” (Rossman, 2017, 92) not just locally, but globally. In my research they act as an assortment of individual experiences that explain the collective reality of seed distribution and access in Paraguay (Fontana, 2005, p. 698). In this way using case studies allowed me to critically look at farmers’ realities while the farmers were able to maintain control over their stories, aligning with the indigenous methodology framework (Smith, 2008, p. 145) (the methods for conducting the case studies are explained in more detail on pages 29).

Alongside using an ethnographic research perspective, this study employed a political ecology framework to create the case studies for the selected policies. Political ecology is influenced by the fields of human ecology, archeology and geography and is informed by peasant studies and postcolonial theory (Robbins, 2012, p. 60). It aims to understand the human and environmental consequences of development driven by capitalism and financial growth, specifically looking at “changes in human-environment interactions” at three levels: household, community, and regional (Robbins, 2012, p. 60). The variables included in political ecology are: “social power, gender relations, division of labor, and economic structure” (Robbins, 2012, p.61). In this way, the political ecology framework is directly tied to postcolonial research methodologies lending itself to my research as I explored how the political relationship between seeds and farmers influences the environmental and developmental landscape in Paraguay.

Ethnographic perspectives, political ecology, and storytelling connect the past, present, and future within one body of research (Smith, 2008, p. 145) while illuminating the “voices of lived experiences” (Jeffrey, 2004, p. 536). However, I recognize, as Tuhiwai Smith expressed, “taking apart the story, revealing underlying texts, and giving voice to things that are often known intuitively does not help people to improve their current conditions” (Smith, 2008, p. 3). I do not expect my work to improve anyone’s lives, but I hope it can contribute to the global conversation of seed sovereignty and resiliency while including the needs of small-scale Paraguayan farmers, creating a stronger global community, support system, and platform for change (Shiva, 2016, p. 223). When this capstone is complete, each person who was interviewed will receive a copy via email. Passing my findings on is just one-way storytelling through an indigenous research methodology can support small-scale farmers by amplifying their voices while making sure they are involved in the research process at every level.

Sources of Data and Population Selection Strategies

The sources of data used in the context section of this study were historically written academic and news articles about the presence of seed regulations and patents in Paraguay. Current Paraguayan federal documents on seed policies were then used to situate Paraguay’s past political leanings into current seed policies, following the political ecology framework. This study defines policies as a set of principles adopted and implemented by a government (Baachi, 2014, p. x). Four current policies from Law No. 385 on seeds and protection of plant varieties were chosen for this study as they most directly influence farmer’s access and control over seeds. The policies are related to: seed production (Art. 45), commercialization (Art. 58), quality control (Art. 61), and circulation (Art. 67). Census information from the department of Caazapa

was then used to give specific regional context for the seed map and case study sections. The historical articles and census data were used to guide the analysis of the seed map and case studies.

The case studies and seed map were based on primary sources of data. The case studies focused on individual interviews done with five small-scale farmers from the department of Caazapa, supplemented with field notes (see informed consent form appendix B). My field notes were written as critical reflections on what I learned through observations and participation in activities related to seed distribution, storage and use over the past two years. In Paraguay, there can be large differences in access to seeds depending on a farmer’s involvement in community farmer organizations, therefore the five interviewees had varying levels of involvement in such organizations: 1. A farmer who is a member of an agricultural committee; 2. A farmer who is a member of a farming cooperative; 3. A farmer who is a member of a community development organization; 4. A farmer who is also a member of a local farmers market collective, and; 5. An independent farmer who has no such affiliations. See interview guides in appendix C.1. My aim is to demonstrate the full scope of farmers’ experiences by drawing comparisons between the quality of the seed varieties they use, how they access their seeds, how much control they have of seed production, and how climate change has affected access, production, and quality. The concepts being compared were allowed to emerge from the case studies.

To supplement my research, I had hoped to also interview representatives from government agencies: The National Service for Plants and Seeds Quality and Health (SENAVE), Paraguayan Institute of Agricultural Technology (IPTA), Ministry of Agriculture (MAG), Environment Secretary of the Republic of Paraguay (SEAM) and one member of the non-governmental organization National Coordinator of Rural and Indigenous Women

(CONUMARI) which runs a seedbank supporting farmers from twelve different departments including Caazapa. See interview guides in appendix C.3. Unfortunately, for reasons discussed in the following section, I was not able to talk to a representative from SENAVE, SEAM, or CONUMARI. However, I was able to interview two locally contracted government workers from the Agrarian Extension Department (DEAG) who are part of the seed distribution process on a regional level (Appendix C.2).

Data Collection Methods

I specifically chose to conduct unstructured, open-ended and in-depth interviews to let the questions act as guidelines to stimulate more natural conversations and provide a more nuanced information (Fontana, 2005, p. 705). However, the emergence of COVID-19 made it difficult to conduct interviews in the way I had intended. My only resource to finish conducting the majority of the interviews ended up being through digital platforms.

The interviews with government officials were conducted over email, limiting the conversational aspect that would have led to more detailed information. This also limited the number of people I could interview as not everyone had the same availability as they had before the pandemic. Since I could not speak to a SEAM representative I included questions related to climate change in the other interviews including questions related to observed changes in the climate in the past ten year, concerns regarding climate change in the future, and whether they feel prepared to address those concerns.

The interviews with the farmers were conducted over WhatsApp. Some were done using voice notes, others texted, and others wrote their answers out by hand and sent pictures of their responses. The way farmers responded depended on their access to cellular service and data. The

interviews conducted using WhatsApp’s voice note feature were the closest to the open, in-depth style I had originally planned on, while I had to rely heavily on field notes for the interviews conducted over text. However, the ethnographic intermittent time mode methodology allowed me the flexibility to creatively connect with farmers to be able to uplift their voices as much as possible in my study.

Both the in-person and WhatsApp interviews were conducted in two different languages, Spanish and Guarani. Spanish is mostly spoken in professional circles and larger cities, whereas Guarani (or Jopara, a combination of Guarani and Spanish) is the dominant language of rural Paraguay and farming communities. It was important for this research to be conducted in both languages when appropriate, instead of forcing farmers to express themselves only in Spanish, to make them feel more comfortable and break down historical power dynamics

Preliminary Data Analysis Strategy

The interviews, recorded using a voice recorder, were transcribed as edited transcriptions, omitting background noises, pauses, and interruptions. As I am fluent in Spanish and conversational in Guarani, I organized them into themes in their original language, only translating the quotes that were included in the body of this Capstone. When translated I took out superfluous language like repetitions of words or stutters, for more fluidity in the body of the text (Appendix D). The common themes were allowed to emerge naturally from the interviews. The themes from the case studies and seed map were then analyzed using the lenses identified in the literature review. I also used comparative methodology in the case study analysis to clearly expose commonalities and differences between farmers (Rossman, 2017, p.92). A comparative approach “invoke[s] a range of relevant theories to sensitize the data” (Jeffrey, 2009, p. 545) and

avoids skewed or biased research results. The selective intermittent time mode framework was also used as a way to identify differences between my and the farmer’s ways of thinking to make clear distinctions between what is my analysis and what is the farmer’s real experience.

The seed distribution map was also used as a tool for analysis, created from the interviews with farmer and government official to understand the seed distribution pathways. The map provided a visual of formal and informal supply channels and acted as a bridge to understanding how policies and their implementation affect farmers’ access to different seed varieties. The map identifies where farmers have control over their seeds, where they do not, and begins to answer the question why?

The four policies were analyzed through a problematization lens provided by Carol Baachi. Baachi believes that policies are made to address certain issues in society and reveal how a governing body understands societal problems (Baachi, 2014, p. xiv). Thus, problematization as an analysis strategy “consists of seeing what kind of assumptions...of established, unexamined ways of thinking the accepted practices are based” (Foucault as cited in Baachi, 2014, p. xv). Baachi lists six questions that guide the analysis of a policy but only five were implemented in this study:

1. What is the problem?
2. What presuppositions or assumptions underline this representation of the problem?
3. How has this representation of the ‘problem’ come about?
4. What is left unproblematic in this problem representation?...Can the problem be thought about differently?
5. What effects are produced by this representation of the ‘problem’

(Baachi, 2014, p. xii)

However, due to both perceived and unforeseen restrictions, the final analysis has its limitations (Appendix E).

Limitations

One limitation to my research is the small scope of my analysis due to cultural and linguistic barriers, and gaps in my personal knowledge of Paraguayan history. To minimize misunderstandings, I recorded each interview conducted in person and over WhatsApp, however, ideally future research on this topic will be conducted by a Paraguayan or South American academic to fully avoid these limitations in the future. It is also possible that as a foreigner I received incomplete information.

My research is also limited because it does not include perspectives from indigenous populations. Peace Corps Paraguay prohibits working with indigenous communities due to their state of vulnerability and politicized history. Ideally, I would have a much larger sample size, speaking to farmers and indigenous communities from all seventeen departments to get a better understanding of national policies and seed distribution. However, even with its limitations I hope this research will be a start to future reflections on how seed policies affect all farmers in Paraguay.

**NOTE:* I replaced all of the interviewee’s names with pseudonyms and excluded the names of the organizations they are a part of to maintain anonymity.

CONTEXT

This section is separated into four subsections: 1. A general introduction to seeds and IPR’s; 2. Paraguay’s historical influences on seed policies; 3. Paraguay’s current seed policies,

and; 4. A description of the MAG’s role in the lives of small-scale farmers. The brief look into the historical background on seed politics in Paraguay aligns with the political ecology framework providing context to understand the ‘problem’ Paraguay’s current seed policies are trying to correct. However, the ‘problem’ could not be understood fully without first comparing the physical and social differences of heirloom, hybrid and GM seeds. A general understanding of how the MAG works with small-scale farmers is included to give context to the seed map and case studies, demonstrating the ways in which small-scale farmers interact with seed policies.

Seeds and Intellectual Property Rights

There are three main categories of seeds: heirloom, hybrid, and genetically modified. Heirloom, or heritage seeds, are not modified meaning their genetic makeup has been the same for at least fifty years. These seeds are open pollinated and cannot be patented, saving farmers money and producing seeds that can be harvested, saved, and planted again the next year with no decline in productivity. Heirloom seeds lend themselves to informal systems of exchange outside of state power, giving farmers complete control over their production and are essential to regenerative environmental practices. Thus heirloom seeds promote the acquisition of real freedoms (Shiva, 2016).

Heirloom seeds also provide a wide breadth of diversity within plant species (e.i. 4,000+ varieties of heirloom beans). The diversity comes from evolving to adapt to regionally specific climates, making them drought resistant, pest tolerant, and able to grow in a variety of soil types (Shiva, 2016). However, many are not considered for industrial production as some do not have a long shelf life, making it hard to ship them over long distances without getting damaged. This can make it harder for farmers to find markets that are as financially stable as subsidized

industrial agriculture. Heirloom seeds are also not tolerant to herbicides or chemical fertilizers. From an environmental standpoint this is positive as no chemicals are leached into waterways, soil, or affecting human health. Heirlooms paired with simple but labor intensive weed control practices can altogether eliminate the need for herbicides, making destructive methods of production obsolete. The seed sovereignty movement was born out of the need to protect heirloom seeds and the autonomy and abundance they provide, as governments all over the world continue to criminalize the use, storage, and trade of heirloom varieties to protect the interests of hybrid and GM seed companies instead of the health of their people and planet (Shiva, 2016).

Hybrid seeds are produced by cross pollinating two or more varieties of the same plant in a controlled environment to produce a new variety of that plant. The goal is to produce a variety that is more drought or disease resistant, or that has a longer shelf life to aid in commercial transportation. Since the fruits are easier to ship to market, many large commercial farmers prefer them to heirloom varieties. Some hybrid seeds can be harvested and saved to use the next year, but with a decline in productivity for a maximum of three years. Other hybrids are completely sterile, requiring the farmer to buy new seeds each year (Shiva, 2016, p. 122). They are also much harder to patent than GM seeds, making them more financially accessible. However, their presence can damage and even eliminate sources of heirloom varieties giving seed companies opportunities to exploit farmer's dependence on their seed (Shiva, 2016, p. 188).

GM seeds are created in a laboratory and always sterile. Plant proteins, called germplasms, containing the desired genetic code are extracted and then placed into a separate seed cell through gene splicing. Those cells are then developed into a tissue culture that is grown

into a plant. The seeds produced by that plant are genetically modified, containing the inherited DNA, and sold as such (Shiva, 2016). GM seeds were created in 1973 for a similar purpose to hybrid seeds, but with the added intention of making them resistant to chemical pesticides and herbicides. They also produce very uniform yields over vast planting areas, making them more appealing to industrial farmers with large, monocultural production. They require large amounts of fertilizers, pesticides, and heavy machinery that the seed companies also produce and sell. GM seeds are also patented, meaning farmers have to buy new seeds every year while paying royalties, adding to the overall cost of production. (Shiva, 2016).

Many farmers around the world have accumulated extreme debt by buying into GM seeds while the international seed companies accumulate a mass amount of wealth. Today only three seed and agrochemical companies (Monsanto, DuPont, and Syngenta) control 50% of the world's seed production (Shiva, 2016, p. 5), creating monopolies on seed distribution in countries like Paraguay where Monsanto soybeans take up over two million hectares of Paraguay land (Tutasig, 2020), representing 12% of Paraguay GDP (Cardozo, 2016; Bajekal, 2015). GM seed monopoly perpetuates Sen's unfreedoms: poverty, systemic social deprivation, exploitation, and powerlessness (Sen, 1999, p.3), as they sterilize heirloom varieties through cross pollination and overpower governments through their financial strength. Now GM seed company's monopoly over production and distribution is stronger than ever with the protection of seed patenting through IPR laws.

Before IPRs were extended to seeds, plant breeder rights were protected through the creation of the International Union for the Protection of New Varieties of Plants (UPOV) in 1961 under a cooperative agreement with the World Intellectual Property Organization (WIPO) (Katarov, 2020). UPOV established principles for examining plant varieties, and protocols for

seed certification, to determine whether or not they are indeed distinct, unique, and stable enough to be considered a new variety. Creating an international union encouraged the creation of “new varieties that were more directed for domestic and international trade” (Katzarov, 2020), incentivizing foreign breeders to invest in plant breeding and seed production in other countries (Katzarov, 2020). This was and is attractive to developing countries as UPOV members gain access to new plant varieties directed to commercial export and are seen as industrial leaders of agricultural technology. In 1994 the UPOV plant breeders’ rights were expanded when the WTO signed the Treaty on Trade-Related Aspects of Intellectual Property Rights (TRIPS), allowing breeders to patent seed’s genetic material through IPR law (Filomeno, 2014, p.2).

IPRs are designed to protect the “creations of the mind, such as inventions; literary and artistic works; designs; and symbols, names and images used in commerce” (WIPO, n.d.). This protection can be given in copyrights, patents and trademarks. When extended to seeds, IPRs give plant breeders the right to patent their varieties based on specific germplasm selection. They are then able to collect royalties from farmers who use the patented seeds. After twenty years seed varieties enter into the public domain, so farmer’s no longer need to pay royalties, but the seed companies still control the production and distribution of that seed variety. IPR’s are touted as a positive incentive to encourage the creation and distribution of new knowledge, however they are also critiqued for restricting the spread of information and use of naturally occurring and essential organisms (Filomeno, 2014, p.1). The seed sovereignty movement views IPR’s as an encroachment on community knowledge by the state and corporate commercial interests, arguing that seeds need to be protected as common goods, and as such people should have the right to distribute and manage them with autonomy, to protect the diversity in heirloom plant varieties, and in turn protect human and environmental health (Shiva, 2016).

Historical Influences on Seed Policies

The political ecology framework requires that before analyzing Paraguay’s current seed policies, understanding the international as well as domestic social and historical contexts leading up to the problematization of seeds is essential. Some of the most influential international seed policies associated with WIPO and IPRs have been implemented in Central and South America in the past forty years (Paraguay, 1997). These changes are very recent as neoliberal commercial politics and free trade agreements produced by international political pressure have been adopted (Wimer, 2020). Before examining the current seed policies in Paraguay, it is important to understand the international pressures and domestic political and economic realities that lead to the implementation of current day policies.

Paraguay became a signatory of UPOV in 1978, protecting the rights of hybrid plant breeders before patent laws were prevalent (Paraguay, 1997). In 1995, as an attempt to remedy an economic downturn for the country, Paraguay joined the WTO and became a Common Market of the South (MERCOSUR) member (Paraguay, 1997) and adopted the Common External Tarriff (CET) which drastically changed their border protection protocol from import restrictions on agricultural items to be based exclusively on tariffs (Paraguay, 1997). Since then Paraguay has had open borders and participated in free trade, protecting corporate interests by promoting the privatization of commerce and deregulating developing sectors, such as the seed commercialization.

Monsanto has been present in Paraguay since 1998, just a few years after Paraguay became a democracy. That year the MAG gave Monsanto its first authorization to conduct a trial with GM soybeans in the country (Tutasig, 2020). In the year 2000 Paraguay took its first steps towards ascribing to more extreme patent laws by becoming a signatory of The Agreement on

Trade-Related Aspects of Intellectual Property Rights (TRIPS). This meant Paraguay was obligated to enact a new patent law, ascribing to international standards. “The law allows patents on transgenic micro-organisms and genes but not on plants and animals as a whole” (Filomeno, 2014, p. 109). Seed companies could now monopolize specific plant genes. Plants that had the same gene, i.e. purple variegations in leaves, without being genetically modified, were then technically patented by the seed companies. Companies now owned genes in plants that they were not responsible for creating. This made it extremely difficult for farmers to save seeds, even if their seeds were heirloom varieties (Filomeno, 2014, p. 110).

When Fernando Lugo became the President in 2008, SENAVE strongly opposed the presence of GM seeds in Paraguay as they were not approved by the Ministry of Health and Environment. However, Monsanto was still able to start an experimental seed breeding operation in the Department of Alto Parana in 2011 (Tutasig, 2020). Between 2004 and 2012 “the Ministry of Agriculture issued several rulings imposing restrictions on the right to save seeds”(Filomeno, 2014, p. 109) and in 2005 Paraguay also became “the first country in South America where Monsanto implemented a private system of royalty collection on GM soybeans” (Filomeno, 2014, p. 109). What finalized Monsanto’s control over agriculture in Paraguay was in 2012 with the impeachment of President Lugo, the assumption of President Federico Franco, and the appointment of Francisco Regis Mereles to the director of SENAVE.

Before becoming the director of SENAVE, Francisco was the head of an agrochemical company, and swiftly included Monsanto’s GM cotton in the National Registry of Commercial Plant Varieties (RNCC) making Monsanto’s Intacta RR2 Pro cotton seed authorized for sales throughout the country (Reuters, 2013). Monsanto soybeans resistant to glyphosate-based herbicides (Roundup Ready) were also authorized for sales, and in 2012 Paraguay became the

sixth largest producer and fourth largest exporter of soybeans, producing 8,350,000 tons per year (Tutasig, 2020). Soy acreage now represents nearly half of all agricultural lands in Paraguay (Bajekal, 2015), reaching over three million hectares with an annual production of over eight million tons (CAPECO, 2015).

Paraguay is still actively in conversations with the United States to reaffirm their commitment to the Memorandum of Understanding on Intellectual Property Rights “under which Paraguay committed to take specific steps to improve its IPR protection and enforcement environment” (Lighthizer, 2020, p. 26). The United States promised to “promote investment in Paraguay and to increase bilateral trade” (Lighthizer, 2020, p. 26) in return. The social and economic power disparities, assessed through the political ecology framework, are apparent as Paraguay’s need to improve their standing in international global markets, and concern of losing access to agricultural technologies continues to make it vulnerable to the power of foreign actors (Filomeno, 2014, p.110). Little progress has been made in the attempt to implement agrarian reforms.

Current Seed Policies

SENAVE is the ruling body in Paraguay that determines what seeds come into the country, what rights seed companies have, and the certification and quality requirement for commercializing seeds domestically. SENAVE purposes is to “secure the identity and the quality of seeds and protect the rights of creators of new cultivars. Understand related matters to biotechnology” (SENAVE, n.d.). Their policies are directly influenced by a WIPO law, Law N. 385, that was ratified in 1994 a year before Paraguay became a WTO member. The WTO is an observer to the WIPO council and WIPO is an observer to TRIPS council, so Law N. 385 takes

great care to protect IPR’s and companies’ rights to patent seeds. An analysis of SENAVE’s own Law N. 385, also ratified in 1994 related to seed production (Art. 45), commercialization (Art. 58), quality control (Art. 61), and circulation of seeds (Art. 67) are listed below.

<p>Article 45</p>	<p>Article 58</p>
<p>Seed producers must have a permanent technical manager, who must be an Agronomist or Forestry Engineer, with a national or revalidated title registered in the National Registry of Agronomists and Forestry Engineers. The professional will be in charge of compliance with the technical standards established for the production of certified and/or audited seeds</p>	<p>Seeds that are exposed for sale to the public or delivered to third parties under any title should come from a system of production of certified seeds and/or supervised and be properly packaged, identified and labeled. The packaging and/or the label should include obligatorily as a minimum the following information: Farmer’s name, address and registration number, species name, variety, lot number, treatment, germination (%), Physical purity (%), Net weight (Kg), and Harvest (year)</p>
<p>Article 61</p>	<p>Article 67</p>
<p>Those who dedicate themselves to commercialization of seeds are obligated to enable a book where they settle the movement and existence of seeds, whose existence will determine the regulation. This book should be by the day and be presented to the Office of Seeds technicians, duly accredited, each time they are solicited</p>	<p>The seeds to be imported for commercial purposes must correspond at least to the hybrid, certified or equivalent category, unless there is no certification program for that species in the country of origin. The import of seed other than those obtained through a certification program, may be authorized by the Ministry of Agriculture and Livestock, with the prior intervention of the National Seed Council, and according to the importance it may have for national agriculture.</p>

(SENAVE, 1994)

Article 45 establishes the presence of strong government oversight during the production of seeds. This policy is relevant for hybrid or GM seeds as their production is very technical and often controlled in a lab. Heirloom seeds, however, are produced by small-scale farmers who do

not require oversight when producing and storing seeds for their own production. The problem this policy is trying to address is the assumption that farmers do not have the adequate knowledge to produce consistent quality seeds and require a highly educated person to aid in the production. Many farmers in Paraguay do not have access to higher education or high levels technical training, however, they have been producing, storing, and controlling their seed quality for thousands of years. This policy is less about a real concern over technical skills than about control of knowledge, and ultimately control of production. If farmers wanted to produce seeds to commercialize legally under this policy many would not be able to comply due to the financial barrier of employing an engineer to oversee their production. This policy was made with only hybrid and genetically modified organism (GMO) production in mind, creating a barrier for the production and wide-spread commercialization of heirloom varieties, and creating a monopoly on who are considered knowledge keepers.

As Article 58 states, appropriate labeling is important when selling seeds. The germination rates, year of harvest, and plant variety are essential information that farmers need in order to have a successful harvest. The problem this policy addresses is the potential lack of transparency between producers and consumers that could negatively affect farmer's yields. However, this policy acts as another financial barrier for small-scale farmers producing heirloom varieties. Receiving registration numbers in order to properly label and certify seeds takes time and money. In many cases getting a commercial label also requires a land title that many small-scale farmers do not have. There are no programs in Paraguay that make this process more accessible to small-scale farmers, reinforcing that seed production and commercialization (thus control over seeds) is resigned for big agriculture companies.

As Article 61 states, books are important to keep so there is a log of the quality of seeds distributed throughout the country. This is important in dissuading the potential of distributors selling seeds at a lower quality than they advertise. However, this policy is rarely enforced. Paraguay does not have enough resources or manpower to be able to carry out regular quality control checks. This means what is being marketed is very often something different than what is sold. The lack of implementation of this policy nullifies its intent, restricting farmers' control over seeds even further as they can never be sure if what they are buying will germinate and have no power in holding vendors accountable for the products they sell.

Article 67 focuses on international seed distributors with little comment on domestic seed producers. The specific mention of hybrid seeds means the government prioritizes them above other seed varieties, and the international companies that produce them are prioritized over domestic production. It is clear that the problem this policy is trying to address is the presence of heirloom seeds. Although there isn't anything explicitly prohibiting farmers from saving and distributing heirloom seeds in this article, heirlooms are explicitly excluded from this idea of a healthy market. This greatly affects the control farmers have over their production and distribution of seeds, as there are very few formal markets selling heirloom seeds and even fewer that buy them. A wider market in Paraguay for heirloom seed varieties, supported by the government, would give small-scale farmers access to more economic opportunities as well as more stable seed varieties.

The following section provides background on MAG's relationship with small-scale farmers to give more context for the analysis of the seed distribution map and case studies,

as the impacts of the aforementioned policies cannot be fully understood without understanding the government bodies meant to implement them.

Ministry of Agriculture and Livestock’s Role in the Lives of Small-Scale Farmers

Farmers who are part of a farmer or community organization have greater access to resources provided by the MAG to help support them while they improve their production. The MAG provides federal funding for projects that align with its mission to “contribute to the development of sustainable agriculture of the country, through the efficient, innovative, and inclusive institutional services” (Misión y Visión, 2018). The most common projects include providing resources for small animal husbandry, donating cover crop seeds to improve soil health, and providing hybrid vegetable seeds for home gardens. Each project is part of their initiative to promote stable domestic agriculture. The DEAG agents are contracted through the MAG to work as local extensionists. They work directly with farmers organizations to help distribute the resources provided by the MAG as well as give technical and organizational support within the communities where they work. There are only 800 extensionists in the whole country, greatly stretching the DEAG agent’s resources (Landini, 2012, p. 129).

Technical farming information is hard to come by for farmers in Paraguay and DEAG is sometimes the only connection they have to help protect their crops and build on their yields. However, they have to be a member of a farmer’s organization in order to receive DEAG resources and participate in their projects. There are many different types of farmer and community organizations that farmers can become members of to receive DEAG support, however, monetary or social barriers can keep out the most vulnerable. Every organization requires a monthly membership fee. The fee amount varies, being as low as 4,000 Guaranies (.85

cents) or as high as 25,000 Guaranies (4 USD). If a member is not able to meet monthly payments they are asked to resign from the group. Many times, farmers hoping to join a local organization are not accepted due to social dynamics.

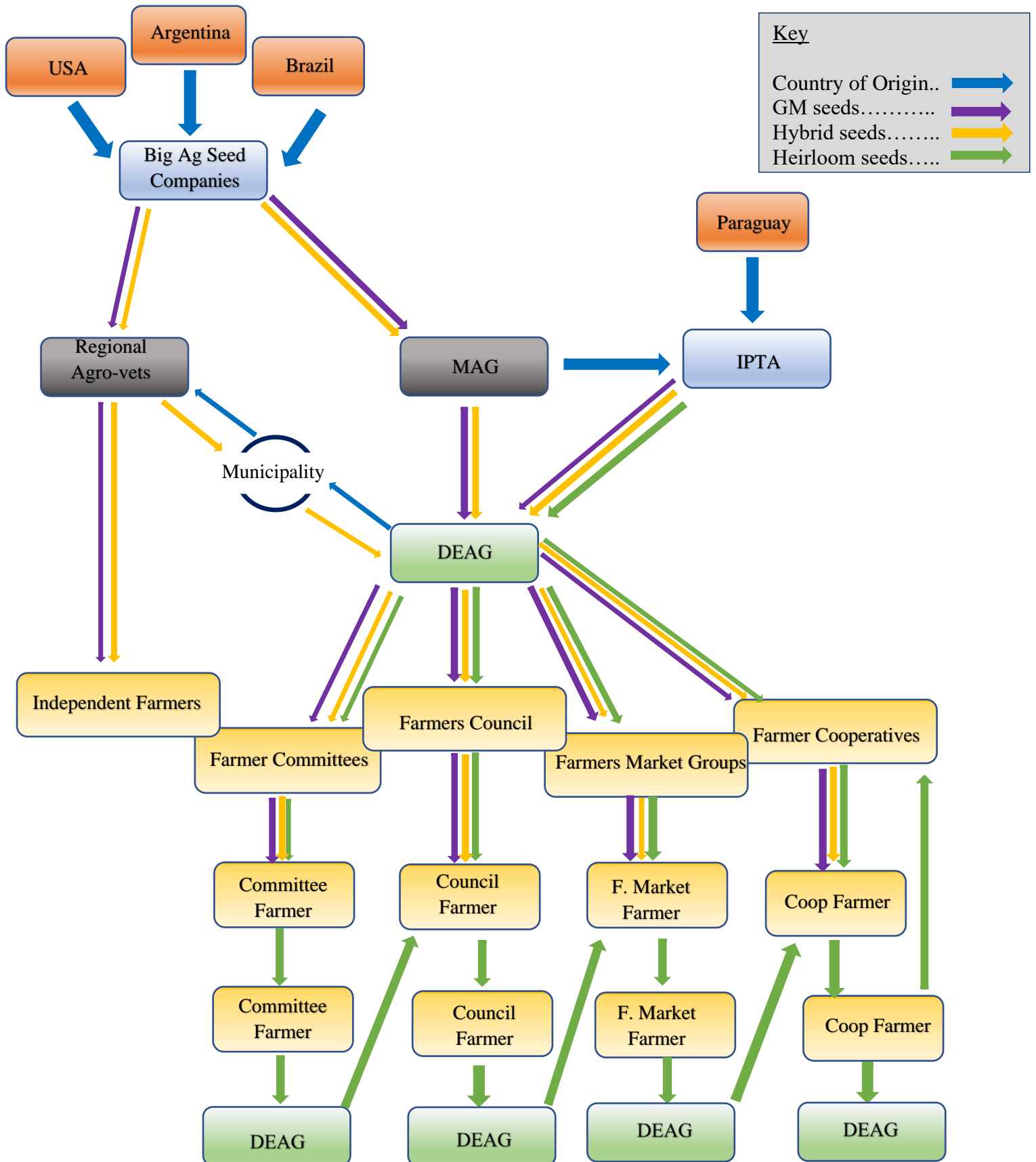
Farmers can also source their seeds from local agro-veterinary stores that are located in every city and small town provides easy access for farming families. Their seeds are relatively accessible prices, however the cost of buying their own seed can add up quickly, especially for commercial production. Although the DEAG offices were designed to reach people in the most rural areas, many farmers still face barriers to access. This is discussed in more detail in the following section.

SEED MAP

The following map is a representation of the channels that connect small-scale farmers to seeds. It acts as a guide, showing the movement of seeds in Paraguay and identifying key actors in the distribution process. It is used as a tool to demonstrate and critically examine how small-scale farmers participate in formal and informal seed distribution cycles.

The red boxes are the countries seed production companies are from. The blue boxes are the seed suppliers and the starting point of the seed distribution process in Paraguay. The grey boxes are the middle-man organizations between the seed suppliers and the farmers. DEAG is shown in green as it acts as a unique intermediary in the distribution process. Farmers are shown in yellow, representing the five different farmer organizations that were interviewed for this study. The arrows represent the movement of different seed varieties. Purple represents GM seeds, yellow hybrid seeds, and green heirloom seeds. The analysis is then separated into two

categories: formal and informal seed distribution practices. The farmer’s individual experience in the seed distribution process will be examined in greater detail in the case studies.



Formal Seed Distribution Chain

Private domestic seed companies are not present in the map since the majority of seeds in Paraguay are produced and circulated by foreign companies. Domestic seed production is represented by Paraguayan Institute of Agricultural Technology (IPTA), funded by the MAG and SENAVE. The seeds supplied by foreign companies are GMO and hybrid. They are distributed throughout the country in both public and private distributions chains facilitated by local agro-veterinary stores and MAG projects. In the private sector farmers have more direct access to seeds as the agro-veterinary stores buy the seeds directly from seed companies and farmers buy directly from agro-veterinary stores. However in public chains, the process becomes much more convoluted as MAG has to submit requests and receive approval to the federal government to order seeds, request seeds from foreign companies, distribute those seeds to regional DEAG agents who then distribute them to farmers organizations, who then divide the seeds between members. In this chain of distribution farmers are void of control at every stage, not even being included in conversations about what seeds would be most beneficial for them in the following growing season. Farmers are kept in this cycle of unfreedom due to financial barriers of being able to buy and control their own seeds, keeping them dependent on the state and therefore hybrid and GM seeds.

Seeds produced by IPTA are also bought directly by farmers, and distributed by MAG, however IPTA is the main source of heirloom seed varieties that are part of the formal chain of distribution. They also produce and distribute hybrid and GM seeds, but they recently started to grow heirloom cover crop varieties in connection with a MAG project to fight erosion throughout the country. Cover crops are the only heirloom seeds they produce, leaving the rest of heirlooms varieties to circulate in informal distribution chains. The DEAG's involvement in

formal seed distribution chains is important to examine as they are the farmer's main point of contact for receiving hybrid vegetable seeds for their home gardens, hybrid and GM field crops, and heirloom cover crop varieties.

In the case of vegetable seeds, extensionists meet with the local municipal office to file a request for the types and amount of seeds they need for that year. The municipality buys them from local agro-veterinary stores and the DEAG office distributes them for free to the farmers they work with (Beto, personal communication, 2019). The seeds are intended to be grown in home gardens and used for home consumption (Beto, personal communication, 2019). The municipality pays for them as part of a national project to increase families nutritional health. Last year GM cotton seeds were also paid for and distributed by the MAG as part of a national project to increase Paraguay's cotton production. In this instance, MAG made a connection with a large seed production company, bought the seeds with federal funding, distributed those seeds to DEAG, and the DEAG distributed them to the interested farmers for free (Beto, personal communication, 2019).

When a DEAG agents want to do a project with cover crops they have to write an official note to the mayor as well as a separate note to the governor's office soliciting the same seeds since it can be very difficult to find heirloom varieties. The municipality works with seed companies to secure the quality of the seeds instead of buying from local farmers, although they have more seeds, since they need official documentation from the supplier to justify the purchase and farmers do not usually have the documentation necessary to provide a legal receipt. However, it can be very difficult for the DEAG to find the seeds they need through formal channels since the majority are used and exchanged informally. When DEAG gives cover crops to farmers it is usually in small amounts with the intention that the farmer will harvest it for seed

and continue to expand the amount of seed they have. “This also serves other members of the same committee who are interested in using the cover crops and the farmer can pass on the access to them for free” (Beto, personal communication, 2019). This distribution practice starts as formal but with the goal of establishing an informal seed exchange system.

Informal Seed Distribution Chain

The majority of heirloom seed exchanges happen in informal channels. Since heirloom seeds are not protected under law, they are not easily found in official chains of distribution. This includes a variety of seeds not just cover crops, such as heirloom corn, mandioca, beans, and peanuts. These channels are cyclical and mostly local in nature. They start in farming communities and stay in farming communities although sometimes DEAG agents or agrovets facilitate the exchanges between farmer to farmer. Agro-veterinary stores will buy cover crops directly from farmers to sell to a wider market, although these seeds do not usually comply with SENAVE’s policies of seed production or certification. DEAG agents who cannot access cover crops from the MAG (who buys them from agro-veterinary stores) for community projects sometime buy them directly from farmers, somewhat under the table. The most common however, is farmers directly giving other farmers seeds. Although they are not certified, heirloom varieties have been reported by DEAG agents as being good quality seeds “I believe that if the farmer is responsible for their seeds it will keep improving” (Beto, personal communication, 2019). No money used in the transfer of heirloom seeds in these channels. These practices will be seen more clearly in the case studies as the differences between farming organizations access to seeds will be looked at more depth.

CASE STUDIES

The case studies are made up of four farmers from different farmer organizations and one independent farmer from the department of Caazapá and have varying levels of access to government resources through the Ministry of Agriculture (MAG). Javier is the president of his farmer’s committee, Alejo is an independent farmer, Ña Zulma is a member of a farmers market committee, Camilo is a member of a community council organization, and Christian is a member of a sugar cane cooperative. Understanding the varied experiences of these farmers is important to grasp the reality of how small-scale farmers are being affected by seed policies in Caazapa. I used pseudonyms in place of the farmer’s real names as well as intentionally omitted the names and locations of the organizations to maintain anonymity.

I was only able to conduct one of these interviews in person, the rest being done through WhatsApp once I was back in the United States, however, I had the pleasure to work with four out of the five interviewees during my Peace Corps service which helped facilitate the conversational aspect of the digital interviews.

Committee President: *Javier* (see full case study Appendix A.1)

Javier has had his farm for the past ten years and is the president of a local farmer’s committee consisting of 29 members. The committee’s primary goal is to connect members to opportunities and resources provided by the Ministry of Agriculture so they can expand their production and become more financially stable. The DEAG provides the committee members with hybrid vegetable seeds for their home gardens every spring. Javier’s wife, Belen, maintains their family garden growing green onions, peppers, tomatoes, peas, cabbage, lettuce, and more for daily meals, and sells their excess lettuce. The seeds they receive from the DEAG usually yield good results but can often arrive late, giving them a shorter window to grow their

vegetables. Belen will supplement with seeds bought at local agro-veterinary stores but she has to buy three or four packets before one germinates. The majority of their vegetables come from their garden, which means when they do not have a crop the nutrition content of their food drops dramatically. Many people, including Belen, struggle with diabetes and have a much harder time managing their health when their garden is not producing.

In the fields Javier grows mandioca, corn, yerba mate, cotton, bush beans, and peanuts. The cotton and yerba mate are strictly commercial, while the mandioca and corn are grown both for commercial use and home consumption. The beans and peanuts are not sold and just for family use. They sell their mandioca, corn, and lettuce to local supermarkets, the yerba mate to a processing plant in the neighboring town. The cotton is sold directly back to the company that supplies them with seed. DEAG agents have been working with him and used part of his land as a demonstration plot to test out new seed varieties. They tested the growing capacity of three different varieties of corn: two hybrids: MP 575 and MP 2001, and Javier’s traditional heirloom variety. Because the hybrid seeds were provided by the MAG, they ended up arriving later into the planting season, so Javier was forced to plant the demonstration plot later in the season. Within the first month of seeding the demonstration plot, they experienced a serious drought and the hybrid varieties did not withstand the lack of rain. He had to replant the area that was supposed to be for the hybrid varieties with his heirloom seeds. The replanted heirloom seeds grew even though the drought persisted.

Javier also has a small cotton crop he started planting three years ago as a part of a national project from MAG started in 2011. The program encourages farmers to plant cotton again as it used to be one of Paraguay’s largest exports but was eventually pushed out of the international market in the 1990’s. The local DEAG agents have been working closely with him

providing him with seeds and fertilizers technical assistance. The seeds are Monsanto Bt GMO cotton seeds designed to be resistant to caterpillars (Reuters, 2013). Javier does not save these seeds since they are GMO and sterile and protected under IPRs. He saw success in his production the first two years he planted, but the third he experienced a major loss in yields almost losing his whole crop due to the same severe drought. The money he spent on the seeds and fertilizers left him at a deficit.

Javier is confident he will be able to find ways to adapt to these climate changes with the continued help of the DEAG who have been working closely with him to introduce cover crops to his rotation. Cover crops are used to restore soil and minimize erosion and are heirlooms so Javier has been saving and storing them every year. Now he has a surplus of seeds and is able to sell them back to DEAG agents when they need seeds to fulfill other project quotas.

Independent Farmer: *Alejo (see full case study Appendix A.2)*

Alejo moved to Caazapa and started farming two years ago. His parents were farmers, but like many Paraguayan youth, he viewed farming as a representation of a hard life, one of poverty and struggle. He worked in sales for a few years but ultimately decided to return to start farming commercially so he could own his own business and be his own boss. Since Alejo is not a member of a community organization or a farmer’s committee he does not have access to resources or technical support from the Ministry of Agriculture. He has had to build his infrastructure and manage his crops on his own. He currently grows peppers, tomatoes, and cucumbers and hopes to continue expanding his production. His personal connections in the area have allowed him to sell his produce to local supermarkets and convenience stores. However, market opportunities are not always stable and prices for his goods have been fluctuating over

the past year as an increase of imports of vegetables from Argentina have driven domestic prices down.

Unlike his family’s farm all of his production is commercial, using the money he earns from his commercial production to buy the food and amenities he needs. All of the seeds he uses are hybrid. He considers them to be good quality and buys them every year from a local agro-vet store in large tin containers. “I work with these types of seeds because of the climate we have in Paraguay. The resistance others have [to the climate] is different”. He finds them more resistant to plagues and harvests an average of 33 pounds of fruit per plant each season. Although he has had good experiences with the quality of his seeds, global warming has caused other problems affecting his yields.

Alejo has noticed an increase in plagues and issues with insect infestations as well as a serious issue with blossom drop, all caused by stressors in the environment. Bloom drop is caused by extreme weather fluctuations or temperatures reaching over 104 degrees Fahrenheit for more than four hours. High temperatures can also cause issues for pollinators, leaving the flowers sterile, causing them to drop without fruiting. Since Alejo does not receive support from local extensionists he has had a hard time trying to manage these issues. He first thought the flowers were aborting because of an insect infestation so he bought and applied more pesticides. Eventually he realized what was occurring but was left without an answer of how to manage this problem.

Alejo believes that in order to deal with these issues caused by global warming in the future, farmers need more access to infrastructure and government support in the form of credits. With stronger infrastructures on his farm, in terms of green houses, sturdy polls and appropriate irrigation systems, he will have a stronger and more stable production. However, without

markets to sell produce, loans cannot be repaid. Alejo wants the government to help establish infrastructure for stable local markets that would guarantee more opportunities to sell produce.

Farmers Market Member Ña Zulma (see full case study Appendix A.3)

Ña Zulma has been selling her produce for twenty-five years and is part of two different community organizations, a local farmers committee and a farmers market collective. She works at the market twice a month where she and the other members bring their produce. “We bring beans, chickens, eggs, many vegetables, corn flour, we sell everything”. All of the vegetable seeds for her commercial garden are hybrids and are provided by the MAG and distributed to her committee by local DEAG agents. She also grows mandioca, beans, peanuts and corn mainly for home consumption but sells some peanuts, corn and mandioca when there is surplus. The farmers market group also sells their produce to local schools for school lunches. This program was an initiative from the governor’s office as a way to source as many local ingredients as possible for healthier school lunch options. This gives her a more stable income since the town where she sells her produce is very small and if it rains they have to cancel the market because the dirt roads become impassable.

Ña Zulma cultivates two different varieties of corn, pyta and chipa. The chipa variety is a heirloom she stores but the pyta is a hybrid she buys each year from a local agro-vet shop. “I use more hybrids than heirlooms because it’s more convenient for selling and for eating it also, but I don’t use GMO seeds”. She also uses cover crops in her field, receiving them from a local DEAG agent. She was interested in cover crops so the DEAG agent bought some from a farmer in the area and gave them to her for free. She saves and replants her cover crop seeds every year and also saves the seeds from her cucumber, lettuce, mandioca, corn, beans, and peanuts. She

saves the peanuts in a metal drum, the beans and corn in a plastic two-liter bottle and the lettuce and cucumbers in plastic bags and refrigerate them.

Ña Zulma is happy with the quality of seeds she has, but has been experiencing issues with her production due to climate change. “This year we’ve had more problems because of the drought, we can’t plant much”. All of the water she uses for her production comes from the community well. During times of intense heat in the summer the well is shut off from 7am to 9pm to ration water. So not only was there no rain for her plants but she couldn’t use her irrigation system. She seeded her garden late waiting for the rain, shortening her growing season. Even after she planted the drought continued, stunting her plants so she wasn’t able to sell them. She was drawn to agriculture twenty-five years ago because it gave her a way to provide financially for her family, but now climate change is threatening her livelihood.

Community Council Secretary *Camilo* (see full case study Appendix A.4)

Camilo has been living and farming in Caazapa for the past five years. He is a member of a community council made up of 40 families. Their mission is to support farmers to provide more stability for their families through the sustainable production of their own food. Camilo is the Secretary of Infrastructure of the council and also owns his own storefront where he sells tomatoes and peppers grown in his home garden. He grows other vegetables, as well as mandioca, corn and beans for home consumption. The seeds for his field crops are heirloom varieties and were first given to him for free by his neighbors. “Organic [seeds] are more difficult to find here in the agrovets”. He saves his seeds mostly in two-hundred- and-twenty pound silos mixed with wood ash to prevent humidity damage as well as a deterrent for bugs. The seeds he uses in his garden and for his commercial production are hybrid seeds. He buys

them from the local agrovet but also saves the seeds in paper envelopes for three months before replanting them. He does this for a few planting cycles until they stop germinating.

He recently expanded his tomato production from his home garden to a larger plot of land owned by his brother. A DEAG agent connected him to the same departmental school lunch program that Ña Zulma is a part of. Now he sells his tomatoes to the state for 4,500 Guaranies (.75 USD) a pound, where before through local markets he was struggling to earn 3,500 Guaranies (.55 USD) a pound. Although it seems like a small amount, the stability of that .25 cent increase is significant, especially when it costs 2,800 Guaranies (.45 USD) to grow one tomato plant. He is hopeful for more income opportunities in the future as the Council moves towards providing the space and equipment for its members to make value-added products like tomato preserves, sauces, and paste.

Camilo, along with the other council members, receives seeds from the Rural Sustainable Development Project (PRODERS). Through this project, each farmer receives one-hundred and ten pounds of cover crop seed for free. Camilo has used the cover crops as a living mulch and soil recuperation in his fields. He has had complete success with the germination of his heirloom seeds, however with his hybrid seeds,

there are seasons when [the seeds] are very good but they aren't good reproducers.

Once I bought seeds and they were very nice, very healthy seeds...and only some, around 10% germinated... I've heard of others having the same experiences also.

Usually this means they aren't certified seeds and seeds they bought the year before Climate change has caused issues with germination as well. Before, at the peak of summer heat it would only reach 104 degrees fahrenheit but now as early as October they are having weeks of 107 degrees fahrenheit.

If it rains it rains a lot, if it's dry, it is very dry...Last year we almost didn't have any production of vegetables in the family gardens because there were 22 days of rain. The sun didn't come out and ruined the seeds because the plants that germinated did not develop and they lost everything. But droughts are more prejudicial for a farmer than rain. When it rains something grows, you have the hope that your crop will grow, but when it's hot, there isn't a possibility that your crop will grow

Camilo believes seeds have a principal role in sustainable agriculture by preparing farmers for future climate changes. With more DEAG training about the importance of seeds, and how to manage storing them appropriately, they won't lose their whole crop of seeds in one season due to climate, not have anything to plant in the next growing season. Bad management of seeds means bad production.

Sugar Cane Cooperative Member: *Christian*

Christian is a member of a sugar cane cooperative with 653 active members. He grew up growing sugar cane with his dad who was also a member. The cooperative has one main office building in a central location in the neighboring city as well as its own factory to process the sugar cane. Christian sells the sugar cane to the cooperative which turns it into cane sugar and a sugar alcohol called caña. After he had his first successful harvest, he joined the cooperative officially as a member independent from his father. The seed (stalk) for his first planting was bought from an acquaintance who he knew had good quality production. He now produces and uses his own sugar cane stalk that he stores in a silo. The cooperative receives workshops from MAG and the local DEAG office to explore their options for expanding their production

capabilities. They are hoping to develop individual member apiaries to start selling honey as well as build commercial fishponds for interested members.

Christian also commercially grows yerba mate, mandioca, and watermelon. The yerba mate is sold to a processing factory in the town over and he sells watermelon and mandioca to local supermarkets on his own. The corn, watermelon, and garden vegetables are hybrids and bought from agrovet in Caazapa city. “we are buying quality seeds, entering in a more advanced process of technology, seeding hybrid seeds, and also working with bettering our soil through direct seeding”. Christian prefers hybrids seeds since “traditional seeds give you a quality of 80% where hybrid seeds give you a quality of 99% germination”. However, In the past ten years different climate events have had significant influences on his production.

One year a hailstorm destroyed Christian’s entire crop. He has also experienced losing 80% of his yields due to frost, drought, and severe winds. Recently he has been using cover crops and practicing crop rotation to attempt to mitigate those kinds of losses in the future. He received his cover crop seeds from a local DEAG agent’s demonstration plot, but what he needs to feel ready to confront more climate changes are “seeds that are resilient to the climate” referring to hybrid seeds. Although he has a lot of stability and opportunities for growth with the cooperative he still relies on DEAG resources to support him as he reacts to the climate.

COMPARATIVE ANALYSIS AND DISCUSSION

The five major themes that came out of the interviews were allowed to emerge from the case studies, creating categories of comparison. The themes are *seed access, seed quality, control of production, farmer’s mentality toward seeds, and the climate’s effect* on farmer’s stability.

The interviews conducted with MAG and DEAG extensionists are used here to help unpack why some farmers might have more access than others. The combination of the case studies, the

extensionist interviews, and the previous analysis of current seed policies contribute to the understanding of small-scale farmer’s sustainability, growth and development.

Access

Each farmer uses a motley of seed varieties. Only Javier and Christian grow GM crops, having accessed them through DEAG connections. More traditional farming focuses on subsistence as well as commercial production and uses the highest amount of heirloom seeds. Every farmer I was able to interview uses an abundance of hybrid seed varieties, the majority of which grow their produce. They all access their seeds either from agro-veterinary shops, DEAG agents, or from other community members, but most do a mix of all three. Hybrid seeds are the most accessible, being handed out for free every year, and being the most common seed variety found in agro-veterinary shops. Heirloom seeds are used and distributed freely between neighbors. Although most small-scale farmers do not comply with certification and commercialization policies they are the majority of the population protecting heirloom seeds. It is hard for farmers to access the varieties they are looking for as the lack of heirloom seed markets limit seed diversity.

Quality

The hybrid seeds from the DEAG are ordered in bulk every year and are generally newer, better, certified seeds, however, as shown in Belen’s case with her garden seeds, the ones from agro-veterinary shops are not.

The agroveter buys from a farmer, from whichever farmer, they don't know the origin or the type of seed, the shopkeepers puts on whatever label they want and sells to other

farmers as if they were selling them good quality seeds. Farmers will buy it expensive and it won't germinate. This happens a lot recently wherever there are agrovets (Alex, personal communication, 2019)

When quality control policies aren't implemented appropriately, farmers are not protected and are instead regularly buying seeds that will not grow.

One common theme between all farmers is that hybrid seeds are considered better quality. This was a surprising discovery as almost every farmer experienced issues with their hybrid production. Hybrids are designed for large plantations and intense care. They need specific amounts of fertilizers and water in order to have a successful harvest. If farmers are expected to cultivate them successfully they need access to fundamental infrastructure like irrigation. Alejo, Javier, and Camilo have individual water towers on their property, used for vegetable production, but the rest have no means of irrigating their crops and rely solely on rain. The pitfalls of hybrid seeds are apparent in Ña Zulma, Javier, and Alejo's experiences with their plants not germinating, being stunted, burning, and dropping their flowers before they fruit. Heirloom varieties have proven to be more drought resistant, in Javier's case, but no farmers had anything particularly positive or negative to say about heirloom crops. They do not value them the same way as they value hybrid seeds. So where does the mentality of 'hybrid seeds are better' come from?

Mentality

One of the biggest factors contributing to the idea that hybrid equals quality is lack of access to heirloom varieties. The heirloom varieties that are present are rarely sold, but frequently distributed through interpersonal transactions. Access to machinery is also a factor as most farmers cannot afford such technologies. “It is extremely labor intensive to harvest and

store certain cover crops without the appropriate machinery, so those seeds are harder to come by” (Alex, personal communication, 2019). The cover crops wanted for DEAG projects often cannot be found for this reason. So even the heirloom seeds that are sold in conventional markets are not easily accessible to farmers, especially if they are not part of a farmer’s organization. So hybrids are considered to be better quality because there is no heirloom equivalent to compare them to. Farmers also do not put them in the same category as hybrids since they are not commercialized the same way.

Agricultural development is rooted in technological fetishism, perpetuating the idea that monoculture GM food production is the only way to support growing populations and urban centers. This creates a system of commodification that commercializes every aspect of production, including seeds. Since hybrid and GM seeds are strictly used in commercial markets they are viewed as developmental advancements, where heirloom seeds are considered part of a subsistence lifestyle not connected to financial markets and are therefore anti-development or not valuable. This mentality is maintained by imperialist policies protecting markets that produce non-heirloom varieties. It creates a national bias that is perpetuated by government organizations like MAG and then disseminated to farmers.

DEAG agents are recognized as knowledge holders. Their technical knowledge and support are never questioned by the farmers they work with. This creates a hierarchy of knowledge, making farmer’s knowledge of heirloom seeds appear inferior. Because they do not have access to heirloom seeds, extensionists cannot do experiments to show a true comparison between the two, and most farmers do not have the opportunity to see the difference like Javier saw in his corn.

Control

Whoever controls knowledge shapes the language of quality and stability. When heirloom options are not present, tests to show the true quality of seed varieties are not possible. Farmers in different farming organizations do not receive the same level of training on how to care for their seeds. Some farmers will buy hybrid corn from agro-veterinary stores but not know about the decline in productivity of hybrid seeds and continue to store them and plant them as if they were heirlooms. They lose productivity every year until they cannot achieve a harvest not knowing what the true cause of the decline is (Alex, personal communication, 2019). Without that technical knowledge it can be hard for farmers to know if the problems they have with their hybrid seeds are due to poor seed quality or environmental stressors.

Different farming organizations also have differing levels of control over their seeds. They have the same access to DEAG resources and the same access to government sourced seeds, however, the more established farmers organizations have a more stable source of quality seeds, cooperative being the most stable. This is because they have an organized internal system of quality control that is regulated by the community and not the state. “in many instances if the cooperative turns in a seed of bad quality to their members, the member is not going to be able to pay their credit, it is more serious because if the farmer doesn’t produce, neither does the cooperative, they lose too” (Alex, personal communication, 2019). Smaller farmer organizations, whether because of size or functionality, do not rely on each other the same way and do not have the same level of financial interconnectedness that requires cooperatives to take more care sourcing seeds for its members. This shows that while the MAG is very helpful in distributing seeds, being a member of a well established organization is the best way to assure seed quality

and control over access. This level of community control is also needed because of the limitation of the government to distribute resources and fully support farmers.

Every farmer interviewed said they needed more support from the government, even though most of them directly work with DEAG agents. Extensionists are expected to work with farmers in the field to teach and give technical support, but they often don't have the time or resources. One DEAG agent I spoke to worked directly with 102 farmers. DEAG's work, although meant to be in the field, is very bureaucratic. Paperwork interferes with time allocated to spend in the field with the farmers, leaving farmers feeling neglected. The government's finite capability emphasizes the importance of farmers being able to access resources and infrastructure independently. The cooperative structure is a good example of a system that gives farmers greater control over their production and development. However, climate poses its own unique set of problems to consider as hybrid and heirloom alike are not ready to take on what the climate has in store for the future.

Climate

Changes in the climate due to global warming have interfered with germination rates and yields and small-scale farmers don't have enough money to implement farming alternatives. They don't have the income to be able to invest back in the farm to reach their production potential. Every farmer I interviewed mentioned losing all or nearly all of their crop to drought. Based on regional differences as well as differences in the variety of crops grown, the farmers have experienced a range of climate related problems including plagues, water tables drying up, and too much rain. They all recognize things could continue to get worse but there was a lot of hope in their views for the future.

Camilo and Christian specifically mentioned the role seeds play in this vision for a more environmentally sustainable future, while having two very different takes. Christian wants more access to hybrid and GM seeds that are bred to be resilient to the changing climate. Camilo called for more training on how to save seeds properly so that even if they lose a big harvest one year they can still plant in the next season. All of the farmers interviewed who have access to DEAG agents were using cover crops as a form of climate adaptation and resilience. DEAG agents also want more support in receiving more diverse forms of cover crops to continue to heal the soil.

if you have good fertile soil, it is very possible you will be able to move forward because you will see good yields...so for farmers to develop I think that the fundamental base should be bettering the soil... and the only way we will achieve that is through access to diverse cover crops (Alex, personal communication, 2019)

DEAG agents and farmers recognize the role cover crops have in providing a more stable production and protecting their agricultural development for the future, but they did not assign their value as mitigators of the climate crisis to the fact that they are heirloom seeds.

What is needed in Paraguay is for farmers to be in control of improving their own seeds, to exchange them and sell them to one another. The organizational systems are already in place and the DEAG is well-equipped to lead workshops and educate farmers on how to access and develop seed markets (as seen in the map). This would help make the DEAG-farmer relationship more bilateral “to support, [and] recognizing the knowledge the farmers have as legitimate and significant, while putting the focus on the participation of farmers, rather than the number of resources delivered” (Landini, 2012, p. 130)

SUGGESTIONS FOR FUTURE RESEARCH

This Capstone study was intended to be a starting point, to bring Paraguay into the global conversation of seed sovereignty. As the majority of research is carried out in Central and South America, it is vital that Paraguay remain central to the conversation. Continued research in and about Paraguay’s political and social relationship to seeds could lead to beneficial agricultural reforms. I have listed five suggested research topics, but I hope future professionals and academics will expand on this study as they see fit, while staying committed to indigenous methodological frameworks and ethnographical, participatory, and critically engaged work.

1. Future research including farmers from all seventeen departments creating a more detailed and interactive seed distribution map. Research on this level could help provide a better understanding of the connections between food sovereignty, food security and international trade, providing a wider breadth of understanding of how national policy turns into local impact. National policy should be examined more regularly using ethnography as a perspective and/or core research method.
2. Future research using a feminist development theory to include indigenous communities and how they are affected by the same policies. This research needs to demonstrate how indigenous communities participate in seed distribution channels and include a stronger focus on women’s roles in seed access, storage, while also legitimizing the value of heirloom seeds. When examining how policies affect the stability of vulnerable populations, the most vulnerable should have the strongest voice.

3. Future research on seed banks and how they fit into the seed distribution chains in Paraguay.

Using the same indigenous methodological framing as this capstone to evaluate how they are successful and how could they be improved or implemented on a wider scale?

4. Further research on how other countries like Colombia have been able to achieve seed policy reform and assess what strategies could also be implemented in Paraguay to achieve the same goal. The extensive research done in other countries is important to use to help guide Paraguay in its journey to achieving seed sovereignty.

5. Future research on Paraguay’s connection to groups such as La Via Campesina would better situate Paraguay in the food and seed sovereignty movements while looking towards how the resources from these organizations could be accessed and influence Paraguay’s domestic heirloom market.

CONCLUSION

Research question: *How does the political relationship between seeds and farmers influence the environmental and developmental landscape in Paraguay?*

Productive justice is concerned with placing marginalized people in decision-making positions, promoting capacity building, communication, and participation to break systems of oppression, while Sen assesses progress by evaluating whether the freedoms people have are enhanced. Paraguay’s national seed policies do not enhance freedoms but are based on a colonial paradigm of development focused on technological ‘advancement’ to promote national economic gains while leaving behind the needs of the majority of the population. Thus, Paraguayan small-scale farmers experience oppression through Western ideas of seed ownership, commodification,

privatization, and commercial patents. They do not allow the free agency of farmers to have control over their production and without freedom to access diverse, culturally and regionally appropriate open pollinated seeds, Paraguayan small-scale farmers will firmly remain in spaces of unfreedoms.

Seeds are the basis for sustainable agricultural practices and are the gateway to organic forms of soil treatment and pest control, but “the problem is that the formal seed system marginalizes all other types of heritage, local, or adapted seeds developed overtime” (ANFAFA et al, 2018). Monsanto and other large seed companies, protected by law, actively participate in monetary exploitation of farmers, and the extinction of heirloom varieties due to cross-pollination, while Paraguay’s acceptance of UPOV and the WTO’s policies on seeds and patent laws create monetary and social barriers for small-scale farmers to legally commercialize and access heirloom seeds. The government’s support of these policies and the ‘knowledge’ they legitimize also affects farmer’s mentality of which seeds hold value. Farmers support and desire hybrids although they are a manifestation of the colonial face of development, because there is more ‘legitimacy’ placed on them. Thus, genetically modified seeds have almost illuminated the domestic market for heirloom varieties, undermining farmers’ control over their production and financial stability. Paraguay has “sold the sovereignty of their territories and the rights of their people to the national and multinational corporations” (Shiva, 2016). This is all made possible by IPRs and the legal ability to extract and patent a strand of DNA that nature created.

Food sovereignty aims to protect farmers by legally situating seeds as a part of the commons and “includes the right of peoples to self-determination-to decide how to distribute and manage [seeds]” (Shiva, 2014). But before small-scale farmers in Paraguay have the freedom to participate in this type of exchange, policies of social exchange need to function in a way that

“can enrich-rather than impoverish-human lives” (Sen, 1999, p.7). Farmers should not be constrained to simply be recipients of harmful neoliberal development strategies, but should be full participants in the process of promoting, accessing, growing, and distributing heirloom seeds to regain control of their production and autonomy.

Heirloom seeds provide stability, security, and health, on an individual as well as community level. They are more tolerant to changes in the climate and can help farmers restore their soil and become more resilient to drastic environmental changes while requiring little to no monetary input. If heirloom varieties of garden, field, and cover crops were supported by the government through policy and MAG programing, farms would have the autonomy and control they require for their survival, and the survival of domestic food markets. By “protecting and taking care of seeds, land, water, and ecosystems under the demand for food sovereignty and living well, people’s movements position themselves against the so called ‘progress’” (Shiva, 2016) of neoliberal imperialism policies that perpetuate huge disparities in ownership and wealth. If small-scale farmers were given access and control over quality heirloom seeds they would be able to obtain the freedoms of food security, community health, financial stability and environmental resilience, however, without this support Paraguayan farmers will remain caught in systems of oppression.

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APPENDICES

Appendix A: Full Case Studies

A.1: Committee President: Javier

“The climate depends a lot on human beings, if there isn’t any more pollution we can change”

Javier has had his farm for the past ten years and is the president of a local farmer’s committee. The committee has 29 members. The group’s primary goals are to connect its members to opportunities and resources provided by the Ministry of Agriculture so they may expand their production and become more financially stable. Just last year they received materials to make large, cement pig pens, and three pigs each, along with technical support provided by DEAG agents to start their own, small pig farm operations. The DEAG also provides the committee members with regular training and resources such as hybrid vegetable seeds for their home gardens every spring. Javier’s wife, Belen, maintains their family garden growing green onions, peppers, tomatoes, peas, cabbage, lettuce, and more for daily meals, although she does also sell their excess lettuce. The seeds they receive from the DEAG usually yield good results but many times they arrive late giving them a shorter window to grow their vegetables. Belen will supplement with seeds bought at local agro-veterinary stores but has much less luck with the quality of those seeds. She has to buy three or four packets before one germinates. They have access to tomatoes, peppers, and garlic at local convenience stores, but the rest of their vegetables come from their garden, which means when they do not have a crop the nutrition content of their food drops dramatically. Many people, including Belen, struggle with diabetes and have a much harder time managing their health when their garden is not producing.

In the fields Javier grows mandioca, corn, yerba mate, cotton, bush beans, and peanuts. The cotton and yerba mate are strictly commercial, while the mandioca and corn are grown both for commercial use and home consumption. The beans and peanuts are not sold and just for family use. Around their house they have a beautiful array of fruiting trees and pineapple garden borders that are also a source or seasonal food for the family. They sell their mandioca, corn, and lettuce to local supermarkets, the yerba mate to a processing plant in the neighboring town. The cotton is sold directly back to the company that supplies them with seed. Although they have diverse commercial production, the majority of their income comes from their corn harvest which is mostly sold informally to acquaintances who order their corn directly through WhatsApp between the months of December and February. In those three months they harvest, shuck, cut, bag and deliver around 15,000 pounds with the help of just a few family members. The corn seeds Javier uses are an heirloom variety he received from his father-in-law when he first started his farm. Every year, after the harvest, they save more seeds for the next year's crop in two-liter plastic bottles. Javier experiments with planting distances and crop rotations every year to try and expand their corn production each season while still working with the same area of land. DEAG agents have been working with him to find the best strategies to reach this goal and last year they used part of his land as a demonstration plot to test out new seed varieties. They tested the growing capacity of three different varieties of corn: two hybrid varieties: MP 575 and MP 2001, and Javier's traditional heirloom variety. Because the hybrid seeds were provided by the MAG, they ended up arriving later into the planting season, so Javier was forced to plant the demonstration plot later than the rest of his corn crop. On top of that, within the first month of seeding the demonstration plot, they experienced a serious drought and he had to replant the hybrid varieties with his heirloom variety because the hybrids did not withstand the lack of rain. The replanted heirloom seeds grew

even though the drought persisted. The rest of his commercial crop were larger and harder by the time the drought hit and so were able to withstand the climate better.

A smaller amount of his income comes from his cotton crop that he started planting three years ago as a part of a national project from MAG started in 2011. The program was started to try and encourage farmers to plant cotton again as it used to be one of Paraguay’s largest exports but was eventually pushed out of the international market in the 1990’s. The same DEAG agent who helped him with his demonstration plot has been working closely with him giving him access to seeds and fertilizers as well the company that buys cotton by the kilo. The seeds are Monsanto Bt GMO cotton seeds that are resistant to caterpillars (Reuters, 2013). Javier does not save these seeds since they are GMO and sterile. He saw success in his production the first two years he planted, but the third he experienced a major loss in yields almost losing his whole crop due to the same severe drought. The money he spent on the seeds and fertilizers left him at a deficit. That same year he lost around half of his yerba mate trees, along with every other farmer in their community. The DEAG agents in the area held meetings and recorded the losses of each farmer who was a member of a certified farmers group with promises of government monetary assistance for what was lost, but the financial support never came.

Javier believes the changes in the environment and the extreme droughts are a product of pollution and deforestation. “The climate depends a lot on human beings, if there isn’t any more pollution we can change”. He hopes that as more people become educated about climate change and the problems with deforestation, the climate issues will get better in the future, “we need a lot of intelligence, we need everyone to be trained to be prepared”. Even so he feels ready for whatever the future brings because his main goal is to provide for his family. He is confident he will be able to find ways to do that through the continued help of the DEAG. One way he has been working to

maintain productivity on his farm is through another project with the DEAG. They have helped him in the past using cover crops in his fallow fields to restore the soil and minimize erosion. All of the cover crop varieties in Paraguay are heirlooms so Javier has been saving and storing them every year. He first received them from a DEAG agent who had extra from a project he was facilitating in an adjacent community. Now he has a surplus of seeds and is able to use the surplus as an extra income, selling them back to DEAG agents needing seeds to fulfill other project quotas.

A.2: Independent Farmer: Alejo

“The biggest obstacles for small-scale farmers is being abandoned by the leaders we have in every department, like technical and financial assistance”

Alejo moved to Caazapa and started farming two years ago. His parents were farmers, but like many Paraguayan youth, he viewed farming as a representation of a hard life, one of poverty and struggle. His parents encouraged him to study and find a different profession so for a few years he worked in sales. Ultimately, he decided to return to his roots and start farming commercially so he could own his own business and be his own boss. Since Alejo is not a member of a community organization or a farmer’s committee he does not have access to resources or technical support from the Ministry of Agriculture and has had to build his infrastructure and manage his crops on his own. He was able to save enough money from his first job to buy a plot of land along with the resources he needed to produce his first crop. He currently grows peppers, tomatoes, and cucumbers and hopes to continue expanding his production every year. His personal connections in the area have allowed him access to local markets to sell his produce to local supermarkets and convenience stores. However, market opportunities are not always stable and prices for his goods have been fluctuating over the past year as an increase of imports of vegetables from Argentina

have driven domestic prices down. He wants to start raising chickens hoping he will be able to access more stable local markets.

Unlike his family’s farm all of his production is commercial meaning he does not grow anything for home consumption. He uses the money he earns from his commercial production to buy the food and amenities he needs. All of the seeds he uses are hybrid. He considers them to be good quality and buys them every year from a local agro-vet store in large tin containers. “I work with these types of seeds because of the climate we have in Paraguay. The resistance others have [to the climate] is different”. He also finds them to be more resistant to plagues and gets a good production from them, harvesting an average of 33 pounds of fruit per plant in a season. Although he has had good experiences with the seeds he has access to, he has experienced other problems that have been affecting his yields that he attributes to climate change. He has noticed an increase in plagues and issues with insect infestations. He has also been having a serious issue with blossom drop, which is caused by stressors in the environment usually meaning extreme weather fluctuations or when the temperature reaches over 104 degrees Fahrenheit for more than four hours. High temperatures can also cause serious issues for pollinators, leaving the flowers sterile and causing them to drop without fruiting. Since Alejo has not been receiving support from local extensionists he has been having a hard time trying to manage these issues. He first thought the flowers were aborting because of an insect infestation so he bought and applied more pesticides. Eventually after many conversations with other farmers in his area he realized what was actually causing the bloom drop and but was still left without an answer of how he could best manage this problem. He has been looking for a sustainable home remedy that he could topically apply to prevent the blossom drop but hasn’t found any such recipe yet.

He knows global warming will continue to cause more issues for his yields in the future and expressed that in order to deal with these changes farmers need more access to infrastructure. With stronger infrastructures on his farm, in terms of green houses, sturdy polls and appropriate irrigation systems, he will have a stronger and more stable production. In order to achieve this he says farmers need “We need support from the government in the form of credits”. He has been trying to get a loan from a bank for the past five years to help grow his production but he has been consistently denied since his business is still so young, which to him feels frustratingly backwards. He suggested a government loan program that would support new small-scale farmers with their first year of production, and later with their goals to expand their production. But without markets to sell produce, loans cannot be repaid. He believes it is the government’s job to help establish the infrastructure for stable local markets that would guarantee more opportunities to sell his produce. “We have land and seeds but without a market we can’t do much”. Ultimately Alejo needs more infrastructure and technical support to help him become more resilient to changes in the market as well as in the climate.

A.3: Farmers Market Member Ña Zulma

“If you want to be a farmer the truth is you need to want it a lot and have ample property”

Ña Zulma has been selling her produce for twenty-five years and is part of two different community organizations, a local farmers committee and a farmers market collective. She works at the market twice a month where she and the other members bring their produce. “We bring beans, chickens, eggs, many vegetables, corn flour, we sell everything”. Through the committee she’s attended workshops on taking care of livestock and has received cows, pigs and materials for her garden through DEAG. In her garden she grows carrots, lettuce, cabbage, radishes, beets,

tomatoes, peppers, and more, all for commercial use. All of the vegetable seeds for her commercial garden are hybrids and are provided by the MAG and distributed to her committee by local DEAG agents. She also grows mandioca, beans, peanuts and corn in a separate plot mainly for home consumption but does sell some peanuts, corn and mandioca when there is surplus. The farmers market group also sells their produce to local schools for school lunches. This program started as an initiative from the governor’s office as a way to source as many local ingredients as possible for healthier lunch options for the students. This gives her a more stable income. Even though she has her stall at the farmers market, the town where she sells is very small and if it rains they won’t have market that day because the dirt roads become impassable.

Ña Zulma cultivates two different varieties of corn, pyta and chipa. The chipa variety is heirloom and is stored but the pyta is a hybrid and she buys each year at a local agro-vet shop. “I use more hybrids than heirlooms because it’s more convenient for selling and for eating it also, but I don’t use GMO seeds”. She uses cover crops in her field, first receiving them from a local DEAG agent. The seeds were not part of a government project connected to the committee, but an individual transaction between her and the DEAG agent. She was interested in cover crops, asked him directly if he had access to any, he bought some from some farmers in the area and distributed them to her for free. She saves and replants her cover crop seeds every year and also saves the seeds from her cucumber, lettuce, mandioca, corn, beans, and peanuts. She saves the peanuts in a metal drum, the beans and corn in a plastic two-liter bottle and the lettuce and cucumbers in plastic bags and refrigerate them.

Ña Zulma is happy with the quality of seeds she’s been able to access through the DEAG and been able to save on her farm but has been experiencing issues with her production due to climate change. “This year we’ve had more problems because of the drought, we can’t plant

much”. All of the water she uses for her production comes from the community well. During times of intense heat in the summer the well will be shut off from 7am to 9pm for weeks on end to ration water. No one in the community can access water in-between that time. This meant that not only was there no rain for her plants but she couldn’t use her irrigation system either. Needless to say, the drought greatly affected her production. She seeded her garden late, shortening her growing season and even after she planted the drought continued, stunting her plants to the point that she wasn’t able to sell them. Her field crops were also affected as it topped the germination of most of her seeds. When asked if she thinks the climate is going to get worse she said “In my opinion yes, it's going to get worse due to the deforestation, around here no one respects it” referring to the laws that mandate farmers must keep a percentage of their property forested. She was drawn to agriculture twenty-five years ago because it gave her a way to provide financially for her family, but now climate change is threatening her livelihood.

A.4: Community Council Secretary Camilo

“I consider myself an environmentalist. Since I was a boy my dad taught me to love nature and take care of it because he always told me ‘it's a living thing, the trees are living things. They don't speak or walk but they breathe, eat and they also give us what we need to eat’. Those are things when you are young that stick with you and you carry on with you”.

Camilo has been living and farming in Caazapa for the past five years. He is a member of a community council made up of 40 families. Their mission is to support farmers to provide more stability for their families through the sustainable production of their own food. They also work on community development projects like building a community center and providing subsidized farming equipment for their members. Camilo is the Secretary of Infrastructure of the council but also owns his own storefront where he sells the tomatoes and peppers grown in his home garden. He grows a lot of other vegetables in his garden as well as mandioca, corn and beans for home

consumption. He is very dedicated to organic production and environmental protection, and recently expanded his tomato production from his home garden to a larger plot of land owned by his brother. A DEAG agent connected him to the same departmental school lunch program that Zulma is a part of. Now he is able to sell his tomatoes to the state for 4,500 Guaranies (.75 USD) a pound, where before at his store and through local markets he was struggling to earn 3,500 (.55 USD) a pound. Although it seems like a small amount the stability of that .25 cent increase has meant a lot for his family especially when the cost to grow one tomato plant is 2,800 Guaranies (.45 USD). He is hopeful for more income opportunities in the future as he sees the Council moving towards being able to provide the space and equipment so its members can make value-added products like tomato preserves, sauces and paste.

Through his connection to the community council, Camilo has received seeds as well as trainings on how to harvest and store them properly from DEAG agents in the past, but currently the council is working on a project with PRODERS. For political and resource distribution reasons a farmers organization cannot work with more than one agricultural technician at a time. Each farmer in the council received one-hundred and ten pounds of cover crop seed as well as tree saplings. Camilo has used the cover crops as a living mulch and soil recuperation in his fields. He saves the lacuna bean seeds but wants to start using sunflowers and lupin as well so he can use the excess seed to feed his animals. The seeds for his field crops were first acquired for free from his neighbors who were growing varieties he liked. “Organic [seeds] are more difficult to find here in the agrovets”. Since they are heirloom varieties, he has been saving them every year, slowly increasing his production scale. He saves his seeds mostly in two-hundred- and-twenty pound silos mixed with wood ash to prevent humidity damage as well as a deterrent for bugs. Wood ash is

readily available as Camilo’s family cooks over a wood burning stove. “It is a practice that we receive from our parents”.

The seeds he uses in his garden and for his commercial production of tomatoes are hybrid seeds and he buys from the local agrovet. He saves these seeds and replants them for a few planting cycles until they stop germinating. He saves these seeds in paper envelopes, ceiling them in plastic bags. He stores the seeds for three months before planting them to maintain a constant yield. Generally, the seeds have been of good quality, however, “there are seasons when [the seeds] are very good but they aren't good reproducers. Once I bought seeds and they were very nice, very healthy seeds, and I planted them and only some, around 10% germinated... I've heard of others having the same experiences also. Usually this means they aren't certified seeds and seeds they bought the year before”. Even when he does have good germination rates, he’s had issues with his production, especially in the last growing season. He noticed with many of his neighbors the low germination rates of their mandioca crop, he thinks it was because of the drought they had during planting season. Drought, especially at the beginning of a growing season, can drastically slow the germination process, changing harvesting schedules, or losing harvests all together.

He has noticed that in the last 5-10 year the temperature has gotten hotter. He says before it would only reach 40 degrees C at the end of December, beginning of January but now as early as October they are having weeks of 42 degrees Celsius. He has also noticed the effects of La Nina and El Nino are more drastic. “If it rains it rains a lot, if it’s dry, it is very dry... Last year we almost didn't have any production of vegetables in the family gardens because there were 22 days of rain. The sun didn't come out and ruined the seeds because the plants that germinated did not develop and they lost everything. But droughts are more prejudicial for a farmer than rain. When it rains something grows, you have the hope that your crop will grow, but when it's hot, there isn't a

possibility that your crop will grow”. He's not sure if the climate will keep changing for the negative in the next five years. He thinks it depends on how people decide to react. “One person should also do their part to have an impact on a global level”

Although he tried to be as organic as possible, he does use some chemical pesticides sometimes when organic methods don't work. He believes that using chemicals in part of production saves time, which in turn saves money but it is not worth it for the chain of negative reactions that follow.

“I used then and one day I decided to not go back to using them because I saw the environment that was agonizing and so even if it's just in my small plot of land, not use, or if I use, use in a conscious way...it's my conscience that doesn't permit me to poison the food...even though sometimes it's hard, right, not having enough time and for the facility that conventional growing gives us, but we keep going”.

He believes that seeds have a principal role in sustainable growing methods because bad management of seeds means bad production, he thinks this needs more workshops also. The importance of seeds, so people understand the impacts of what they have been doing and taught to do for years instead of just doing them. He also believes if farmers had more training on how to manage a farm that produces enough for the family's needs while also having a cash crop that can be used to invest in other elements of the family's life like health care or education. Also thinks this is directly tied into saving seeds, because if someone doesn't plan accordingly, they could lose their whole crop one season due to climate and not have anything to plant in the next growing season.

Appendix B: Participant Informed Consent Forms

Title of the Study: The Politics of Seeds in a Paraguayan Context

Researcher’s Name: Maeve Mallozzi-Kelly

I am a School of International Training (SIT) student, and Peace Corps Agriculture Volunteer conducting this research as part of my master’s thesis.

You are invited to participate in this study. Your participation is voluntary and anonymous. Please read or listen to the information below, and ask questions about anything you do not understand, before deciding whether or not you would like to participate. If you decide to participate, you will be asked to sign this form and you will be given a copy of this form.

PURPOSE OF THE STUDY

The purpose of this study is to understand how policies about seeds in Paraguay are implemented and how they affect small scale farmer’s access to seeds. By conducting these interviews, I am hoping to learn how these policies affect farmer’s ability to grow their production and how it affects their ability to adapt to climate change.

STUDY PROCEDURES

Your participation will consist of engaging in an interview about where you access your seeds, what the quality of those seeds are, whether or not you save seeds, and how you’ve seen the climate changing in your region over the past ten years. I will ask you to take pictures of your farm (not of people) in response to three interview prompts. I will not ask for video recordings, but the interview will be audio recorded over voice messages on WhatsApp only to limit the potential of any misunderstanding due to language barriers.

POTENTIAL RISKS AND DISCOMFORTS

There are no foreseeable risks to participating in this study and no penalties should you choose not to participate; participation is voluntary. During the interview you have the right to refuse to answer any questions and you may discontinue participation at any time.

POTENTIAL BENEFITS

There are no specific, anticipated benefits to participants in this study.

CONFIDENTIALITY

Any identifiable information obtained in connection with this study will remain confidential. No one’s name will be used when presenting the information gathered during the interviews.

I may wish to quote from the interview within the written paper resulting from this work. If you agree to have part of your interview quoted a pseudonym (fake name) will be used in order to protect your identity.

Initial one of the following to indicate your choice:

_____ (initial) I agree to be quoted under a pseudonym in the presentation of this research

_____ (initial) I do not agree to be quoted in the presentation of this research

The only people who will have access to this research during and after it is presented will be me and my academic advisor Kelly Teamey. No one else will be allowed ownership over the research. This research will not be shared in any other contexts.

PARTICIPATION AND WITHDRAWAL

Your participation is voluntary. Your refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may withdraw your consent at any time and discontinue participation without penalty or concern.

“I have read the above and I understand its contents and I agree to participate in the study. I acknowledge that I am 18 years of age or older.”

Participant's signature _____ Date _____

Researcher's signature _____ Date _____

If you have any questions or want to get more information about this study, please contact me

WhatsApp: +1 5743105553

Email: Maevekelly6@gmail.com

Appendix C: Interview Question Guide, in English

C.1: Farmers Interview Guide

1. How long have you had your farm? / How long have you lived here?
2. Are you a member of a committee or cooperative?
3. What do you grow?
4. What do you sell? / what is used for home consumption?
5. Have you had to change what you grow in the past 5-10 years?

6. Where do you generally get your seeds?
7. What kind of quality are the seeds?
8. Do you notice a difference in quality of seeds depending on the year or where you buy them?
9. Do you use green manures in your field?
10. What time of year do you receive/buy seeds?
11. Do you save your seeds? – from what plants?
12. How do you store your seeds?
13. Do you sell any of your seeds?

14. Do you have a home garden?
15. What do you grow?

16. Where do you get your seeds?
17. Do you save your seeds? – from what plants?
18. What kind of quality are the seeds?
19. Do you notice a difference in quality of seeds depending on the year or where you buy them?

20. Have you noticed a change in the climate/weather patterns in the past ten years?
21. What changes have you observed?
22. Have they effected your crop production? How so?
23. Do you expect the weather to continue changing in the next five years?
24. How do you think it will change?
25. Do you feel prepared to deal with those changes?
26. What do you need to feel prepared?

C2: Interview Guide for DEAG Agents

How many producers do you work with?
How long have you been working in this region?

What garden seeds do you provide?
Where do you source these seeds?

What field crop seeds do you provide?
Where do you source these seeds?

Do you distribute green manures?
To how many farmers?
Where do you source these seeds?

Do the seeds that you have access to change from year to year?
What do you think are the main obstacles to development for farmers in your region?
Do you think access to seeds has an effect on their ability to have a stable production?

Have you noticed a change in the climate/weather patterns in the past ten years?
What changes have you observed?
Have they effected crop production? How so?
How has it effected the producers you work with?
Do you expect the weather to continue changing in the next five years?
How do you think it will change?
Do you feel prepared to deal with those changes?
What do you think farmers need to be prepared?

C.3: Interview Guide for Government Workers

MAG

How does MAG work with SENAIVE?

How do you identify seed suppliers?

Do all of your suppliers meet with SENAIVE’s commercialization standards?

How do you store your seeds?

What is your process for seed distribution?

What are the biggest issues you see with access to quality seeds in Paraguay?

What do you see as the biggest obstacle to growth and stability for Paraguayan farmers?

IPTA

What is your overall goal with your seed production projects?

Do you have different standards for hybrid vs non-hybrid seeds?

Do you sell seeds domestically or internationally?

Is it difficult to compile with SENAIVE’s seed certification standards?

How many Paraguayan institutions sell seeds under those standards? – do you feel in competition with any of them?

Can you show me how you monitor and process your seeds before you sell or distribute them?

What other national organizations are you connected to?

Do you work directly with small scale farmers?

What are the biggest issues you see with access to quality seeds in Paraguay?

What do you see as the biggest obstacle to growth and stability for Paraguayan farmers?

Appendix D: Interview Sample

D.1: Ña Zulma

Spanish

M: Ah bueno ya entiendo, muchas gracias. ¿Entonces hablando solamente de tu producción que siembras? ¿Que cultivas? ¿Como para vender y también por el autoconsumo de la casa?

NZ: Si en la huerta yo tengo zanahoria, lechuga, repollo, rabanito, remolacha, tengo tomate también locote, lechuga, todo, todo tengo en la huerta y en la chacra tengo para el consumo hay mandioca poroto maní maíz hay arveja, de todo

M: Que guapa. Muchísimo ¿entonces que será para la venta y que es para el autoconsumo? ¿Es como todo en la huerta es o la mayoría en la huerta es para vender en la feria y en la chacra todo es para el autoconsumo?

NZ: Si un poco vendemos de la huerta y también yo consumo y de la chacra también se vende. Maní se vende, maíz mandioca también se vende, pero todo como autoconsumo también

M: ¿Y lo que vendes, vendes todo allí en [REDACTED] como parte de, del grupo de feriantes o también venden en otros pueblos como grupo o solo es en, en [REDACTED]?

NZ: Si vendemos en la feria y también los feriantes estamos dando para el almuerzo escolar toda la verduras y frutas y poroto también y toda la verdura entra en el almuerzo escolar y también en la feria vendemos

English

M: Ah ok, I understand now, thank you. So, speaking solo about your production, what do you sow? What do you cultivate? What is to sell and what is for home consumption?

NZ: Yes, in the garden I have carrots, lettuce, cabbage, radishes, beets, I have tomatoes, also peppers, lettuce, everything, I have everything in the garden and in the fields to eat I have mandioca, beans, peanuts, corn, there's peas, everything.

M: How hard working. Thank you. So, what is for sale and what is for auto-consumption? Is it like the whole garden or the majority of the garden is to sell at the market and the fields everything is for auto-consumption?

NZ: Yes, we sell a little bit from the garden and I also eat some, and the fields are also to sell. Peanuts are sold, corn, mandioca we also sell but everything is for auto-consumption also.

M: And what you sell, do you sell in [REDACTED] as part of, of the farmers market group, or do you also sell in other towns as a group, or by yourself in [REDACTED]?

NZ: Yes we sell at the market and also as members we give to school lunches, all of the vegetables and fruits and beans also, and all of the vegetables go to the school lunch, and we also sell at the market.

D.2: DEAG Interview

Spanish

M: Porque eso es mas enfocado en las semillas, ustedes distribuyen semillas de la huerta a todos los, ¿a cada comité con quien trabajas?

A: Si, nosotros tenemos una coordinación con la municipalidad y ellos nos provean las semillas. Compran la municipalidad y distribuimos, en mi caso a los 102 productores con quienes trabajo, a la totalidad, las semillas, tanto semillas de hortalizas en cuanto para la huerta y también hemos

conseguido semillas de abonos verdes de invierno principalmente para parcelas demostrativas de la gobernación.

M: Entonces eso de las semillas que vienen de la municipalidad ellos tiene que pedir por la gobernación o por la oficina allí en MAG en Asunciones?

A: No, nosotros como técnicos elaboramos una nota dirigida a la intendenta y allí ya mediante la secretaria de producción que tiene la municipalidad nos proveen las semillas de hortalizas y la gobernación de la misma manera los técnicos elaboramos una nota solicitando las semillas y de allí nos proveen para las parcelas demostrativas de abonos verdes de invierno principalmente avena y también se consiguió mediante esta coordinación de la secretaria de producción de la municipalidad y la DEAG de [REDACTED] obtener semillas de abonos verdes del verano. Te hablo de el año pasado para semilleros cuales vamos a disponer ya este año. Los productores ya cuentan con sus propias semillas digamos

English

M: Because this is more focused on seeds, you distribute garden seeds to all the, to each committee you work with?

A: Yes, we have a meeting with the municipality, and they provide us with the seeds. The municipality buys and we distribute, in my case, to the 102 farmers with whom I work. In totality, the seeds, so many vegetable seeds for the garden and we have also received winter cover crop seeds, principally for demonstration plots for the department.

M: So, of the seeds that come from the municipality, they have to send a request to the governors office or to the MAG office in Asuncion?

A: No we as technicians write a note directed to the mayor and then through the secretary of production the that municipality has, they give us the vegetable seeds and the department, in the same way the technicians create a note soliciting the seeds and from there they give them to us for the winter cover crop demonstration plots, normally black oat, and we also received, through this coordination with the municipalities secretary of production and the DEAG of [REDACTED], obtain summer cover crop seeds. I'm talking about last years seedbeds that we are going to distribute this year. The farmers will then count on their own seeds, as we say.

Appendix E: Research Time Frame

In November of 2018 I started writing my research proposal. Before I could get it approved by SIT's IRB committee I had to receive local IRB approval. I worked with the Peace

Corps staff to identify and request a IRB committee to look at my proposal, however, the Peace Corps staff was in the middle of developing a new framework for the agriculture sector and did not have the time required to help me identify and connect with a local IRB committee in a timely manner. I received IRB approval from The National University of Asuncion, Caazapa in September of 2019, and received IRB approval from SIT that same month. I then had between September and November to contact potential interviewees and conduct as many interviews as I could. I completed three interviews and was able to identify and connect with all other interviewees. However, my service ended in November of 2019 and I had to return to the United States. Between November 2019 and February 2020, I enjoyed reconnecting with my family and thought about how to go about doing the interviews that were still missing from my research. In Paraguay the holiday season, which is during their summer months, last until February were schools as well as many government offices closed down, so I was waiting until February to reconnect with the people I had originally connected with. However, in March the COVID-19 spread globally and I took some time to readjust and re-design how to finish conducting the interviews over a virtual platform while being considerate of the interviewees time and energy during the pandemic. In April I was able to conduct the rest of the interviews over WhatsApp and email, concluding the last interview in July of 2020.