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**GROWING RESISTANCE: AN ECOFEMINIST ANALYSIS OF SEED
SOVEREIGNTY IN XOY, YUCATÁN**

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ABSTRACT

Despite political-economic pressures to adopt hybrid seed (Chambers and Momsen, 2007), the Maya of the southern Mexican state of Yucatan have managed to preserve indigenous maize varieties (Gonzalez-Valdivia et al, 2016). They have accomplished this through ancestral seed saving practices, participatory plant breeding and seed exhibitions (Llanes-Ortiz, 2015). This achievement is doubly-complicated by the tension between Maya subsistence agricultural traditions, high social and economic vulnerability in the region, and local government plans to commercialize agriculture (Plan Municipal de Desarrollo de Peto Yucatan).

The survival of indigenous seed has important implications for the genetic diversity of maize, economic and climate resilience, and Maya sovereignty of cultural plant genetic resources (Bellon, et al. 2015). Few studies have examined the role of Maya women in the maintenance of traditional landraces, particularly in opposition to the challenges posed by climate change and rapid commercialization. However, a gender analysis fits this context given the endemic division of agricultural labor between men and women (Lope-Alzina 2007; de Frece and Poole 2008). This thesis examines the roles, motivations, and successes of Maya women and men in maize agriculture and seed saving, as well as how social stratification by gender moderates food sovereignty in the region. Its analytical frame integrates ecofeminism into critiques of the political-economic, technological, and social relationships between humanity and agriculture introduced by teleological modernity, and explores alternative approaches to food production, community development, and the sciences thereof.

Using an ethnographic case study comprised of participant and non-participant observation and semi-structured interviews sited in Xoy, Yucatan, I find that while men overwhelmingly dominate the labor, decision-making, and activism of seed saving and renewal,

there are several moments throughout the maize and seed lifecycle in which women intercede, and their participation in the cultivation, processing, and saving of seed is necessary for it to endure. Discrimination by gender undermines local efforts at seed sovereignty—women occupy a key position in the viability of native seed conservation, providing a social glue that helps to maintain Xoy's cultural practices, knowledge, and very existence.

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LIST OF ABBREVIATIONS

CIMMYT - International Maize and Wheat Improvement Center; Centro Internacional de Mejoramiento de Maíz y Trigo

MAP – Mexican Agricultural Program

HYV – High Yield Variety

PGR/PGRFA – Plant Genetic Resource for Food and Agriculture

TEK – Traditional Ecological Knowledge

IP/IPR – Intellectual Property Rights

GM/GMO – Genetically Modified Organism

LVC – La Via Campesina

PRI – Institutional Revolutionary Party; Partido Revolucionario Institucional

NAFTA – North American Free Trade Agreement

FAO – Food and Agricultural Organization of the United Nations

CGIAR - Consortium of International Agricultural Research Centers

OSSI - Open-Source Seed Initiative

FPE – Feminist Political Ecology

NGO – Non-Government Organization

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Key Terms

Food sovereignty (LVC):

- The right of communities to determine their agricultural practices, policies and foodways free from coercive third parties;
- The right of peasants to farm and of consumers to choose, each having the resources necessary to carry on doing so;
- The linkage of food prices to their true cost of production;
- The recognition of women farmers' rights

Decoloniality: A process to undermine dominant narratives stemming from Eurocentric colonialism that define our epistemological commitments and understandings of political economic norms, laws, and institutions (Ortega, 2018)

Landrace: A local breed improved through indigenous agricultural practice

Native variety: subsets within families of landraces that are bred at the local level

Agrobiodiversity: agricultural biodiversity

Ejido: a piece of land farmed communally under a system supported by the state

Ejidatario/a: one of the holders of land in an ejido; a member of the ejido

Milpa: a small field that is cleared from the forest, cropped for a few seasons, and abandoned for a fresh clearing. Generally, maize is intercropped with other species, such as legumes, cucurbits, tubers, tomatoes, etc.

Milpero/a: A farmer, generally male, who works on and controls a milpa

Comunero/a: Family member of an ejidataria/o, granting them free access to the ejido lands

In Situ: "situated in the original place," "on site"

Ex Situ: "off-site," often in a germplasm bank

CHAPTER 1

Introduction

Arriving to the Mayab, or the geographies of Maya history and culture in Mexico, it does not take long to read the signs of Maya “mystique” (Harbor, 2017) that intersperse tourist zones, roadways, and even the Cancun International Airport. As the ADO bus leaves the airport and passes through the city, “famed as a site of the worst excesses of scorched earth tourism development,” (Galvez 2018, 31) the “hyperdevelopment” (ibid) manifest in high-rise hotels, recognizable restaurants and stores from the United States and Europe, and lawns and roadways manicured in the English tradition is undeniable. But one also sees Maya hieroglyphs made of concrete incorporated into these new constructions, local vegetation like the china tree, chaya bush or ramón tree planted by sidewalks, and small temples dedicated to *aluxes*, or miniature mythological troublemakers, who can be deterred from making mischief on these construction sites with a gift of cigarettes.

The contradictions and conflicts between neoliberal modernity and indigenous Maya tradition center the problematic discussed in this thesis, and the solutions proposed to redress it. As I travel westward toward Mérida, the presumed home of Maya mestizaje, and then to the study site of Xoy, a Maya peasant community, these contradictions do not become any less apparent. Cancun remains a fixture in the dynamic of peasant communities facing agricultural modernization, international trade, and genetic appropriation. Yet despite global pressures to increase productivity and to abandon traditional ways of living with and through nature, farmers in this region have maintained a wealth of ancestral agricultural knowledge and native maize growth. Many farmers dedicate the strong majority of their milpa space to native varieties, forgoing the available hybrid seeds (Fenzi et al, 2015). These farmers have demonstrated a

resilience and resistance to the modernized way that begs the question: why modernize? The *milperos* have demonstrated and continue to demonstrate every day the sustainability of a way of life and way of knowing about the world that can trace its roots through generation upon generation. This way of knowing is not only valuable in and of itself, but it provides evidence for the effectiveness of living in a mutual existence with culture and nature. Despite decades of global pressures from capitalism, climate change, land loss, and an ever-decreasing sovereignty and agency over one's world, many of these *milperos* continue their way.

As these global forces act upon the landscape of Xoy, many locals of Xoy, or *Xoyenses*, through processes of depeasantization and proletarianization, will find themselves living and working in Cancún or other metropolises in the Yucatan Peninsula and abroad—no longer able to maintain a life in their hometown. Some however will remain, resisting global political-economic and environmental forces built to displace them. Often, the *Xoyenses* that stay behind will be women, carrying on the household while their spouses or family members seek employment elsewhere. In so doing, they carry on the agricultural and culinary practices and native maize seed that co-constitute one another. This thesis explores the nature of resistance to global structural forces that undermine Maya agricultural practices and Maya seed, and the gendered components of both the challenges facing Xoy and the community's responses to those challenges.

Chapter Overview

Chapter 2 follows this section and introduces key cultural and historical elements experienced in Xoy. This will aid in setting the stage for a discussion of why the other ways of knowing possessed by these farmers are so important. The historical component will discuss the ebb and flow of relationships that the Mexican federal government has had with indigenous and

peasant farmers throughout the past century, and will discuss the steady and at times sharp declines in agrobiodiversity that have emerged from that relationship. This chapter will additionally discuss and define the importance of the *milpa* and begin to discuss the role of gender within agriculture within the context of Mexico.

Chapter 3 investigates the literature existing within topics relevant to this exploration including agrobiodiversity, the issues of technological fixes, the need for food and seed sovereignty, and how an ecofeminist approach may further inform attempts to reconcile the modern and colonial damages caused in the Global South. This section pulls upon a wealth of literature spanning diverse but deeply interconnected themes and attempts to frame them within their applicable context to Xoy.

Chapter 4 frames the research questions I brought to my fieldwork and explains the processes taken to complete that fieldwork. This will include a detailed description of not only the study site, but the procedures and media used for data collection during 2018. This chapter will include snippets from interviews, conversations, and passing interactions with my Xoyense hosts – with careful attention to providing their own words and understandings of the world they live in.

Chapter 5 follows, attempting to synthesize the qualitative reports I gathered and apply them to my research questions. Data is carefully considered in how it directly and indirectly informs these questions, but also how it may illuminate the context for how these findings should be understood. This thesis finds that while men do tend to hold control over the labor of regenerating native maize seed throughout its life cycle, including in the selection of maize seed, women participate in key aspects of the crop life cycle, making their principal contribution in the processing of the maize grain into tortilla and other food products. Findings also point out

departures from these norms, in which women, most often single women, take control over the seed selection and cultivation of maize as well as its processing, and in which men participate in ceremonial preparation of food for holiday events. This section also discusses factors that affect seed and varietal selection, key among them seed availability as well as relative productive intensity of the crop. Finally, this section discusses the possibilities for native seed conservation into the future, looking at assets such as land tenure and nascent organizing projects, and limitations such as poverty and environmental pressures, which undermine organizing efforts, and increase out-migration and subsequent erosion of local knowledge.

Finally, Chapter 6 bridges the results of this analysis and existing literatures in its conclusion. Findings add nuance to existing literature on gender and agrobiodiversity by engaging with the notion of the feminization of labor in the particular context of Yucatan. Additionally, this work introduces decolonial and Other or indigenous ways of knowing to the concept of technological fixes and extends the current conversation between tech fixes and food and seed sovereignty by exploring the relationship between in and ex situ seed saving. Lastly, I apply ecofeminist frameworks of transcorporeality and explorations of mind/body/environment relationships to the processes of growing, preparing, and consuming native seed in Xoy. This chapter discusses the future directions of and motions toward promoting sovereignty in the Global South, and addresses limitations in the study. In this concluding chapter, I aim to demonstrate the importance of solidarity for these farmers with one another, but additionally for all of us in the united effort against the rampant overgrowth of capitalism.

CHAPTER 2

Background

Historically, Mexican agriculture has been dominated by the itinerant milpa, a system of swidden, rain-fed agriculture known mainly for its “Three Sisters” intercropping method, which grows maize, beans and squash together. Maize sprouts first, takes nitrogen from the soil and provides scaffolding for the beans to grow, beans climb up the maize stalk and replace the nitrogen used by the maize, and squash grows on the ground, forming a natural mulch (Perez Garcia and del Castillo, 2016). Agroecologists acknowledge the benefits of this system to soil quality and pest management, and this manner of intercropping has also been taken up by small-scale producers in the Global North (Letourneau, et al. 2011). But because this method forgoes what I describe as the productionist logic of commercial agriculture to scale through mechanization, it has not been taken up by large scale producers. And as Mexican agriculture has increasingly moved toward commercialization, extension agents and researchers throughout the country have pushed for farmers at every scale to embrace mechanization, chemical inputs and hybrid seed to increase productive capacity (Eddens, 2017). These changes subvert the communities where they are implemented by undermining local rights as well as food sovereignty. Food sovereignty is best understood as the rights that any people exercise to maintain their own domestic agriculture, maintain accessible and nutritious diets, as well as to regulate market access both within and outside of their communities (Ibarra et al, 2011). In the case of food sovereignty in Mexico, I aim to discuss the role of Maize.

Mexico is the world cradle of maize, and yet due to the earliest stages of the Green Revolution, which can be traced back to the early 1940s, these seeds are being appropriated and redeveloped throughout the world today. In contemporary development, maize from Mexico is

being used in Africa in a way that clearly appropriates indigenous maize (Eddens, 2017). Though the Green Revolution boasted increased crop yields, it came at the expense of agrobiodiversity and in many cases of crop and human well-being. The success and progression of these Green Revolution methods into new regions requires a homogenization of land. In this way, soil variations and diverse landscapes are ultimately lost over time. This loss causes an inability for multiple crops' growth, change, and development, fixed as they are in standardized growing environments—one of the many strengths of the itinerant milpa (Jiménez-García, 2014). The milpa, the ancestral home of native maize and its many associated crop pairings, and the space which the Green Revolution subverted, not only brings biodiversity, it brings a rich sociocultural landscape for the people who work within the milpa.

Working within the milpa is central to social life in Mexico. To understand how, one must begin by dismantling the boundaries between production and culture. I argue it is equally important to understand how the self is represented and designed from both internal factors such as goals and desires, and the external, such as environmental connections and pressures. In Yucatan, Mexico, there has been much pressure from government agencies as well as non-governmental organizations (NGOs) for rural farmers to redesign their way of life to better fit production, but this lacks a sufficient consideration for the identity of these farmers as well as for their understanding of their place in the world (de Frece and Poole, 2008). For these peasant farmers, a viable lifestyle is not one that brings about the most economic growth or investment – rather their lives are more concerned with what connects them to a cyclic shared identity: an identity attached to their history and the history of the community. The milpa plays an integral, if not keystone, part in this identity, and the replacement of this system in exchange for higher economic gain is nonsensical through this lens (Poole et al, 2007). This breeds the identifying

term *Milpero* – a term used by many Maya peasants to identify a certain way of life and lineage connected to the milpa. For milperos, the milpa is not simply a job or a source of sustenance, it is the way of life that the Maya have always known.

The milpa also extends its social graces to the household. For many, a good milpero is the prime quality in becoming a head of household. Being a hard worker in the milpa and being able to provide through that hard work is a defining quality of masculinity and therefore a key trait in establishing a marital relationship (de Frece and Poole, 2008). These ways of working are passed through generation and between households as a way of strengthening the community. Indeed, many use these relationships as ways to establish lasting bonds that can be relied on in times of hardship, a social advantage that is lost within a more individualized, high production world.

The milpero culture permeates all life in Xoy, not only culturally and in its habitus, but in the life, workflows, and relationships with the natural environment and non-human world, including with farm animals. In Yucatan, it is standard practice to keep a connection with a village dog. This dog is different from a contemporary understanding of a household pet, and instead is understood as a trusted companion whose main duties may involve guarding the home, the solar (a garden plot that may include a coop, fruit trees, or vegetables), or accompanying hunts. Plata and Montiel (2020) describe yet a 4th role for these dogs: sentinel in the milpa. Their findings suggested that nearly 1/4th of the peasant-farmers articulated getting their dogs for the purpose of driving other animals out of the milpa. In this way, the milpa serves to build a unique human-animal connection.

While the milpa is the space of the masculine, the fruits of that labor are passed along to the women, who in turn also find a cultural heritage through it. To fully frame the importance of the milpa to culture, it is important to include the importance of the tortilla. The knowledge of

tortilla preparation is women's knowledge (Lind and Barham, 2004). This preparation is not just a chore one suffers through but is a highly symbolic practice connecting the people to the Maya origin story. Fussell (1999) explains that, "even today, every time a Maya housewife in the Yucatan or in Chiapas or in Huehuetenango cooks a tortilla on her *comal* she is linked to the twin hearths of creation, one in the earth's navel and the other in a constellation of stars" (Fussell, 1999,45). The milpa is upheld as sacrosanct; it not only connects the people to their survival, it connects them to their past, to their partners and alliances, to their creation and to their eventual end. The milpa is a pillar of Maya culture, but the agrobiodiversity it begets by virtue of intermixing crops, flora, fauna, insects, and flowers holds longstanding effects for the rest of the world down the food commodity line. In turn, the monoculture system being forced is only sustainable for a small number of crops and overexploits soil and water systems, creating nutritional generation loss that leaves consumers down these chains malnourished despite being well fed. As important as the milpa is for the Maya people, the polyculture method of intercropping is one important to the survival of us all.

According to the Food and Agricultural Organization of the United Nations, (FAO) plant genetic resources form the biological basis of food security (2017). Directly or indirectly, they support the livelihoods of every person on the planet. The conservation and sustainable use of Plant Genetic Resources for Food and Agriculture, (PGRFA) hitherto referred to simply as "agrobiodiversity," is necessary to ensure crop production, particularly in the face of climate change, environmental degradation and shifting economic or market pressures. This provides farmers with a measure of economic and environmental resilience amidst these changes.

Agrobiodiversity ensures the continuation of agricultural activities in an ever-changing world. Yet 95 percent of human nutrition derives from 30 plants (Mooney, 1980). "Modern

agricultural history is, at least in part, a history of declining food variety...” (Mooney, 1980). As the United States, Canada, Europe and Australia increasingly synthesize agricultural production to dwindling varieties of a few cereals and horticultural crops, these nations increasingly rely on the Global South as a store of crop genetic diversity to ensure productive resilience in the face of environmental shocks, (climate events, pests, or pathogens) (Mooney, 1980) or political and economic upheaval. Due to the large amount of maize produced in Mexico, especially after the reformation inherent to the Green Revolution, these nations have turned to Mexico as a place to convert into a land of hyper production and crop oversimplification.

Genetic erosion of maize throughout Mexico has decreased the quantity and quality of indigenous landraces¹ throughout the nation. In a cross-sectional longitudinal analysis of maize genetic diversity in Mexico, Dyer, et al. (2014) found notable decreases in the use of particular maize landraces, particularly in Central and Northern Mexico, and in lowland areas (Dyer et al. 2014). As discussed above, this negatively affects farmers’ resilience to environmental or economic shocks. For example, as rain patterns become more irregular, farmers rely on diverse maize varieties with varying lifecycles from planting to maturity in order to stand the greatest likelihood of successful yields (Gonzalez-Valdivia et al, 2016). In contrast, commercial hybrid varieties require more rigid growing conditions, reducing farmers’ flexibility as weather patterns become more erratic. Moreover, given that indigenous maize varieties have been bred to fit the

¹ One researcher at the CIMMYT germplasm bank (the largest gene bank specially-designated for maize and wheat) gave the most helpful way to conceptualize of landraces; Landraces are a constructed category to organize different types of the same plant, when bred. As such, landraces are similar to pure-bred dogs—they are categorizations of plants based completely on their conformity to an agreed-upon phenotype. Only native seeds are designated as landraces (interview with CIMMYT germplasm bank researcher, 2018).

requirements of the local ecosystem, they require fewer inputs and grow more easily than exotic hybrid seed (Bellon and Hellin, 2011).

I. The Yucatec Maya

1.A. Description of the Maya Milpa and Solar and its Gendered Components

The Yucatan peninsula is characterized by difficult growing conditions. Its soils are rocky, and the layer of topsoil is thin. By intercropping within the forest, farmers produce a diversity of plants and fortify their crop against diseases, pests or drought that may wipe out a particular species. Yucatec farmers also mix wild-growing plants with cultivated produce in their diets. Over-harvesting of wild tubers, leaves, and fruits common to the community is taboo. By practicing slash and burn agriculture and allowing for long fallow periods, soils can regenerate without the addition of commercial, chemical fertilizers (Bello-Baltazar and Lugo, 2002). In fact, some farmers allow their fields to rest for as long as 50 years. However, economic pressures to increase production and ecological pressures such as drought and soil erosion have decreased fallow periods substantially (Xolocotzi, 1988).

A tradition of in situ seed saving persists in the Maya solar, which is effectively a large garden plot in the backyard that may also contain small animals such as chickens. This tradition further allows farmers to share seeds through kinship ties, allowing for access to seed even in the event of seed or crop loss due to extreme weather events. In these situations, seed is kept in storage containers in the family's solar. However, in these seed exchanges, unregulated storage and dissemination of seed can lead to the spread of disease, or to mixing up or improperly labelling varieties (Dzib-Aguilar, et al. 2016). This improper labeling or mixing can be devastating when certain seed selections are intended but are not made properly, leading to poor harvest as well as misuse of seed generally.

In *Gendered Production Spaces and Crop Varietal Selection: Case Study in Yucatan, Mexico*, Diana Lope-Alzina (2007) outlines the selection criteria of two indigenous maize varieties from Yucatan, Mexico. In this case study, women overwhelmingly chose and saved seed considering post-harvest management, ease of culinary use and cultural value. By contrast, men chose seed based on agroecological and production criteria. (Lope-Alzina 2007).

This article further illuminates the gendered divisions that exist within the agricultural realm of these farmers. These selection criteria should not be taken as evidence in support of gender essentialism; rather, they demonstrate the stark divisions in labor that arise because of this essentialism. “Thus, gendered knowledge and the gender division of labour reinforce each other and are the basis for negotiations between men and women in crop varietal selection” (Lopez-Alzina, 2007). It may appear at first glance that the women’s selection criteria relate to cooking and other household labors as well as aesthetics, but rooted within these are household longevity criteria as well. For example, the ease of grain milling selection saves the household money by allowing for degrading at home as opposed to paying to use the community mill. Lope-Alzina also articulates stages in the life cycle of local maize in which men and women farmers in Yucatan tend to engage with the plant.²

Although commercial seed hybrids and climate pressures have diminished the quantity and quality of Maya seed elsewhere in the region (Gonzalez-Valdivia, et al. 2016), both the use and valorization of that seed have endured in the rural research site proposed for this study – the village of Xoy (Llanes-Ortiz, 2015).

² For greater elaboration of Lope-Alzina’s findings on gender and seed selection criteria, or gender and interactions with maize, refer to table 3 and figure 3 in *Gendered Production Spaces and Crop Varietal Selection: Case Study in Yucatan, Mexico* by: Diana Lope-Alzina (2007).

II. A Look at Mexico

2.A. The Green Revolution in Mexico and Technological Causes of Agrobiodiversity

Loss

The battle for agrobiodiversity is twofold; to one end, food production ought to satisfy the needs of the people via nutrition and accessibility. To the other end, agrobiodiversity is a naturally occurring resource that we have demolished via hyper-productivity. Prescott-Allen and Prescott-Allen (1990) stated that 90% of the energy humans gain from food comes from only 82 different crop species. This number should be contrasted with the nearly 13,000 edible plants available to human societies (Kunkel, 1984). The availability of these other plants is being choked by large agroindustry that has committed large scale land use change in order to further promote development and production of the few easily manipulated plant genes.

Problematically, the fixation on these small number of crops has additionally caused a loss in their genetic variation. Normally, as smallholder farmers reproduce their crops, there is much cross pollination and mutation that serves to strengthen the genetic background of the crop. In the case of the milpa, the three sisters all grown together serves to benefit the genetic strength of each one as each develops resistance to the pests and parasites of the other and strengthens competitive advantage, along with additional genetic mutations coming from wild relatives and pollinators (Qualset et al, 1995). In monoculture growing setups where focus is on high yield, these factors are missing and in turn the crops end up suffering. The Green Revolution and its discursive and research-based legacies represent the newest wave of agrotech advancement, but it does not consider the full scope of its effects, trading long term stability for short term output.

There have arguably been three key technological revolutions in food production in agriculture's 10,000-year history: In 8000 BC, humanity domesticated plants and began to

establish human settlements; in 600 AD, societies developed agricultural technology such as the horse-and plow; and in the 20th century, farmers used mechanization, chemical inputs, and then biotechnology to drastically increase surplus production (Harper and Siller, 2015). The Green Revolution extended the 20th century processes of mechanization that had taken place in the Global North to the South by championing the same notion of “technological fixes” (Drengson, 1984) to increase the productive capacity of smallholder and peasant farms. Researchers and extension agents commonly advocated for the incorporation of farm machinery, hybrid and then genetically modified seed, and agrochemicals, often disseminating these inputs and tools in technological “packets.” The “packet approach” to agricultural technological development purposively engineered seeds and chemicals that would support and constitute each other and fail without their complements (Mooney, 1980). However, the pesticides, herbicides and fertilizers caused a financial burden that could only be met (often barely so) by profits from increased yields. Increased productivity in this way became a snare for these farmers; they were promised higher yields, but this came at the exchange of their sustainability and free income.

Yet once extension agents, researchers, or development practitioners left the field, withdrawing their training and support, smallholder farmers often found themselves trapped in a technological treadmill, but without the resources to keep up with it. For example, improved seed, designated as such due to bred traits like high-yield or disease resistance, quickly becomes prohibitively expensive for subsistence and smallholder farmers, given either loss in hybrid vigor that occurs after one season in commercially bred hybrid seed varieties, or genetic use-restriction technology in transgenic seed. In the process of breeding commercially intensified seed, hybrid crosses display “hybrid vigor,” resulting in high yields or other favorable traits. However, this vigor only lasts for one generation. If farmers save this commercially bred, hybrid seed, its

quality will dramatically drop off in the following planting season. This requires farmers to purchase commercial seed every year to continue enjoying the benefits of the seed (Gaalaaas Mullaney, 2015). Because this represents an impossibility for many smallholder farmers, their productivity falls behind that of larger farming operations that can afford to purchase hybrid or transgenic crops.

However, competitive advantage relative to commercial farming does not aid subsistence farmers, whose agricultural concerns center on household nutrition and financial survival amidst the economic precarity of peasant life. For them, the ability to continually save seed (for free) of plants that require fewer inputs to flourish, promises greater food and economic security during times of crisis (Badstue, et al. 2005). Seed saving of indigenous seed also forms the basis of local networks of seed exchanges, which help to form general social networks and alternative local markets (Mendoza 2004). In addition to economic considerations, many smallholder farmers simply prefer to plant local maize varieties. Each local seed is uniquely suited to meet a different ecological condition, productive need, or culinary preference (Badstue, et al. 2005). Farmers prize local seed for its ease of use and its superior taste relative to hybrid seed (Lopez-Alzina, 2007).

Given these concerns, the insistence by Green Revolution interventionists to convert smallholder farmers to hybrid seed adoption contradicts local needs and values. As such, the technology packets they broadcasted, whether knowingly or not, represent acts of violence to the smallholders. At best, these packets assume a better knowledge about seeds and their growth or conservation. At worst, these packets assert the notions of a mono-logical scientific world over those of the farmers and assume their knowledge to be too primitive to provide, and in so doing, trade a long term and permanent stability for a short-term flourish that cannot last. This leaves

these smallholders struggling economically in coming years and removes them from the insurance built into their previous system.

The Green Revolution in many ways launched its first experiments in Mexico, beginning in the 1940s when the Rockefeller Foundation sponsored the creation of the Mexican Agricultural Program (MAP). The first MAP scientists contrasted their agricultural research with the agricultural practices of Mexico's indigenous farmers to demonstrate their presumed superior agricultural knowledge. Green Revolution scientists also brought maize from Mexico and Central America to Global North agricultural researchers for research or product development (Eddens, 2019). In this process of appropriation of indigenous technology, called "biopiracy," scientists explicitly referenced the indigenous origins of native seed to depict it as exotic, othered, traditional and unchanging—a depiction that sharply contrasted the gloss of high-yielding varieties (HYVs) generated through hybridization.

In the 1960s, MAP gave way to the International Maize and Wheat Improvement Center, (CIMMYT) which became a Green Revolution hub. CIMMYT aimed to "modernize" agriculture in Asia and Latin America by training farmers to use agricultural chemicals and HYVs, and to formalize their production into the market through mechanisms such as credit. At the height of the Green Revolution, scientists perceived their role as neutral, although the presiding discourse presumed the superiority of said modern agricultural science and technology (Eddens, 2017). The empirical basis of this presumption has weakened as agrobiodiversity (and by extension the preservation of native seeds) gains increased recognition as a source of economic and climate resilience relative to less diverse HYVs (FAO, 2017). Moreover, soil erosion arising from Green Revolution packet chemical exposure becomes an increasing productive and ecological concern (Perez-Garcia and del Castillo, 2016).

Researchers commit biopiracy by appropriating genetic source material to commercially breed, patent and profit from it. Scientists commonly sample genetic resources such as seed or even human blood work from biodiversity hotspots, particularly in the Global South, without compensating the originators of this genetic material, often smallholder or indigenous producers. According to Jack Kloppenburg (2000), some geneticists justify this process by arguing that any genetic material is a common resource of humanity, ironically pirating it to create products such as hybridized seed for a profit that benefits only a very small share of humanity. Notably, indigenous peoples object to this on commercial as well as cultural and ecological grounds. They do not necessarily object to commercial seed production if granted their fair share of the benefits of their genetic source material (Kloppenburg, 2000). The political, economic, and historical role of teleologically modern science and technology in disrupting the human ecologies of Mexico forms the basis for ideologies to form around ideals of food and seed sovereignty in contrast to those of food security.

2.B. Institutional and Research-Based Encroachments on Agrobiodiversity of Native Seed

Historically, academic scholarship has favored what Eve Tuck and K. Wayne Yang term “settler colonial” understandings of science that delegitimize the ways of knowing that work with or extend beyond Cartesian logic and empiricism, ironically, while spurred to discovery by the extraction of indigenous and local knowledge and technology, raw material, or even bodily matter (Tuck and Yang, 2014). “Modernization” as a teleological understanding of human and societal development epitomizes the risks that this type of positivist epistemology can pose to indigenous communities and other(ed) ways of knowing. It posits that modernization is a linear process in which indigenous societies, cast as traditional, transform from a perceived earlier

stage of development to a modern one, namely through technological innovation and scientific discovery, individual pursuit of self-interest, and transformative rather than reproductive or regenerative labor (Rostow, 1959).

By placing indigenous communities in the first stages of a singular continuum of development, Rostow's linear trajectory positions indigenous communities in a backward or subordinate state relative to European and European descended mass (or market) society. With this comes a tacit understanding that if indigenous communities are "behind" industrialized communities, they are not "modern," and are thereby inferior and beholden to modern society. By casting development pathways to reach modernization as situated in technological innovation, Rostow argues that indigenous societies not only lack their own systems of science and technology but operate by a lower order of rationality that reproduces knowledge and materiality rather than manipulating it. As Merchant (1989) describes, this linear pathway mirrors Newtonian empirical processes; in both empirical science and linear theories of development, the world operates by singular laws, discoverable not through sensory experience but the manipulation of the material world through transcendent and transformative rationality. The epistemological assumptions that support Cartesian logic to the exclusion of embodied, cosmological, or environment-based systems of knowledge often support technological or scientific innovations to solve production shortages in agriculture (Scott, 2011). This assimilates agricultural systems into productionist and commercial systems, in which surplus production and profit become the primary goal of farm-owners (ibid).

Schurman's (2018) analysis of empirical agricultural development at the Bill and Melinda Gates Foundation (BMGF) illustrates the drawbacks this system of knowledge can have on smallholder communities at the hands of even well-meaning empirical development and

modernization projects. Here, Schurman argues that the BMGF's emphasis on abstract solutions to agricultural problems obscures contextual nuances, leading to unsustainable solutions. Its reliance on technology to fix problems leads to interventions that fail to take the whole of the problem into account, focusing instead on single variables (Schurman, 2018). Furthermore, she calls attention to the lack of longevity in these plans. There is a tacit notion permeating the BMGF that these abstract solutions ought to be efficient enough to solve problems quickly, manifest also in the foundation's lack of interinstitutional networks with local researchers, extensionists, and communities. However, when this (often) is not the case, these projects simply pack up and leave. This disrupts the natural order and often the systems at play holding issues at bay, and in turn leaves chaos in the wake (ibid).

Popp (2018) argues that indigenous knowledge can "inform" or "complement" empirical science but does not thoroughly consider the potential of indigenous knowledge and understandings on their own. Using a Traditional Ecological Knowledge (TEK) frame, Popp does not escape the presumption of the past inherent in casting indigenous societies as "traditional." This occludes the dynamism that defines indigenous knowledge (Lind and Barham, 2004) and identity just as much as occidental mappings of development and change. Indigenous knowledge presents situated, rigorous and polyvalent understandings of both local and cosmological phenomena. Depending on the indigenous system of knowledge in question, this way of thinking can provide a model for holistic and sustainable human-environment interactions (Mazzochi, 2006). Newly expanding conceptions of agricultural science and technology result from a discursive and economic process that on the one hand appropriates indigenous science (Kloppenburg, 2000), commodifies indigenous invention (Shiva, 2019), and undermines the systems of knowledge that underpin these appropriated and commodified resources (Mazzocchi,

2006), while simultaneously opening new windows into the realm of what is materially (and thus socially) possible.

Norms, laws, and institutions tend to favor approaches flavored by the same modernist epistemic approaches that put forth technology as the panacea to complex problems, yet favor capital, determining the application of said technologies. In 1980, the *Diamond v. Chakrabarty* US Supreme Court decision deemed plants patentable subject matter. The many legal challenges to this decision reinforced the legal basis for declaring plant varieties, gene sequences, and plant and seed physical material as intellectual property (IP) (Kloppenburger, 2014). Increasingly, this IP concentrated under the control of “gene giants” (Kloppenburger, 2014) which consolidate power through corporate mergers (MacDonald, 2019). Concentration has led to fewer seed alternatives for farmers that choose non-GM varieties, such that IP agreements do not discipline farmers for patent infringement as much as the dearth of competing seed companies and plant varieties. Patents also protect research technologies and breeding methods, posing a high or even prohibitive cost to gain ‘freedom to operate’ for independent breeders, especially public researchers, small seed companies and farmer breeders (Kloppenburger, 2014).

The Mexican government has also pushed for the modernization of seed. By allowing for the privatization of seed genotypes, it effectively determines who can access and control seed. In Mexico, private investment and patents in particular varieties bar the majority of farmers from accessing commercial seed without permission or payment. Ostensibly, anyone can patent a seed variety. Yet historically in Mexico, commercial interests have successfully patented seed varieties while denying ownership of the original genetic source material to the people of the geographic and cultural origins of the seed gene (Gaalaas Mullaney, 2014). This has created inroads for materials scientists to commit biopiracy as described above (Kloppenburger, 2000).

When research agencies or large-scale GM companies come “to learn” from indigenous people, they are free to simply take any plant genetic data, information, or material, and patent it as their own. This disregards the history of the plant-seed as well as any and all cultural nuance that has factored into its origination.

The widespread dissemination of agrochemicals and the switch from local varieties and their associated plants (squash, beans, and other crops) led to soil erosion, deforestation and overall greater productive pressures that would only be exacerbated by climate change shifts in rain patterns (Avalos Sartorio, 2006). This web of ecological and economic pressures proved too much for many smallholders to compete; many farmers fled to cities in Mexico and the United States in search of other work. In the process, many sold their lands to commercial farmers who worked in livestock agriculture or monocultural hybrid production (Chambers and Momsen, 2007). This phenomenon, termed in Mexico the “abandonment of the countryside,” naturally coupled with processes of proletarianization and consolidation in the agricultural industry.

2.C. NAFTA, Article 27 Reform and Structural Causes of Agrobiodiversity Loss

To grasp the impact of the reform of Article 27, it is best to begin with a history of its origin. A full description of Mexico’s land tenure history is too large for this discussion, and so a brief description will touch upon selected points of interest.

In 1910, Porfirio Diaz was elected to his 8th presidential term after jailing his opponent, Francisco Madero. Diaz controlled elections, silenced journalism, and concentrated and imposed liberal economic structures that concentrated wealth and power in urban centers. This displaced many campesino farmers, forcing them to work in feudal conditions on plantation farms for wealthy, often foreign, landowners, or led to their proletarianization in growing extractive industries--the condition which pushed the peasantry to fight alongside urbane, intellectual

revolutionaries (Womack, 1969). Upon Madero's release from prison, he called for an armed conflict to combat the corruption he had seen. Several armies, often comprised of peasant farmers and their domestic partners, took up arms, and war raged on for a decade. In 1917, prior to a complete termination of the conflict, a new constitution was enacted which contained Article 27 (Knight, 1992). Article 27 states that, "ownership of the lands and waters within the boundaries of the national territory is vested originally in the Nation, which has had, and has the right to transfer title thereof to private persons, thereby constituting private property." This not only declared all land, water, and mineral rights as property of the Mexican people, but allowed, if not mandated, the government to redistribute land from large landholders to smallholders and agrarian communities (Kelly, 1994). The Mexican Revolution and its agrarian call for "land and liberty" resulted in one of the most egalitarian Constitutions in history, and created a model for collective peasant land ownership, a legacy that neoliberalism would gradually disassemble.

In the article, "Article 27 and Mexican land reform: the legacy of Zapata's dream," J.J. Kelly (1994) outlines the process by which land tenure under the ejido system was ultimately undermined by 1992 reforms. In the 1930s during the presidency of Lázaro Cárdenas, land redistribution finally came into effect. This process had wide-ranging, if not wholesale, impacts on the region and won the loyalty of campesino and indigenous populations for much of the twentieth century (Kelly, 1994). After the stock market crash and during the subsequent depression in the United States, the PRI reoriented its export-driven economy to one of domestic industrialization based on campesino production of inexpensive food. Ejidos, collective community farms, did not require much investment at this time, so food prices stayed low. Campesino populations also provided a market for new industrial goods. The PRI further

incorporated campesinos by encouraging them to occupy and retake large, private estates and plantations (ibid).

During World War II, the presidency of Manuel Camacho brought with it a right-wing shift in governing: the economy transitioned once more to an export-driven economy to meet increased demand for produce, fibers, and textiles from the United States. Sustenance agriculture gave way to commercial agriculture to meet increased demand for export goods. Land reforms came to a halt, diminishing improvements to campesino livelihoods. Further, as prices of manufactured products rose faster than those of food, campesino farmers had to increase food production to meet the costs of living. They exploited their land to its limits and often sought wage work to supplement household income. Their efforts kept the price of food down, and thus, industrial wages. In effect, campesino agriculture provided a subsidy for industry (Kelly, 1994).

Mexico enjoyed a rapid growth in food production because of these campesino efforts, however when the Mexican government officials attempted to subsidize a change away from the now established fiber and textile exports to grains and beans there was a collapse. The failure of these subsidies to meet the needs of farmers left the government officials disappointed and spurred a criticism of the ejido system and land tenure overall, instead seeking to privatize (Kelly, 1994).

Following the 1982 debt crisis, household finances suffered even more as opportunities for wage work decreased (Collier, 1997) In desperation, the rural poor began to contract their labor to wealthy landowners in advance, which often resulted in lower wages. During the crisis, Mexico went through a period of economic liberalization, selling state-owned corporations and reducing market controls, subsidies, and public land credits. In 1987, President Salinas de Gortari created the Economic Solidarity Pact which eliminated most food and agricultural

subsidies and price controls and effectively chopped the ejido system at its knees. This process occurred in 1991, wherein Salinas de Gortari proposed that the guarantee of land to rural communities, and moreover the ban on ownership of land by large corporations be removed from the constitution. This not only crippled the existing ejido system, but it allowed if not incentivized the transfer of land from ejidarios to major food corporations.

In 1992, two years before NAFTA went into effect, reforms to article 27 of the Mexican Constitution privatized or parceled out lands previously held under common ownership. Previously, many smallholder agriculturalists collectively worked, organized, and administered the needs of their land alongside their neighbors, which granted all shared access to community resources. Following 1992, farmers could opt to divide common ejido lands and privatize land ownership, rendering them less resilient to economic shocks. That is, in moments of precarity, farmers could more easily sell their land, leading to widespread land grabbing and consolidation. Through the enactment of NAFTA, Mexican farmers were placed in competition with large scale and commercial farming operations in Mexico, the United States and Canada. Smallholders, traditionally maize producers, could not compete with US subsidized maize (Radel, et al. 2010) especially once supports to smallholders such as ProCampo subsidies and agricultural price fixing were lost to post-NAFTA restructuring (Keleman, 2010).

2.D. The Feminization of Labor

Friedmann (1991) explains how parallel currents of farm mechanization and consolidation displace many individuals from food production, creating a “metabolic rift” between farmers and the land and alienating them from agricultural production. This alienation correlates with a rise in the consumption of value-added and processed foods. It also creates a growing class of the proletariat in the Global South, as food and technological aid from the North

disconnects subsistence producers from local crops and practices and creates a reliance on exogenous inputs and seeds that better fit into the global supply chain (Friedmann, 1991).

One result of these economic shifts in agriculture is the assignment of more women to agriculture because of a disproportionate number of men's displacement and out-migration from local agricultural production (Friedmann, 1991). As individuals seek employment opportunities, sometimes even in the commercial farms that displace them from their land and practices, women, especially older women, tend to stay on to manage family farm operations and maintain local practices. This in part feminizes rurality, leaving women as caretakers of original communities (Chambers and Momsen, 2007). A second consequence of major shifts to agronomic production is the integration of more women into capitalist agricultural production and consumption (Enloe, 2014). When women and men leave original homes in a process of proletarianization, or when they leave their original practices but join the local proletariat, their lands are most often incorporated into large-scale commercial agriculture, as new farmers lacking in local knowledge buy and work the land (Chambers and Momsen, 2007). Newcomers also introduce cattle and monocultural commodity production, practices that degrade the soil, making it useful only as pasture for cattle (Collier and Quaratiello, 2005).

The "feminization of labor" is a Janus-faced process of incorporating women into some of the worst jobs in the market through proletarianization (Enloe, 2014), and burdening women with the upkeep of local agricultural practice and knowledge (Friedmann, 1991). This process has also created a space for women to act as leaders in food movements that challenge global agricultural restructuring; their placement as some of the last stewards of local agricultural knowledge and practice and as workers undergirding international food regimes (Friedman, 1991) has also placed them in a potentially resistant position. This position not only allows for a

protection of food sovereignty across different groups but maintains agrobiodiversity throughout the food chain.

CHAPTER 3

Literature Review

I. Gender and Agrobiodiversity

Traditional “Women in Development” (WID) research, extension, and development practice frame smallholder women farmers the world over as stewards of seeds and plant genetic resources (Song and Vernooy, 2010). Though these depictions have a material basis in smallholder and subsistence farming communities in many sites in the Global South, Song and Vernooy (2010) warn that they tend to essentialize the duties of seed saving and agrobiodiversity preservation (among other agroecological practices) as necessarily gendered domains. Indeed, they may imply that women’s social role or intrinsic nature as “caretakers,” (Rengalakshmi, et al. 2002) or their more profound relationship with the environment (Shiva, 2016) primordially assigns them to this task, or naturally results in this tendency. Moreover, I argue that WID-based interventions on gender and agrobiodiversity may instrumentalize women in hoped-for future agroecological transitions—that is, they may cast women’s gendered labor and knowledge as the answer to unsustainable agricultural practices.

Though the relationship between gender and agrobiodiversity in the literature historically carries these discursive undertones, research on gender and agrobiodiversity makes clear that, in many parts of the world, the relationship itself is undeniable. But one must bear in mind that women’s outsized role in agrobiodiversity preservation often results from invisible and undervalued household labor and drudgery and social and cultural conditioning (Pionetti and Shrestha, 2010).

Women have bred more seed diversity and plant traits than any industrial breeding system—in fact, women have bred over 7,000 species and countless varieties worldwide for taste, nutrition and agronomic performance (Shiva, 2011; Akhter, 2001). By contrast,

commercial breeders offer significantly less diversity based on significantly fewer criteria. Moreover, commercial, patented species require renewed capital investment by farmers each year, where women subsistence farmers most often breed “open-source” seed. Despite the contribution of women to agrobiodiversity in their roles as plant breeders, intellectual property regimes in commercial seed product have undermined women’s sovereignty over seed (Shiva, 2012). Women also tend to dominate sites of informal, extra-market seed and produce exchange, though commercialization of products may shift exchanges of certain products to the purview of men (Howard-Borjas, 2001). Though often women experience greater barriers to resources like land tenure, credit, extension education, and agricultural development aid, women have still been able to cultivate expertise as seed breeders and distributors within local networks (Song and Vernooy, 2010). Below, discussion of the technological limits to agrobiodiversity in Mexico will indicate that agricultural development aid in the form of monetary resources, technological packets, inputs, and even extension education may form a barrier to agrobiodiversity retention, much less a hindrance.

There is a strong disconnect between the expressed needs of women for their role in food security maintenance and the actual aid provided by development minded NGOs. As Akhter, (2001), argues, a primary reason for this disconnect is the modeling of women the world over as consumers of food rather than of producers of it. In turn, these women are provided with opportunities to educate themselves on matters such as financial literacy and are offered food aid to help relieve the assumed and perceived stress of being a rural woman. However, these aids fall short in helping women to take advantage of the positionality they already possess within the food chain globally and indeed, ask them to step out of that line (Akhter, 2001). Additionally, the seed supplementation that is provided is sold to these communities and is generally sold to the

men alongside pesticide and other chemical growth aids (ibid). This serves only to further disempower women by removing them from the seed selection, conservation, and generation processes.

Women's disproportionate role in subsistence agriculture is increasing due to historically gendered processes of out-migration and proletarianization – processes primarily undertaken by men (Radel, 2012). The process by which subsistence farmers leave peasant agricultural practices to pursue formal employment is referred to as depeasantization (McMichael, 2012). These global political-economic processes have created a trend of feminization and aging of agriculture and seed systems. Despite the commonly assigned labor and cultural role of women smallholders as seed savers and circulators apparent in studies on agrobiodiversity, studies of seed saving and agrobiodiversity tend to be “gender-blind,” taking men's agricultural practice as standard, and therefore women's as deviant from the norm (Howard-Borjas 2001).

The material tendency for women to participate in important ways in agrobiodiversity conservation extends to Mexican women farmers and agrobiodiversity. Due to international and national Mexican trends in household division of labor that place women in the informal agricultural economy and at the head of subsistence activities, they tend to possess greater knowledge of local plant genetic resources (OECD, 2017). To leverage those resources on the farm, Mexican women select for a wider variety of plant characteristics than men, such as the quality of seed for processing, storage, exchange, and medicinal use (Lope-Alzina, 2007). Women also participate in seed saving in crucial ways. These practices include seed storage in clay receptacles to decrease moth infestations, smoking seeds to decrease pests, disease, and humidity, and saving seeds with plants such as tobacco to deter insects (ibid).

Yet among Yucatec Maya communities, I feel that these literatures face a tension—while women may be widely recognized as de facto environmental stewards due to their social positioning under global food regimes, it is Maya men who claim principal domain over the Maya milpa, where most maize is grown (de Frece and Poole, 2008). These men have final say over how the milpa is maintained and any decisions for the household regarding the well-being of the milpa. As the background outlines above, pressures from outside nations, NGOs, and ultimately NAFTA have caused further damage to agrobiodiversity by pressuring these households away from the milpa and toward systems that ultimately rob them of their food sovereignty.

II. Modernization and the “Technological Fix”

Technology is an easy concept to bring to mind but a difficult one to define. We use technologies in all sorts of different ways to aid our lives and goals, and to fix problems we find in our world. Alvin Weinberg (1967) argued that technology should promote “positive social action” without replacing “social engineering” - a pattern of inquiry to reframe and address social problems. In this way, he defined a technological fix as the solution to a problem resulting from reframing a social problem as a technological one. Simplification of the problematic reduces insurmountable social problems to manageable technological problems, and in so doing evades the complexity of human behavior. Lastly, it creates further tools to address complex social problems as they arise (Scott, 2011). These high-tech innovations can create effective short-term fixes, but this section will argue by evading human behavior we assume through the solution process that the social dimension does not exist.

Technological innovations can fail to truly resolve human problems, and as Scott (2011) puts forward, are simply “mere technological fixes.” In other words, they are tourniquets to

infected wounds: stopping the bleeding is good, but without a long-term solution that considers every dimension of the problem, danger continues to loom. In the case of technological fixes in agricultural biotechnology, we overlook the true social nature of food shortage and malnutrition. There is no lack of crops as is pushed by the Green Revolution narrative; there is lack of *access* to food and lack of healthy nutrients. Altieri (1999, n.p.) states that, “By challenging the myths of biotechnology, we expose genetic engineering for what it really is; another technological fix... aimed at circumventing the environmental problems of agriculture (which themselves are the outcome of an earlier round of technological fixes) without questioning the flawed assumptions that gave rise to the problems in the first place.” As we continue to compound technology to fix technology, we further elude the social dimensions at play and fail to create lasting positive change. These technological fixes are based on an infrastructure deeply rooted in public and private research institutions as well as dedicated to efficiency and profit, meaning they are quick, cheap, privilege capital, and ultimately create more problems than they ever solve (Rosner, 2004).

Weinberg, who coined the term, noted the drawbacks of the technological fix approach: reduction of the problem may exclude important factors that cause the problem, and lead to unintended consequences. In this way the proposed fixes treat the symptom and not the disease. Yet Weinberg argues that technological fixes remain quick, efficient, and effective where social engineering rarely works (Scott, 2011).

Leo Marx’s 2010 article on technology describes this exact concern. The term technology is “peculiarly susceptible to reification.” In this way, discussions of technology can fall quite short of addressing what it is truly intended to do: resolve human problems and improve human relations both with one another and with the world. When we allow the

assumption that human technologies alone can change the world, we fail to represent the important factor of who is using these technologies and who has governance over them. That is, he argues, technology is a tool, but it must be wielded to have an effect—and the who, why, and how determine the success or failure of technology to address a problem. It is these relations to technology that ultimately dictate their outcomes, not some measure of function inherent to the technology itself (Marx, 2010). These technologies coupled with contemporary science along with a world view that justifies the use of that coupling to dominate and control nature has created the present environmental trouble we see.

This coupling can be understood looking back to the invention of the heavy plow (White, 1967). The application of this agricultural technology transformed how people understood their relationship with the natural world. Prior to the heavy plow, White argues, “man has been part of nature; now he was the exploiter of nature.” like numerous environmental critics of technological culture, White references Francis Bacon’s seventeenth century utopian vision in *The New Atlantis*. The creed of this utopia and the culture it has come to represent is that “scientific knowledge means technological power over nature” (ibid). This creed has taken root in Western empiricism, stating that science and technology are the only savior and in turn “Othering” nature. The problems we seek to fix with these technologies however are sociopolitical ones and require sociopolitical solutions.

Further accounts on technological fixes come from Alan Drengson in “The Sacred and the Limits of the Technological Fix” (1984). In this article, Drengson describes the attitude that even limits of technology are seen as simply needing technological fixes by technocrats. In this line of thinking, there is a desacralization of nature and goal of its full exploitation. The biosphere without the human technology shaping it is seen as an unfinished product, missing its

master and controller. However, Drengson posits there are economic, social, and environmental factors that cannot be addressed using technological fixes. Rather there must be a recentering and promotion of relation to nature, particularly as sacred. That is, our relationship to ecology and our habitat must be one that is culturally related to and through that environment, not one that objectifies it as a would-be source of goods and profit. Through this, a new philosophy will need to emerge to address these issues - one that “*responds* creatively and sometimes unpredictably” rather than “*reacting*” mechanically and predictably. (ibid).

Drengson (1984) goes on to situate technological fixes into modernist notions of science. Science as we understand it relies on these mechanical and predictable ways. The core of scientific inquiry is to produce knowledge that bestows predication power, capacity for control, and the ability to predict outcomes. It is seen through this lens as the fount of human happiness while it simultaneously engenders its expanding suite of problems and insecurities. This science is one at odds with the natural world in a fundamental way. Scientific progress is not as common sense as our understanding of the term may lead us to believe. In the late 1960s and early 1970s several important thinkers began to dispute the common sense understanding of scientific progress, which was built on the idea that scientific discoveries are cumulative. Several influential philosophers and historians of science called into question the idea that modern science is providing an increasingly detailed and objective description of physical reality. These scientific progresses are not better suited to understanding the world, but within their own logic of understanding fit a better model of the world. This can be disastrous because as stated above, this understanding relies on the absence of a human element. In this way, the successes of science serve only to alienate and complicate human sociopolitical truths.

In the past 100 years, problem-solving in agriculture has been near-solely defined as its ability to increase productivity of farming operations (Thompson et al., 1995). This productionist view of farming operations continues the trend of disregarding the true nature of agricultural problems. Increasing productivity within a slim measure of food availabilities, particularly in ways that creates food low in nutrients, does not aid anyone who was experiencing food shortage. An endless supply of the lowest nutritional maize would not resolve the issue, yet the productionist continues to expand in the uniform direction of generating more. LeCain (2004), quoted by Scott, (2011) states however that, “data would suggest that, contrary to popular perceptions, environmental technological fixes have indeed solved many environmental problems” (2011:216). However, this is only true through a limited look at the problem. Whether or not the technology proves to be a “solution” depends on the criteria for success, and how and by whom it is defined (LeCain, 2004). As Scott (2011) adds: “If a problem is narrowly framed as an engineering puzzle, then a technological fix can be said to solve that problem. However, from the perspective of the long-term environmental problems, it would be much harder to judge these fixes as successes” (2011:216). Abstract technological fixes only solve abstract problems.

This problem becomes apparent in evaluation of the Green Revolution's success. This revolution was a success such that it staved off malnutrition in South Asia through increased yields (Scott, 2011). However, as populations continue to grow, new technologies such as biotech are required to keep pace. New technological fixes are continually required without ever getting to the heart of the issue which lies within sociopolitical rights and access. The success is further undermined by negative social side effects as well as environmental side effects such as soil degradation, pollution, and nutritional depletion of soul, and differential socioeconomic impacts of new technologies (Evenson and Gollen 2003, in Scott 2011). Environmental

degradation may directly undermine high yield productionist goals as well. As soil fertility drops and soil erodes, there is increased disease for plants, animals and people, and the required high energy and chemical inputs may not be sustainable. Furthermore, changes like these unfairly benefitted large producers, leaving small farms behind the temporarily boosted yield curves and displacing them (Scott, 2011).

“The FAOs 2004 report on biotechnology proposes a technological ‘fix’ of crops critical to the food security of marginalized peoples. If we have learned anything from the failures of the Green Revolution, it is that technological ‘advances’ in crops genetics for seeds that respond to external inputs go hand in hand with increased socio-economic polarization, rural and urban impoverishment, and greater food insecurity. The tragedy of the Green Revolution lies precisely in its narrow technological focus that ignored the far more important social and structural underpinning of hunger. The technology strengthened the very structures that enforce hunger.” (An Open Letter to the Director General of FAO 2004, in Scott 2011).

Yet, the ‘success’ of the Green Revolution was used to justify biotech as a technological fix of intensive agricultural practices. The Green Revolution had many failures, including some unacceptable, if unintended, social injustices. It solves abstract problems for which it is designed—to increase yields. Biotech is therefore devised to solve problems created by the use of Green Revolution technologies (Scott, 2011), preserving an exploitative agricultural system by fixing it, rather than seeking alternative systems.

Twenty-first century agriculture must somehow harmonize the seemingly conflicting goals of food security for everyone and ecologically sustainable agriculture with biotech as a key strategy. A technological fix with this in mind must not simply seek to increase raw production values. Using traditional agriculture to feed the population in 2050 would require a tripling of land under production. Yet on a global scale, modern agriculture produces enough food for all to lead healthy active lives. The real causes of hunger are poverty, inequality, and lack of access to nutrients as people are too poor to buy the food that is available (Rosset, 2002). Trewavas (2002) adds that it is far easier to “conjure more food from the plants we grow than to persuade the West

to share its agricultural bounty with its poorer neighbors.” Like Weinberg, Trewavas argues that technological problems are simpler to solve than social problems.

This is not a stand-alone example of the issues of high-yield focused technological fixes. The Consortium of International Agricultural Research Centers (CGIAR) attempted production of high-yield rice in Bali. It was believed that food insecurity could be solved through increased yields. However, these higher yields led to increased pests, leading to higher pesticide use, and causing pervasive pollution of water and soil (Machbub et al., 1988) as well as dependence on purchase of pesticides, once again creating barriers of sustainability for small farmers and overdependence on short term fixes for large producers. Prior to this technological fix, Balinese agriculture was organized by a system of water temples whose priests controlled the schedule for allocating irrigation water, playing a crucial role in pest management. Scientists treated these temples as purely religious institutions and failed to grasp the sociocultural technology at hand that was handling a problem their fix recreated. Balinese farmers became locked in a struggle to stay ahead of the latest plague, planting the latest resistant variety of Green Revolution rice. Any effort to return to the old water management system wherein the pests were not an issue was deemed religious conservatism³ (Lansing, 1991). These costs become apparent for the small farmer rapidly, not to mention the added cost of seed they now had to account for.

The traditional systems of managing irrigation practices through the water temples had evolved over 800 years to “minimize the exposure of native crops to insects, disease, drought,

³ One can see clear parallels with the discourses of techno-optimists, who have been known to cast critics of biotechnology in its current political-economic form as anti-science troglodytes, and march out lawn signs that argue “science is real.” A better lawn sign might read, “science is a socially and materially embedded understanding of the world with accepted methodologies to grow that understanding,” but that would not fit their near-religious zeal.

flood and other natural enemies” (Toulmin, 2001). Removing this system put the Balinese farmers in an environmentally harmful arms race against pests.

Toulmin further argues that professionals who are committed to particular disciplines, technical or economic, too easily assume that economic and technical issues can be abstracted from situations in which they are put to use, and so can be defined in purely disciplinary terms. They assume, for instance, that economists and engineers can know in advance what things are (or are not) relevant to their policy decisions (2001). Technological fixers seem to be held captive by a habitual belief that “the achievements of molecular biology [and chemistry] will be translated into social progress” (Marx, 1983). In this way, these professionals seek to claim right to their proposed fixes to these issues through intellectual property rights. As corporations appropriate not only plant genetic resources, but the epistemologies of these plants, there is a clear barrier to use and access to seed for farmers (Kloppenborg, 2014).

These intellectual property rights (IP) have decimated seed (and thereby, food) sovereignty globally, as the right to access, grow, and otherwise use seed are controlled by a few, small, massive firms and are ultimately mediated by capital. Kloppenborg (2014) goes on to detail how IP has been a strong tool for companies looking to take complete control of new crop varieties: “in 1930, they settled for a Plant Patent Act covering some asexually reproducing species.” In 1961, European seed companies helped establish some of these IP rights through the Union for the Protection of New Varieties of Plants. Shortly after followed the US Plant Variety Protection Act in 1971.

Farmers and breeders are still able to save and replant protected varieties for their own use, however there are no exemptions once material is protected under patent law (Kloppenborg 2014). This begs the question: what constitutes a protected breed? Must it be formally

registered? Cases such as the 1980 *Diamond v. Chakrabarty* US Supreme Court decision have demonstrated that plants (and through future challenges, plant material) can be assigned an IP ownership.

Ownership of these rights becomes problematic rapidly, as the farmer who intends to use the seed must first seek out an appropriate deal that allows access to the seed, but in so doing enters a contract with the firm that owns the seeds IP. These deals are often not trades wherein the farmer pays cash and has an ownership of a specific iteration of a seed; rather, the farmer licenses the seed for use and waives the firm of any and all liability, as well as signing to not save or replant seed (Winston, 2008; Kloppenburg, 2014). Monsanto has aggressive campaign against seed saving and re-planting, and *Bowman v. Monsanto* supreme court decision prohibited saving and planting patented seed.

A practice of infusing multiple genetic modification traits into one variety has become the standard, particularly in cases where one trait may be no longer under patent, thereby continuing its legal ownership and protection and simultaneously raising prices. Due to the small number of firms able to keep up with the capital maintained and generated by a select few, access to varieties with fewer or even no genetically modified traits is becoming more difficult and selection is becoming scarce. Patents also protect research technologies and breeding methods, posing a high or even prohibitive cost to gain ‘freedom to operate’ for independent breeders, especially researchers, small companies and farmer breeders (Kloppenbug, 2014). What would be the effects on indigenous and peasant breeders operating outside of these frameworks? Mirowski (2018) warns that one must be cautious to not conflate these restrictions with a purely contemporary scientific problem. The movement toward open science is not a movement that remediates the issue of IP over plant material. Rather, science will continue to

exasperate this issue, as “science has always been constituted by a sequence of historical regimes of epistemic and logistical organization” (Mirowski, 2018). The only lasting change to an institution like this is a rebellion against it via solidarity and coalition with those who also seek to dismantle the reliance on technological fixes.

These coalitions have been on the rise for decades to varying degrees of success and attention. La Via Campesina (1992) and Navdanya (1987) are two such coalitions that arose at roughly the same time. Navdanya focuses its efforts primarily in India but has had global outreach, while LVC is a network of peasant farmers and indigenous groups focusing on seed sovereignty. (Kloppenburg, 2014). Further groups have attempted to follow in these footsteps, such as the Open-Source Seed Initiative. Organizations such as these aim to discuss and promote land tenure, water rights, demilitarization, the sharing of germplasm, and public plant breeding as well as promoting gender equity in the agricultural domain. These groups additionally promote autonomous seed use (granting the right to save and replant), open, reciprocal exchange to maintain and promote genetic diversity, the right to take part in shaping seed policy and the idea of “seeds as the fourth resource after land, water, and air” (LVC, 2013a). These groups also share an opposition to IP rights based on the grounds that “genes, as the essence of life, cannot be owned” (LVC, 2001:49). Additionally, they share an opposition to genetically modified organisms (GMOs), not solely on the grounds of the environmental side effects GMOs bring, but on the ethical grounds that genetic engineering violates the integrity of a sovereign entity (Kloppenburg, 2014).

Finally, these groups share core initiatives that serve to disrupt the systematic compiling of short term agricultural technological fixes to resolve other technological fixes. Among these core initiatives are: Community seed saving and exchange, Agroecology and participatory

breeding, legal sovereignty over seed, and openness to allies (Kloppenborg, 2014) These initiatives tie these groups not only to one another but to the communities they intend to serve and aid. This is by no means a coincidence, as these groups are comprised of many smallholders with immediate stake in the well-being of these initiatives rather than the well-being of large producers or of research institutions. One final important piece of this conversation is the role of gendered labor divisions throughout the agricultural world. In many cases, the smallholder peasant and indigenous communities seek to save seed, but efforts are weakened by divided gender and understanding of what should be mutual goals. While these groups, (particularly Navdanya, headed by Shiva), do shed light on the efforts, needs, and gaps in service for women of the agricultural world, there is still much work to be done.

A full gamut of the shifts in thinking toward these modernist and development centric ideologies is too large for the scope of this document. However, it is best to re-center on the Green Revolution and the idea that regions that are not maximizing their productive capacity in a westernized sense must be behind or uncivilized. Eddens discusses the role of the Green Revolution in expanding this all too incorrect view in his 2017 article “White Science and Indigenous Maize.” Throughout this article, Eddens discusses the lasting impact of the Green Revolution beyond its immediate effect on production. “Though often periodized as a Cold War-era history, the Green Revolution, as Raj Patel argues, is better conceptualized as a ‘long’ history ‘of state reconfiguration, capitalist accumulation, concentration of power, disenfranchisement, agricultural investment and innovation ... [that] both predate[s] the standard history and continued long after 1970” (2017:2). I argue however that these effects are persistent and pervasive even to this day. We must look to a time prior to even the Green Revolution to understand the historical and material factors at work.

The Rockefeller Foundation-sponsored Mexican Agricultural Program (MAP) of the 1940s and 1950s predates CIMMYT (Eddens, 2017). The goals of MAP were centered on collecting and cataloging the extensive varieties of maize in Mexico, however it was undergirded by “racial logics in which whiteness was equated with the ability to control nature, and indigeneity was viewed as ‘not yet’ developed and thus incapable of managing nature.” (Eddens, 2017:3). This logic is the very crux of the developmental history: The Other world was something for the western world to appropriate, manage, and ultimately control and develop. The MAP became the seat of this logic and as the point of origin, drove all of its descendant programs into the same problematic space.

The International Maize and Wheat Improvement Center, (Centro Internacional de Mejoramiento de Maíz y Trigo, CIMMYT) began in the 1960s and was the true root of the Green Revolution. The Green Revolution aimed to “modernize” food growth and production through the Global South and in Asia by introducing technologies that would boost productive capacities. This progresses the thinking that the rest of the world is a land to be mastered and conquered; that these other cultures and relations to food and the world are simply primitive and lack a true knowledge or skill. Eddens’ analysis of the racial logics in the Green Revolution demonstrates the coloniality, racism, and even epistemicide that figures into the research center’s research and dissemination of technological fixes.

Mexico served as a model for other Green Revolution projects (Cotter and Connelly, 2003; Jennings, 1988; Perkins, 1997; Wright, 1990). The idea that the rest of the world had primitive and in turn non-scientific relationships and understandings of their agriculture allowed for a mass movement for the Green Revolution in other “Third World” locales. As managers of science, introducing scientific inquiry, know-how, and development, American scientists and

Green Revolution workers continued colonial violences in these regions in ways that they saw as a priori justified and good for the world. They felt that by introducing primitive Third Worlds to the productive power of science and mastery of nature, it became a benefit to them to have not only greater access to food, but the ability to participate in the global market of exchange. Eddens argues that it is only through truly embracing the racial logic inherent to the Green Revolution's mission is it possible for the Green Revolution to continue expanding (2017). By combining notions of whiteness to notions of scientific knowledge and technological capability while simultaneously tying indigenous backgrounds to specific crops is it possible to continue the Green Revolution from country to country. Eddens states, "Science and technology studies scholars use co-production as an analytic for theorizing the interrelation between science and technology and social systems. As Sheila Jasanoff describes, the 'idiom' of co-production provides a framework for analyzing the reciprocal 'relationship between the ordering of nature through knowledge and technology and the ordering of society through power and culture' (2004:14). "Race has been crucial for the Green Revolution's co-production of science and social order." (2017:3). Furthermore, only by tying the Green Revolution to its origins in Mexico and as a cold-war era project is it possible to allow it to continue its practices globally under the guise of update and reinvention as a 'New Green Revolution.' Modernization became the banner of the Green Revolution, Rockefeller and Ford Foundations, and the US State Department (Eddens, 2017). These scientists would display the outcomes of their practices against those of indigenous farmers to push their legitimacy as better producers. Beyond the clear demeaning and insulting that comes with this, these scientists further pushed colonial and imperial violence by appropriating maize and redistributing it to American seed companies and other development institutions, effectively robbing the Global South of their knowledge. These maize varieties

would be called exotic or landraces in order to place their origin in Mexico. Indigenous maize became an object of knowledge for MAP and Green Revolution projects (Tallbear, 2013).

Tallbear argues that today's researchers do not trace indigenous DNA (be that plant or otherwise) back to its true origins but rather see it as a collectively owned piece of Western science. MAP's maize seeds had race embedded, collected from diverse agroecological regions, sorted into varieties, catalogued in pages of academic publications, bred into composites, and sent to plant breeders across the globe.

The Green Revolution was born out of the notion of comparing indigenous knowledge and scientific progress. They often held these two things as within one spectrum, wherein scientific progress was the end point and indigenous science a vast and empty beginning. It was well established and documented that program designers had been informed by cultural geographers, social scientists, and other officials that simply applying these commercial methods to Mexican agriculture would fail to have the same outcomes. Harwood writes, "In 1941, the Survey Commission had assessed the state of Mexican agriculture and found that: "It would be wholly impossible, even if desirable, to impose the modern American culture upon Mexico; any improvement that is to be brought about must come within the framework of Mexican culture." (2009:390). Carl Sauer, a social scientist with experience in Mexico added that, "A good aggressive bunch of American agronomists and breeders could ruin the native resources for good and all by pushing their American commercial stocks. Mexican agriculture cannot be pointed toward standardization on a few commercial types without upsetting native economy and culture hopelessly." (Harwood, 2009:390). These warnings were disregarded, and Sauer was dismissed as a "romanticist who wanted to preserve 'traditional' agriculture as something to study"

(Eddens, 2017). The hierarchy of the Green Revolution saw the effects they had on the people and culture as sacrifice to the name of science and capital.

The scientists at work ignored and disregarded indigenous knowledge as well. It was seen as the “Other” - it was traditional, primal, and undeveloped. Few scholars have attended to the centrality of race in the Green Revolution, yet it is clear that race serves as the fallback and justification to these projects. The “Third World” *needs* the Green Revolution because they are behind the westernized idea of development and seemingly cannot get back on track. Without this racial underpinning the Green Revolution falls to nothing more than a business expansion project.

The early Green Revolution was clearly defined by racial logics crucial to the collection and appropriation of Mexican landraces. These same logics continue to shape Green Revolution projects-within other countries (Eddens, 2017). As Green Revolution projects expand beyond Mexico, the racial logics of white scientific superiority and nonwhite marginality were reproduced across the globe. White science and indigenous maize as categories persist in ‘GR thinking’ (Patel, 2013) [Eddens, 2017]. To extend this to indigenous rice, for example, takes no effort on the part of the white scientist as the culture and practices are simply excluded for not meeting the Western form of progress.

The ethic of Norman Borlaug, a key figure in MAP, CIMMYT and Green Revolution history, further exemplifies the ideologies of the technological fix: His notion of techno-optimism or “cornucopianism” spurred him to use genetic plant breeding to dramatically increase plant yields in the name of feeding the world’s growing population. He dismissed his critics as “luddites,” and held that science could help humanity solve problems and overcome barriers that no other species on earth could. His successors call efforts at conserving resources, preserving

indigenous science and technology, and curbing endless productivity and economic growth as “intellectually dishonest, indifferent to the poor, even racist (because most of the world’s hungry are non-Caucasian)” (Mann, 2018). This rhetoric reveals an almost religious faith in the capacity of science and technology to solve problems such as global hunger and an all-too-accessible derision of conservationist, critical and epistemologically diverse approaches to agriculture and food production. Longstanding research has demonstrated not only that a structural analysis of scarcity and abundance will be needed to address global food security as a problem of resource allocation, extraction, and availability, but that increased production has coupled with increased hunger, and agricultural technology has reproduced inequitable food access (Gaalaas Mullaney, 2014).

Marx and metabolic rift (Bellamy Foster, 2016) take an important space in this discussion, as the rift relates well with the notion of the divides in a binary, or in the semiotic separation between signifier and signified. These are all cleavages imposed by structures of power upon subaltern people. The consequences are clear—once we feel ourselves discrete from nature, (even holding transformative power over it,) it becomes that much easier to turn from subject to object, and to thereby do violence to it. To its logical conclusion, once we feel a seed to be discrete from us in terms of history, culture, language, identity, it becomes that much easier to empty it of its meanings and transform it into a commodity.

The commodification of seed and in turn development of this food regime was, to many theorists such as Marx, of no surprise. Though Marx’s work did not primarily focus on food and subsistence, there are clear concerns within his greater framework for survival under a capitalist world. Marx writes in *Capital* that “all labor is originally first directed towards the appropriation and production of food. (Vol III 770). Within this writing Marx reproduces tables of daily food

intake and nutrition which demonstrated a great gap between the food needs of the working class and the actual nutritional intake they received. Marx stated that “the diet of many of the families of agricultural laborers was far below the minimum necessary to avoid starvation diseases.” Food insecurity despite productionism exemplifies the separation between food and its various environmental, cultural, and nutritive meanings (Bellamy Foster, 2016). Food processing (when complicated by industrial food science), is an example of adulterated food - this translates well to notions of hybrid or GM seed as adulterated seed. Adulterated food is available to the working class, and “pure” food available to the bourgeois. Similarly, Galvez argues in *Eating NAFTA* that even as depeasantization and poverty have spurred many Mexicans to consume processed food, resulting in a serious uptick in non-communicable health concerns, traditional Mexican food from the milpa is being discovered, appropriated, and lauded in fine-dining restaurants throughout Mexico City, the US and Europe (2018).

The ontics of adulterated food shift from historical moment to moment, in line with Marx’s description of soil as a historical product - soil both occurs naturally and results from human agency. Our interactions with the soil change it, and through mass exploitation, come to deplete and ruin it. John Bellamy Foster describes the position of critics of Marx: “Marx, they said, mistook the problems of soil for universal conditions, and “failed to understand soil formation as a historical process”—though here they overlooked the fact that Marx was a close student of the geology of soil formation and referred throughout his works to soils as historical products, unlike most earlier classical political economists” (2016). This notion of soil as a historical material will align with discussions of seed as a lived expression of culture, knowledge, and history in a discussion of food and seed sovereignty (below), and of transcorporeality (below).

Marx also concerned himself with animal abuse in his analysis of agricultural production. Again, this relates to ethics of other ways of knowing: recognizing other beings as actors in their own right. This is an important metaphor for coalition as well as a literal example of the practice of coalition building. This is not, however, to equate humans with non-human actors or to equate their problems. I am in no way saying women or indigenous people are more in tune with nature. Instead, I am stating that there is theoretical importance in subjectifying other(ed) beings in order to argue for an epistemology that does not follow Cartesian reductionist logic and does not fetishize rationality. A dynamic and relational mind-body-world connection creates one alternative to this. Marx argues that humans are subjects whose bodies naturally hunger for and require the incorporation of other subjects within the ecosystem to survive (York and Mancus, 2009) rather than subjects separate from objective nature that bend it to their will. This clearly has correlates to Stacey Alaimo's (2010) transcorporeality, in which the human body continually interacts with the world around it through food (described in greater detail in the following section on ecofeminism). Both allow us to connect the material with the discursive by way of the body. By blurring or erasing these divisive lines, we can undermine and resist dominant logics, (which inscribe structures of domination in and of themselves). This is a praxis of refusal to the violences enacted by the first colonialists and their enlightenment thinking, right down to scientists of today. Perhaps, more importantly, it can help articulate an alternate way of being and knowing that can bring justice to marginalized people. It deconstructs and then reconstructs. And notably, it is by ingesting food that we begin to blur those lines; this lands studies on the production and consumption of food in a crucial position for articulating the ideologies and practices of a just world.

This follows from a material analysis of Marxist alienation. Marxist alienation refers to the process by which people, groups or institutions become alien to the products of their own labor, to the nature in which it lives, and to one another (Bottomore, et al., 1991:11-15). Broadly conceived, alienation is a cleavage between producers of creators and their creations, their context, and from each other. Marx argues that these cleavages stem from self-alienation—through which different aspects of ourselves such as the mind and the body, become incommensurable with one another. In this incommensurability, the individual has a fractured identity (distinct from a multi-voiced or intersectional one.) As an individual reconstructs and reconnects their self, they gain a unified personal identity, a greater connection to the world around them, and coalition with other individuals and groups.

That said, this notion of self-alienation could also be read as arguing there is an internal essence that is then fractured through capitalism or colonialism. However, I argue that a self-actualized, unified identity does not constitute an essential self, rather a way of experiencing and knowing the world and others that does not lead to their objectification, invasion, or other violences. Through that self-actualization, one can begin recognizing the limits to that experiencing and that understanding—allowing difference to exist in peace. Additionally, since nature and societies constantly change, so too can the self. It is beyond the scope of this paper to outline the development of the dualism between rationality and materiality, or of the concomitant alienation of the individual from community and the world. Suffice to say it is a classically-argued separation dating well before the Scientific Revolution, at least as far back as Platonic forms, a process which Carolyn Merchant traces in great detail in *The Death of Nature* (Merchant, 1983).

The goals that were set to further develop the world without questioning the political-economic and ideological processes that created it have proven to fall short—namely, the Millennium Development Goals (MDGs). A clear crisis has emerged within the capitalist development framework wherein systems such as technological fixes and hyper production do nothing to resolve, but instead complicate and breed new issues. Indeed, efforts to revisit these MDGs and to create more Sustainable Development Goals (SDGs) continue in the vein of technological fixes. Without a true changing of the guard, the same mistakes will continue to be made as global capitalist interests are continually pushed to the forefront. Sexsmith and McMichael (2015) discuss these erroneous repetitions, such as the privileging of large-scale production and the goal of adding smallholders to the global chain, plans that are ultimately akin to the preexisting Monsanto “Technology/Stewardship Agreement.” Furthermore, the perspective of these SDGs still takes the form of a modernist/developmental lens, wherein even the rights of international migrants are only called into concern due to the economic productive output they provide (Sexsmith and McMichael, 2015). As these authors write, “While the ambitious, universal targets for alleviating poverty that are being promoted would represent a significant advance in human welfare beyond that achieved by the MDGs, they must proceed farther to address the structural causes of unequal and unsustainable outcomes.” (2015:592). It is imperative that we rebuild and reshape our assumptions such that Other ways of knowing and understanding may have a seat at the table as well. The Western understanding of progress and production has brought the world past a point of destruction, and true development planning must begin to cast off these chains in exchange for more transnational and equitable ones, we must fight for sovereignty among all peoples.

III. Seed and Food Sovereignty

Though one can intuit the relationship between seed sovereignty and food sovereignty, certain distinctions require their treatment as discrete concepts, which I will outline below. La Via Campesina defines food sovereignty as “the right of Peoples to healthy and culturally appropriate food produced through ecologically sound and sustainable methods, and their right to define their own food and agriculture systems (Desmarais, 2008).” In this way, it is directly in disagreement with the corporate food regime we currently live under. Seed sovereignty is the right of a farmer to use, save, exchange, and disperse seeds. This again is in disagreement with the efforts we have seen from corporations to take ownership and control of seeds. These two forms of sovereignty share a common enemy and a common goal; the dismantling and disruption of corporate ownership and overstepping, and equitable accessibility globally. Inspired by Kloppenburg, I add that seed sovereignty in particular carries an additional underpinning with it – that of epistemic sovereignty. Because native seed carries with it generations of breeding, which results in genotypical and phenotypical particularities, it carries the knowledge of generations of milperos. This intergenerational knowledge is multidimensional, carrying with it different cosmological understandings of the seed that cannot be erased from it.

As such, I emphasize an important distinction between seed as a lived and continuously constituted, ontological and material substance, and the accessions of genetic material entering, say, a gene bank at CICY, CIMMYT or other parts of the world. When a native seed is divorced from its particular lived and cultural context, it ceases to be seed (and ceases to be cultivated for food). Rather, it lives in the preservation of its genes, without the full gamut of knowledge and living history that accompanies it. This is not a dismissal of ex situ seed saving, but an exaltation of in situ—an argument that in situ must be at least as zealously pursued. Though there are

possible failings in in situ, namely the potential for local politics to undercut the commonality or full community access to such a local, situated commons.

Sovereignty must be the underpinning of the movements we make within our fieldwork, our writing, and our program design. To fight for anything separate is to extend colonialism's work while wearing the guise of decolonization. This is of course not to say that there ought to be no contact, exchange, or development of cultures together. Rather that we are at our best when we embrace the interactions and the unknown compounding effects that come from building coalition in an equitable way. We must discuss and focus in on the noncoercive nature needed to reach that equitable blending. This sovereignty must take place not only in the political spheres, but the biological and agricultural as well. Here, I discuss the role of seed sovereignty and in turn food sovereignty.

Seed sovereignty is necessary for food sovereignty, given the seed is the core of agricultural production. Farmer sovereignty over seed has been eroded by corporate appropriation of Plant Genetic Resources for Food and Agriculture (PGRFA), growing monopoly power in the seed industry, development of transgenic crops, and the global imposition of intellectual property rights (Kloppenburg, 2014). Seed sovereignty is a potential avenue to create a shared consciousness as envisioned by Marx or could serve as a platform to "form a common base for globalizing the struggle" as envisioned by LVC (Kloppenburg, 2014). Seed Sovereignty groups and discourses reject technical (GMOs) and legal (Intellectual Property Rights; IPRs) tools of the master and affirm PGR as "a social product, a collective heritage of farming communities that should be freely exchanged and disseminated for the benefit of all... unimpeded by IPRs." They call for local and sustainable agriculture, practiced in conjunction

with scientific institutions (but in an equitable and participatory manner) generating socially and environmentally appropriate plant varieties (ibid).

Through this lens, plant genetic resources are seen as the common heritage of mankind. This idea was however combatted by the FAO during the 1980s because the global seed industry began using IPR to exclude others from using their varieties for breeding and multiplication purposes (Kloppenburg, 2014). The primary issue of these IPR bindings was not that companies themselves had taken and produced using these genetic resources, but that this use was founded on indigenous knowledge while simultaneously restricting access of PGRs to indigenous people and other smallholders. By claiming ownership of the PGRs involved, the companies not only claimed the seeds past as their own and as their doing, but the seeds future became locked to a specific form and function and could not be reciprocally shared, nurtured, or shaped.

The FAO responded to this problematically in 1983, not by forcing companies to pay for PGRFA but to declare proprietary lines as common heritage and by trying to enlarge the commons—a move deemed impractical by many. Opponents of this decision argued to make industry pay for raw materials instead. This counter-movement proved inadequate – it was a compensationist approach to “access and benefit sharing” that failed to protect farmers and indigenous groups from biopiracy, rather legitimating and institutionalizing their continued expropriation.

Kloppenburg (2014) argued that “Pulling the companies’ breeding lines into the status of common heritage was not a workable approach and continuing to maintain peasant landraces as a freely accessed mine for genetic resources was unjust...Perhaps what is required is a mechanism for germplasm exchange that allows sharing among those who will reciprocally share but excludes those who will not.” What is needed is not re-creation of the inadequate open-access commons, as attempted by the FAO but creation of a ‘protected commons,’ argues Kloppenburg.

He states that A Protected Commons allows creators to add to, modify, share content, develop content, and liberally exchange it to be built upon by others, but not appropriated and privatized by corporations. This means there is a right to derivative use, by way of a license or contract, material can be copyrighted then made available through licensing, modifications and further distributing would be allowable under this very same license, and create space for a ‘viral effect,’ incentivizing sharing of program and its derivatives/mods in an Open-Source form. This is the goal of the OSSI. (Kloppenburg, 2014).

OSSI is a working group of public plant breeders, private breeders, NGOs and sustainable food system advocates. OSSI is of particular interest to me as it is a group dedicated to farmer’s rights to save and replant seed and to access seed via open sources for breeding purposes. This level of access and promotion of use encourages sovereignty, exchange, and the results of interaction between different farmers, different seeds, different times, and different ways of knowing. To do all of this through use of “The Master’s Tools” of licensing, royalties on those licenses, and further legal tools is difficult. To the one end, these terms, systems, and structures have put off indigenous farmers and smallholders due to destruction of their sovereignty in the past. They were left with so few access channels because of these systems – to ask for faith in these tools as repurposed operators for positive change can be grating. To the other end, legal documents and structures win legal battles, not strongly crafted requests or hopes of flying under the radar. It would seem the only way to beat large corporations is to be ahead of them in their race to have PGR under ownership.

OSSI is dedicated to the organic sector, and especially participatory breeding, but it does not outright reject genetic engineering. Genetic engineering can be seen as another of the technologies to reclaim or as another technological fix, depending on who controls research

imperatives and outcomes. However, there are realms of possibility in which genetic engineering of plants could serve to benefit farmers in the same way licensing could, via systems such as the little-known process of Apomixis—a process I only came across through conversation with a fellow graduate student in biotechnology. Apomixis is asexual seed reproduction, so that the offspring plant is a clone of the mother plant. Using apomictic seed farmers can take an individual transgenic plant that has demonstrated success and continue to regrow it without the imperative to re-purchase it each year (GRAIN, 2001). Additionally, these apomictic lines can be crossed with individual crops to reduce weaknesses in the genetic characteristics of those crops. This allows for less company dependency for new seed but does maintain dependency on fertilizers to push the hybrid seed forward in its growth. As we've seen in reports on the needs of farmers, however, there is rarely a call for a stable genetic line or even higher yield, rather their truest challenge to productivity lies within consistent plant failure due to lack of agrobiodiversity. These apomictic lines run the risk of being too specified for a certain growing condition that cannot be maintained within the natural environment and present a very real threat of genetic erosion if not separated from native varieties. Though, as research on apomixis progresses there will be strong push to get the seeds to all farmers and being aware of and ahead of this development may aid smallholders.

Another technology in development which I would like to highlight is the use of digital plant computers. These computers go far beyond the at home grow kit or suite of monitors that can be provided in some deluxe and luxury DIY kits. Rather, Harper from the MIT lab envisions a world where rather than food coming from other locales, other locales climates, soil, and additional growing conditions can be created in lab (Harper, 2016). This to me, strikes a chord of reducing the role, input, and purpose of indigenous and international farmers. Why grow maize

in the Global South if we can just reclaim the conditions of the Global South as our own – especially when the seed and PGR are under our intellectual property rights? This technology when employed by the OSSI or by these smallholders themselves could help to relieve the unpredictable environments that occur due to climate change as well as negate the land loss from large corporations. However, this type of technology hardware may also be a deterrent for small farmers who may see these tools as harmful and never helpful. I argue that in order to escape from under the thumb of these corporations, it is necessary to explore potentially equitable deployments of new technologies, discoverable in and outside the realms of dominant science. This is not to promote the use of technological fixes – certainly access to a lab that can create a climate does not generate sovereignty for indigenous farmers. Rather, by promoting equal access to tools, the smallholder becomes able to continue their work without being beholden to the corporation. Technologies such as control of apomixis and of digital plant computers (as well as the technology that develops from their interaction) are only useful in so far as they are put to good use. As long as the focus of these is on maximizing yield and profit instead of on maximizing independence and access, they will fail to create meaningful change. Ignoring these technologies in exchange for the traditional method has its place, but it is important to not play into purity politics and avoid systems and technologies because they are new and innovative. If a tool can be reclaimed and repurposed, it is a tool worth investigating and applying to our fight for sovereignty.

The need for political intervention on this topic is clear and has historical grounding. As the land tenure system was disrupted, many new civilian-run solidarity systems have developed in the interest of pursuing equitable access as well as use of land, resources, and in particular, the access to seed. Red Andaluza de semillas is one of many groups dedicated to pushing this

message to lawmakers who may affect structural change. In their case, they share concerns about the development of a food system that focuses on macro-farming and produces waste, pollution, and compromises the lives of the smallholder farmers. This group has hosted biodiversity fairs that provide access to seed to members and attendees as well as incorporates lessons regarding activism and the promotion of solidarity amongst the small farmers. The phrase, “Sin maiz no hay país” (without maize, there is no country) is at the center of this and other groups’ fight for sovereignty. It is not enough that large corporations are producing maize, the experience and cultural relevance of maize exists within the individual farmer’s experience and relationship to it. When this relationship is circumvented, the country as a whole suffers.

Efforts by groups such as these have had lasting legal impact and positive outcomes. In April 2020, the “Federal Law for the Promotion and Protection of Native Corn” was passed into law and created protected areas for the growth of native maize varieties using traditional methods and recognized community seed banks as preservation centers. The law also provides a formal definition of native maize as follows, ‘the species of the taxonomic group *Zea mays* subspecies *mays* that indigenous people, peasants, and farmers have cultivated and are cultivating, from seeds selected by themselves, obtained through exchange and in constant evolution and diversification.’ (White and Case, 2020). This law also serves to create a clear distinction between maize at market by its production form, be that traditional, hybrid, or genetically modified as well as orders that the government is obligated to maintain in situ conservation of native seed, thus granting access to traditionally used land as well as promoting the creation of new community seed banks.

Change such as this uses legal channels to create space for the native maize farmer to interact with the market as opposed to being pushed out of it. This gives rise to concerns around

the commodity fetishism of marketing an item as native and pushing it as a competitor, but to provide legal protection and access to indigenous people is a step in the direction that Kloppenburg aims for.

However, Kloppenburg's method of reclaiming the oppressive tools in service of smallholders is not the only nor primary option. There is a vast and messy discourse regarding how best to go about pursuing sovereignty. One of the biggest barriers to enacting sovereignty is the role of the government in the conversation, defense, and maintenance of sovereignty. Examples such as the Federal Law for the Promotion and Protection of Native Corn can illustrate good use of the state and its tools, though other critics may believe the state not only has no business intervening in sovereignty, but additionally can only serve to interrupt it (Edelman et al, 2014). These beliefs are well-represented by Trauger, who states "[food sovereignty's] activities are always vulnerable to state power unless food sovereignty's economic and territorial alternatives are written into the national state constitution' (2014:1148). Evidence globally shows that even when these ideas are placed on highest authority, they are vulnerable to the influence of agro-industrial players and large corporations. As is the case of Mexico, as well, these constitutional promises can also always be revoked as was the case of land tenure, and because of this, sovereignty can be held as a carrot on a stick. I argue that sovereignty cannot occur as a top-down process – it is not a gift to be accepted by the state but one to be demanded by the peasantry. The state's role in this case is to ensure that opponents of this sovereignty, such as large scale agro-industrial corporations, have no foot hold in the nation, and in particular in the ownership of land. Only through bottom-up solidarity and coalition can true sovereignty arise. This follows logically, in that sovereignty functions best when there is free exchange between different smallholders, farmers, and indigenous life ways. It is these interactions that not only

fuel sovereignty but are also sovereignty's best output. The best method for achieving this is likely going to come from a combination of all ideas, new methods not yet discussed, or a specific cocktail of methods that differs by region.

A center piece, regardless of which road to sovereignty is taken, is going to be availability of land as a resource. As food sovereignty is so deeply intertwined with seed sovereignty, it is going to be essential for smallholders to not only have the legal ability to select, save, and exchange seed, but the means to use that seed. A focus on smallholder land use often focuses on the ownership or access of that land to the farmer, be that through land tenure or through private property acquisition. Alternative methods of collective ownership are difficult but can prove exceptionally effective over the longer term (Agarwal, 2014). This collective ownership requires a pooling of private resources toward a shared and open space and goal amongst the group. Once again, a deep solidarity and shared coalitional effort is required in order for a system like this to not only begin, but to stay in place and function.

Sovereignty is not just the freedom to use seed or to acquire food, it is about the united front that is borne from the desire to work outside the bounds of corporate interest. Only by banding together can peasant farmers move against the regime that is displacing them and destroying our food networks. This sovereignty is not simply a desire to work outside of a given framework and to build one's own, it is an understanding that the global food regime is depleting nutritional resources faster than they can be regenerated, and the only way to prevent total loss is through solidarity and food growth that is not reliant on external inputs. It must consider the role of all players and in that consideration, must acknowledge the history and influence of women. This acknowledgement must break from seeing women solely as caretakers and nurturers of the

seed, but as farmers of it as well. Only through inclusion of the seed's full history and understanding will we achieve a true seed sovereignty.

IV. Ecofeminism

Food sovereignty and seed sovereignty discourses, which cast peasant producers as key agents in addressing food security and food justice needs, create two points of departure for an ecofeminist analysis—a critique of modernity that explores the relationships between the exploitation of the non-human world and of the human social world, especially of women, and explores the cultural and social relationships between humans, their bodies, and the non-human world. For one, Harriet Friedmann provides a gendered view of global agricultural restructuring and its effects on women producers and consumers, informing and relating to critiques of capitalist production. To Friedmann (2016) parallel currents of farm mechanization and consolidation displace many individuals from food production, alienating them from the land and from production. This alienation correlates with a rise in the consumption of value-added and processed foods. It also creates a growing class of the proletariat in the Global South, as food and technological aid from the North disconnects producers from smallholder crops and practices and creates a reliance on exogenous inputs and seeds that better fit into the global supply chain (Friedmann, 2016).

One result of this major economic shift in agriculture is the assignation of more women to agriculture as a result of men's displacement and out-migration from local agricultural production (Friedmann, 2016). Notably, as individuals seek employment opportunities, sometimes even in the commercial farms that displace them from their land and practices, women most often stay on to manage family farm operations and maintain local practices. This in part feminizes rurality, leaving women as caretakers of original communities (Chambers and

Momsen, 2007). A second consequence of major shifts to agronomic production is the integration of more women into capitalist agricultural production and consumption (Enloe, 2014). When women and men leave original homes in a process of proletarianization, or when they leave their practices but join the local proletariat, their lands are most often incorporated into large-scale commercial agriculture, as new farmers lacking in local knowledge buy and work the land (Chambers and Momsen, 2007). Often termed the “feminization of labor,” the double-move of incorporating women into some of the worst jobs in the market through proletarianization (Enloe, 2014), and the burdening of women with the upkeep of local agricultural practice and knowledge (Friedmann, 2016), has also created a space for women to act as leaders in food movements that challenge global agricultural restructuring. Women’s placement as some of the last stewards of local agricultural knowledge and practice and as workers undergirding international food regimes (Friedmann, 2016) has also placed them in a potentially resistant position. In terms of maintaining agrobiodiversity, it sets women up as uniquely knowledgeable of local seeds and uniquely crucial in their maintenance.

Women have been boxed out of use and application of this unique knowledge, however. Modern empiricism was designed by and for men, who therefore establish its operations, priorities, standards and objectives, which equations are solved and which hypotheses are tested (Lee, 2018). Science, technology, and business are still dominated by men, with women underrepresented in the agricultural sector in particular. “With the increasing scientization and commoditization signaled by new food technologies, the values, knowledge, and experience of women are persistently sidelined, and existing power structures further reinforced” (Lee 2018:77). There is a consistent appeal to expertise, to authority and to power – constructs deeply rooted within the masculine (Lugones, 2010). (Note here that “the masculine” is a construct that

both women and men can take part in, so mere representation of women in positions of power will not solve the problems of scientism, especially when those positions of power are entrenched in structural and ideological alignments that will only alienate humanity further from each other and the world.) Ecofeminism allows a disruption from this gendered division, opening space for emphasis on the experience of the knower; it allows for truths and values that arise from that experience. This is of the utmost importance, especially in the domain of food which is itself riddled with sociocultural understandings and ethical values (Lee, 2018). The self that experiences and develops these knowledges cannot be separated from its material form and as such, is rooted within its expertise. Stacey Alaimo discusses how our interactions with nature are inherently alienated, that we experience them in highly mitigated ways such as films, photography, websites, and aquariums (2014). This is a particularly relevant point to developing our understanding of the needs of farmers – it is not enough to desire a better, safer, farm future based on our understanding from representations. Rather, it is imperative that we lean into the transcorporeal nature of these knowers who have accepted themselves as members of and participants in nature rather than Master of It. This understanding brings about material change for the knower, who does not see the farm as a source of production for profit, but as an interconnected entity with which to have a mutually beneficial relationship wherein one feeds the other and is reciprocated. These knowers have been erased in pursuit of the masculine, Western empirical, knower, and in turn have been disappeared from our understanding as well.

The roles of women are not solely created by material positionality within the agricultural domain. Ortner argues that all human societies in some measure value the transcendence of nature. That is to say, human societies privilege the manipulation of nature by culture, which demonstrates a certain measure of power over nature (Ortner, 1972). Traditionally, she argues,

we view men as transcendent beings who manipulate culture, and women as natural. That is, man's creation changes the object over which he acts. Woman's creation does not manipulate nature but reproduces it. Her creativity manifests in her role as mother. Reproduction of the species, a natural function of all beings, is her form of creation. Thus, according to cultural assumptions, her creation is lesser than that of man. While Ortner does not deny that we see women as more natural than men, which gives men some power of manipulation over women, she establishes women as both natural and cultural. By circumventing this binary, she credits women with the power both to reproduce and to transcend nature (ibid). Notably, non-Western communities, especially those in the Global South, are also more closely affiliated with nature in this paradigm (Alaimo, 2010), legitimating the civilizing and extractive projects of colonialism and imperialism.

Ortner describes women's relationship with nature and culture through physiology, the social roles dictated by that physiology and the "psychic structure" dictated by those social roles. First, physiologically, Ortner describes how woman is 'more enslaved to the species than the male, her animality... more manifest' due to the enslavement of the female body to reproductive functions (Ortner, 1972:66). Woman's role in the regeneration of the species, (in reproduction,) contrasts with men's mode of creation, which is inventive and surpasses the simple re-creation of human beings. "At the same time," Ortner argues, "woman cannot be consigned fully to the category of nature, for it is perfectly obvious that she is a full-fledged human being endowed with human consciousness just as a man is; she is half of the human race..." (1972:66). Ironically, Ortner explains that by accepting the cultural values that place women in a subordinate position to men due to their relationship with nature, women cement themselves as

cultured beings. Their implicit conspiracy in their own subordination demonstrates their capacity to fit into culture as fully as do men (ibid).

Ortner discusses women's social positioning, namely as mothers, as determined by female physiology. This again places woman in a subordinate, natural position as she spends her time caring for children, so-called irrational beings with undeveloped capacities for rationality. What's more, her time in the private, familiar sphere secludes her from the public, social sphere. And because the private composes just one part of the social, we view the private as subordinate to the social (Ortner, 1972). Again, assumptions of women's natural correlation to nature as reproducers and as mothers ally them with a force that men overcome through rationality.

As Ortner discusses women's psyche as distinct from that of men, she begins by mentioning presuppositions of women as irrational as a Western construct. Ortner's goal, though, is to nuance her argument to discuss the universal female experience, so she discusses female and male socialization, which predispose gendered people to act within their gender. She describes women's socialization as less mediated, less cultural, and direct whereas men relate socially in more mediated terms, and act upon and transform in their socialization. Ortner concludes that the response to all these assumptions of women is that "both men and women can and must be equally involved in projects of creativity and transcendence..." (1972:74). She chooses the cultural, "male" category over the natural.

Ortner lends us a compelling argument for an undergirding principle to women's subordination, casting women as conduits between nature and culture in comparison to men's wholly cultural formation. Her response to this problem, however, seems to be to recognize the cultural in the woman, to give women the freedom to transcend nature as completely as do men. I argue that there exists an alternative conclusion: Women and men should both be cultural and

natural beings. Rather than privilege culture over nature, all of humankind should have equal access to both realms.

If we examine Ortner's piece from an ecofeminist standpoint, we see that Ortner establishes gender dualities as based in dualities between nature and culture. She does not completely manage to undo that duality because she privileges the cultural in women and men.

A true progression of our thinking must account for all of these issues and must work to move beyond these limits, not simply create band-aids or sweep them to the side in the name of efficiency or production.

In his critique of the food sovereignty framework, Bernstein (2014) articulates how capitalism is the source of corporate industrialized agriculture. He claims it is "Interchangeable with ideologies of 'modernity' (and modernizing projects) which is based in certain conceptions of rationality, efficiency and the conquest of nature -- held to constitute (and explain?) the global food order (thesis) that food sovereignty defines itself as against (antithesis)." Here, Bernstein opens himself up to a uniquely ecofeminist critique. First, by framing his argument against the food sovereignty framework in terms of a Hegelian dialectic whereby the synthesis of conflictual theses and antitheses give rise to new theses (Zwart, 2022), he is firmly rooting himself in the modernist school. Though not as controversial as a linear development path, exemplified by Walter Rostow's stages of growth (Rostow, 1959), the idea of dialectical development implies "forward motion" or "progress," with the unavoidable consequence of casting ancient, indigenous, or other ways of knowing, bounded outside of this empirical process, as behind or even backward. Secondly, Bernstein defines industrial agriculture as conforming to modernistic notions of rationality and empiricism. Ecofeminism extends his analysis, defining how the dualism created between objective rationality as framed in

the Global North, creates a discursive distance between rationality and sensory experience, namely the physical realms of the body and natural environments. This distance, articulated as fear, disdain or objectification and alienation, makes space to do violence against nature and the beings associated with it, often women, people of color and indigenous communities (Ortner, 1972; Plumwood, 1991).

Important critiques of ecofeminism argue that it contributes to sexual dimorphism by reinforcing gender stereotypes that place women closer to nature (Banerjee and Bell, 2007; Leach, 2007). However, many articulations of ecofeminism cast the association between women and nature as a social construction, resulting from social interpretations and taboos of sexual functions (Ortner, 1972), from undermining other ways of knowing and being (Shiva, 2014), and from creating social dualisms and reified categories in the first place (Gaard, 1997). Within capitalism, this results in fragmented identities and practices that compound alienation from sensory experience, allowing for exploitation. We must take care to put forward this latter notion of ecofeminism, that which critiques the separation of nature, which is itself a cultural construct, and rationality and culture, themselves born out of our natural bodies, and avoid the pitfalls of bio-essentialism as well as the exclusion of trans identities.

Ecofeminism therefore supplements food sovereignty frameworks not only by challenging the rationalist logic of domination that undergirds industrial agriculture, but by adding a separate unit of analysis--gender--to discuss smallholder farmers as agrobiodiversity stewards. Vandana Shiva's discussion of women's participation in biodiversity conservation fits comfortably on the seed sovereignty side of this debate. She identifies how technocratic approaches to agricultural development alienate humanity from the environment, turning land and plants into genetic resources to be acted upon in a lab and dispossessing indigenous

communities of lands and subsistence livelihoods, and their accompanying local knowledges (Shiva, 2014). Shiva also identifies that women have bred over 7,000 species and innumerable varieties of crops for taste, nutrition, pest resilience, drought resilience, flood resilience and salt resistance, though their activity as plant breeders, one of the key components of agrobiodiversity maintenance, is invisibilized (Shiva, 2011). In particular, intellectual property regimes overlook indigenous communities (Kloppenburg, 2000) and women in particular (Shiva, 2011).

Considering Bernstein's concern with "scaling up" local production to supply food to communities that do not farm (2014), Feminist Political Ecology (FPE) presents another framework from which to gender debates on agrobiodiversity conservation at distinct geopolitical scales. As defined by Rocheleau, Thomas-Slayter and Wangari (1996), Feminist Political Ecology (FPE) examines the effects of global political, economic, and environmental shifts, such as Friedmann's International Food Regimes, at the local level. First, it questions the hegemony of empirical and rationalist science and makes room for "different possibilities for defining the relationship of people and 'nature,'" that is, other ways of knowing the world and reality (Rocheleau, Thomas-Slayter, and Wangari, 1996). As they define it, these other ways of knowing are often gendered, stemming from daily lived experience (Gaalaas Mullaney, 2014) division of labor, and the limitations and opportunities to work and socialize in the public and private spheres (Rocheleau, Thomas-Slayter, and Wangari, 1996). This gendered knowledge builds upon the food and seed sovereignty framework, which legitimates knowledge that exists outside of formal institutions (Kloppenburg, 2000). Like ecofeminism, it integrates knowing and doing, breaking down a separation between rationality (knowing) and sensory experience (doing) (Rocheleau, Thomas-Slayter, and Wangari, 1996).

The feminization of agriculture and the gendered division of labor in existing smallholder

communities lend women a distinct sensory experience, or knowledge by doing, which creates a different store of information acquired from that sense data (knowing). Therefore, under FPE, women will logically hold distinct knowledge of seeds and PGRFA separate from men, and thereby holding a crucial piece of the puzzle in maintaining agrobiodiversity into the future. In a study of agrobiodiversity conservation in Malawi, Rachel Bezner Kerr (2014) found that women were responsible for the persistence of finger millet, despite the fact that colonial powers discouraged its use. However, they faced barriers to maintaining finger millet into the future, as it competed with other household duties, and because men did not clear the land for its planting, not seeing the importance of the crop.

FPE also examines gendered environmental rights and responsibilities. Women face barriers to resource tenure, including land and seeds, though they may have informal use rights to such resources. Rural displacement resulting from processes of agricultural consolidation has exacerbated this effect on women (Rocheleau, Thomas-Slayter, and Wangari, 1996; Vaz-Jones 2018). As smallholders are displaced physically from the land, or displaced indirectly through alienation and knowledge loss (Vaz-Jones, 2016) new producers on original lands tend to come from outside communities, lack local knowledge, and therefore depend on commercial technology and practices in agriculture, including commercial seed (Chambers and Momsen, 2007). Displacement is an important form of resource tenure loss. Land loss and knowledge loss have a cyclical and reinforcing relationship.

FPE also discusses gendered opportunities for resistance. Gaalaas Mullaney's (2014) study of continued reliance on landrace maize seed by peasant women in Guanajuato emphasizes the importance of knowledge through doing. She calls the use of native varieties over commercial hybrids a quiet act of "refusal" of commercialization. Interestingly, the

Via Campesina framework of gendered resistance focuses on an integration of women into the existing movement for seed sovereignty but does not articulate particular knowledges or socialized capabilities in women (Desmarais, 2008). This indicates that further exploration into gendered resistance is needed in the food and seed sovereignty framework.

We must strive to adapt a view that encompasses “all of the various forms of oppression as central to an understanding of particular institutions” (Gaard and Gruen, 1993:29). Therefore, we must consider the myriad forms of oppression when looking to resolve our systemic cultural issues, and as such I argue that one of the most important lessons tied into ecofeminism for any agricultural investigation is to shift to a “non-modern” way of thinking. Maria Lugones (2010) discusses this idea as one that breaks from the mold of one-dimensional colonial thought. The idea that our technology, relationship with nature, and ultimately our way(s) of knowing ought to exist on a single spectrum is not only demeaning, but highly limiting. Within the modern thinking spectrum is the understanding that to be not modern is in turn to be *premodern*. This is to be avoided by shifting toward a view that is non-modern. Lugones argues that central to colonial modernity is the dichotomy of human and non-human. This relationship is expressed not only through man and beast, but master and slave, civilized and barbaric, white and non-white, and even man and woman. This dichotomy is pervasive, and by its very nature discredits and disregards anything not in line with the status quo of the bourgeois white colonial man (ibid). One crucial element of ecofeminist values is the rejection of power dynamics, including between culture and nature—a discussion which is brought forward and complicated by decolonial understandings of agency. Ecofeminism refutes unequal power exchanges, whether between the genders, between nations or between humankind and nature. Ecofeminist theory argues that the values we traditionally deem “masculine” do not fit in today’s historical context, considering the

political and environmental damage it has unleashed upon the world. It argues that such values, rather, allowed such a threatening macro-political and macro-environmental predicament to establish itself in the first place. To transcend this paradigm, we must transcend formulations of femininity and masculinity that ultimately threaten us. In this way, we must turn to our assumed power dynamics between the modern and the traditional; the colonized and the indigenous.

Shifting into non-modern thinking is not a matter of simply adapting or absorbing “old world” knowledge into day-to-day life. Quite on the contrary, this way of thinking is the center of modernity. An example of this is well illustrated by Popp (2018), who discusses how indigenous knowledge can fit into and serve modern western knowledge. Attempts to incorporate indigenous understanding with western ways often prove problematic. I argue this is because all western knowledges are built upon the indigenous ones as mere steppingstones. They are seen not as ways of their own, but as pieces to place into a greater and path for the Stepper. Jesse Popp states that indigenous cultures have historically contributed to the construction of knowledge. That scientific process of knowledge production is culturally relative (Popp, 2018). Further, she states, “Indigenous perspectives are holistic and founded upon interconnectedness, reciprocity, and the utmost respect for nature. Both Western and Indigenous science approaches and perspectives have their strengths and can greatly complement one another” (Popp, 2018). The problem here is subtle, as it is so deeply intertwined. The indigenous science is defended in so far as it is useful to the western world, and not in its own right. It is seen as still attached to nature, still intertwined with a so-called soft and feminine nature via being holistic and through valuing nature. Indigenous knowledge is seen as ancient and traditional, it is inherently behind the western methods. The discussion Popp entails is not one of incorporating indigenous

knowledge, rather it is one of re-visiting a traditional and natural past where certain answers were left behind a wave of technology.

Popp (2018) illustrates the discussion that I hope to dismantle, or at least reroute around. It is not that Popp single-handedly has created a problem, but rather that she repeats and represents a problematic line of thinking. Indigenous knowledge is not a tool to inform Western knowledge any more than woman is a tool to reproduce men. To allow this dichotomy is to disregard one for the other, to create a single continuum where there is only one master. Instead, I argue that ecofeminism at its core argues against these dichotomies: to relate the indigenous with the uncivilized is a weak category and serves to cause nothing but harm to the categorized and categorizer.

The danger of this is made clear by Margaret Little (1996). Little discusses how a feminist approach can inform bioethics, but this is particularly relevant to this thesis as well. Instead, I answer the question, “Why an Ecofeminist Approach to Indigenous Knowledge?”. My explanation is that by treating the Western way of knowing, culture, science, technology, and world as the default world or as the normative standard, we force variations to not be parallel streams of experience, but rather as a resource to fuel the ever-moving Western engine. As Little writes, “A subtle but powerful message is communicated when we always anchor one side of what is logically a symmetrical relation as the fixed point of reference: the anchored point gains the status of the center; the other receives the status of the margin” (1996:4). This idea is echoed by Spivak, who describes the danger that this anchoring entails. When one anchored point becomes the center, those marginalized speakers not only speak from powerless positions, but often the anchored speaker’s detailing and explanation takes priority. To attempt to understand the West by the West is to erase its violent imperialist history, and to keep male the dominant.

“If, in the context of colonial production, the subaltern has no history and cannot speak, the subaltern as female is even more deeply in shadow.” (Spivak, 1988:28) Lugones extends this further, famously stating that “to suggest that ‘woman’ and ‘black’ are homogenous, separable categories, ‘then their intersection shows us the absence of black women rather than their presence’”. (2010:742). In this way, indigenous people, especially indigenous women, become defined by their marginality. That is, they are only seen through their differences from the Western anchored point *through* the Western anchored lens. This means that not only are they objectified in so far as they become more natural (relating to nature) but they are extracted from as a part of the nature that is to be profited upon. Beyond this, their existence is all but erased outside of this context of use and object. Therefore, Popp is unable to separate indigenous knowledge from how it may fit into and benefit Western knowledge – within modern ways of thinking there is nothing else anything could be.

How then can non-modern thought help restructure this dilemma? A first response to this is often to switch one’s thinking into a decolonial framework. This framing opposes the external and internal colonialism tactics (Tuck and Yang, 2012) used by the oppressive Western world, however, may often fail to call to action. Decolonization is an interweaving and complex concept – it is not as easy as placing indigenous knowledge on a pedestal to be admired as something good and valuable in and of itself. It cannot be enough to call to attention that besides the Western stream of time and progress are other worlds and ways of relating to the world. Doing so only serves to soothe the colonizer by allowing them to feel they have “moved to innocence” (ibid). In this movement, the true work of correcting the thinking is diminished to a simple acknowledgement – by identifying that the Other has a history, it relieves some of the stress of the current truth, the “white guilt.” This relief does nothing to change the material conditions or

wellbeing of the indigenous persons, nor does it create structural change that may build a path forward to a better future. Rather, it relieves the colonizer performing the cosmological violence of the responsibility to fix it – the colonizer has apologized, what more is needed?

A difficult question one must ask when generating these steps is “who needs this, who benefits, and who are the agents of this change?” this decolonization requires a true glimpse into what lives within the skin of colonialism: modernity. Walter D. Mignolo (2007) reminds us that there are many foundational languages beyond Greek and Latin, many beginnings beyond Adam and Eve. As we begin to consider how best to work with (and within) indigenous spheres, we must tread lightly and avoid assimilating indigenous knowledge into dominant Western frames; an absorption of indigenous understandings into boundaries build by superstructure. In becoming non-modern, one must not extend the owned ideals as gifts, as this assumes a primacy that may not be desired or welcomed. Mignolo (2007) gives a helpful description:

“If modernity is understood essentially as a European phenomenon, then the ‘emancipation’ of people in the non-European world has to be planned, dictated and executed from Europe or the US itself only. ‘Spreading democracy in the Middle East’, President Bush repeated dictum is a case in point and an illustration of what Habermas’s project on the completion of the incomplete project of modernity. It is not sure that Islamic or Indigenous progressive intellectuals, like Habermas himself, would like to go along with German ideals. In such a scenario, there is no possibility of an-other political economies and political theories. Religions would be tolerated as far as they do not interfere with THE political economy and THE political theory that rules the world. Every thing shall be dictated by and from that original point, in space and time, where power concentrates.” (Mignolo, 2007:457).

The very value of knowledge, understandings, desires, and relations are rooted within modernity, and modernity is rooted within colonialism. As two inseparable pieces of violence, one cannot hope to assuage the damage and create a shared bridge to a peaceful future, one must understand that cosmological peace does not arise in cosmological violence. Therefore, in order to build a better tomorrow with the indigenous world we must not attempt to look at how they

may add to our assumed and projected future. Instead, we must reject colonial modernity, and embrace coalitional solidarity across our timelines and understandings.

“One does not resist the coloniality of gender alone. One resists it from within a way of understanding the world and living in it that is shared and that can understand one's actions, thus providing recognition. Communities rather than individuals enable the doing; one does with someone else, not in individualist isolation. The passing from mouth to mouth, from hand to hand of lived practices, values, beliefs, ontologies, space-times, and cosmologies constitutes one. The production of the everyday within which one exists produces one's self as it provides particular, meaningful clothing, food, economies and ecologies, gestures, rhythms, habitats, and senses of space and time. But it is important that these ways are not just different. They include affirmation of life over profit, communalism over individualism, “estar” over enterprise, beings in relation rather than dichotomously split over and over in hierarchically and violently ordered fragments. These ways of being, valuing, and believing have persisted in the resistant response to the coloniality” (Lugones, 2010:754).

As one US-based activist admonished me when I asked about the role of the peasantry in rural resistance, “our path forward does not begin by going backwards.” Indeed, the framing of indigenous knowledge and peasant lifestyles as backwards not only offends but fits within the same teleological understanding of progress I have critiqued above. It is true, we must accept that modernity is here, and we are not going to undo its particular histories, violences, destructions, and designs. Moreover, we must accept that indigenous peasant producers are every bit a part of the modern world as those more deeply rooted in market society. But we must be careful to not become complacent to modernity either. This is the goal of a non-modern way: not seek to become pre-modern, to a point where the violences of colonization, empire, and neoliberal expansion had not occurred, and the world was naive to other parts of itself as a pre-globalized entity. Equally, we must not aim to become fully postmodern and in so doing lack a critical eye. Rather, by being non-modern, we pull upon our knowledge, our resources, and our effort to refuse to stifle the experience and subjectivity of Others. We must fight to create a united effort to protect the sovereignty of all, not just the power of those who have given us the modern. “No human can speak as nature, of course and yet, as many have argued, it may be even more

problematic to magnify the opposition between “human” and “nature,” since that very opposition undergirds many of our philosophical, ethical, and environmental troubles.” (Alaimo, 2014:2). We must work to detangle the knots of our material existence, disrupting our view of ourselves as subject of and nature as object of. In so doing, we must work to be a part of nature and in the particular case of food, to develop a reciprocal relationship to it, rather than being dominated by the tangles of preconceived Western dichotomies.

The final concern I present to you is how to translate ecofeminist thought into resistant action—not just via the infrapolitical moves named above, but in the material world—for the stakes here are material not just in terms of the political economic oppressions of Maya farmers and their history, but in the physical matter that is the seed, that is the maize stalk, the land it grows upon, and the body it nourishes. Above, I call into question the notion of progress as modernist, begging the question, how do we move beyond the confines of the superstructure and into the world? I invoke Marxist notions of metabolic rift and alienation, while asking us to further exam the forward march of history. While certainly, I cannot overcome the contradiction between dialectical materialism and the non-modern, I believe that ecofeminisms and critical praxis can pair if we allow some flexibility. For example, ecofeminism helps supplant the notion that theories of identity are idealist relative to the materiality of, say, the labor theory of value. Stacey Alaimo’s theory of transcorporeality allows for material and ideas to con-constitute one another. Above I have discussed the widespread disregard for nonhuman nature in the Western cannon, and the rift humanity has had with the natural orderings of itself and of the world. To Alaimo, the natural world is relegated to the backdrop of human existence by this hierarchy, when in actuality, it exists in the materials we take from the material world to sustain us, is incorporated into our physical bodies, and exchanged through a continued cycle of death and

renewal. In this way, not only are all humans connected to one another, we are connected to the non-human or more-than-human world (Alaimo, 2010). This material exchange keeps us alive, and I would argue, we then we experience it through our five senses, make sense of it in our rational minds, and use the ideas formed therein to enact changes upon the world, acting in an iterative cycle of exchange between rationality and materiality (in both a physical and historical sense). Not only does this allow us to translate ideologies into material change, it allows an opportunity to overcome self-alienation. The mind and the body, the human and the non-human world, need not be dual when they can be dyad.

Examples of our surprising proximity to non-humanity abound. Donna Haraway notes that companion species live alongside us, even in the human habitats we attempt to sterilize against them, and in the most cosmopolitan of cities (Haraway, 2016). Plants and fungi, so foreign to us mammals, are increasingly understood as experiencing and reacting to sense stimuli, and even communicating amongst themselves (Chamovitz, 2012). In a relational yet increasingly alienated world, is it so crazy to define seeds as the physical embodiment of the thousands-year histories that reproduce them, and therefore, as historical, material, and yes, ideological? Are not these seeds telling a story, too? Shouldn't we fight to overcome that alienation and tell that story to the best of our ability?

CHAPTER 4

Methodology

I. Research Questions and Objectives

In this section I will discuss the goals and design of this project. Primarily, it is important to frame that this study took place in Yucatan, Mexico. There is an existing literature about Yucatan, and about the indigenous Mayan foodways present there. The goal of this study was to add to this literature in a way that would continue not only to progress understanding, but that would actively avoid adding to a pool of research that treats the Maya (physically, culturally, and otherwise) as an object of inquiry. Rather, the intention is to learn from this way of knowing, with the hope of understanding how best to stand together in solidarity. This solidarity must be based on a matter of trust (Nagar, 2014); trust that this investigation was a collaborative one where I was present to be taught, a student to my willing instructors, and not one where I was present to attempt to improve, coopt, or steal knowledges. With this in mind, my work and writing focus heavily on the importance of sovereignty, particularly of seed sovereignty. Additionally, I aim to understand how seed sovereignty is understood, approached, and how it will ultimately be obtained through the respective influence and roles of gender within the community I joined for my time. This was done through the following research questions:

1. What are the respective roles of women and men in the lifecycle of maize seed renewal?
2. What do women and men look for or require from traditional maize seed? To what extent do their motivations align? Which needs take precedence in farm decision-making?
3. How are women and men attempting to preserve their native maize varieties?

This thesis finds its data primarily through semi-structured interviews, participant and non-participant observation, and key-informant interviews among the population of Xoy. With the intention of this thesis so heavily rested upon pursuing solidarity and sovereignty, many efforts were taken to reduce any feelings of requirement or need from participants. Every effort was taken to make clear, meaningful intentions and to respect boundaries of participants, while pursuing a deep dive into the how and why of many daily activities. My concerns during the interview process are addressed and discussed within the Research Epistemology section below.

Worth additional note will be my interest in performing a proper border crossing, as discussed by Richa Nagar (2014). In this border crossing, it is imperative to step out of the role of northern-based researcher who serves as voice of the voiceless for the Global South subaltern. Rather, I will attempt to develop “[anti]colonial and transnational feminist praxes that focus explicitly on conceptualizing and implementing collaborative efforts that insist on crossing multiple difficult borders” (Nagar, 2014:110). As such, my epistemology will be heavily influenced by my collaboration with interlocutors rather than strictly study of. They are full people, with full understandings that I must not simply document, translate, and put to use as my own authored IP, but with intentions, goals, and desires in sharing this knowledge.

II. Research Epistemology

When discussing the world of the peasant farmer one must remember to not fall prey to the trap of settler colonial thinking. In preparation for this project, I engaged with postmodernism, decoloniality, other ways of knowing, and historical materialism in an effort to make room for structural, contextual, multivalent and shifting truths. This way of knowing allows a more embedded and relational account of seed sovereignty and seed saving in Xoy that is very personally situated; it acknowledges the limitations of representation in the research and

writing process, shedding light on ethical concerns of speaking for others while turning away from representations that obfuscate the act of representations in the guise of scientific objectivity.

Research must not strive to “civilize” and “modernize” the cultures it engages with in ways that bring them up to a standard of Western design. Rather, we, as researchers, must allow for a weaving and endless tangle of the now and how. The studies, findings, and understandings we develop are nothing more than signifiers - however I argue that these symbolisms of life are misconstrued for indexes in the meaning of Peirce’s Theory of Signs (Atkin, 2022). Some believe incorrectly that these ways of drudgery are clear referents to a world of aimless misery, that there can be no time for purpose when one is wrapped in labor. Rather, this drudgery is misinterpreted: it references visceral and deep beliefs that hold a way of life as very, very difficult, yet sacred.

The misinterpretation described above is rooted within a positivist framing of acquiring knowledge from other cultures. Positivist science brings with it material effects, not just discursive ones that affect academe. For one, it constitutes research and the university as an institution, which have historically committed and presently commit violences to the communities they research. A key example relevant to this study is the Green Revolution and the lasting economic, environmental, and sociocultural tolls it took on Mexican milperos. In addition is the history of biopiracy that led scientists to steal indigenous knowledge, seed, and identity in the name of “international public good” (Kloppenborg, 2000). These are not examples of positivist science gone wrong, but indicators of the violences inherent to pursuing an objective truth. When a world must be broken down and observed in its rawest most calculable form, especially a world full of cultural nuance, these sorts of damages ought to be expected. Much more appropriate is a leaning on the tools of constructionism that allow for multiple truths,

subjective knowledge, and value-laden understandings (Ritchie et al, 2014). When investigating a culture (and agriculture) so deeply divided across gender lines, one is bound to find nuanced understandings of different physical spaces, practices, ceremonies, and activities. Attempting to manage this notion within a positivist and reductionist framework ultimately fails, as it requires a shifting understanding across time, space, and identity.

This has aided colonization in its most literal sense, as an epistemological cousin of Manifest Destiny. The 1862 Morrill Act appropriated massive swaths of native land to create land grant institutions as part of the US colonizing project. These not only served as the sites of research projects that would attempt to assimilate agricultural practices under industrial and mono-cropping norms, but they would also produce capital through resource extraction and the sale of lands that funded the growth of the new empire, developing land for agribusiness or resource extraction (la paperson, 2017). Extension itself, and its Mexican correlates, has served commercial agricultural missions, displacing smallholder subsistence farming. Even the discipline of Rural Sociology included agricultural efficiency as one of its primary research objectives after its Purnell Act establishment, though it also inquired into rural quality of life (Smith, 2011) More recently, there has been a turn in agricultural extension that recognizes the essential need of biodiversity and lauds native seed. This positive turn carries the risk of the cooptation of seed and knowledge. I instead looked to another legacy of the discipline of Rural Sociology: a non-teleological understanding of how modernization and development occur (Smith, 2011).

When describing the epistemologies and practices of other cultures and communities, one must be wary of “eating the other” as bell hooks describes (hooks, 1992). As a researcher at an institution motivated to enter new cultures, explore new ways, and embrace other

epistemologies, I vigilantly guarded against objective fetishization. To enter these cultures, one must realize that it is not enough to arrive and pay tribute, it is not enough to feel a sense of shame or misfortune for the history of political violence. Rather, one must be motivated to actively rearticulate the relationship between indigenous science and the university superstructure. This requires one to understand that a distrust and unwelcoming is a fair and accurate placement for potential hosts. Xoy in particular has experienced such a multitude of research and extension work among its small populace that I kept an eye out for “refusals” or boundaries set by research interlocutors (Tuck and Yang, 2014). Indeed, indigenous communities in general are “hyper-surveilled” yet rendered voiceless by so much research, that I welcomed such refusals—what was not, on an individual basis, sacred to me was sacred to them (ibid.)

For this topic, in general, “eating the other” may extend beyond the appropriation and consumption of land, resources, knowledges and signifiers of difference. In fact, eating the other can be taken quite literally: the rise of superfoods is a particularly clear indicator of the desire to partake in, be changed by, and commodify the so-called exotic Other. In the case of this study, the interest in indigenous maize fits this niche all too well. The way of life of the milpero is not a study tool to allow us to peer back into a past that holds a secret we may use to modify and master our present and future, and the seed is not a spice to add to one’s culinary list that adds identity and edge. They are people of the here and now, existing in modernity and suffering its violences, with ways of knowing that ultimately connect them to the world.

The world is in shift in many directions through political change, technological change, and social changes that arise because of them. To think that there is one correct understanding and one whole end point is at best a supercilious approach to learning other cultures. It views the Other as a window into a self one wishes for without desiring the work the Other has dedicated.

It then abets the Other to adopt the way of life it so desperately is seeking change from. This adaptation is a directly material one as has been described here through technologies that not only rob smallholders of land and knowledge but leave them on the hook for new technologies as time progresses. These material changes must not be underestimated - this is not a matter of growing pains into a new, better way - it is the corruption and destruction, the absorption of the goods a way possesses as a means to the end of growth. It is a primal violence, one that kills the Other for survival via consumption rather than through mutual cooperation.

Given the multitude of cultural and social concerns at play in this study, I found a critical social constructivist research epistemology to be a useful starting point. Constructivism stems from a legacy of feminist methodology and epistemology and challenges the assumption that generalizability should be the goal of research. Rather, contextual truths are co-constructed by research participants and researchers, each affecting the discursive and ontological landscape through their words, actions, personal experiences, knowledges, beliefs and very presence (Guba and Lincoln, 1994). Our self-understandings and formulations transcend the critical categories of subjectivity. Each individual arises from a lifelong call and response of events and emotions, intersecting with superstructures of identity and power, and also meandering in the interstices of these identities. Just as world systems penetrate the most remote geographies, even the smallest details reflect the work of a larger, overarching world system. (Gaspar de Alba, 2014). As such, I required an epistemological frame that would reflect and embrace the interacting and positional bases of truths reflected in my research findings and confront my own biases as a part of the learning and research process.

I found that a constructivist epistemological basis fit well with the needs in this research project to account for the multiplicity of truths and viewpoints stemming from interlocutors in

Xoy. Moreover, it agrees with the criticisms of modernity, science, and technology and the resistant, ecofeminist praxes advocated for in the literature review. Because I worked for so long over this project, I also wanted to honestly account for the fact that I participated in this project as an interpretant of everything I saw and recorded in Xoy, and as an interpretant of the written data. Similar to the aforementioned ecofeminist, transcorporeal framing of the interplay of matter and ideas, constructivist ethnographic field work accounts for the fact that the ethnographer's mind is a site of translation, mediation and assimilation of understanding the field site (Churchill, 2005)—that is, that field work empowers the researcher as a reader of their observations, who interprets based on their existing experience and knowledge, and translates that synthesis into field notes, coding, and written outcomes of the study.

III. Qualitative Research Design

This project called for a qualitative case study of Xoy, Yucatan, with epistemological and values-based foregrounding in critical theories of development, social constructivism, feminist research and anticolonial praxis.

3.A. Setting

During this study, I conducted semi-structured interviews and participant and non-participant observation within the homes and milpas of milperos and housewives in Xoy, Yucatan. I observed and took part in daily activities in every public space and conducted interviews in the homes and milpas of interlocutors. Forty-three (43) total interviews were recorded with two (2) additional sessions sitting in on meetings with the *Guardianes* group. All of the respondents were over the age of 18 and consented to participation in the interview with no compensation, as to avoid coercion.

I chose Xoy as my study site because every professor and activist I spoke to in Mérida and Peto agreed that it was a historically important site for native seed diversity and had a greater amount of agrobiodiversity than many other peasant communities (interview Caamal Itza, 2018; interview Soto, 2018). I also had two in-roads into the community prior to arriving in Mexico, so I thought that it would be possible to find further in-roads and conduct effective snowball sampling. I did not realize that it hosted so many research projects when I organized my field work to the community.

I chose the state of Yucatan as my host site based on my experience as a visiting student for two semesters at the Universidad Autónoma de Yucatán. Not only did I make many personal connections there during this period, but I developed a strong affinity for the location—an affinity present but not nearly so strong in my travels to other regions in Mexico and to other Latin American countries. I began to visit whenever I had occasion to do so. The particularities of Maya mestizaje, the deep connection to history, the political and artistic engagements of residents, the food, the cenotes all spoke to me deeply. Even the difficult aspects of living in the region, such as poor infrastructure and urban planning, the brutally hot and humid climate, the invasion of European, US and Canadian gentrifiers in the historical downtown colonias, and the subaltern status of the region within an already subaltern country to me presented worthwhile structures to investigate and learn to live within. Moreover, Yucatan, with the exception of Chichén Itzá and Mérida, has been overlooked relative to other states in Mexico by research (interview anthropologist, 2018), and has not been adequately recognized for its cultural contributions even in the face of under-resourcing. All of this made the state a site ripe for further inquiry, and I felt that it merited the ideological and personal commitment I developed toward it.

3.B. Research Sample

For the purposes of this study, I used a snowball sampling method using several inroads to participants who would not only be willing to participate but would offer insights critical to my research questions. Snowball sampling allowed me to gain a sort of birds-eye view of the community of Xoy – I was able to understand the social networks, alliances, and familial connections by interacting with relatives and friends of each participant. However, in this way I needed to be careful to also monitor the how and why of who was being recommended to me. In some cases, for example, participants simply wanted to share the experience with friends of being interviewed or believed that a relative may have an interesting or valuable anecdote to add into their report. This meant I needed to now be conscientious not only of my research questions (ie. Am I adequately representing gendered knowledge if my sample is skewed to one gender?) but additionally needed to be mindful of how deeply invested in one social network I was becoming (ie. Am I adequately representing this culture if I only record this family's knowledge?). To avoid running into these problems, my sampling strategy used four separate inroads into the community, ranging from activist organizers to my host family. I also used purposive sampling in order to ensure I found information relevant to ongoing activist work related to native seed, to the experiences of single women, to the structure and implementation of the ejido system, and to the history of Nal Xoy. I resided in Xoy for the entirety of my three months of field work, though I traveled to Mérida three times for weekend visits and personal rest. Because of my constant presence, social and research networks within the community evolved naturally over time as community members became more accustomed to my presence.

3.C. Interlocutor Characteristics

The majority of my interlocutors were indigenous Maya identified members of the Xoy community. All of the women identified as housewives or farm wives. The majority of men identified as milperos, though a few were students or workers that worked on the milpa in their free time. The majority of interlocutors were married, though a small number were widowed or divorced. From this group, I spoke to 18 women and 19 men, with as even a dispersal of age ranges as possible given the characteristics of the community (below).

Gender	18-19	20-29	30-39	40-49	50-59	60-69	70-79	80-89	90-99
Women	0	3	2	3	4	3	3	0	0
Men	2	0	2	4	2	3	3	2	1

I also spoke with 6 key-informants, who were outsiders to Xoy in origin but conducted professional, political, or research-related activities in the community.

3.D. Interview Instrument

Prior to embarking on my field work, Dr. Kathleen Sexsmith and a Cinvestav Maya interpreter reviewed and provided feedback on my interview instrument. It allowed me to collect basic demographic data, information regarding farm activities and the household division of labor, information on seed selection and storage, and information on values and concerns related to native maize and indigenous agricultural practices. The interview instrument was written and administered by myself in Spanish, and I have provided an English translation of the instrument in the Appendix.

IV. Data Collection

4.A. Participant- and Non-participant Observation

Participant observation consisted of daily agricultural practices, monthly landholder meetings and local seed exhibitions and fairs. Participant observation ranged from planting and

fertilizing the maize harvest, purchasing inputs, cutting weeds, selling seeds at local markets, nixtamalization--preparing maize for milling and cooking, milling, creating the tortilla, and meals. Discrete points of observation included a local market event, a *Guardianes de la Semilla* organizing event, a SAGARPA fertilizer training, 2018 political campaign speeches, and the Cha'ac rain ceremony.

Non-participant observation focused primarily on daily traditional agricultural practices of women and men in the milpa and the solar. These practices extended to planning and decision-making in both farming systems, organizational, extension, and activist meetings around agricultural practice, as well as processing and utilization of produce post-harvest.

Every night, I reflected on my day's notes and added a reflection of my process, what I had seen and experienced, and what I had learned. I also wrote daily journal entries to both begin to theorize about what I learned in the field work process, and to reflect upon my personal feelings and internal processes, confront my biases, think through and plan difficult interviews or the process of asking permission to enter sacred spaces, and reflect upon how my presence impacted interlocutors and the host site.

4.B. Semi-Structured Interviews

Over the course of 3 months in Summer 2018, I administered forty-three in-depth semi-structured Interviews (n=43), nineteen with men farmers and eighteen with women farmers as well as six with key informants. Forty interviews took place in Xoy either with permanent residents or with researchers visiting the area. Two interviews took place in Mérida with key informants and one interview took place in the neighboring community of Chacsinkiin to fill a gap in the sampling frame; because most of the young men found life as a milpero to be unsustainable, the vast majority had migrated to a nearby or international city. As such, I had to

open up my sampling to one young man in Chacsinkiin who had decided to become a milpero, as the only other young man interlocutor I found under the age of thirty worked in the milpa in his breaks from university. Prior to each interview, I obtained informed consent from the interlocutor.

These interviews discussed daily lived experience and agricultural practice in Xoy, indigenous seed saving practices, the values surrounding them, and the local response to shifting agricultural currents in Mexico. It also discussed social characteristics of the community, the history of the Nal Xoy variety, and the community's historical relationship with research, development, and civic organizations. Additional questions focused on economic activity external to agriculture, seed activism, and general history of Xoy. Interviews were conducted in Spanish, with eleven interviews aided by the presence of a Maya-Spanish interpreter from the Centro de Investigación y de Estudios Avanzados (Cinvestav). I used snowball sampling, beginning with four separate inroads into the community, from a local indigenous rights activist, the community ejido commissioner, a biotechnologist at the Centro de Investigación Científica de Yucatan (CICY), and my host family. I developed additional inroads into the community through the process of participatory and non-participatory observation, through which I developed relationships with additional individuals and households in Xoy.

I administered the majority of interviews in common areas of the homes of interlocutors, with one interview taking place outside of a community meeting. I also conducted brief follow-up interviews in the milpa, the mill, or the solar, but these tended to be informal conversations during participant observation. Sometimes, a family member would sit with the interlocutor and myself during the interview process, and even volunteer information. While this presents a challenge to the purity of the data, for example, if a family member reminded the interlocutor of

something they had forgotten to mention in regards to a question, I do not feel it strongly impacted the validity of the findings, because the responses were internally commensurate with those of my other interviews. Given the conversational pattern of semi-structured interviews, which left breaks for informal chat, deviations from the research instrument, and emergent thoughts and questions from myself and from the interlocutor, interviews tended to last for at least an hour, with a few enthusiastic interlocutors speaking to me for two hours. Considering the length and social labor of participating in such a long and detailed interview (Ritchie, et al. 2014), I feel that the addition of a family member in those instances helped to bolster energy and enthusiasm.

4.C. Key-Informant Interviews

I administered key-informant interviews to individuals who did not self-identify as Maya or as peasant farmers but worked in the community in some regard. One was a local activist and political candidate, four were researchers that conducted research projects in Xoy, and one ran an agrotourism retreat and farm for value-added products in the community. The majority of these key-informants were identified through snowball sampling, though two provided me inroads into the community after I reached out to them in preparation for fieldwork. I obtained the informed consent of key-informants prior to each interview.

V. Data Analysis

This study received IRB approval from The Pennsylvania State University (STUDY00009309). Following the fieldwork period, interviews were professionally transcribed into writing, and I began a process of open coding of both qualitative interview transcripts and field notes in search of emergent codes in Spanish. Despite my active role as an interpreter of the study site and the problematic, as evidenced by my field notes, I worked very hard to allow for

codes to arise inductively without imposing my assumptions upon the data. This was harder in the field notes, which were heavily colored by my reflections. For my open coding, I used descriptive, values-based, (reflecting the values of the interlocutor), and in situ (pertinent quotes) codes. In order to best organize the data, I made use of subcoding and simultaneous coding (Saldana, 2015:121). These methods allowed me a few advantages in analyzing my data. For one, subcoding allowed me to investigate the entire realm of an area (Milpa-Men's work, Milpa-Women's work; Fears-snakes, Fears-loss of seed; etc) but additionally to pull nuance from descriptions I was given from my interlocutors. Often, within a single breath, an interlocutor would detail the drudgery of milpa work, the assumed gendered divisions of that work, and the goals that the household shared together and individually. Being able to mark and assess all of these topics was of critical importance to me. From here, I used pattern coding (Saldana, 2015:322) to further develop my themes of interest and to better direct my investigation. Finally, Axial coding was employed to help reduce redundancies in my data – such as removing overlapping codes for health concerns – wellness; poverty – precarity; local market – local sales; etc. Through this process, I identified the key themes presented by my interlocutors. I achieved saturation after coding 20 interviews with Xoy community members, and additionally coded key-informant interviews.

Once key themes appeared in the data, I used focused coding to group my data along each key code and further codify and nuance it. This allowed me to begin forming my analysis of the field work and assigning data to my research questions. The majority of my findings related to the household division of labor in the selection and renewal of native seed, or to the challenges that local farmers faced, principle among them being poverty. A total evaluation of these subcodes revealed the primary lines of division by gender, but also allowed for a gathering of the

rituals, taboos, beliefs, and reasonings for these divisions. In this way, I was able to gain a better understanding of the study site than if I had used other coding methods that rely on comparisons to previous studies, such as elaborative coding (though a comparison to Lope-Alzina's findings in Yaxcabá, Yucatan was considered and ultimately rejected).

VI. Description of the Study Site

“En Xoy te vas a perder” This is what the man sitting at the front of the Mayab bus from Mérida to Xoy told me as I grabbed my bags and deboarded. I did not know whether to feel indignant or worried by his laughing statement, delivered so confidently. I collected my backpack from the bus storage below and began to totter toward the house in which I would be staying. My initial contact into the community, a Maya indigenous rights activist, agronomist, and long-time resident of Peto, (the capital of Peto municipality, in which Xoy resides), had driven me to meet my hosts the previous week, so I knew where to go. It was 3PM on a Monday and most people were in their homes finishing their lunch and resting in hammocks. As I walked down a dirt road past sleeping dogs guarding open doors, I could feel eyes following my progress. Arriving at the house, I did not know whether “losing myself” in Xoy would be possible under the scrutiny of locals, or in this “NGO capital” that was so popular for researchers and *tesistas* like me, no matter how remote or inaccessible the community was to reach, or how inaccessible some of the answers to my questions would become. As the weeks went on, I never “lost myself” or focus of my research agenda, but I was absorbed into the local rhythm of everyday life. I developed an uneasy ease in my surroundings and activities. As I told my friends, “The days just pass here,” feeling full but natural at the same time. And as I came to understand the community better, bit by bit, what I understood to be the people and questions

foregrounding the research expanded. Maybe I lost myself in a rabbit hole of mounting questions, answers and contradictions. Maybe I just took a detour.

Characteristics of the Case Site

Xoy is a town located in the Southern Municipality of Peto (Latitude:20.123388, Longitude: -88.971014) roughly 80 miles Southeast of Yucatan's state capital, Mérida. Located on the Western edge of the municipality, it is bordered to the North by the municipality of Chacsinkin, to the East by the municipal capital of Peto, and to the West by the neighboring municipality of Tzucacab's ejido land (Departamento de Estadística e Información, 2018). It is the largest of Peto municipality's 26 *comisariados*, or rural communities outside of the municipal capital, with an area of 1948.62 square miles and a permanent population of 751 people (Departamento de Estadística e Información, 2018)

Xoy has 186 families (Departamento de Estadística e Información, 2018). 99.3 percent of the population is indigenous Maya and 85.15 percent speaks Maya, with 10 percent monolingual Maya speakers (Can Tapia and Chi Can 2018). Ethnographic and interview data indicate that the monolingual and bilingual population skews older, and that children tend to speak only Spanish. As many parents revealed to me, they chose to educate their children in Spanish alone to avoid discrimination from the Maya mestiza communities in urban sites like Mérida or Cancun, and to ensure that children can engage with schoolwork, which is administered in Spanish by monolingual Spanish speaking teachers, mostly from Mérida.



Figure 1. Location of Xoy within the Yucatan Peninsula (Wikipedia; <https://es.wikipedia.org/wiki/Xoy>)

Xoy Demographic Data 2018 (Departamento de Estadística e Información, 2018)

Age	<1	1-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-69	70+	TOTAL
Women	6	32	45	21	30	33	36	32	17	29	18	13	19	19	13	23	386
Men	3	24	39	38	18	30	29	30	21	30	13	11	18	24	12	25	365

Informal labor as subsistence agriculturalists in the *milpa* represents the dominant economic activity for men, while the majority of women identify as “housewives” (field notes 2018; Departamento de Estadística e Información, 2018). Government and research officials characterize community members as underemployed due to the dearth of local formal employment opportunities (Plan Municipal de Desarrollo de Peto, Yucatan). Some residents drive taxis and *mototaxis* or operate small convenience stores (field notes, 2018). Two women own and operate a bakery, while many men and some women work for their neighbors in their *milpas* or *solares* (field notes, 2018). Young people increasingly emigrate to Peto, Mérida, the Riviera Maya in Quintana Roo, or San Rafael, CA in search of work, most often in construction or domestic labor (Departamento de Estadística e Información, 2018). The people of Peto municipality in total are highly vulnerable in economic, social and food security terms (Plan Municipal de Desarrollo de Peto, Yucatan). Roughly 49 percent of the population depends on

remittances from family members for monetary resources (Departamento de Estadística e Información, 2018).

Local government consists of an Ejido Commissioner and Municipal Commissioner (Departamento de Estadística e Información, 2018). The Municipal Commissioner is appointed by the Municipal President in Peto every 6 years, and the Ejido Commissioner is elected by *ejidatarios* every three years (interview with Alfredo Canul, 2018). Meetings of *ejidatarios* take place in the Comisaria Ejidal, while formal and informal town assemblies take place in the adjacent plaza.

Xoy has its own health clinic, which administers basic health services to the community. It is run by a medical student, a full-time nurse and, once a month, a nutritionist (Departamento de Estadística e Información, 2018).

Local transportation primarily consists of bicycles and tricycles, though these are primarily used by men (field notes, 2018). A handful of residents own motorcycles or cars. Buses and mototaxis bring residents to Peto, Mérida, and other destinations on a limited schedule (Departamento de Estadística e Información, 2018). Within Xoy, women travel on foot or receive rides in their male partners' motorcycle. A growing number of women travel by tricycle, though this decision has stigma attached to it. When traveling to next door Peto, women receive rides in cars or mototaxis. Xoy has a Catholic Church which offers services on Saturday evenings and Presbyterian Church, "El Divino Salvador" which offers services Tuesday, Wednesday, Thursday and Sunday. In partnership with a US-based Presbyterian Church, "El Divino Salvador" sells gallons of water from its own store, though most community members drink well water or rainwater when potable water is unavailable. Community holidays include the Day of the *Virgen de Guadalupe* and the Town Saint's Day (*fiesta patronal*) to

commemorate the *Virgen Dolorosa* at the end of April (Departamento de Estadística e Información, 2018)

Educational resources include: Adolfo Lopez Mateos pre-school, in which one teacher takes care of three groups of children, Felipe Carrillo Puerto primary school, which offers 6 classrooms and a library, and Rufino Chi Tele-Middle School (Departamento de Estadística e Información, 2018). The schools do not have internet access (Can Tapia and Chi Can 2018). Students who choose to pursue studies beyond Middle School (at Rufino Chi Telesecundaria) attend High School (*preparatoria*) in Peto or Chacsinkin. 14.8 percent of the population is illiterate, 61.1 percent of the population has graduated from secondary school, and 8.3 has pursued education beyond secondary school (Departamento de Estadística e Información, 2018)

Community organizations include Scouts, two baseball teams (the “Tomateros” and the “Novatos,”) and Narcotics Anonymous (Departamento de Estadística e Información, 2018). “Casa Shaja” is an eco-hostel that sells natural remedies in Mérida. It is owned and operated by two newcomers to the community (field notes, 2018).

Few households have indoor plumbing. The vast majority of residents, even residents with access to indoor plumbing, prefer to use latrines on the edge of their property out of custom (Departamento de Estadística e Información, 2018). 95.14 percent of households have electricity. Most solares contain a cement block house as well as a *palapa*, or house made from *guano* leaf, with open walls and dirt floors, where most cooking and dining takes place (Can Tapia and Chi Can, 2018).

Xoy/desvío/detour -- Environmental Conditions

Xoy lies 21 miles above sea level, though water scarcity is a defining geographic and climatological feature of the community (Departamento de Estadística e Información, 2018). The

Yucatan Peninsula is known for its abundance of *cenotes*, (from the Maya “D’zonot,”) sinkholes filled with *ojos de agua* or springs of groundwater connecting to subterranean rivers. However, Xoy is devoid of rivers, lakes, cenotes or any other bodies of water. Compared to the rest of the state, the underlying limestone rock layer in the Southernmost municipalities is thick, making the excavation of wells difficult and costly (Departamento de Estadística e Información, 2018).

Although potable water is available to all residents for roughly four hours each day, water access for crop irrigation is virtually unheard of (interview with Bernardino Canul, 2018).

To complicate the issue of water access, Xoy suffers from some of the most challenging climatological conditions in the peninsula. It has a subhumid tropical climate, with a summer rainy season from May to September (Departamento de Estadística e Información, 2018) that corresponds with the planting season in the milpa. Within this rainy season is an initial rainy period, a month-long period of drought referred to as the “canícula,” and a second rainy period, with less rain. Climate change has diminished the second rainy period to practically nothing, according to interview data and *Cinvestav* data (interview with Biotechnologist at CICY, 2018). The end of the canícula is marked by the Cha Cha’ac rain ceremony, in which milperos and men of the village pray for rain and prepare a feast for the community (field notes, August 12, 2018). Average summer temperatures range from 77-104 degrees fahrenheit (Departamento de Estadística e Información, 2018).

“Xoy” means “detour” in Maya. It received this name because historically the rail line changed paths in the town. Today, *milperos* joke that “Xoy” refers to the Southeastern winds (Departamento de Estadística e Información, 2018) that historically push rain clouds away from the town, a feature seemingly unique to the community that persists today.

Though the majority of agriculture takes place on *kankabales*, expanses of flat soil ideal for agriculture, the topsoil layer is thin, and has a high pH, decreasing the fertility of the soil (interview with Javier Migangos, 2018).

“Xoy es el capital de las ONGs”; “De Repente todos miraban a Xoy”

Xoy plays an important role in the history of traditional maize in the region. It is the sight of origin of an improved open-pollinated native variety of maize, *Nal Xoy*, which community members and most particularly a local milpero named Rufino Chi generated by breeding traditional and hybrid varieties in the early 1980s (Itzá, 2014; FMD, 2015) and which generated international attention among agronomists (Fenzi, et al. 2017). Rufino Chi and Nal Xoy carry historical and cultural significance in the community.

While the Municipal government of Peto has called for increased market access in agriculture and greater use of commercial hybrid seed (Plan Municipal de Desarrollo de Peto, Yucatan.) Xoy faces competing pressure to protect the cultural patrimony of local maize seed, particularly of Nal Xoy. Given its reputation as a center of conservation of native maize, it currently hosts research projects coordinated out of the International Maize and Wheat Improvement Center, CIMMYT, University of Chapingo, The Yucatan Scientific Research Center, CICY and community work run by *Guardianes de la Semilla* under the umbrella of *Misioneros, AC* as well as the non-profit, *Todos Por el Cine* (field notes 2018; interviews with anonymous key informants, 2018). Research and organization also stem from the difficult environmental and climatological conditions that seem to contradict the fitogenetic diversity in the community (interview with Biotechnologist at CICY, 2018).

VII. Researcher Reflexivity

I took great care to avoid reproducing the extractive or exploitative research practices that have long-impacted scientific and agricultural research and ethnographic field work. Even so, my status as an outsider, particularly one with multiple empowered valences to my positionality such as my nationality, race, and the assumed status from my educational background, impacted my engagements with interlocutors. For one, I always emphasized that interlocutors were never required to participate in an interview, show me around the community or the milpa, or teach me how to engage in a certain practice such as preparing the nixtamal or planting maize seed. However, I was very curious about all aspects of life in Xoy, particularly those surrounding the life cycle and processing of maize seed. I did not hesitate to ask for permission to learn about a particular process, or to enter a specific space. For example, women are traditionally barred from attending the Cha Cha'ac rain ceremony—some said that this was to ensure the successful completion of the ceremony, some said it was to protect women's more fragile constitutions from potentially malevolent spirits or winds, and some said it simply was not done. I asked the milpero who organized the 2018 Cha Cha'ac if I could attend, take notes, and take pictures, and he granted me permission without any hesitation. That said, this may have come down to some of the privileges I enjoyed as an outsider. Luckily, the men at the ceremony welcomed me and allowed me to help prepare food and observe the altar. It did rain that afternoon (field notes, 2018).

I also did not hesitate to invite community members to participate in semi-structured interviews. Whenever I reached any hesitation, I stepped back. On one occasion, I feared I overstepped my boundaries; at one point I really wanted to interview a woman ejidataria who was also the widow of Rufino Chi, the man responsible for breeding Nal Xoy. I felt she would

grant a crucial perspective in the history of seed sovereignty in the town. The first time I asked her if she would speak with me, she just sat there silently. Perceiving her discomfort, I changed the subject to small talk. The second time I spoke with her, after some pleasant conversation, I could not resist and asked her if she would be interested in speaking with me, and she was silent again. I apologized for putting her in an uncomfortable position, and said I would not impose on her anymore, but would be happy to keep talking with her and getting to know her as an individual. This was true—I made several friends in the community and learned a lot on a personal level by being able to connect to people on an interpersonal level, and without an agenda. But when I she heard my apology, this woman's daughter asked me a couple of questions about my project and my goals and said her mom would participate. I asked the woman if she felt comfortable with that, and she said yes. Given my fears of ontological expansion, I approached the interview with delicacy, and tried to be very aware of any discomfort my questions or presence might inspire. Happily, she seemed to warm up significantly during the interview process and enjoy herself (field notes, 2018).

One advantage and simultaneous disadvantage during the interview process was my professional experience as a labor organizer—I found it easy for the most part to find interlocutors and to gain access to community events and important community sites. I also found it easy to get answers to my prevailing questions. But each night I would worry as I wrote my field notes that I was somehow subtly coercing people to work with me. No matter how much I reflected, I could not pinpoint anything in my behavior that jumped out to me as coercive. I backed off when I received a refusal or if I perceived discomfort, (though I did ask the aforementioned interlocutor to work with me twice.) I believe that most of my success came down to following up on invitations and appointments in a timely manner, and demonstrating a

constant presence in the community, and an openness to answering any question that was asked of me. I would not describe myself as the most socially graceful person, and I cannot help but view networking with some distaste, but I was able to demonstrate that I am a good person, I care deeply for the subject matter, and I am willing to be transparent about my study aims and foci. I still keep in touch with some Xoy community members who have Facebook profiles, but I have not had the opportunity to return to the community since my field work. People also really appreciated that I speak Spanish and enthusiastically tried to learn how to do their farm and household labor. People loved that I ate the local food without getting sick—the said I was “just like them,” and bragged about my strong constitution. When I played music on my computer, people enjoyed listening to my playlists of cumbia or banda but were not interested in the music I played from the United States, which I increasingly played during my journaling or housework hours when I became homesick. The only complaint I experienced was that I did not speak Maya. While I did pick up a few words, people strongly encouraged me to learn Maya and said it would be preferable to speaking Spanish (field notes, 2018).

Living and working in Xoy as a woman presented certain challenges and opportunities. I was able to speak with women one-on-one which I would not have been able to do as a man, but when I wanted to work with a man, I could not be alone or out of eyesight. Generally, I enjoyed much greater mobility as an outsider than a local woman—for example, while it is acceptable for women to ride tricycles, bicycles, or, in one instance, a motorcycle, it still carries a certain taboo, and most women still walk everywhere or ride side-saddle on the back of their partner’s motorcycle. I, on the other hand, traveled to most of my interviews or to the milpa by bicycle, saving me time. I rented and resided in a house in Xoy and felt so secure as to leave my door and windows open at all times. I did feel eyes on me at all times, which made me uncomfortable, and

which I attributed to my outsider status as well as my gender. Older men liked to regulate my behavior and I knew I must present myself and behave very conservatively, wearing long clothing, never drinking beer in public, never being loud or calling attention to myself. But I like to think this gave me empathy for how the community might have felt at my presence and under my observation, or under the observation of the many other researchers that had preceded me.

I did accidentally make a spectacle of myself on occasion. For one, I pet my landlord's dog, and given that most of the local dogs do not receive human affection, this dog became my shadow for the entirety of my stay. Eventually, a little puppy walked up to me one night, sick with a life-threatening parasite, and I brought him to the vet and cured him. After that, I had two shadows. Then, the grandson of one of my best friends in the community began to follow me around because of the two dogs, and because kids in Xoy don't have any way to pass the time, especially if they are too young to work, and their parents are too busy with household or agricultural labor. I sometimes had a small parade of dogs and children following me throughout the community, but what could I do to prevent it (Field notes, 2018)?

CHAPTER 5

Results and Analysis

This chapter will outline the results of this case study. Section I presents findings related to the Gendered Division of Labor, in answer to research question 1. *What are the respective roles of women and men in the lifecycle of maize seed renewal?* Section II discusses the considerations taken into account when selecting which seeds to plant in the following growing season, which determines in situ varietal trait characteristics, and which varieties to favor more generally. This section responds to research question 2. *What do women and men look for or require from traditional maize seed? To what extent do their motivations align? Which needs take precedence in farm decision-making?* Because questions one and two are descriptive in nature, their answers are more straightforward. They are important in that they nuance our understandings of the gender dynamics in milpa maize production and in agrobiodiversity conservation, which helps to reconcile the contradictions arising in the gendered understandings of each process presented in the literature review. They also depict the quotidian practices that have allowed Maya milperos to achieve some success in native seed conservation.

Section III examines the factors to which Xoy locals attribute their ability as yet to preserve local landraces, and which they articulate as most important to carrying that success onward. It responds to question 3. *How are women and men attempting to preserve their native maize varieties?*

The findings presented here are narrative kin to the seed accessions frozen ex situ in major institutional seed banks. They are snapshots of a specific time and place recorded for posterity. They are useful to grow an international store of knowledge, and it is possible they will be invoked as a resource if needed in the future. But this research is less likely to be useful in

Xoy than local, recurrent texts and practices in keeping with the changing conditions of the community.

I. Gendered Division of Labor

In Xoy, the gendered division of labor in the life cycle of maize renewal echoes the schematic outlined in existing literature on women's and men's respective roles in agrobiodiversity preservation in the Yucatan peninsula. In Lope-Alzina's 2007 article on gender and agrobiodiversity in Yaxcabá, Yucatan, she articulates a division of labor in which men control the process of selecting seed from the existing in situ seed store, men's labor dominates the cultivation process, and women's labor dominates the processing of grain for consumption (Lope-Alzina, 2007). The same division of labor follows, broadly speaking, in Xoy. Similarities between these two studies make sense given key similarities between each study site: Both are indigenous Yucatec Maya peasant communities in which the lifestyle and food system of the milpa predominate. Moreover, Yaxcabá, similar to Xoy, is known to enjoy high rates of agrobiodiversity of maize due to its long history of agroecological and seed research. In the case of Yaxcaba, research occurred in partnership with noted Mexican agronomist Efraím Hernández Xolocotzi (interview with biotechnologist at CICY, 2018). The relative success of both Xoy and Yaxcabá in preserving agrobiodiversity of maize may stem from their mutual, longstanding involvements with research projects, granting training in best practices and resources for farmers. Additionally, the persistence of cultural gendered divisions of labor in both communities suggests that the survival of agricultural practices consistent with ancestral norms preserves agrobiodiversity—that is, we find the unsurprising notion that places that practice agricultural outside of the disciplining and exploitative effects of capital have greater agrobiodiversity.

However, this study's findings differ in notable ways. Lope-Alzina (2007) finds that despite the gender norms around the division of labor in the selection, cultivation, and processing of maize, women communicated their preferences on varietal selection to their partners, and men took their partner's feedback into account when planning which varieties to grow. In Xoy, I rarely found this to be the case, though this is partially attributable to limitations on seed availability, which I will discuss further in section II. Additionally, my study examines the experiences of single women and women temporarily acting as heads of household in the lifecycle of maize renewal, including widowed and divorced women and women whose husbands have left Xoy for work in nearby cities, tourist destinations, or the United States. Other nuances arise throughout the seed selection and labor process that will differentiate the results of this study from those prior.

These results will outline the gendered divisions of labor in the life cycle of maize and provide additional attention to the role of single women farmers, whose households deviate from the traditional structure dictating gender norms around maize production and consumption, in which a man heads the household and works as a milpero and likely an *ejidatario*, and his partner works as a farm wife and has *comunera* status to the milpa and ejido lands. Single women adapt variously to meet their needs for maize production and consumption.

Gendered Division of Labor in Seed Saving

Below I will discuss the decision-making parameters in seed selection. Here, I detail the labor assignments according to gender of seed saving as a process. To begin, we must look at the origins of the seed. The beginning of this of course takes place within the milpa, where the maize is grown. After maize matures in the milpa, it is left on the stalk for about a month to dry in the open air in the field. Often these maize stalks, which range from roughly 8 to 12 feet tall

depending on the variety, are folded in half as a measure to protect the fruit from birds and other animal pests while it dries. Women, men, and children all participate in this “doubling over,” or “folding” of the maize, and it is one of the few “genderless” activities that take place in the seed saving process (field notes, 2018).

After the maize has sufficiently dried, men, women, and children all participate in harvesting the crop. In fact, it is the task that carries the most evenly-dispersed involvement by gender and age. Seeds are subsequently stored in *trojes*, or granaries. These granaries are generally open-air thatch houses made from logs and guano leaves. The seeds and grain within the *troje* are kept on the cob and stored in plastic woven sacks or left in open air and grouped by variety. Husks remain on the fruit as an added layer of protection from pests. To further protect the maize, men will sprinkle lime (calcium hydroxide) on top of the fruit to prevent pests from eating it. Generally, men administer the storage of grain in the granary and set aside preferred ears for seed. Women continually interact with the granary, however, entering to choose ears for grain and remove them from the cob in preparation for the nixtamal process, elaborated below (field notes, 2018). Notably, hybrid maize is more likely to be attacked by pests during the storage period than native varieties because it has not been bred to be durable in local conditions and resistant to local fauna. When the pests get to it, the grains will have visible small holes in them, making it evident that they have been eaten by pests and can no longer be used as seed. From here, men will select which seeds are best for growing and separate them out. The rest will be used as grain in the making of tortillas. This is significant because hybrid maize cannot easily be saved year after year as seed due to its loss of hybrid vigor, yet its added vulnerability to pests further mitigates the seed saving of hybrid maize, and even the saving of hybrid grain (field

notes, 2018). Below I will discuss some of the reasons milperos in Xoy still choose to grow hybrids.

Gendered Division of Labor in Maize Production

Milperos, whether men or women, must wake up early to conclude enough of their agricultural duties before it gets too hot to work. Generally, they will wake up, eat breakfast, and travel to their milpa by tricycle or motorcycle in the surrounding ejido lands, some of them traveling several miles before they get to their plot. Often, farmers will have small plots spread out in different parts of the ejido lands but grouped somewhat close together. Different maize varieties may be planted in separate plots or within the same plot but separated. Interbreeding is prevented by planting seeds according to their growing cycle, taking care that the different varieties do not flower at the same time, as maize is open-pollinated. The loss of knowledge of ancestral farming practices and decreased exposure and familiarity with native varieties and their flowering and growth cycles has increased the risk of accidental cross-pollination (field notes, 2018). I spoke with one milpera whose native seeds had crossed with hybrid maize:

Entrevistadora: ¿Hay muchas milpas vecinas?

Flor: Sí, tenemos vecinos. Toda la arena que carga sus pechitos se van allá, donde está la flor del híbrido, así se cruza, dice el difunto Rufino, dice, "Si ustedes quieren cuidar la semilla que estoy vendiendo, que lo siembren así, que no tengan vecinos así cerquita", porque esas avispas o no sé cómo se llama ese-- Abeja, lo llena toda su chan patita y va otro para que lo llene más, para que lo lleven a su panal. Así como dice que una vez que lo que pegue ahí en la flor del maíz, que ya lo cruzó así. "Así cruza", dice el difunto. Nos platicó así también cuando fuimos a comprar la semilla. "Si usted la quiere cuidar a la semilla que la siembran, que no hayan vecinos cerca de ustedes, porque eso es legítimo híbrido".

Entrevistadora: ¿Cómo ustedes ven que sí está cruzando?

Flor: Sí, ya los vimos que ya está cruzando, porque hay unos maicitos amarillos dentro de esa, se ve que hay amarillos. Ya está cruzado así.

Interviewer: Are there many neighboring milpas?

Flor: Yes, we have neighbors. All of the sand (pollen) that [pollinators] carry goes there, where the hybrid flower is, that's how it's crossed. The late Rufino says, "if you want to take care of the seed that I'm selling, you must plant it in such a way that it doesn't have neighbors close by," because those wasps or I'm not sure what they're called—bees, they cover their little feet [with

pollen] and go to another [flower] to fill up with more pollen, in order to bring it to their beehive. Just like he [Rufino] says that once it hits the maize flower, it already crossed. "That's how it crosses," says the late Rufino. He told us also when we went to buy the seed, "if you want to take care of the seed, plant it far from your neighbors, because that is legitimate hybrid."

Interviewer: How can you see that it did cross?

Flor: Yes, we already saw that it already crossed, because there are little yellow grains inside of that, one sees that there are yellow grains. It's already crossed.

Despite this accidental crossing, whether through open pollination or pollinator insects, Flor still manages to save and store this crossed variety until the subsequent growing season and use it for her culinary needs (Interview with Flor Castillo, 2018).

From the morning's labor in the milpa, most milperos will return to their homes before lunch, eat lunch, rest during the siesta hours, which coincide with the hottest hours of the day. Men will then often walk around town and play table games like dominos in the town square, socialize, and sometimes imbibe. Sometimes they might go back to the milpa in the cooler hours of the evening before dark for more work. I saw this only rarely, though notable field work occurred during the most humid part of the year. The milperos will return for dinner and then go to bed early (field notes, 2018).

Native maize is also often planted in the solar, alongside horticultural crops, tree fruits, herbs, and flowers. The solar, referred to elsewhere in Latin America as the *traspatio*, is the yard surrounding the cement house, palapa house made of wood and guano leaves, chicken coops or other animal enclosures, and the latrine. Crops in this space are usually planted, cared for, and harvested in a less orderly way, (for example, without regard to planting in rows.) However, order is not necessary in the solar because, distinct from the milpa, plants grown here are supplemental and exclusively for culinary use—they do not need to be grown intensively and dot the solar's terrain. Agricultural labor in the solar occurs throughout the day and is most often carried out by women and children (field notes, 2018).

Tumbar/Quemar

This practice is commonly referred to in English as slash-and-burn. This is the process of controlled burning and deforestation undertaken when a new area of the surrounding ejido is to be cleared for cultivation. It must be done with approval from the other *ejidatarios* and the commissioner, as ideal spaces and soils for growing are contested, and everyone wants access to the best growing conditions possible. As *ejidatarios* are mostly men, this decision-making realm is predominantly male, though there are some women *ejidatarias* (field notes, 2018).

Deforestation is a problem for soil erosion, as is the over-exploitation of a specific milpa plot without leaving it fallow. However, because soil conditions are so rocky and the topsoil is so thin, it is difficult to find good soil, so farmers tend to overwork a plot of land that has had the biggest rocks cleared out and has an ideal soil type. This overworking leads to an extreme thinning of soil nutrients and erosion. Pesticides, herbicides and fertilizers also lead to soil erosion, and are used in conjunction with these spaces to attempt to aid growth in otherwise poor soil conditions. All of this compounded has led to greater deforestation and a big soil erosion problem, which manifests as limited productivity from the seeds (field notes, 2018).

Regarding the gendered divisions within slash-and-burn farming, men are usually the only ones who chop down trees and practice controlled-burns in this process, though I did encounter one woman who administered controlled burns (interview with Isaura Tum Canul, 2018). Extension-style projects from CIMMYT and SAGARPA have discouraged the use of controlled burns to get rid of plants and weeds in order to grow in a new area because it kills micro-organisms in the soil, destroying its structure and leading to even further erosion (interview with SAGARPA extensionist, 2018). Taken together, soil erosion is a problem that is

not being properly addressed but instead, being further promoted through attempted fixes and pest control methods.

Pest Treatments

Within the prevention of pests or preventing of infestations, Men are the only ones who apply pesticides and herbicides to the crops. In fact, generally men will be the only ones who apply fertilizers, though some women will allow their families to apply fertilizers. This is often done by placing a small handful of colored fertilizer pellets in a small hole near the base of each maize stalk. These stalks will grow weeds that must be removed as well. Women are generally in charge of controlling weeds by chopping them with a machete. Men will also chop weeds with a machete, but not as often. The use of this machete to cut weeds is known as *chapeando*, and it involves significant drudgery. Additionally, because this chopping does not pull up the weed from the root, the weed will rapidly grow back, requiring further chopping often (field notes, 2018).

Planting



Figure 2: *The Three Sisters: Maize, beans, and squash, in this case planted simultaneously, growing together (photo by author)*

Once the land has been prepared by clearing weeds through the slash-and-burn process, herbicides and weed-whacking with a machete, and it is the appropriate time to plant a particular variety, men will begin to plant maize seed. This is done by walking in a straight line roughly 18-25 feet, and making a hole for planting with a large, pointed stick. Maize and squash seeds are planted at the same time, with 3-5 seeds going in each hole, then being covered up. Beans are usually planted later, or as is more common now, are planted separately from the maize and given large wooden poles to climb instead of the maize stalks. Men tend to predominantly do the physical planting though women also participate. Special care must be taken to time the planting correctly to avoid unwanted cross-pollination. Once the seeds have fully matured it is time for them to be harvested. This is the activity in which most people have experience, even those with the least experience in the milpa. This is still dominated by men, but women and children also participate (field notes, 2018).

Gendered Division of Labor and Food Processing—Preparation of the Tortilla



Figure 3: Two women mill grain to make masa for the tortilla (photo by author).

The preparation of the tortilla is a 24-hour (off-and-on) process that universally and unequivocally falls to women farmers and farm wives in Xoy. In the evening, following dinner, women boil maize grain over the fire for roughly forty minutes, then leave the maize to soak in lime (calcium hydroxide) over night. In the morning, following breakfast, women wash the lime from the grain by passing the mixture of lime, water and grain between two pots, filtering out more lime each time, until the water is clear and no longer opaque. The grain is clearly softer, with the shell rubbing off easily, and the grain exhibiting a slight green tint. The grain is drained of water one final time, and thrown into a bowl, which women carry on their heads or hips and walk to one of the three local mills. Otherwise, they carry it on the bench of a tricycle, an increasingly accepted mode of transport for women. There remains a taboo against women riding bicycles or tricycles, as the machinery goes between a women's legs (field notes, 2018). At the mill, they pay MXN \$2 to use a large electric mill, powered by the wife of the municipal commissioner. It is her responsibility to clean and service the electric mill, and to keep the power on in the mill building, funded by the \$2 MX supplied by each woman in town who visits. When a new commissioner is elected, she will train his wife to run and operate the mill (interview Renata Euan, 2018). After milling the grain, women return the masa to their bowl and transport it back to their homes. From there, they begin to prepare tortillas for the lunch hour, placing a small ball of dough on top of a sheet of plastic, most often repurposed from a plastic bag. Spinning clockwise or counterclockwise, they push the ball into a disc shape. Once it is placed on the fire, the tortilla is successful if it inflates while cooking. In the afternoon, during the hours of the siesta, the process continues as women sit together to remove the next day's grain from its cobb. If a woman purchases hybrid maize from the CONASUPO market in town, they do not

need to take place in this process, as the maize is sold in a plastic bag. Dinner follows soon after, and then the boiling of the following day's grain for the nixtamal (Field Notes, 2018).

Men do not learn how to prepare the grain, nor do they prepare the tortilla itself. This is explicitly referred to as "*trabajo de mujeres*", or "women's work" (Interview with Raul Poch, 2018). Once a year, men make something approximate to a tortilla for the annual rain ceremony, *Primicia* or *Cha Cha'ac*—Using only their hands, they make a *pim*, a thick tortilla about the size and thickness of a pancake (Field Notes, 2018). For one, they do this because women cannot make any of the food for the rain ceremony, as women are banned from preparations for the rain ceremony out of fear that a bad spirit will take advantage of their named weaker constitution (Interview Gabor Canul Carranza, 2018). The fact that men make the *pim* rather than the *hua* or tortilla for this ceremony indicates not simply that men do not make the tortilla out of ignorance, rather out of a refusal to make the tortilla, perhaps out of respect for the tortilla or out of a sense of sexual dimorphism that extends to the very labor carried out by women's and men's bodies respectively. Curious to this dynamic is the name of the tortilla press in this community. In Xoy, a tortilla press, which presses a ball of dough flat in place of a women's hands, is referred to as a "*marica*," which students of Spanish will know is in present day a homophobic slur against gay men (Field Notes, 2018). If this is the etymology of the name for a tortilla press, I believe that this fits into the narrative of sexual dimorphism according to work. That is, that no man would ever create a tortilla, and if he were to try, he would not be able and would require a tortilla

press. And further that the very desire, curiosity or need to make a tortilla would evidence that he must be gay.

Men also do not set foot inside the mill, as stated explicitly in multiple interviews and evidenced by several months of observation of the Xoy mill (field notes, 2018; interview with Homero Castillo, 2018). Some men will bring their wives or partners to the mill by motorcycle or tricycle for her to mill the grain and wait outside for her to finish with her work. In this case, she will sit on the tricycle platform in front, or will sit side-saddle on the back of the motorcycle, due to the aforementioned taboo surrounding women operating motos, bicis or tricis). Women suggested men might feel embarrassed to be seen entering the mill, which some men confirmed in their interviews:



Figure 4: An outside view of a mill in Xoy sponsored by the Comisión Nacional para el Desarrollo de los Pueblos Indígenas (CDI) or National Commission for the Development of Indigenous Peoples (photo by author).

Entrevistadora: ¿Te daría pena ir al molino?

Raúl: Creo que sí, porque no está acostumbrado que vean a los hombres que llegan más que las mujeres. No te burlan, pero como que a veces cuando llegas se andan burlando. Solo por eso.

Entrevistadora: ¿Quién se burla? ¿Son las viejitas [que están siempre por el molino]?

Raúl: No, entre los amigos, los señores del centro que ven.

Interviewer: Would you be embarrassed to go to the mill?

Raul: I believe so, because it's not customary to see men that go there, just women. They don't make fun of you but like sometimes you arrive and they start joking. Just for that reason.

Interviewer: Who makes fun? Are they those old men that sit across from the mill?

Raul: No, between friends, the men that go to the square (interview with Raul Nis Palomo, 2018).

Raúl refers to the congregations of men in the town square, be they the young men who play marbles in a lot next to the mill, the customers at the market smoking the odd cigarette and chatting, or the men playing dominos in the plaza (Field Notes, 2018). Because women's movements are largely restricted to the mill or the market when unchaperoned, social groups in the square are dominated by men who watch the goings on of the townspeople and discipline peoples' practices through *chisme*, (gossip), *piropos*, (catcalls,) or jokes, well-meaning or otherwise (Field Notes, 2018). Their vigilance discourages any deviation from gender norms surrounding the mill and its visitors, as it does when those men return to their homes and engage with the women in their households.

As such, the importance of the mill for women cannot be overstated. As a place that men refuse to inhabit, it is also free from the disciplining effects of their gaze and their tongues. Instead, as a space coordinated by a woman and visited by women alone, it is a safe place for women to gossip, joke, and socialize amongst themselves, within the bounds of their time and workload (Field Notes, 2018; Interview with Renata Euan, 2018). The mill, a single room with one bench and no fan, densely populated by the machinery of the mill and several women, is insufferably hot in the summer, requiring women to come and go rather quickly from this safe haven (field notes, 2018).

Single Women

In Xoy there are a few women who have *ejidataria* status, some of whom choose to work in the milpa and some of whom do not. There are a few women who are *comuneras* rather than *ejidatarias*, but still take part in the milpa. Those women *ejidatarias* who do not want to work in

the milpa leave it for their sons to work in, or contract out for day-laborers to work in them or leave the land to fallow. One woman I observed worked alongside her son and split the labor with him, planning on leaving her milpa lands to him after her passing. The women who work in the milpa practice all of the agricultural activities that tend to be dominated by men. They are divorcees, widows, women whose partners have left them, and women whose husbands have gone to work in Cancun, Isla Holbox, or other touristic areas, or have gone to the United States. Married women whose husbands are in Xoy or local do not work in the milpa alone or unsupervised, nor do they make decisions regarding the milpa. In this way, the single women have a unique status within the milpa as it pertains to their gendered responsibilities (field notes, 2018). In exercising these responsibilities in the milpa, these women tend to use fewer agrochemicals than men and in so doing practice the methods of their grandfathers, as they put it. “Puro rocear hacen los hombres” (interview with Fernanda Cauich Euan, 2018). This change in agrochemical use may also be because they tend to have less economic freedom than men. They tend to farm a smaller plot than men, which means they have less profit at the end of the growing season than men might. These women who work in the milpa do not typically participate in slash-and-burn practices. This responsibility remains a primarily masculine labor, and therefore they tended to find a friend, family-member or contractor to do this piece for them if needed (field notes, 2018).

These circumstances are the only way any women ever seem willing to go to the milpa on their own. Women who primarily work as farmwives and housewives do not go into the milpa alone—most often they cite snakes as a risk, but I sensed this is a euphemism for other risks; Women who go to the milpa alone and have a husband might be viewed as improper, or rumors might spread that she is having an affair. Single women who go out into the milpa might be

rumored to be having a romantic rendezvous. Women are very much expected to be taking care of home or to be with their husband. In fact, it is unacceptable for a woman to be alone with a man who is not her husband. Single women who are not separated/widows, and generally older must not go to the milpa alone or without a family member or girlfriend. It is also understood that pregnant or breastfeeding women should not go to the milpa because they will attract snakes. Women may go with their women friends or family to collect firewood at any time, however (field notes, 2018).

A woman *milpera* gets up at 6 or 6:30 to prepare breakfast, travels to the milpa, then returns home to mill her grain, make tortillas and prepare lunch. After lunch she will rest for a little while, sometimes while making handicraft to sell or doing some other household chores. She will take care of grandchildren, the *solar* and any animals throughout the day. In the evening she will prepare dinner and prepare the next day's *nixtamal*, then go to bed early. In essence, she must complete the full roster of daily activities of both men and women. She must act as the glue to preserving native seed culture, especially when men increasingly migrate out. However, single women or women heads of household experience greater independence, decision-making power, and freedom from domestic violence, a widespread phenomenon in the town (field notes, 2018; interview with Susana Huidobro, 2018).



Figure 5: *Two tricycles and their gendered uses: The first is a man milpero's tricycle, with seed loaded up in the front carriage. The second is a woman milpera's tricycle with chicken and tortilla masa, who, despite working in the milpa every day, must also attend to the processing of maize, providing for family meals, and taking care of the household (photos by author).*

II. Gendered Dynamics to Selecting Seed

Considerations Related to Productivity

Men choose seed according to productive factors. Most often, these include the size of the maize fruit and the numbers of ears on each stalk. This can extend into other measures of productivity such as efficiency. One man chose his seed according to what grew the most quickly, selecting for faster-growing seed. Additionally, the men also take pest resistance into account, though this occurs naturally, as the maize that is eaten by pests on the field or in the *troje* will naturally be selected out of the gene pool (field notes, 2018). This may be considered an additional measure of efficiency, as it may save money when pesticides are considered.

Considerations Related to Aesthetic Value

Additional selection criteria relate to the sense appeal. The colors of maize grown in Xoy are yellow, white, red, and purple. People most often prefer the white and purple varieties based on their color, with the belief that the white and purple tones are indicators of better fruit. Taste preferences were also a factor, though varied widely. Generally, people preferred the taste of

native varieties to hybrid maize grown in the milpa or hybrid grain purchased at the CONASUPO (field notes, 2018).

Considerations Related to Availability

Though Xoy has a relatively large amount of agrobiodiversity of maize, the availability of different maize varies widely from household to household due to genetic erosion resulting from knowledge loss and subsequent cross-pollination, or due to the non-viability of milpa production for some families, resulting in their relocation to metropolitan areas, and in places like Xoy, another community member who stores and exchanges seed at the local level. The “Guardianes de maiz” tend to have several varieties of seed that they grow, which takes a significant amount of planning on their part to avoid accidental cross-pollination. Other households may have just one or two, so when they are selecting seed, it is limited by the options available to them (field notes, 2018). Many do not purchase seed at seed fairs because of a perceived markup, citing that the seed fairs are for “city folk” (interview with Julio Rodríguez Ixim, 2018). Because of this, many are content to grow just one or two varieties as long as they can produce enough grain to meet their needs and seed to plant for the following season (field notes, 2018).

Limited availability of native varieties predisposes households to plant hybrid maize. Despite the factor that hybrid seed must be purchased, and often must be paired with other farming technologies such as agrochemicals, it is readily available and more productive than native varieties. Farmers who lose access to native seed can always locate hybrid maize seeds to plant (field notes, 2018).

Considerations Related to Health

While selections based on health considerations do not relate to the selection of seed from available grains, it relates to the choice of growing native seeds in exclusion, rather than growing hybrid maize or a mixture of native and hybrid maize. There is a perception that native maize is healthier than hybrid seed, and a deep perception that native maize is healthier than GM seed, though no one in Xoy grows GM seed. GM seed is seen to be contaminated with “chemicals and cancer” (interview with Dolores Chi, 2018). Though this view does not align with the prevailing wisdom on transgenic seeds, it signals a unilateral rejection of the technology that couples with the hegemonic use behind it. The rejection may be for the wrong reasons but signals a rejection of the power relations behind the seed. Said Eider Guzman:

Hay un señor detrás de México que se llama Monsanto A él no le gusta que sigan teniendo un poco de su producto de los pobres, dice él, "Para que se acabe su semilla de ellos, yo voy a sacar mis semillas, regalado lo voy a hacer a ellos", pero como hay algunos que lo saben de antes, nadie quiere agarrar las semillas.

There's a man after Mexico called Monsanto. He doesn't like that the poor continue having a little of their own produce. He says, "In order to put an end to their seed, I am going to take out my seeds, and give them as a gift to them" but as there are some of us that know about this from before, no one wants to take the [transgenic] seeds (2018).

In the case of hybrid seed, there is a perception that the seed is forced to grow more quickly through the use of agrochemicals and in this way has not been allowed to properly mature and to acquire nutrients from the soil. Because of this, hybrid seed is seen as a poor alternative to more native seed selections. According to a journalist in the area of Maya rights:

El maíz que se comía traía todos los nutrientes suficientes porque, para empezar, es un maíz que cumple su ciclo... un ciclo criollo, completo, donde madura la semilla de un suelo fértil, pues, la persona que se alimenta de ella lógicamente que su salud va a estar excelente, va a estar bien. Pero qué me dices de un maíz obligado a crecer rápido con fertilizantes, que es cosechado cuando ni siquiera ha madurado, que es secado y luego por qué? Porque se necesita hacer dinero. Y no les interesa si la persona que lo consume le va a nutrir o no le va a nutrir. De allí viene el decremento de la situación de la calidad de vida de la gente. Todo rápido y así la vida rápida.

The maize that used to be eaten carried sufficient nutrients because, to begin, it is a maize that completes its cycle... A native cycle, complete, where the seed matures from a fertile soil, well, the person that feeds themselves from that seed logically will be in excellent health. But what would you tell me of a maize fruit obligated to grow quickly with fertilizers, that is harvested before it has even matured, that is dried and later, why? Because one needs to make money. And they don't care if the person that consumes will be nourished or not. From there comes the decrease in people's quality of life. Everything quick and as such a quick life (interview with journalist at Xepet radio, 2018).

Considerations Related to Agrobiodiversity Preservation

Guardianes de la semilla grow seed with the mission of preserving agrobiodiversity.

They will grow as much of each varietal they have access to every year to renew its fertility. This means they tend to require a greater growing area in order to grow enough of each variety to renew the seed as well as to subsist, and to separate the seeds from each other sufficiently to avoid cross-pollination. They also must map out their milpa holdings in advance of each growing season, which people with one or two varietals tend not to do (field notes, 2018).

Prioritization of Needs

Men choose seed according to the productivity of the maize and its growing practices.

Women look for seed that tastes good and has an aesthetic value. Both choose seed according to availability, in this case very directly meaning what they have access to. The availability of these seeds is diminishing due to genetic erosion and biodiversity loss, as well as depeasantization and proletarianization. This is further due to exclusion of farmers from organizing and research/development projects as a result of resource-hoarding, referring to the fact that most households grow one or two varieties while the Guardians are able to grow a lot more. The seed selection can also be seen as a money-saving measure, a way to survive as food is one less thing to have to purchase (field notes, 2018). In fact, many milperos argued that this was their prime reasoning in practicing milpa architecture—in the absence of anything else, they never risk going hungry (field notes, 2018) Although, the intense time and money spent on peasant farming does

not seem to factor into this perspective. If people worked and didn't practice peasant lifestyles, they would have more money with which to purchase seed.

Color and Taste of Tortilla, colorful maize

Women farmers and farm wives displayed a tendency to favor maize varieties according to the color of the tortilla that would result from the nixtamalization of the maize grain. White and purple maize were the most prized colors among women farmers of Xoy. Popular white varieties included Nal Xoy blanco and Xnu'uc Naal blanco. The only purple maize variety grown in the area was Xnu'uc Naal Morado, more commonly referred to as Éek' jub. Éek' jub resulted in a purple tortilla on the first day after nixtamalization, and a pink color two days after nixtamalization. Often, these farmers named the agreeable taste of a particular maize variety in the same breath as its agreeable color. That is, one aesthetic pleasure was associated with the other. The good taste of a tortilla was also coupled with discussion of its texture: farmers and farm wives associated a softer, less granular masa and subsequent tortilla with a superior taste (field notes, 2018).

Often, motivations align insofar as women's selection criteria coincide with men's incidentally. The milpero makes the final decision, and though there are women who work in the milpa and even women that administer it on their own, the majority have limited access to the milpa, limited types of agricultural labor they practice in the milpa, and subsequently, limited decision-making power. There are rare exceptions to this dynamic, and some men do take their wives' preferences into account (field notes, 2018).

III. Resistance and Resources to Save Native Seed

A. Land Tenure



Figure 6: *A local map of the Xoy community (small square in the center of the map) and its surrounding ejido landholdings (Photo by author)*

Land is one necessary resource to save native seed to which Xoy enjoys access. We see that *milperos* who choose to parcel their land overwhelmingly tend to sell it in inevitable times of economic duress, whereas Xoy farmers, due to their solidarity as *ejidatarios*, managed to fend off buyers who wanted them to “*malvender*,” or sell their lands at a low rate (Interview with Venustiano Can, 2018) *Milperos* who sell their lands lose access to the monte and can no longer farm, forcing them to move and join the labor force (Interview with Xoy ejido commissioner, 2018). Large-scale producers purchase the land for pasture, monocropping, or building development (none of which are conducive to the farming of native seed). As one *milpera* said to me in reference to *malventos* of land, translated to English, “Lazaro Cardenas gave us this land, and we’re throwing it away” (Interview Flor Castillo, 2018). *Said one member of Guardianes de la semilla in a monthly meeting:*

Lo que tenemos que hacer es proteger la semilla, y una manera de protegerla es sembrándola. Si no lo siembro, y a veces estamos en defensa de las semillas, y ya vendí mi tierra, qué voy a proteger?

What we have to do is protect the seed, and one way to protect it is to plant it. If I don't plant it, and sometimes we are in defense of the seeds, and I already sold my land, what am I going to defend? (discussion with Guardianes de la semilla, 2018)

This quote also calls upon the importance of in situ seed saving practices in the regeneration of native seed, and the maintenance of milpa culture to carry native seed onward. Without planting the seed, on one's land, to feed one's body and family, the native seed loses its importance. Without a cultural context, it is inert genetic material.

Land access is complicated by the degradation of soil and the end of soil rotation practice due to increased productive demands. Though more men than women tend to be *ejidatarios*, women can access the milpa due to their *comunero* status, though that access has its limitations as discussed above (field notes, 2018)

B. Peasant Production and Financial Precarity

Women and men in essence require the world to be a different place for them as indigenous peasant farmers. They point to a lack of income to purchase the materials they now need to get their seeds to grow, even if the seed is free. The environment and soil are so degraded, and rain patterns so disrupted by climate change, that farmers require fertilizers, pesticides and herbicides to coax the last bits of productivity out of the soil. They can acquire some money to purchase these things from ProCampo or ProAgro, selling food or handcrafts, from joining the formal or informal labor force (usually as a construction worker) and returning intermittently to farm, or from remittances from a family that has left Xoy to work abroad or in a tourist destination. Guardians have made some of the money they need from selling seeds at seed fairs, often charging a premium for native seed and selling to people from Merida and other cities (field notes, 2018).

One interesting development is that certain university groups have created a local commodity chain of native seed, intending to sell it to restaurants at a premium, considering the work and singularity of native seed. However, Xoy farmers have not been able to meet the demand even for one restaurant, because milpa farming is not intended to produce at scale, it is not even sufficient to feed a family for an entire year. Even the most dedicated *milperos* run out of grain before the next season (field notes, 2018; interview Raul Poch, 2018). A Biotechnologist at CICY proposes to create a commodity out of native seed and sell it to companies like Maseca (interview with biotechnologist, 2018), but for one, if the farmers banded together could not meet a local order, they are unlikely to be able to meet the demands of a large company, and for two, the company could easily appropriate the seed and grow it as a commodity crop on their own if Xoy farmers went down this path.

C. Ecological and Ancestral Farming Practices

Alternately, there is a more difficult option of practicing agroecological farming or what's commonly referred to in Xoy as "organic" farming, such as fertilizing the soil with animal waste and compost (interview with journalist at Xepet, 2018), "*chapeando*" instead of "*roceando*", (Isaura Hernandez, 2018), and rotating crops, which carries challenges of balancing the needs of other *ejidatarios*, as good land is increasingly difficult to find, and certainly too tempting to give up, and as the population of *ejidatarios* seems to be growing to eclipse the productive capacity and land availability of the Xoy ejido (field notes, 2018). This way would require much more drudgery on the part of the farmer, complicated by the increasingly oppressive heat. It would certainly require people who work some of the time to leave their jobs and dedicate themselves full time to the milpa. This is the option most often put forth by university groups.

D. Erosion of native seed knowledge

Knowledge of the cycles of each of the native seeds is a crucial resource in saving seed. However, it is a knowledge that is being lost as farmers increasingly lose access to native seed, (in events such as draught which cause the loss of that year's crop), and as farmers don't pass on their farming knowledge to the next generation, especially due to processes of depeasantization. Educational projects that specifically include women and children would help to curb the loss of this knowledge. All of the guardians in Xoy are middle-aged or elderly men, demonstrating a clear lack of access to knowledge for women and children. University research and extension can aid in this process, and in the case of Xoy, many do seek to, but their reach into these communities has proven too superficial to overcome the local politics and resource-hoarding of the same people who are continually tapped on as resources for this project. The majority, especially women, tend to be passed over for agricultural education projects and initiatives. Research and development projects also have not overcome the well-earned distrust of locals, due to a history of biopiracy and exploitation of knowledge. Because the labor of the milpa and the subsequent processing of the maize crop are so segmented by gender, women and men depend on one another to continue to grow native seed. Each carries necessary knowledge for the way of life that is needed for native seed to endure (field notes, 2018).

E. Networks of Resource- and Knowledge-Sharing, Activism, and Barriers to Their Formation

The single greatest way to preserve native seed is to share it with other farmers who grow for subsistence purposes. If a seed is lost, there is a repository for them to fall back upon. This sharing can be accomplished by in situ seed saving, which allows the seed to be more finely attuned to local conditions and preferences, and which allows for greater genetic diversity of seed accessions. In situ requires coalitional thinking and solidarity. *Guardianes* is providing the beginnings of that network of solidarity, as *Red en Defensa de la Semilla* (field notes, 2018).

CHAPTER 6

Discussion and Conclusion

I. Summary of Study Aims and Methods

The goal of this study was to investigate gender stratification within milpa agriculture in Xoy as well as investigating the methods, divisions, shortcomings, and successes of seed saving in the region. Through these goals, I looked to understand the factors affecting agrobiodiversity in the region in both positive and negative ways, and to frame and explore these findings through an ecofeminist lens focused on promoting solidarity both within and outside of my study site. This solidarity, as has been stated in other sections of this document, must be based on a mutual trust in shared goals and intentions, and must promote a growing of networks that participate in and preserve the lifecycle of native seed.

These goals were addressed through the following research questions:

1. What are the respective roles of women and men in the lifecycle of maize seed renewal?
2. What do women and men look for or require from traditional maize seed? To what extent do their motivations align? Which needs take precedence in farm decision-making?
3. How are women and men attempting to preserve their native maize varieties?

This chapter will discuss the results and findings as they apply to these questions as well as consider their situation within the greater literature of this field. Beyond this, I hope to discuss the importance of this data not solely as it adds to a body of literature, but in how it may affect material change via the growth of solidarity. From here, I will discuss the limitations I identified both in my research design and experience and discuss directions and methods of remediating these limitations and further expanding the base of knowledge on this topic. In doing so, I hope

to present these findings in a way that provides space for other ways of knowing, rather than presenting these findings as “deviations from” or objects of inquiry.

II. Summary of Conclusions

This project was initially inspired by two contradictions at play in Xoy. First, a contradiction in the real world, in which a Maya peasant community, Xoy, was found to have increased its maize agrobiodiversity, when globally, agrobiodiversity is in sharp decline due to the interactive suite of political, economic, technological, and environmental conditions discussed in this paper. Second, a contradiction in agrobiodiversity literatures, which point to women as stewards of global seed diversity, and cultural studies of the Maya milpa, which squarely locate men as its stewards.

This study does shed some light on these apparent contradictions. For one, while Xoy has managed to preserve native maize varieties, this capacity is very unevenly distributed throughout the community, with those milperos who have the greatest access to activist networks such as Guardianes de la semilla or university research and extension project able to leverage those networks to eke out the extra financial and technological resources required to dedicate the extra time and money to preserve native seed. And while I do not question these milperos’ commitment to preserving native seed, I see a clear and repeated process of gatekeeping on their part, preventing the involvement of further community members. While I empathize with these farmers’ desire to control access to valuable institutional resources and networks given the extreme precarity they experience, it is apparent that this gatekeeping has undermined activist networks and organizing, and therefore local seed diversity. Second, Xoy has contributed to increased agrobiodiversity in the region because Rufino Chi, a Maya milpero native to the town, crossed a hybrid maize with a Xnu’uk naal in the 1980s, and was able to generate the

productivity of a hybrid with the resilience of a landrace. This is a proud legacy, but it has not turned Xoy into a hub of plant genetic diversity. It instead attracted an endless stream of research which has had limited reach into the community and limited impact. It has also created significant mistrust, as the fate of Chi's research documents from his process of synthesizing Nal Xoy has been deeply contested, along with the nature of his fame and legacy in the community, the account of who participated in Nal Xoy's creation, and the best strategies to maintain sovereignty over the variety.

There is nothing that Xoy can do independently to preserve native varieties, because the political economic, climatological, and general ecological challenges are too great to battle as a lone community. The only possibility for the survival of native seed, which is central to indigenous peasant farming culture and its survival, is to work with other communities in a concerted effort to defend seeds and their accompanying practices and cultures: to share seed in the event of seed loss, spread seed to communities in which it is no longer or not yet grown so that the repository in the event of emergencies is greater, spread knowledge of how native seed can be grown responsibly (in terms of soil preservation and growth cycles), organize in solidarity to battle biopiracy, land appropriation, impositions of GM and hybrid seeds, and the creation of laws and trade deals that further disadvantage peasant farmers, and organize in solidarity to put forth economics and politics that contradict and combat globalization, neoliberalism, and coercive capitalism. It is difficult to imagine this multi-regional or international coalition arising when Xoy cannot create solidarity within. Future research and organizing initiatives would do well to take a deep dive into this community, ensuring that no interested potential participant is excluded from learning and organizing to save native seed, and integrating as many people as possible into this important fight.

The second contradiction relates to the role of women in agrobiodiversity literatures as seed stewards, and the clearly gendered relationship in milpa agriculture that gives men the lion's share of decision-making power. What I feel my data reflects is that while women may not have significant agency, they hold irreplaceable positions in the lifecycle of maize renewal, such that without their involvement, even without significant agency, maize agrobiodiversity would likely decrease. As such, women demonstrate relevance as seed stewards of maize, and their increased agency in this process might increase diversity given their distinct interactions with the seed and grain. Additionally, the involvement of single women in milpa production is a further expression of the feminization of agricultural labor, in which women, left to provide and make household decisions for themselves, take on traditionally masculine and feminine roles in the maize lifecycle. Not only does this demonstrate women's knowledge and ability as farmers of maize, but as women like those interviewed in this study choose to stay in sending communities, they maintain a foothold on the culture and knowledge that resides there and provide a familial linkage back to the community point of origin for any family that has left to pursue work opportunities. They occupy lands that, when emptied of Native populations, have been shown to be incorporated into industrial agricultural landholdings or analogous development projects, and cultivate seeds that, when not renewed year after year, and when not available in as many hands as possible to mitigate the effects of environmental shocks, have been shown to disappear. These women represent a last line of defense of sorts for the language, culture, and agricultural practices of rural Yucatan, all of which fade during processes of out-migration and proletarianization. Because the environmental and economic pressures on Xoy are likely to worsen for the foreseeable future, an increased number of women may be left behind in Xoy as

their partners seek opportunities and survival elsewhere. This may change the gendered relationships to maize and to milpa agriculture as it currently stands in the community.

Rural Yucatan is home to several abandoned communities, where life became difficult enough that eventually towns emptied out completely as women and men pursued new ways of living in urban centers. Eventually those lands will be purchased and put to pasture, and the people that once lived on them will stop speaking Maya, and their children will lose the direct line of access to their culture and knowledge, including of agriculture. This eventuality is certainly within the realm of possibility for Xoy. Because this process is out of my control, and largely out of the control of Xoyenses, I am wondering at the meaning of such a quiet fading away of Maya culture. Is it a genocide? The inevitable synthesis of a so-called cosmic race? Can humanity, culture, and nature really be so intertwined as to share a fate? Xoy's fate is by no means sealed. But how do I responsibly bear witness and act in solidarity with this community?

III. Contributions to Literature

This thesis introduces new findings and nuances to existing literatures on gender and agrobiodiversity, criticisms of technological fixes, food and seed sovereignty, and to understandings of ecofeminism.

While the body of gender and agrobiodiversity does incorporate analysis of the feminization of labor, the existing literature on gender and agrobiodiversity that is specific to Yucatan does not speak to that issue. Lope-Alzina (2007) provides a key article to discuss the role of gender on agrobiodiversity in the region. Her article nuances existing dynamics of seed selection and agricultural labor within Maya households, and places special emphasis on the solar as a gendered production space. Local scholarship produced at universities in the region focuses more narrowly on the solar in its gender analyses of agricultural writ large, and the

majority of agrobiodiversity research on the region tends to be gender blind. This thesis intervenes by discussing where and how the feminization of labor comes into play in Xoy. This figures most prominently in the case of single women or women acting as temporary household heads as they adapt to processes of out-migration and depeasantization—usually by picking up work that is typically considered part of the male realm on top of their pre-existing “women’s” work, though sometimes by abandoning their milpa and leaving it to fallow, or by enlisting a family member or neighbor to take over the masculine duties in the milpa. The discussion of the process of the feminization of labor is additionally nuanced in my paper as it notes some of the additional freedoms and decision-making powers that these single women tend to enjoy relative to women whose husbands remain to work in the milpa—though that freedom is mitigated by the drudgery and demands on time presented by a doubled workload. Necessarily, women who control greater aspects of the milpa and its work will determine the fate of that site and the seeds planted there, selecting for a wider range of seed traits based on their additional encounters with seed throughout its lifecycle and in processing. The notion of women as the glue maintaining Xoy and its agricultural practices, knowledge and accompanying seeds coincides with understandings of the feminization of labor.

Literatures on food and seed sovereignty have long critiqued technological fixes. However, this thesis pays explicit attention to indigenous or other ways of knowing and decoloniality as epistemological turns or alternatives to the mono-logical modernism and scientism at the heart of the technological fix. This introduces infra-political and methodological considerations for researchers in order to challenge existing relationship dynamics between research institutions and researched communities. It asserts that indigenous and peasant communities have been doing science and using technology, and that these are not exclusive

domains of the university. Moreover, it situates indigenous science and technology in the present, rather than in an encapsulated past-in-present as presented in some discussions of indigenous knowledge. It also explores how technological fixes, if affixed to structural analyses of capital and power, may even serve indigenous and peasant communities.

This paper also builds out analysis on *ex situ* versus *in situ* seed saving as measures of seed sovereignty, naming *in situ* as primary of the two in preserving local seed sovereignty due to its co-constructive relationship with the knowledge, labor, and practices needed to preserve community control and access to native seed. There is no *in situ* seed saving without local culture and praxis, so it necessarily aligns with strategies that help Maya milperos persist. This is fundamental not just to preserving native maize as a physical encapsulation of the thousands of years of knowledge and culture that brought its current iterations into being, but as an emblem of the culture that keeps it alive and that it helps to nourish in turn. *Ex situ* is a helpful tool in preserving genetic diversity and even sovereignty in the face of shocks that might eradicate a seasonal iteration of a seed, but it does not have the same interactive relationship with the quotidian ins-and-outs of Maya milpero culture.

Finally, this paper contributes to ecofeminist theories through unique pairings with decolonial feminisms. Additionally, by choosing a materially-based understanding of ecofeminism, rather than, say, a spiritual one, the paper supplements its critique of modernity by putting it in dialogue with indigenous or other ways of knowing and the literature on technological fixes. Ecofeminism proves particularly applicable to this study due to the co-constituting ecological, social and political-economic problematics facing the community, and the intricate relationships between Xoy community members and between the humans of Xoy, their surrounding environment, and the seed that is so contingent upon and bridges the two. It

also helps us to understand some of the factors mitigating effective group solidarity between Xoyenses and between their environment as expressions of greater forms of alienation resulting from the disciplining effects of modernization.

IV. Study Limitations

Research will always be limited in its ability to accurately and properly portray the information it acquires and to properly represent the people it is acquired from. In the case of this study, one limitation I found myself grappling with is the agency provided to my interlocutors. In some ways, I remained very conscientious of boundaries, requests, and the influences of my interlocutors – I tried to remind myself that they are telling me their stories in their words and intended to empty myself as a vessel to receive them—an impossible task. In other ways, I struggled with my positionality as a researcher and the positionality I forced on to them as participants or subjects. In this way I found resonance with Richa Nagar's (2014) discussion on co-authorship. If my goal was to properly relay and present the data I collected without trying to decorate it as *my* ideas, *my* words, why were my interlocutors not in some form co-authors? As Nagar found in her work, "A simple answer is that none of them wanted to be a coauthor because the broader issue of what constitutes a postcolonial geographical methodology is not one they found particularly relevant to their concerns. While they were interested in the specific representation of their own struggles and of our collaborative process, (re) defining geography was not central to their struggles, nor were they interested in becoming token coauthors" (2014:120). Though our interlocutors, consultants, and topics differed, the core concept here spoke to me and illuminated a major limitation; my interlocutors shared with me concerns relating to their daily lived experiences and reality, reflecting deeply and critically on their lives and meaning, but not theorizing within academic discourses. Of course, the goal of research is to

grow a body of work powerful enough to affect change, but I felt there was clear limitation in my ability to bridge that gap through this project alone. I worked very deliberately to give supremacy to the voices I was hearing, but ultimately was interpreting their information through a constructivist lens.

Beyond design concerns, there are issues of generalizability in this research. Though generalizing is not the core goal of a qualitative study, having data applicable to different groups, times, and regions is beneficial, especially when looking to promote connection and solidarity. Though this study has discovered some key differences even within existing research in Yucatan, I argue that this lack of generalizability is a double-edged sword. To the one end, those differences may set the population of Xoy apart from or at odds with other groups. To the other end, I have left this study with more questions, more understanding, and more direction than when I entered. Furthermore, I agree with Stake who states, “that inquiry [should] be directed toward gathering information that has practical and functional uses rather than the cultivation of persistent pedantic laws” (1980:70). This framing in mind, it feels less important to me to provide data that demonstrates a certain general case, but rather that provides rich detail to a unique human experience and way of knowing.

A final limitation exists within my interlocutor comfortability. For one, a large part of my research was focused on gender in a community and culture with rather sharp gender divides. Because of this, I worry the women may have become eager to have an opportunity to discuss some of these concepts and that the men may have been more reserved and given less than accurate information. In other instances, men opened up while women remained quiet and self-contained during interview engagements. Additionally, as an outsider to this community there were other emotional responses to the interview process. For some, interviews were often

conducted in a less than private manner, as I was not allowed to be alone with men, or family and friends would drop in during interviews with women. There is bound to be a self-monitoring of response from interviewees in this context, and this may have modified responses or caused withholding of certain knowledge.

V. Future Research Directions

While this project dealt with the division of gender within agriculture in Xoy, there are certainly areas of inquiry worth returning to. Because the gendered divisions are so stark, future research may benefit from investigating the lives of single women or those women acting as head of household who have husbands away for work. These women find themselves in a unique, almost genderless position: they are women who are permitted (if not required) to do men's work. My research demonstrated certain tasks generally still remained strictly stratified by gender, such as the slash-and-burning of fields, but it would be beneficial to explore what tasks and activities are permeable and impermeable to gender bending, and what the social perception of these tasks is when undertaken by single women. A similar proposal is to focus further research on the culture of the town mill, a subject on which I have found no studies. For some women, this represented their only public social world and their only foray outside of their home. The mill represented mobility and freedom from the male gaze, if for minutes at a time. It is a small space that plays an outsized role in the lives of peasant women in rural Mexico and merits more attention.

Further research may also investigate the design and impact of biodiversity preservation education. While the men hold the primary decision-making power over seed selection in Xoy, it would be useful to explore expanding the genders' shared understandings in an effort to further

protect native seed. In this way, shared understandings within a household can begin to form, and hopefully begin to form bridges toward solidarity within the community and outward from there.

Finally, future research may want to consider a longitudinal evaluation of this community or others like it to examine the effects of the coercive pressures impacting them. This would serve the purpose of seeing what factors, ways, or practices create resilience to the pressures of global capitalism, as well as detail the submissions and persistent resistances therein.

It is unclear whether there are ethical and methodological concerns that remain. While others have undoubtedly answered these questions to satisfaction, I remain encumbered with doubts: Is one able to be a constructivist researcher, forced to interpret information from one's given positionality, and still maintain a critical or decolonial research aim? Is it possible to travel to these communities and extract information and keep it true to its form without overly compartmentalizing it within one's own biases so much that it no longer represents its location or origin? Which value-laden research ethos and practices both give rise the generation of new knowledge and move beyond the realm of critique into community action?

When leaving Xoy, I was given maize seeds to attempt to grow here in the North – a personal point of pride for me because it invited me into the physical network of seed guardians as one of its cultivators. Yet upon my return to the United States, it became apparent to me quite quickly that without starting these seeds in a controlled environment, using fertilizers, heat lamps, and other technological fixes to aid their growth, they would not fruit in this area. I feel as though these seeds are representations of the knowledge I acquired in Xoy: They may be planted, may grow, may even look like tall, healthy, green plants; but ultimately, they will not fruit. The loss of one maize landrace, *Dzit Bacal* for example, is not in and of itself a major issue to the world at large. But that loss is a permanent one – it is an extinction felt by this community and

vigorously avoided. Losing such markers of agrobiodiversity constitutes a step toward monocropping and mono-production, where there is only one crop, one producer, and one agricultural logic. Defending native landraces should therefore be seen as a priority, not as a beneficial side effect to other research goals. While seeds may take root elsewhere, they will not fruit – and similarly we must be cautious to not move our findings too far into the ivory tower where they too will not fruit. The generation of new knowledge and ideas is a critical and laudable pursuit. But this research is valuable in so far as it produces a change to and alongside researched communities such as Xoy, not strictly adds to a growing library of knowledge that remains shelved, static, and referred to only to further develop theory. My truest goal for future research is to determine how to achieve that.



Figure 7: *A small plot of four different varieties of maize that the researcher attempted to plant and grow in State College, PA. While the stalks have grown tall and look healthy, they all failed to produce fruit (photo by author).*

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Appendix A

Ethnographic Observation Checklist

- ✓ Ongoing activities in the milpa (summer farm tasks)
- ✓ Milpa maize harvest where applicable
- ✓ Ongoing activities in the solar (summer garden tasks)
- ✓ Solar maize harvest where applicable
 - Helps clarify what the current practices are in Maya production spaces
 - Helps clarify the social dynamics of farmers in the milpa and the solar
- ✓ Maize milling and nixtamalization (adding lime)
- ✓ Preparation of maize in tortilla and any other maize cooking
- ✓ Preparation of maize in atole or any religious ceremony
- ✓ Any other preparation of maize
 - Demonstrates the uses of maize in this community, and who in the community processes the maize in what ways.
- ✓ Seed saving activities of maize
 - Exemplifies how local seeds are saved and maintained in this community
- Ejido (landholder) meetings
 - Exemplifies how men make collective decisions about the milpa farming space in this community
 - Did not occur during field work
- ✓ Seed fairs/Maize festivals
 - Exemplifies who has access to these events
 - Helps demonstrate how maize is exchanged, sold and spoken of in the region and across local communities
- ✓ Guardianes de la semilla meeting

Appendix B

The Pennsylvania State University
Department of Agricultural Economics, Sociology, and Education
Interviews--Oral Consent
English Translation
[Verbal Consent recorded on audio]

Greetings,

My name is Megan Griffin, I am currently a graduate student in the M.S. of Rural Sociology/ International Agriculture and Development Program at Penn State. I plan to conduct my thesis research from May through August 2018, and to graduate in May 2019. As a part of my research, I will conduct in-depth interviews with farmers and home-gardeners from this community to learn about indigenous farming and seed saving practices. I am contacting you now with the hope that you will be willing to participate in an in-depth interview. All adult community members involved in farming or gardening, or with prior experience in farming or gardening, are welcome to participate.

If you agree to participate in this interview, it will take approximately 30-60 minutes of your time. There are **no expected risks** to participating in this study.

This interview will be confidential, and I will be the only person with access to your identifying information. All of your responses will be saved in an encrypted computer file. Please note that this research has been approved by the Penn State IRB, *[Spanish translation will include an explanation of the IRB]* so before we begin this interview I will ask for your **verbal consent to proceed with the interview and to record the interview.**

Your participation in this interview is voluntary. You are not required to answer any question that you do not want to answer, or provide any information that you do not want to share. You can stop the interview at any time.

Thank you very much for your participation. **Your insights are important, and will add great value to this project.**

Please let me know if you have any questions at any time before, during or after the interview. If you also would be willing to participate in a focus group to explore the development of a research deliverable to help farmers and home-gardeners in your community, you will be able to inform me about that at the end of the interview, or at any time before the focus group.

Sincerely,

Megan Griffin
M.S. Student | Rural Sociology | International Agriculture & Development
Department of Agricultural Economics, Sociology, and Education

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Appendix C

Interview Guide English Translation

Before beginning interview, discuss, answer questions and obtain verbal consent on audio from the participant.

DEMOGRAPHICS

What is your name, age, gender?

What is your occupation?

How long have you lived in Xoy?

FARM ACTIVITY--DIVISION OF LABOR

To start, can you describe what a typical day is like for you?

What is your schedule like?

What are your main duties during the day?

What else do you like to do?

Can you tell me about your family's farms and gardens?

Milpas?

Solares?

Any commercial agriculture?

Any other growing spaces

What do you or your family grow in each of these spaces?

In which seasons?

When do you plant? When do you harvest?

What plants do you intercrop?

What are your primary responsibilities in each of these spaces?

Who is primarily responsible for each of these spaces?

How do you or your family decide what to plant in each of these spaces?

What do you consider when planning your farm or garden activities?

How do you and your spouse/family member determine what to plant in each space?

What factors do you consider when planning your farm or garden?

Are there regulatory, economic or environmental conditions that impact your decision-making?

What barriers do you or your spouse/ family member face in executing this plan as you wish?

How does your local ejido commission or municipal government impact this process?
 Has anyone in the family every disagreed about what variety to plant?
 If so, what was the outcome of this disagreement? How was it negotiated?

How do you and your family choose what varieties of maize to plant in the milpa and the solar each season?

What do you consider when choosing varieties?
 Who in the family chooses maize for the milpa? The solar?
 Has anyone in the family every disagreed about what variety to plant?
 If so, what was the outcome of this disagreement?

What do you look for in maize?

Which is your favorite(s)? Why?
 What is the ideal growth habit, growth period and yield?
 What are the primary culinary uses of each variety of maize you use?
 How do you use each variety differently or the same?
 Which is the easiest to process? (nixtamalization)
 Which tastes the best? (In what preparation?)
 What other uses of maize are important to you? (religious?)
 Do you have the varieties of maize available to meet these needs?

How do you store your seeds each year? Where?
 Who is responsible for this process?

Who participates in the harvesting of maize, and how?

Who participates in the processing (nixtamalization) of maize?

Who participates in the cooking of maize?

What changes do you see (if any) in the cultivation, harvest, use and seed-saving of maize?
 Do you see generational differences?
 Gender differences?
 Regional differences?
 Has out-migration of men or families changed your role in agricultural practices?

What challenges do you see if any in the cultivation, harvest, use and seed-saving of maize?

FARM ACTIVITY--SOCIAL IMPLICATIONS

How do you self-identify?
 By class? (campesinx, milperx)
 By ethnicity? (Maya)
 By household role? Etc.

In what ways, if at all, does your participation in the milpa/solar impact this identity?

What do you feel is the importance of the milpa? The solar?

What do you feel is the importance of maize?

Who is your community?

How would you characterize your community of Xoy? Of Peto? Beyond? (A larger Maya community? Yucatec? Mexican?)

How does the milpa impact the community?

Who can access the milpa? Under what conditions?

How does the solar connect the community?

Who can access the solar? Under what conditions?

How does maize impact the community? What do the following maize-centered activities mean to you?

In agricultural labor:

Seed fairs/ Maize festivals:

Seed exchange

Information exchange

What is the role of children in the milpa? The solar?

What role do you hope they will play as they grow up?

What is a day in the life like for you spouse/family member?

What do you feel are their primary responsibilities?

What is the importance of these responsibilities?

NAL XOY (cut?)

Where you around during the breeding of Nal Xoy?

What was that process like?

Did you participate?

What is Nal Xoy like? Do you feel it is a good representation of the Xoy community?

LOOKING FORWARD

What do you want to preserve about your agricultural work? What practices would you like the next generations to carry on?

What are your strengths to preserve this? Your community's?

What do you feel you need to preserve this?

What do you feel your community needs to preserve this?

What do you want to change about your agricultural work? What don't you want to carry forward into the next generation?

What are your strengths to change this? Your community's?

What do you feel you need to change this?

What do you feel your community needs to change this?

CLOSE

Thank you for your participation!

Do you have any questions for me? Any concerns? Here is my contact information if you have questions in the future.