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Adaptation Under the Canopy: Coffee Cooperative and Certification Contributions to Smallholder Livelihood Sustainability in Santa Lucía Teotepec, Oaxaca

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ADAPTATION UNDER THE CANOPY:
COFFEE COOPERATIVE AND CERTIFICATION CONTRIBUTIONS TO SMALLHOLDER
LIVELIHOOD SUSTAINABILITY IN SANTA LUCÍA TEOTEPEC, OAXACA

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Thesis

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Adaptation Under the Canopy: Coffee Cooperative and Certification Contributions to Smallholder Livelihood Security in Santa Lucía Teotepec, Oaxaca, Mexico

Chairperson: Dr. Stephen Siebert

ABSTRACT

The collapse and reorganization of global coffee markets associated with the “coffee crisis” have had profound, negative impacts on smallholder producer livelihoods throughout the world. In Mexico, the collapse of the International Coffee Agreement (ICA) coincided with withdrawal of government support for agriculture, which devastated producers dependent on coffee for their livelihoods. Smallholders responded by shifting livelihood strategies to diversify income, migrating, and converting primary forest cover to subsistence crops and pasture to support household livelihood security. In some instances, producers also joined or formed cooperative organizations to access specialty certifications that offer higher priced markets, extension information, and other benefits. However, certifications have had limited benefits for producers, particularly where administered through cooperatives. This research applied a livelihoods framework to a smallholder coffee producing community, Santa Lucía Teotepec, Oaxaca, Mexico, in order to understand smallholder responses to economic crisis and prolonged stress, benefits derived from cooperative membership, and motivations behind rustic shade-grown coffee management decisions. The study used qualitative and quantitative methods to obtain in-depth data about livelihood strategies, household adaptations to crises, producer experiences and opinions regarding opportunities and constraints of cooperative membership and local knowledge, uses and management practices of shade trees in coffee farms. Results suggest that responses to the coffee crisis have been mostly reactive, coping strategies limited in their duration and ability to bolster livelihood security. Membership in the cooperative UNECAFE has resulted in some income, material, and social benefits as compared with non-member producers. However, the benefits are minimal and constrained by factors common to the coffee industry as a whole (i.e., persistent low prices and disease) and particular to community context, notably that the cooperative was not a grassroots organization and had strained relationships with producers. Results indicate that shade tree values and management practices do not vary due to cooperative membership or certification, but rather due to ecological attributes of coffee plots and producers’ access to resources. Producers derive a wide range of benefits from traditional shade coffee systems that reflect cultural traditions and rich local ecological knowledge. This study points to the need to develop locally-based cooperatives and to invest in their institutional and management capacities, to increase local representation in cooperative leadership, and to support and build upon traditional ecological knowledge and management practices in conservation and development initiatives.

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LIST OF ACRONYMS AND SPANISH PHRASES

- RA: Rainforest Alliance
- ICA: International Coffee Agreement
- INMECAFE: Instituto Mexicano del Café
- GEF: Global Environment Facility
- UNECAFE: Unidad Ecológico del Sector Café Oaxaqueño
- SEMARNAT: Secretaría de Medio Ambiente y Recursos Naturales
- PROCAMPO: Programa de Apoyos Directos al Campo
- PROSPERA: Conditional cash transfer program
- CONABIO: Comisión Nacional para el Conocimiento y Uso de la Biodiversidad
- CI: Conservation International
- AMECAFE: Asociación Mexicana de la Cadena Productiva del Café
- CATIE: Centro Agronómico Tropical de Investigación y Enseñanza

- *Socio*: member
- *Roya*: coffee leaf rust
- *Broca*: coffee berry borer
- *Ojo de gallo*: rooster's eye fungus
- *Parcela*: plot of land
- *No alcanza (alcanzar)*: not enough, doesn't reach or cover
- *Campesino*: farmer, often used as 'peasant farmer'
- *Rancho*: farm
- *Campo*: farms, fields
- *Milpa*: traditional corn, bean and squash polyculture
- *Mozo*: hired laborer

1 INTRODUCTION

Changes in the global coffee commodity market after the International Coffee Agreement (ICA) collapse in 1989 and subsequent drop in prices had profound effects on the ecologies and economies of smallholder coffee producing communities. Coffee prices hit their lowest levels in 2005 and have not recovered to historic levels, prompting a variety of responses at the household level. The crisis was especially pronounced across Mesoamerica, where producers had been almost solely dependent on coffee to support their livelihoods (Jaffee 2007). Producers responded by changing their livelihood activities; they abandoned coffee plots, converted to subsistence crops, intensified production practices to increase yields, or migrated in search of other opportunities (Hausermann 2014). Throughout the crisis, some smallholders also increased their reliance on other resources that could be obtained from shaded coffee agroecosystems in order to increase household food security (Morris et al. 2013; Bacon 2015; Avelino et al. 2015a). The effects of the crisis have continued, and many smallholder producer communities are developing strategies to adapt to a restructured global coffee market. One set of livelihood adaptations that holds promise to decrease producer vulnerability to future market shocks are specialty coffee certifications, and the producers' cooperatives that administer them.

Research since the coffee crisis has focused on the benefits of certification on the economic, ecological, and social aspects of producers' livelihoods (Raynolds et al. 2004; Perfecto et al. 2005; Méndez et al. 2010; Bacon 2010; Gitter et al. 2012; Barham and Weber 2012). However, there has been little work concentrated on how producers have used cooperatives to enhance their livelihoods and the role that cooperatives play in expanding the adaptive strategies that producers could utilize (Eakin et al. 2014). This thesis explores a case study community of smallholder coffee producers in the southern state of Oaxaca, Mexico, where producers are continuing to adjust their livelihood strategies reaction to the protracted coffee crisis. This research focuses particularly on producers' experiences of cooperative function and management, and the ways in which the organization may shape the decisions and challenges that smallholders face in maintaining traditional shade coffee cultivation.

In Oaxaca, the coffee crisis has continued to affect producers through high variability in price swings, compounded at a regional scale by extreme weather events that have pushed many producers to convert coffee into other uses (Blackman et al. 2005; Aguilar-Støen 2017). The

state has also received attention from international conservation non-governmental organizations (NGOs), such as the Rainforest Alliance (RA), and the specialty coffee industry, in an attempt to prevent land use conversion at a local level (Mas and Dietsch 2004). Such global-scale NGOs have focused on the role of independent, third-party certifications as strategies to stabilize the effects of the crisis and incentivize sustainable ecological, social, and economic livelihood practices on the part of coffee producers (Jurjonas et al. 2016). Certification, whether Fair Trade, Organic, the conservation-focused RA, or private party such as Starbucks, is a market-based strategy to incentivize sustainable production practices by giving producers access to specialty product markets that offer higher prices (Jaffee 2007). Currently, an estimated 40% of all coffee exports worldwide carry some form of production standard, either through voluntary verification or formal certification (Potts et al. 2014). The market share for certified coffee has grown over 30% in the past decade, and is projected to increase by a further 20-25% in the coming decade (Pierrot et al. 2011).

The coffee crisis impacted smallholder farmers in Mexico disproportionately as the majority already comprised some of the most marginalized, vulnerable, and resource-constrained groups in coffee producing regions (Martinez-Torres 2006). The initial “crisis” has resulted in structural change in the coffee market and a perennial state of low prices and little government regulation of the coffee sector that has persisted into the present. The downward turn in the coffee market triggered the range of responses at the community and household level explained above, as farmers sought to maintain their livelihoods in the face of new economic conditions (Bacon 2004). These adaptive responses also included collective organization into growers’ cooperatives, and connections with higher-priced specialty markets through specialty certifications. Adaptation, or adaptive response, is most commonly theorized in the literature as a response to climate change, both after severe weather events and as a result of slower, sustained change (Harvey et al. 2018). However, the same framework can be applied to producers’ responses in adjusting their livelihoods to economic change, in this case extreme price drops and the ongoing challenges of price volatility and decrease in government support for the coffee sector (Eakin et al. 2006a).

The ICA collapse and resulting coffee market restructuring impacted smallholder farmers differently depending on pre-existing government institutions and the states’ level of involvement in the coffee sector. Mexico was already dismantling its national-level coffee

governing institutions as part of the terms of structural adjustment and international debt-relief programs (Eakin et al. 2011; Jaffee 2012). The compounding impact of ICA collapse and dissolution of state coffee support institutions was disastrous, as smallholder growers were left without organizational structure and vulnerable to the manipulation of intermediary buyers. In Oaxaca, one response that producers sought was organization into growers' cooperatives in order to develop or support responses that could be applied to their institutional, cultural, and ecological context.

In smallholder producing communities in Oaxaca, certifications are managed by growers' cooperatives, which are collective organizations that seek to increase producers' access to external support resources and specialty markets (Gitter et al. 2012). As such, the impact that broad-scale certification initiatives have on producer households is dependent on the performance of the cooperative that administers them (Ruben and Heras 2012). In this region, producers sought to join cooperatives in order to survive the crisis, but also to preserve traditional livelihoods where coffee has been the sole source of cash income and forms the backbone of local communities. Certification schemes that focus on ecological conservation are congruent with traditional coffee cultivation practices, as they share motivations to maintain a diversity of shade trees that provide environmental and material benefits.

While there has been significant research on cooperatives for other products and coffee certifications, there is relatively little attention given to how these two institutions may guide smallholders' ongoing responses or adaptations to economic change. Research suggests that coffee cooperatives can enhance producers' adaptive capacity by aggregating resources, providing stronger connections to markets, improved access to technical knowledge, and a social network that can improve recovery from economic or environmental shocks (Eakin et al. 2011). By organizing smallholders into a collective organization, cooperatives provide stronger standing in a complex commodity market (Altman 2015). Collective action and the ability to coordinate resources from disparate sources at multiple scales may help smallholders develop strategies that support adaptation to ongoing change, while retaining important elements of their traditional livelihoods (Eakin et al. 2006a). However, the impact that cooperatives and associated certification resources for household livelihood sustainability depends on their organization and the political, ecological, and economic context.

Similarly, coffee certifications may promote more sustainable ecological, economic, and social practices in exchange for higher prices, access to niche consumer markets, and social benefits such as democratic organization (Bacon 2004; Reynolds et al. 2004; Jaffee 2007; Jha et al. 2014). Certifications often guarantee a minimum price and a quality premium, both of which are intended to insulate growers from price volatility and may provide higher coffee-derived income (Hagggar et al. 2012). However, growing coffee under the conditions required by certification criteria may result in lower yields, which can decrease farmer income as it has been demonstrated that higher yields, not price premiums, translate to net economic gains for smallholder growers (Barham and Weber 2012). While there is general consensus in the literature that certification translates to ecological benefits (Hagggar et al. 2012; Jha et al. 2014; Takahashi and Todo 2014; Rueda et al. 2014), the evidence about social and economic improvements is mixed (Jaffee 2007; Philpott et al. 2007; Barham et al. 2012; Beuchelt et al. 2011). The mixed conclusions regarding the benefits that certification holds, and gap in investigation on how they may influence overall livelihood strategies, suggests that other context-specific factors likely limit the potential benefits.

Adaptation is frequently discussed as a response to climate change, but can be applied to the ways in which smallholders respond to economic change as well. Livelihoods strategies can be considered to be the “combination of resources used and the activities undertaken” in order to live in a particular place in a particular way (Scoones 2009). Livelihood adaptations have been defined as the processes or actions by which households or communities make changes to their livelihood strategies to enhance existing security or reduce vulnerability in the face of economic or ecological change (Davies and Hossain 1997). While these choices are made to reduce vulnerability and allow households or communities to retain aspects of their traditional customs and ways of life, adaptive responses may also be negative and result in greater vulnerability to changing conditions (Juhola et al. 2016). The intensity and duration of the coffee crisis has challenged smallholder producer households and communities to retain defining characteristics of their culture while also transforming their livelihoods. Coffee production is only one aspect of producer life strategies, which also incorporate a range of other land uses, jobs, and governance institutions that sustain rural identities.

This thesis contributes to understanding about how producers’ cooperatives and certifications may contribute to smallholders’ livelihoods strategies, security, and eventual

sustainability. I used the case study community of Santa Lucía, Teotepéc in Oaxaca, Mexico to analyze the opportunities and constraints that cooperative membership and specialty certifications, including that of RA, provide for producers' ongoing responses to the coffee crisis. Producers in this community have adjusted livelihood strategies in a variety of ways, including organizing to join a statewide-growers cooperative, La Unidad Ecológica para el Sector Café Oaxaqueño (UNECAFE), which carries multiple, separate specialty coffee certifications. The strength and duration of the crisis has been such that producers also undertook other adaptive actions, including changing land uses, shifting to other sources of local employment, and migrating out of the community in search of other economic opportunities. These responses have been ongoing as the coffee crisis has transitioned into a permanently restructured market characterized by sustained low coffee prices (Snider et al. 2017). Coffee production and producer adaptations in southern Oaxaca are priorities for conservation because of the region's high level of biocultural diversity that influences growers' coffee production decisions. Smallholder coffee producing communities manage local ecologies to support their livelihoods and respond, adaptively or not, to change. It is important to understand the motivations and variables shaping shade tree management decisions because these affect ecosystem function and resilience to shock and stress. This thesis adds to understanding about the livelihoods benefits of certifications by focusing on the benefits, constraints, and outcomes of a cooperative on smallholder producers by analyzing their experiences and perceptions of how membership has impacted their livelihoods.

Research Objectives:

In order to address the gap in knowledge about the benefits that cooperative organization and certification schemes can have on smallholder producers' livelihoods, I used a case study of a community of organized, certified and independent producers in Oaxaca, Mexico to address the following objectives:

1. Document and understand the range of responses that coffee producer households have adopted in response to the coffee crisis and to mitigate its ongoing effects.
2. Understand how smallholder coffee producers in this community have used a growers' cooperative and associated certifications to benefit their livelihoods following the coffee crisis.
 - a. Analyze the barriers to cooperative membership and the factors that constrain the cooperative's ability to benefit producers by increasing or enhancing livelihood strategies.

3. Analyze the impact that cooperative membership and certifications have on producer decisions about maintaining shade trees on their coffee plots, and the multiple ways that these shaded system may affect producer adaptation to crisis.

The following sections detail the background of the coffee crisis as it has affected producers in Oaxaca in order to situate the study in an ecological, social, and economic context. The background also provides explanation of certifications and cooperative organizations, and lays out the livelihoods and adaptation framework to analyze producers' responses to the crisis in Teotepec. The third section details the methodology of the study, including the study site, partners, and specific methods used to address the objectives. The subsequent three sections address the above objectives, including results, discussion, and implications of each set of findings. The final section discusses overall implications for policy and the need to build capacity of cooperative organizations in order to impact smallholder producers, and makes recommendations for future policy and research.

2 BACKGROUND-LITERATURE REVIEW

2.1 Significance of Coffee Landscapes

Coffee producing landscapes, or agroecosystems, have been lauded in the international conservation arena because of their ecological, cultural, and economic significance (Perfecto and Vandermeer 2015). Coffee is cultivated across the tropics in areas that also coincide with biodiversity “hotspots,” significant because of their high levels of species diversity and endemism and susceptibility to habitat conversion for agriculture and development (Jha et al. 2011). While coffee is grown under a variety of production systems, shade-grown coffee has been recognized as beneficial for biodiversity conservation because it closely mimics the natural forest canopy structure (Perfecto et al. 1996). Smallholder coffee producers commonly cultivate coffee under complex shade canopies that incorporate native tree species that are ecologically beneficial for both coffee plant health and other biophysical indicators (Moguel and Toledo 1999). This floristic diversity, in turn, provides critical habitat and connectivity for other species. Shaded coffee farms also support important ecosystem services, including pollination, pest control, microclimate regulation, carbon sequestration, and water quality (De Beenhouwer et al. 2013).

Coffee landscapes also support a high level of cultural diversity, as many smallholder producers worldwide belong to an indigenous group or ethnic minority. Such rural communities frequently speak an indigenous language, often also in decline or under threat of extinction, and face cultural degradation as their population moves to urban centers in search of non-agricultural opportunities (Robson and Berkes 2011). As a global commodity crop, coffee represents one of the only sources of cash income for many of these communities, and shade cultivation is often congruous with use of other forest resources that support household livelihoods (Bacon 2015; Ibnu et al. 2015; Morris et al. 2013).

In southern Mexico, many indigenous communities have incorporated coffee into traditional forest garden cultivation systems, deriving both cash income from coffee sale as well as other forest products (Martinez-Torres 2006; Jaffee 2007; Aguilar-Støen et al. 2011). These communities rely on shade coffee plots in direct and indirect ways. Smallholders maintain an overstory of shade trees that provide critical resources, including food, firewood, timber, fodder for livestock, or remedies (Bacon et al. 2010). Producers also cultivate a suite of wild or domesticated understory plant species which may enhance household food security in times of economic or ecological stress (Aguilar-Støen 2017). Shade coffee forest cover can benefit smallholder livelihoods in indirect ways as well, as many native tree species improve soil nutrients and productivity (Lorena Soto-Pinto et al. 2000) and can buffer households against the impacts of extreme weather or climatic events (Tucker et al. 2010). The dual ecological and cultural diversity of these agroecosystems, coupled with threats to their long-term stability and sustainability, has increased attention on what resources or policy measures may help them adapt to future change.

2.2 *The Coffee Crisis*

The “coffee crisis” is the term commonly used to describe the dramatic drop in prices and global coffee market restructure that began in 1989 with the collapse of the International Coffee Agreement (ICA). The ICA was an agreement amongst coffee-exporting countries that controlled prices and set production quotas in order to regulate the market and prevent massive shifts in commodity prices (Tucker 2008). When countries failed to come to an agreement, this governing institution was dissolved, and overproduction flooded the market. In 2002, commodity prices dropped to their lowest levels in 50 years (adjusted for inflation) (Blackman et al. 2005).

In Mexico, the price per pound paid to growers dropped to \$.41 at a time when the average production costs were \$1 per pound, which devastated producers at all scales of production (Renard 2010). Indigenous smallholders, already marginalized and with little access to external livelihood support, have been amongst the most profoundly affected.

While prices have since recovered, to about \$1.07 per pound in 2018 (\$.75 when adjusted for inflation), this is still too low for most producers to be able to make a profit, let alone support a full livelihood. Unlike natural disasters or pulses of overproduction by individual countries, the changes in the coffee market are structural rather than cyclical and have resulted in a protracted crisis that has persisted into the present (Ávalos-Sartorio and Blackman 2010). Most research continues to use the term “crisis” to describe the ongoing, perennial situation, which has thrown many producers into a situation of “chronic coping” responses in the face of consistently weak markets (Eakin et al. 2014). In reaction to the crisis, international conservation and development NGOs directed greater resources to programs that could support smallholder livelihoods and thereby slow ecosystem degradation.

2.3 *Coffee in Mexico*

Coffee was originally introduced to Mexico in the 18th century, and is now an integral part of the nation’s economy and culture. Mexico is the ninth-largest coffee producing country in the world, the leading producer of certified Organic coffees (25% of the global trade; (Renard 2010)), and a growing market for Fair Trade, RA, and other specialty coffees. While Mexico is not a leading country in terms of volume, the coffees grown there are considered to be of very high quality, which opens more opportunities for producers—especially smallholders—to access higher-priced niche and specialty markets (Nestel 1995). Coffee production provides direct employment for half a million people in the southern states of Chiapas, Oaxaca, Veracruz, and Puebla (Renard 2010), and generates 36% of total agricultural export revenue in the country (Perfecto et al. 2005). Mexico grows over 25% of certified coffee on the global market, with many producers holding a combination of organic, Fair Trade, and RA certifications (Renard 2010). Carrying multiple certifications allows producers to access multiple, distinct, specialty markets and thereby ensure that more coffee produced according to certifications is sold at certified prices (Ruben and Zuniga 2011).

Coffee-Producing States of Mexico



Figure 2.1: Context map of the coffee-producing states of Mexico; Chiapas, Veracruz, and Oaxaca.

Oaxaca is the fourth-largest coffee producing state in Mexico, with a yield of 66,053 metric tons of green coffee in the 2015-16 harvest year (Flores and Mcleod 2018). Producers in Oaxaca range from large-scale commercial plantations, to mid-size holders, to smallholder farmers, the latter which comprise the majority of farmers in the state (Eakin et al. 2012).

Smallholder producers in this state typically cultivate one to 15 hectares of land, have relatively little infrastructure development on their farms, and generally rely on family or community members for farm labor (Lewis 2005; Hite et al. 2017). Smallholder farms also represent a variety of land tenure systems, from privately owned *fincas* to community-held *ejidos*, and typically grow for sale through regional cooperatives (Jaffee 2007).

The Mexican government has historically had varied involvement in supporting coffee producers with “technical packages” and other extension resources since it was first introduced and promoted as a cash crop. Since the 1950s, there have been a series of “coffee impulses,” in which the government has invested in programs to aid existing producers and expand production to meet quotas (Nestel 1995). This trend resulted in periods of coffee expansion and intensification, with associated impacts on local ecologies and communities as producers responded by integrating more coffee into their livelihoods strategies. Up until the late 1980s, the state played a highly regulatory role in the sector. The Instituto Mexicano del Café (INMECAFE) was the government agency responsible for extension, production, and export of coffee. INMECAFE supported indigenous *campesino* entry into the sector, offering technical assistance packages to encourage smallholders to convert their land to coffee (Aguilar-Støen et al. 2013). Initially, INMECAFE extension encouraged subsistence farmers to plant coffee under forest canopy, integrated with existing forest gardens (Rappole et al. 2003). In the early 1980s however, state extension promoted adoption of more intensive production practices, including pressure to convert to full-sun monocultures and increased use of agrochemicals (Moguel and Toledo 1996). Many smallholders resisted this shift in production practices due to the integral role that the rest of the traditional polycultural system plays in supporting their livelihoods and traditional land (and coffee) management (Moguel and Toledo 1999).

Following this period of intense investment in coffee production, the state rapidly withdrew its agricultural support programs beginning in 1989, a trend which has continued to the present. The Mexican government adopted structural adjustment programs required by terms of International Monetary Fund and World Bank loans, including dismantling INMECAFE (Renard 2010). INMECAFE had been the sole source of extension information and outside investment in coffee, and had not invested in building producer capacity or independence in the sector (Tucker et al. 2010). There was no other source of support for coffee producers, so when the global

coffee crisis hit, producers were left without an effective response or way to buffer their livelihoods against such a catastrophe (Blackman et al. 2005).

Many indigenous producing communities, already marginalized, were the most vulnerable to the effects of this protracted economic shock. While smallholders had been organized to some degree into cooperatives prior to INMECAFE collapse, these organizations were still dependent on the state for resources. The coffee crisis was especially devastating for *campesino* smallholders and their cooperatives, because the state had been the primary coffee purchaser and producers were left with extremely limited export networks (Aguilar-Støen et al. 2013).

The coffee crises in the early 1990s and 2000s that resulted in ICA collapse and subsequent market restructuring had pronounced effects on farmers in Oaxaca. Small-scale producers in Oaxaca experienced a 70 percent drop in coffee-derived income, and prices fell below farmers' production costs, making coffee cultivation unprofitable (Jaffee 2007). The severe price drop drove increases in outmigration, food insecurity, coffee plot abandonment, a shift to technified production, and conversion to other crops (Ibid.). Smallholders in Oaxaca responded by forming community and regional cooperatives that hold certification from one or multiple third-party organizations (NGOs or coffee corporations). Although the cooperative organization and governance brought other benefits that allowed some producers to continue to cultivate coffee for income, the number of smallholders, total area in production, and harvest yields dropped as a result of the coffee crisis (Renard 2010).

Even before the ICA collapse and dissolution of INMECAFE in 1989, small-scale producers in Oaxaca were organized into cooperatives. Individual smallholders, also known as *productores libres* or independent producers, had been pursuing strategies of collective organization in order to take control of a greater share of the commodity chain, have agency in the processing and trading process, and obtain higher prices for their product (Jaffee 2007). Cooperatives became critical for smallholder producers at the onset of the crisis, and in Oaxaca were able to take control of the processing, warehousing, and trading infrastructure that INMECAFE once managed. Cooperatives, including UNECAFE, attempted to insulate producers, their families, and communities from the devastating drop in prices, and preserve the trading relationships that INMECAFE had facilitated (Renard 2010). Cooperatives were instrumental in expanding certifications to organized producer communities, beginning with

Organic, and later Fair Trade and RA labels. Cooperatives fulfilled critical needs for smallholder coffee producers in Oaxaca, where rural and mountainous farms and communities lack the infrastructure that might allow producers to access outside resources such as financing for farm improvements, hybrid coffee varieties, or processing skills on their own.

A focus on coffee production practices in Oaxaca is ecologically significant as well. Oaxaca is recognized as the most biologically rich state in Mexico, yet very little land is held as state or federally protected areas (Robson 2009). Oaxaca, internationally recognized as a ‘megadiverse’ region, supports an extremely wide variety of ecosystems, habitats, and species (Perfecto et al. 2005). The coffee-producing regions of Oaxaca overlap with areas designated as “extreme priority sites” by the Mexican conservation authority, CONABIO (Roberts 2009). Additionally, CONABIO’s National Strategy for Biodiversity includes support for coffee agroforestry systems as a strategy to protect biodiversity (Cruz-Angón 2016). Certified coffee farms exhibit greater species diversity than non-certified farms, in some cases up to 60-70% of the biodiversity found in intact forests of the same size for some taxa (Perfecto et al. 2014). Shaded coffee polycultures have been documented to also support upwards of 20 native tree species, as well as a high level of bird and forest mammal diversity (Bandeira et al. 2005). RA and other conservation organizations (including The Nature Conservancy, Conservation International, ABC México, and ProNatura Sur) have explicitly focused on this region to promote ecologically-based agricultural practices in order to protect the biological diversity in this region.

The negative impacts of market restructuring, the ICA collapse, and elimination of industry protections at the national level have been compounded in recent years (2013-present) by devastation from disease. The coffee leaf rust (*roya*) is a fungus that attacks the leaves of coffee bushes, resulting in greatly reduced coffee cherry production and often mortality. In Oaxaca, it is estimated that as much as 20% of the coffee harvest was lost directly to *roya* between 2014-2017, with indirect effects from coffee plant death that will continue to inhibit coffee harvest into the future (Flores and Mcleod 2018; Avelino et al. 2015). This dynamic has rendered recent recovery in per-pound price virtually meaningless for producers, whose coffee-derived income comes primarily from yield volume, as detailed above. Certification schemes may play an important role in insulating smallholders from price volatility in these complex circumstances, as producers may be guaranteed a price floor in times of extremely low prices.

Additionally, certification organizations often connect producers with agricultural extension, training, and research institutions which may provide disease-resistant varieties and information on adaptive production strategies, important resources have previously been shown to aid smallholders' ability to recover from crop losses (Vignola et al. 2015; Talhinhos et al. 2017).

The social and cultural dimensions of coffee-producing regions in Oaxaca may also factor into smallholders' decisions regarding certification. Oaxaca remains among the poorest states in Mexico, with a large population of indigenous peoples, many of whom are reliant in full or in part on coffee for cash income (Wohlgemuth 2014). The indigenous character of the region differs across communities, from primarily *mestizo*, to mixed *mestizo*-indigenous, to primarily indigenous. Following the adoption of NAFTA and more recent passage of another regional trade agreement, the Plan Mesoamerica, in 2008, Oaxaca has undergone greater integration into the global economy, particularly with regard to agricultural commodities (Ibid.). These two agreements changed the nature of agricultural production in the region, increasing commodity export crop production (including coffee) and allowing privatization and sale of *ejido* lands (Wohlgemuth 2014). Agricultural industrialization and export-orientation has not been homogenous across the region, however.

2.4 *Effects of NAFTA*

The North American Free Trade Agreement (NAFTA), enacted in 1994, further eroded government support for smallholder agriculture in Mexico. This agreement consolidated policies of economic and trade liberalization and deregulation that had begun in the mid-1980s. NAFTA opened Mexico's agricultural sector to foreign competition, which led to increased investment from multinational corporations in large-scale export operations (Lewis and Runsten 2008). NAFTA also facilitated commodity export from the US to Mexico, particularly of cheap, subsidized wheat, corn, and sugar, which undermined household food security and nutrition (Otero 2011). Such imports have made it very difficult for smallholder agricultural households to sell their crops to local markets at competitive prices, which negatively impacted producers' economic sustainability and increased household dependence on imports. Growers could not sell subsistence crops locally, so switched to higher-value fruits and vegetables for export or migrated to northern states to work as contract labor on corporate farms (Barnes 2009). Many farmers reduced staple *milpa* production to subsistence levels and converted *milpa*, coffee plots,

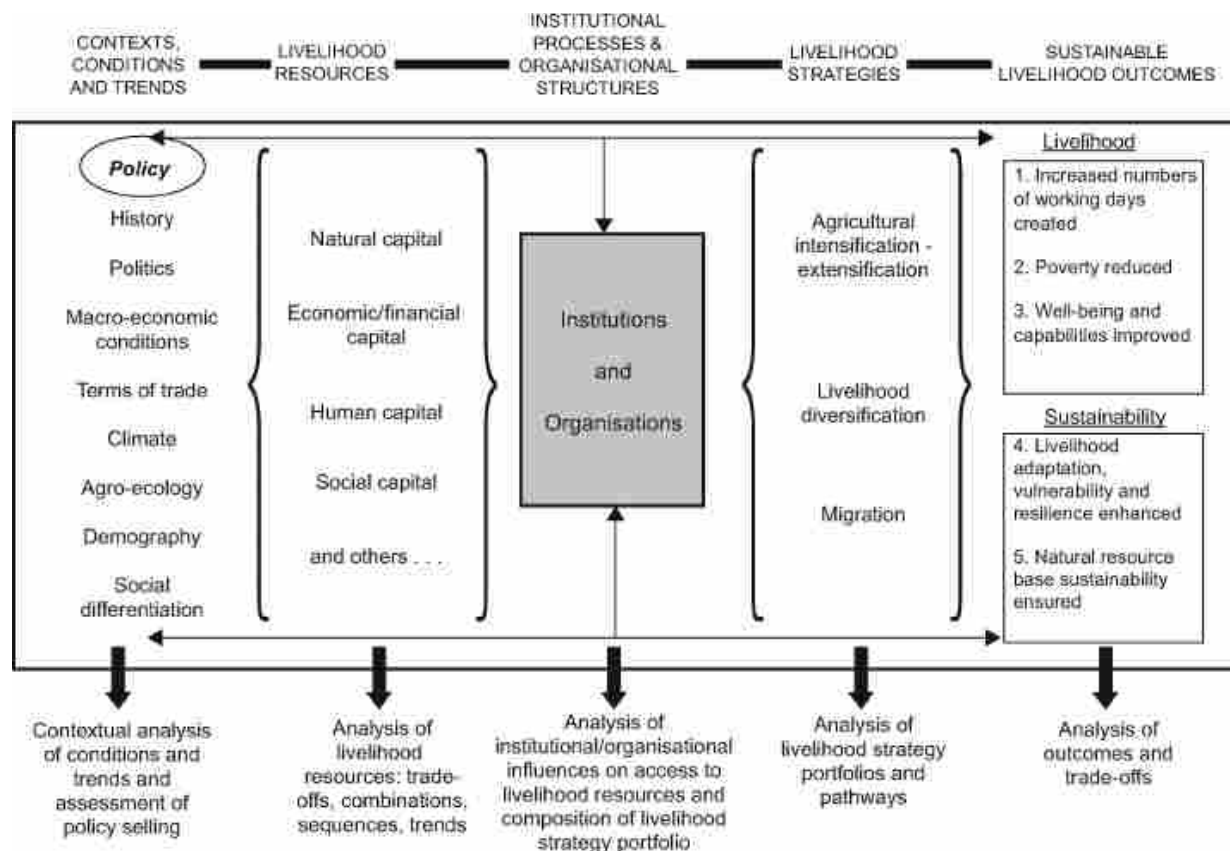
and primary forested land to pasture for livestock (García-Barrios et al. 2009). Many peasant farmers are now dependent on agricultural subsidies through the PROCAMPO program, a per-hectare payment for subsistence cultivation (Davis and Eakin 2013) NAFTA compounded impacts of the coffee crisis in Mexico, as coffee producers faced both low coffee *and* subsistence crop prices, as well as decreased government support for both sectors.

NAFTA has also exacerbated the effects of the coffee crisis for Mexican producers because of interactions with out-migration, land tenure, and indigenous *ejido* or *comunitario* sustainability. Smallholders in these communities could no longer support their families on subsistence crop and coffee cultivation alone, and NAFTA's trade liberalization increased opportunities for wage labor in Northern Mexico (Robson and Berkes 2011). The higher earning potential in the US also became more attractive, increasing rates of cyclical or permanent migration "al Norte." The loss of able-bodied men and women has put the traditional *usos y costumbres* customary resource management system in jeopardy. Through this system, community members hold positions of governance and decisions through *cargos*, and complete community work project through *tequios* (workdays), both of which govern natural resource management, use, and enforcement. In many communities there are now not enough people to fill all roles, or community members must fill positions on more regular rotations, which diverts their labor away from cultivation or household responsibilities (Robson and Berkes 2011). These positions are unpaid, and combined with the drop in coffee income and loss of labor for subsistence cultivation, increases household vulnerability (Robson 2009).

2.5 ***Sustainable Rural Livelihoods***

The sustainable livelihoods framework provides an approach to analyzing smallholder coffee producer households' responses to the coffee crisis, and the strategies they have used to navigate the restructured coffee market. The livelihoods framework was developed by researchers and practitioners engaged in questions of rural development in the 1980s as a way to holistically address smallholder realities. It recognizes a need to incorporate a range of disciplines to understand the different strategies that households utilize in order to make a living. The approach grew out of a recognition that development projects needed to be contextualized and move away from prescriptive, single-sector initiatives (Chambers and Conway 1992).

Figure 2.1: Sustainable Livelihoods Framework, from Scoones (2009)



As laid out in the diagram above, livelihoods are situated in specific macroeconomic, political, social, and ecological contexts that influence what resources (“assets” or “capitals”) that households have access to and how they utilize them in response to change. Households and communities may also gain access to resources and information to support their livelihoods through outside institutions or organizations. A livelihood is considered to “comprise the capabilities, assets (including both material and social resources) and activities required for a means of living” (Chambers and Conway 1992). There are five prominent groups of assets that comprise a household’s security and sustainability, including natural capital (i.e. water and forest resources, ecosystem services), economic or financial capital (i.e. household savings, credit, income, and remittances), human capital (i.e. skills, knowledge, labor), social capital (i.e. social networks, access to services, strength of institutions), and physical capital (i.e. infrastructure, agricultural inputs, information and appropriate technology) (Scoones 2009).

These classes of assets, or capitals, are what a household has available to draw upon as a means to secure a living, as well as to respond to shocks or stressors that can increase a households' vulnerability to risk. Livelihood security is based on whether a household has sustained access to income-generating or subsistence activities, both of which households may depend on as alternative strategies of mitigating risk. A livelihood is considered sustainable "when it can cope with and recover from stresses and shocks, maintain or enhance its capabilities and assets, while not undermining the natural resource base," (Chambers and Conway 1992: 5). Shocks are any impacts that are sudden, severe, and unpredictable (Ibid.) and can be environmental, economic, or political in nature. Economic crisis, such as the coffee crisis, is a shock that can trigger devastating impacts on household cash flow (Amekawa 2011). In contrast, stressors are pressures that are continuous, compounding, and which occur over a longer time frame, such as seasonal shortages, declining resource productivity, or protracted economic depression (Chambers 1987). For coffee producing households, stressors encompass persistently low prices following the crisis, labor shortages, and declining coffee harvests. Households may respond proactively to the vulnerability caused by shocks or stressors, in a manner which can be adaptive, or reactively, with coping strategies. Sustainable livelihoods and adaptation scholars clarify that both proactive and reactive activities may enhance livelihoods or have negative effects (Ellis 2000).

A sustainable livelihoods lens incorporates all of the strategies that a household incorporates in order to make a living, including on-farm and off-farm activities. For rural agricultural households, mitigating risk and vulnerability may include agricultural intensification (increasing output), extensification (increasing land area under production), diversification (of farm products or off-farm income sources), and migration (Amekawa 2011). Integrating multiple livelihoods strategies more accurately reflects smallholder coffee producers' realities, in which households are not focused solely on natural resource-based activities. Rather, in response to the coffee crisis, all of these strategies are incorporated to some degree based on a given households' access to resources (assets or capitals).

Previous research has demonstrated that in the wake of a crisis or shock, farmers continue to participate in agriculture for market and subsistence (Eakin et al. 2014). Both strategies mitigate risk from future shocks, be it a downturn in the commodity market or a natural disaster (Hausermann 2014; Tucker et al. 2010). In the context of smallholder response to the coffee

crisis, investing in diversification of subsistence or market crops may enhance future household security and sustainability (Hausermann and Eakin 2008; Altieri and Toledo 2011).

Households make livelihood decisions in response to shocks or stressors that occur across scales, which are mediated by government institutions and power structures which may amplify or diminish their effects (Eakin et al. 2014). Therefore, analyses of rural livelihoods security and sustainability need to recognize the political and institutional structures that bound smallholder decisions about shifting livelihoods activities. Such power relationships define opportunities and constraints at the household level, and can limit individual producer agency (Scoones 2009). It is within this broader framework of political and institutional power that collective organization, in a growers' cooperative, for instance, has the potential to expand producer capacity to reduce vulnerability in response to shocks or stressors (Rosset and Martinez-Torres, 2016). This study considers how outside organizations or institutions may positively enhance livelihood strategies, and whether such external assets are sufficient to mitigate the negative impacts of migration and land use change on traditional practices.

2.6 *Adapting to the Coffee Crisis*

2.6.1 *Producer Adaptation to Economic Change*

While adaptation in agriculture is most commonly discussed in the literature as a response to climate change, it is important to also consider adaptations made in response to non-climatic factors. In agriculture, producers undertake adaptive actions in response to market shifts or changes in the institutions that affect production systems. Adaptation has been defined as “the process of adjustment to actual or expected [market] change and its effects,” and is understood to occur at a range of scales, from the individual plot or farm to state and international policy levels (Adger et al. 2005; Mach et al. 2014). Adaptations may be passive, reactive, or anticipatory, may be spontaneous or planned, and may occur as a result of individual agency or external recommendations (Smit et al. 2000). Adaptive responses are context- and place-specific, and the adjustments that individual growers make differ depending on farm location, growing conditions, and the economic, political, and institutional circumstances under which production occurs (Smit and Skinner 2002). Changing commodity prices, transnational trade agreements, government support programs, and subsidies complicate the adaptation process and may cause producers to prefer certain adaptive actions over others (Smit and Wandel 2006).

Adaptations typically seek to “moderate harm or exploit beneficial opportunities” in response to changing production conditions. However, it is critical also to recognize that adaptive actions may not always result in this positive outcome (Mach et al. 2014). Responses may not always be successful, and may in fact be *maladaptive*, with the opposite of the intended outcome. Maladaptation can thus be considered as an “action taken ostensibly to avoid or reduce vulnerability to change that impacts adversely on, or increases the vulnerability of other systems, sectors, or social groups” (Barnett et al. 2010: 211). Adaptations can become maladaptive for a variety of reasons, including misinformation, inadequate policy mechanisms, or lack of resources to undertake the most appropriate adaptive response (Juhola et al. 2016). Maladaptation, or negative adaptation, can also result if the adaptive action is not appropriate to the scope, scale, or root cause of market or institutional change (Eriksen et al. 2015). Inappropriate responses to change can have the unintended consequence of exacerbated vulnerability or increased exposure to livelihood risks from market, climatic, or other change.

In an analysis of adaptation, it is important also to consider the duration of change and the actions taken to respond to it. Some authors make a distinction between adaptive responses and coping responses, employing the argument that reactions to change differ by the time period over which they occur (Adger et al. 2003). Adaptation is usually understood to refer to changes that occur over longer periods of time, and which result in permanent alteration in production practices or some aspect of livelihoods (Smit et al. 2000). In contrast, coping responses are those actions taken in the short term to increase producers’ ability to “just survive” an economic crisis or extreme climatic event (Smit and Wandel 2006). Coping strategies are temporary and easily reversible, and typically do not result in permanent changes in land use, labor strategies, farm management, or cultural values of natural resources (Tucker et al. 2010). The distinction between adaptive and coping responses is important in the discussion of producers’ reactions to market changes because it reflects their agency, access to information, and resources (assets or capitals, in the livelihoods framework) to be able to implement responses before the shock or stressor negatively impacts their lives.

Smallholder agricultural producers, including coffee growers, are among the groups most vulnerable to non-climatic and climatic change. They are typically highly reliant upon local natural resources for their livelihoods, have little access to outside assistance, and are often the

last to receive resources from outside sources that would help them adapt to change (Eakin et al. 2014).

2.6.2 *Smallholder Adaptations*

Coffee growers are accustomed to some variability in the factors that impact their production, including climate, market shifts, or changes in government subsidies or impulse programs, amongst others (Smit and Skinner 2002). However, they are vulnerable to more extreme shifts that severely impact yields or income in the short term, or changes that persist over longer periods of time. Smallholder coffee farmers are especially vulnerable to market volatility and shifts in international, state, parastatal, or NGO resources that support their production. Joining or forming a cooperative organization is one way that smallholders may reduce or mitigate effects from these outside changes (Bacon et al. 2010).

Some producers reacted to the crisis by intensifying production practices and switching to more “technified” forms of cultivation (Rice 1999). This response included removing shade trees and increasing the use of agrochemical fertilizers and pesticides in an effort to increase yields. Although overall global production did increase 36% due to conversion to full-sun monocultures and agrochemical application, the benefits of increased yields and agricultural technology came at a cost to producers’ livelihoods and local ecologies with forest degradation and deforestation in southern Mesoamerica (Blackman et al. 2005). Smallholder producers comprise some of the poorest rural communities in coffee-growing countries, and the most marginalized growers in the global coffee production chain. They are constrained by a lack of financial capital, and as such cannot afford costly inputs and are left out of the government-funded agricultural stimulus programs that promote intensified production practices. Nevertheless, at the recommendation of international development programs and country-level “coffee impulses,” many smallholders did adopt these technologically-intensive practices, resulting in higher production costs and local ecological degradation (Nestel 1995; Renard 2010; Meyfroidt et al. 2013). Producer vulnerability increased due to resulting ecological degradation, with the loss of critical ecosystem services such as pollination and pest control that had formerly been provided by the shade canopy system and increased input costs resulting from agrochemical inputs (Hite et al. 2017).

2.7 *Coffee Cooperatives*

Coffee growers' cooperatives, like other agricultural cooperatives or farmers' organizations, represent an alternative to large-scale, plantation farms (*fincas*) and independent, unorganized smallholder growers (*productores libres*). Organizing into grassroots-level coops, or seeking a regional or state-level coop to join, was one way that coffee producers responded to the coffee crisis (Bacon 2015). Many of these same organizations have persisted through the protracted crisis, guided by a combination of principles about collective action in addition to, ideally, the priorities of communities they work with. The relationship between coffee cooperatives and communities is important, because cooperatives are usually the institution that holds certifications and which interfaces with extension technicians and international NGOs.

Cooperatives are important institutions for smallholder producers, who comprise some 25 million growers and 80% of coffee production worldwide (Fairtrade International 2018). Cooperatives frequently represent some of the poorest and most marginalized communities (Valkila 2009). Producers in rural communities face significant barriers to accessing specialty markets, including poor infrastructure, absence of market or price information, and lack of access to transportation (Bacon et al. 2008). Cooperatives may help alleviate some of these challenges by coordinating resources from government agencies, research institutions, non-governmental organizations (NGOs), and private firms to make them more accessible to smallholders (Ruben and Heras 2012). Cooperatives may be instrumental in reducing transaction costs, which are all the costs of organizing, managing production, transporting product, and negotiating with a buyer (Marcos-Matás et al. 2013). The potential to reduce transaction costs is especially important for coffee producers, as difficulty of forming market networks and price manipulation from purchasers is common (Raynolds et al. 2004). By organizing into a collective group, individual smallholders may improve their standing in the market and be better equipped to compete with large-scale producers (Abebaw and Haile 2013; Bro et al. 2017).

The governance and decision-making structure of cooperatives is often instrumental to their ability to positively impact producers' livelihoods. The "best practice" model for a cooperative is one that is democratically organized, democratically managed, and conforms to principles of equal treatment of members, equal voting rights, and shared ownership of assets (Alho 2015). However, this ideal is not always the reality of how cooperatives are governed, and many do not effectively involve members' voices or participation in the decision-making process

(Ruben and Heras 2012). They may be vulnerable to patronage or nepotism by community leaders; in Mexico, this has frequently taken the form of *caciquism*, or the manipulation by local political bosses individual gain (Bray 2013). Cooperatives can also be limited by inadequate resource base and a lack of member participation (Woubie 2015). Further, if cooperative leadership is not rooted in the smallholder community, it may be difficult to build trust, maintain accountability, and monitor projects at the local level (Ruben and Heras 2012).

This can be critical for a cooperative's ability to successfully administer development projects. There is a large body of research on cooperatives' role in economic development (Altman 2015) and coffee producers' livelihoods (Bacon et al. 2010; Jha et al. 2011; Barham et al. 2011). However, the function of cooperatives in partnering with conservation, development, or certification NGOs remains understudied (Méndez 2013; Bacon 2015). Because large-scale conservation and development initiatives are frequently applied through cooperatives, such institutions play an important role in the impacts of such programs. Coffee certification for smallholders is managed by cooperatives, so the impacts of certification on producers is contingent upon the performance of the cooperative (Tellman et al. 2011). Cooperatives also may have greater capacity to coordinate larger-scale projects involving multiple external stakeholders, such as the recent Climate Coffee initiative in Teotepec or the "tree for every bag" partnership between Conservation International and Starbucks (Rainforest Alliance 2016). As such strategic partnerships expand, cooperative organizations are likely to play an increasingly important role in coordinating larger-scale projects. Understanding the benefits and constraints producers face in working with a cooperative in conjunction with that cooperative's relationship with smallholder communities can aid analysis of certification impact on producer livelihoods.

2.8 *Coffee Certifications*

Currently, more than 40% of the world's coffee supply carries some form of certification, often multiple forms, a trend which is projected to grow by 20-25% in the coming decade (Potts et al. 2014). The number and types of certifications has also expanded, from the initial Fair Trade or Organic to now include Rainforest Alliance (RA), womens'-produced (IWCA) coffee, and private certification labels pioneered by Starbucks' C.A.F.E. Practices and Nespresso. There has been significant research on the economic, social, and ecological benefits of certifications on growers' livelihoods and environmental conditions since early years of adoption following the

first coffee crisis. Certifications are a market-based incentive program that rewards sustainable social, economic, and/or environmental practices (Snider et al. 2017). In this model, consumers exhibit the willingness to pay a higher price for certified products, under the expectation that the price difference will trickle down to producers and contribute to tangible improvements in living conditions (Glasbergen 2018). Certifications, particularly Fair Trade, were developed and promoted as a path to improve smallholders' livelihoods by offering higher and more stable prices, investing in social and educational programs, and changing labor practices (Berndt 2007). In contrast, RA and Organic certifications emphasize improving environmental aspects of production to benefit conservation goals and minimize adverse health impacts on producers (Philpott et al. 2007). They have been designed to incorporate some of the best principles of cooperative management, notably, that they are democratically controlled by their members. However, the actual social, economic, and ecological impacts of certifications are mixed and frequently context-dependent.

There is greater consensus that RA and Organic certifications result in positive ecological outcomes than economic or social ones across geographic contexts. Studies have concluded that certified farms have better outcomes for water quality, better soil conservation practices, and were more likely to adopt integrated pest management plans (Rueda and Lambin 2013; Whelan and Newsom 2014; De Jesús Crespo et al. 2016; Hughell and Newsom 2013). Research that has distinguished between certification type emphasize that the ecological criteria that RA promotes are beneficial for biodiversity by mimicking natural forest community composition, structure and function and by providing important ecosystem services (Jha et al. 2011; Perfecto et al. 2014). In order to comply with RA standards, certified farms at every scale must maintain at least 12 native tree species per hectare (Rainforest Alliance 2018). A study that compared RA-certified and uncertified farms in Nicaragua found that certified farms had significantly higher biodiversity, carbon stocks, soil depth and ground cover than uncertified farms of similar size and climatic conditions (Haggard et al. 2012).

Shade canopy cover preservation and enhancement has been associated with increased tree cover at the landscape scale, suggesting resurgence in forest cover in coffee landscapes (Rueda et al. 2014). Compliant producers have been found to use significantly less agrochemicals and produce less wastewater from coffee processing, improving water quality as compared with conventional producers (Milder et al. 2015). The ecological benefits can be

especially important for smallholder communities where sanitation and wastewater infrastructure are poor, and the agricultural production impacts on human health may be pronounced (Haggart et al. 2012). RA recently conducted a study comparing certified (including RA/SAN and AAA) and non-certified farms that concluded that certified farms had better management practices related to water quality, soil conservation, native species and biodiversity conservation, and higher income from the coffee crop (Hughell and Newsom 2013). Reducing chemical inputs may also enhance household economic security by reducing cultivation costs, though there may be a tradeoff associated with reduced yields (Bravo-Monroy et al. 2016). The focus on refining production practices under certification is producing increased specialization on income-generating export products while attempting to promote greater on-farm diversity (Zimmerer 2007; Rueda and Lambin 2013).

The economic and social benefits of certification to producers' livelihoods (regardless of RA, Organic, or Fair Trade) have not proven to be as clear as the ecological outcomes. Each certification claims to offer producers financial incentives for more sustainable production practices. Proposed benefits include a guaranteed minimum price, price premium for social development (Fair Trade), or higher price per volume (Organic and RA), especially when sold to niche specialty markets (Beuchelt and Zeller 2011; C. Bacon 2004; Barham and Weber 2012). However, the Fair Trade-guaranteed minimum price has declined in purchasing power due to inflation, and RA certification does not guarantee a higher price paid to producers (Newsom, pers. comm. March 2017). The price premium for social development (*premio social*) is supposed to be distributed through democratic decision-making how to use those funds in community development projects (Weber 2011). However, because this premium is retained by the cooperative, the benefits at the household level are dependent upon cooperative governance, transparency, and accountability to members (Ruben and Heras 2012)

In other contexts, there is a clear, positive economic impact from certification, in which higher prices do translate to greater income for producers (Barham et al. 2011). Recent data from RA concluded that certified farms have higher productivity than non-certified farms (Milder and Newsom 2015) and that higher yields, not higher prices, have a greater positive effect on actual economic outcomes for smallholders (Barham and Weber 2012). Another recent study comparing different certification systems with non-certified farms in a one Nicaraguan coffee community found that RA farms had higher yields than non-certified farms or farms that carried

most other types of certification (organic, Fair Trade). In other localities, lower yields resulting from shade cultivation and associated production costs outweigh the financial benefits of higher price for certified coffee (Ibid.). Shade cultivation may reduce harvest volume, although the higher production of sun-grown coffee can only be sustained over the long term through the addition of nutrient inputs (Millard 2011). However, the quality of shade coffee is often higher, allowing producers to sell their product to specialty markets for better prices than those offered by certifications themselves. Some case studies have found that individual smallholders or cooperatives that hold multiple certifications (RA plus Fair Trade or Organic) are able to access better markets and sell a greater proportion of their product at certified prices, which may enhance direct income benefits (Beuchelt and Zeller 2011; Bravo-Monroy et al. 2016). These trends cast important critiques on the benefits that each certifying organization claims their seal offers, and the importance of site-specific studies to evaluate their impacts.

In addition to higher price points and price premiums or “floors” that reduce vulnerability to market volatility, certification offers producers other economic benefits. RA and their in-country organizational partners provide trainings and workshops for farmers or cooperative staff, (Lucas Bakker, pers. comm. April 28, 2017). The certification network has also been instrumental in providing farmers with new coffee varieties, which may produce higher quality coffee cherries or are resistant to disease, at little or no cost to producers (UNE3, pers. comm.). These resources decrease farmers’ production expenses and may help ensure improved harvest in the future, making it easier for smallholders to change production practices to comply with certification standards (Bravo-Monroy et al. 2016). Fair Trade and RA certification also claim to advance social development within producer communities. The price premium from Fair Trade is intended to fund community development projects, while RA criteria require that smallholders make progress on forced and child labor, harassment and discrimination, and living conditions (Rainforest Alliance 2018). RA standards also prioritize farmer protection by reducing production hazards and promoting adequate access to health services (Raynolds et al. 2007).

Despite extensive claims and marketing of benefits of certifications, there are significant limitations to its ability to improve smallholder producer livelihoods. While certified producers do receive higher prices than their uncertified, conventional counterparts, the coffee crisis’ effects has meant that producers earn less per pound than before (Méndez et al. 2010). Smallholders face barriers in even entering certified markets as they must *first* be organized into

a cooperative to even access potential benefits (Dragusanu et al. 2016). There is also limited demand for certified coffee, so volumes produced under certification regulations may yet be sold at conventional prices (Glasbergen 2018).

Finally, cooperative organizations pose particular challenges for the benefits of certifications to actually be conferred to producers. As noted above, cooperatives are supposed to be democratically organized and demonstrate accountability and transparency in how social premiums are used (Dragusanu et al. 2016). However, cooperatives may not actually be democratic in management or decision-making, leaving producers out of the process of administering price premiums. Certification is also costly, and consumes cooperative time and resources in coordinating audits, enforcing compliance with standards, and processing the crop according to specialty standards (Barham and Weber 2012). Cooperatives that are not locally based or participatory may not inform member producers of certification, and the “lack of knowledge about certification on the part of producers can erode trust and increase tensions within a cooperative,” (Dragusanu et al. 2016, 231). The cooperative as a mediating institution between producers and certifications remains understudied yet critical to implementing programs that will actually benefit producer livelihoods.

2.9 *Power Relations and Governance in the Coffee Sector*

One criticism of the livelihoods analytical framework outlined above is that it frequently adopts too narrow a frame of reference, by focusing on household or local-level decisions without sufficient attention into how extralocal forces constrain smallholders’ options (Scoones 2009; Carr 2015). Many livelihoods response studies and development projects used the asset-based approach developed by Chambers and Conway (1992), which tend to ignore the pervasive effects of globalization and scale and loci of power and politics (Knutsson and Ostwald 2006). Rural livelihood analyses typically have engaged with extralocal processes when they increase farmer vulnerability, as following shocks or stresses such as the coffee crisis (Carr 2015). However, such a narrow frame does not critically engage with the ways that the state and global commodities markets frame how smallholders in the Global South utilize those assets. An analysis of smallholder producer livelihoods and the impacts of certifications or cooperative membership in response to the coffee crisis would, therefore, be incomplete without considering power relations and inequities across the coffee sector. While this thesis analyzes livelihood

decisions taken at the farm and household scale, such decisions are bounded by policies and priorities set by Mexican and international institutions.

Coffee in Mexico was historically controlled by Mexican and foreign elites with larger landholdings, who have benefited from national policies that favored more intensified production and greater access to capital (Toledo and Barrera-Bassols 2017). From the outset, coffee was promoted as an export cash crop through extension packages of seed, plants, and ‘appropriate technology’ to indigenous smallholders, who were primarily subsistence farmers. The top-down approach to information and resource transfer from agricultural professionals to farmers perpetuated a relationship of dependency on the state rather than independent knowledge and capacity amongst producers (Moguel and Toledo 1996). Coffee was seen as an engine for rural economic development and integrating subsistence communities into the market economy, projecting state power and governmentality at the expense of local self-determination (Jaffee 2007). From this perspective, coffee served the interests of the central state to govern rural populations and to improve the health and well-being of its citizens (Foucault 1991). This approach to promoting adoption of coffee amongst smallholders reflects state goals of export oriented agriculture that often run counter to local community priorities about food security, self-sufficiency, and economic opportunity (V́ctor M. Toledo and Barrera-Bassols 2017).

Smallholder decisions regarding resource allocation to coffee production or other livelihood strategies have been determined in large part by the political economy of coffee at the international and national scales. The Mexican government has had varied involvement in the sector, from a high degree of regulation and support during the period of statism under INMECAFE, to very little support under contemporary neoliberal and free trade regimes (V́ctor M. Toledo and Barrera-Bassols 2017). During the period of state austerity following adoption of Structural Adjustment Programs (SAPs) as required by the World Bank (WB) and International Monetary Fund (IMF), resources for smallholders were virtually eliminated (Renard 2005). Such policies and associated resources (financial and technical) are determined according to the knowledge, perspectives, and priorities of technocrats outside of local communities and removed from local social, political, ecological, and economic context. The swings in state involvement reflect distribution of power in the sector, where external institutions set the agenda for agriculture and development and smallholders carry the burden or implementation and response. This dynamic brings to light the distribution of power in the sector and may help to understand

that producers face exogenous constraints in ‘adapting’ to the crisis, and why short-term ‘coping’ strategies have been the predominant response to the restructured coffee market.

2.10 *Certification Systems and Scales of Governance*

Certification systems themselves reflect inequities in the distribution of power, knowledge, and influence in the coffee sector and its intersections with global conservation and development agendas. Certifications were initially developed to address social, economic, and environmental inequalities in the commodity coffee chain by offering higher prices, better labor practices, and incentives for conservation (Raynolds et al. 2007). However, the growth in market for certified products has required standardization across countries and coffee as a commodity product, which has brought increased involvement from national governments and international actors. Certifications, like that of the Rainforest Alliance, are developed and managed in consuming countries of the Global North, rather than within producing communities or countries. As such, they increasingly reflect consumers’ concerns over product quality, health, and ideals about conservation that are often taken out of context and do not incorporate producer context (Mutersbaugh et al. 2005). While this does ensure that certifications are consistent across locales and may provide greater transparency about production practices, the criteria may not represent what producers, their families, or communities would determine as most appropriate for their livelihood context. These transnational alternative trade movements (specifically Organic, Fair Trade, and Rainforest Alliance) are increasingly linked to international development and finance institutions such as the World Bank and the Global Environment Facility (GEF). Such institutions do provide necessary funding to assist producers in complying with certification criteria and to implement important development projects, but nevertheless embody neoliberal principles that are at odds with the initial goals of certifications and the alternative trade movement (Mutersbaugh et al. 2005).

In order for certifications to achieve their full potential as a conservation tool, they need to be economically viable and appropriate to ecological context. In many producing countries, the support that producers need to comply with certification standards has resulted in increased involvement from external actors such as the state or cooperatives, who may not hold producers’ livelihoods as their foremost priority (Otto and Mutersbaugh 2015). Working with government agronomists or specialists from external NGOs introduces new barriers, financial and regulatory,

that producers must overcome in order to take advantage of potential benefits. Further, changing production practices to comply with standards and norms requires up-front investment and high transaction costs that risk excluding the very smallholders for whose benefit certification systems were ostensibly designed (Blackman and Naranjo 2012). The system requires that producers conform to externally-set standards that fit what consumers demand in order to receive the benefits that certification may provide (Mutersbaugh et al. 2005).

Power distribution and governance of certifications in the coffee sector reflect the structure of the global commodity chain itself. Coffee is a “buyer-driven” chain, wherein importers, roasters, large coffee corporations, and consumer demand determine what rules and standards producers must meet in order to participate in the market (Muradian and Pelupessy 2005). Thus, larger actors based in the Global North set the parameters of the market and, crucially, the price at which coffee (certified and conventional) will be bought and sold, concentrating income and profit amongst larger players in the system. This is particularly important for the certified market, because the higher price point that consumers pay for certified products does not get transferred in full back to producers, while they are required to meet more stringent regulatory standards that they themselves do not participate in developing (Muradian and Pelupessy 2005). The high costs, stringent requirements, and low returns for certification further place consumers’ interests ahead of producers, and emphasize attributes of the product rather than producers’ livelihoods.

3 METHODOLOGY

3.1 *Study Setting: Santa Lucía Teotepec*

Figure 3.1: View of Teotepec and surrounding Sierra Chatina.



I conducted field work in the community of Santa Lucía Teotepec, a small community (*localidad*, the demarcation of land divisions) in the municipality of Santos Reyes Nopala, in the Costa region of Oaxaca, Mexico (Figures 3.2 and 3.3). International biological and cultural conservation organizations have identified the region as high priority for strategic conservation initiatives, due to the significance of ecological and cultural resources and threats to future sustainability (Rainforest Alliance-Café CO2 project; Conservation International). Oaxaca is the most biologically diverse state in Mexico, a country which overall ranks fifth globally in terrestrial biodiversity (Koleff et al. 2007). However, very little land area in Oaxaca is conserved in state or federal protected areas. Instead, 80% of forested land is under the management and control of about 1400 local communities (Robson 2009). Many of these communities, including Teotepec, have local restrictions on land use that protect forest resources so that they may be sustained into the future (Emanuel and Greenberg 2000).

Figure 3.2: Location of Santos Reyes Nopala

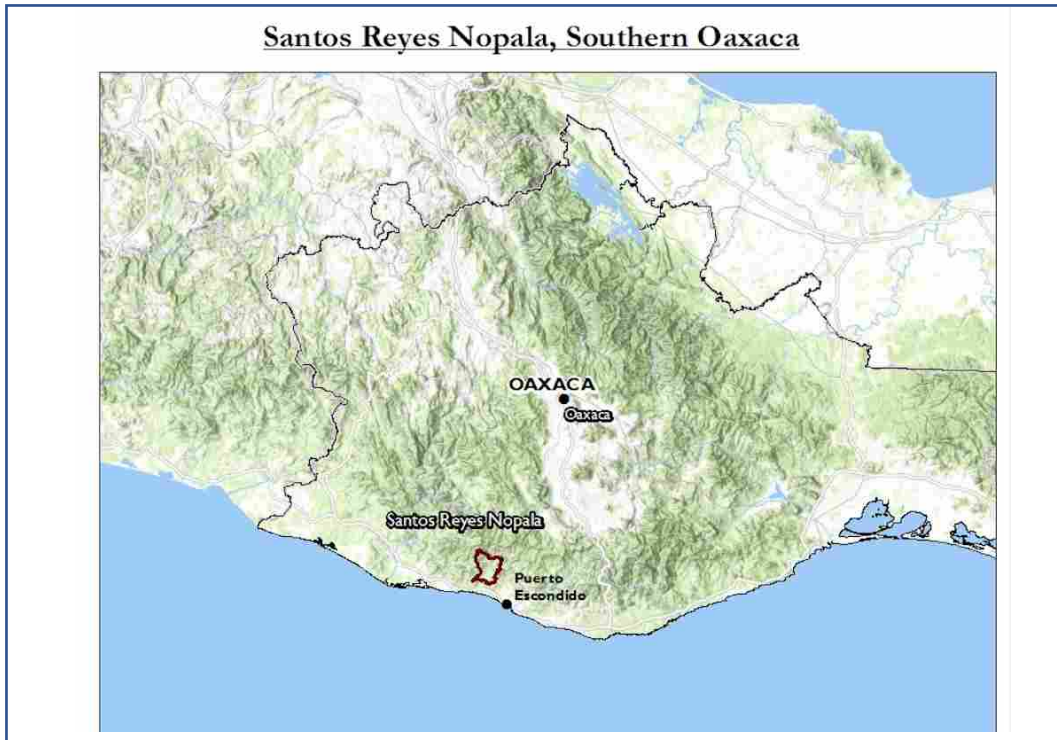
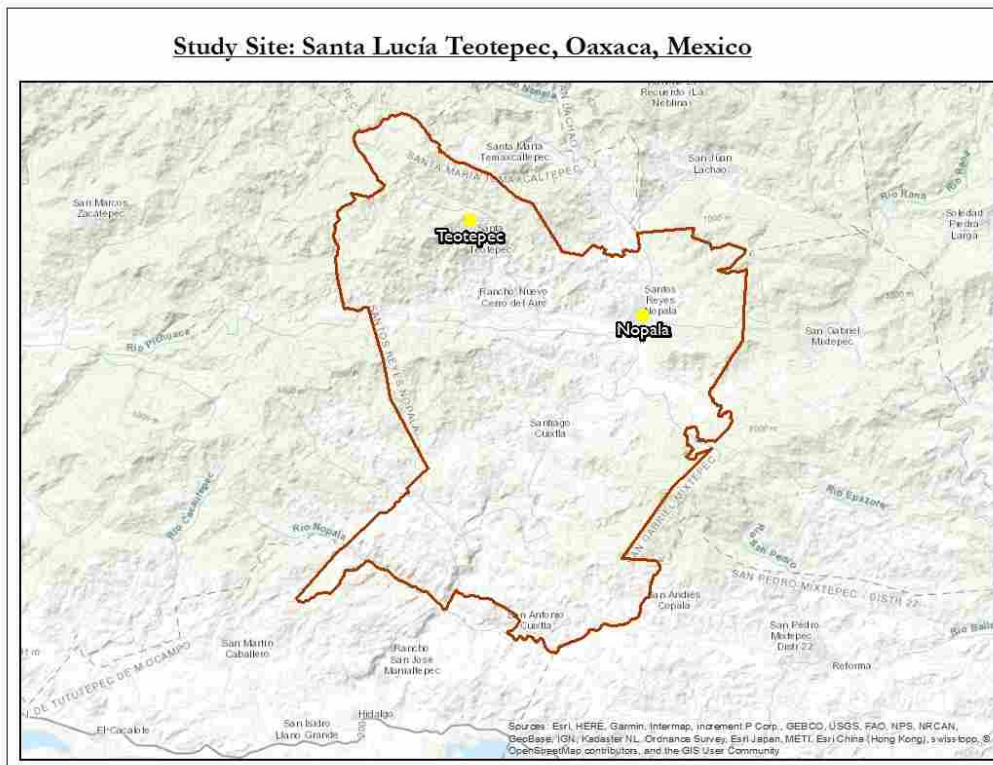


Figure 3.3: Location of Teotepec, in the northwest of Municipio Santos Reyes Nopala.



3.1.1 Climate and Ecology

Teotepec is situated at 1172 meters above sea level in the Sierra Madre del Sur mountain range. The community itself sits at the top of a steep mountain ridge above the Río Las Flores. The *localidad* is approximately 4200 ha over extremely steep, rugged, difficult to access terrain. The community's territory is formally designated, according to regulations in the Mexican Constitution, as an *ejido*, meaning that land is communally owned by villagers but individual households have usufruct rights to work plots for subsistence use, including agriculture and community forestry. Designations and restrictions on land use are taken at the community scale, by the local governing council (*Bienes Comunes*, detailed below). Closer to the town itself, the area is a matrix of *milpa* (traditional polyculture of corn, beans, and squash), pasture, and fragments of intact forest, much of which is planted with coffee in the understory. Farther from town center, the land cover is more contiguous forest, ranging from mixed deciduous to pine-oak forest at higher elevations. Coffee plots tend to be situated on north-facing slopes ranging from 1100-1600 m in elevation. Dominant soils in the area are leptosols and regosols, but tend to be highly eroded and with relatively little organic matter, limiting nutrient availability, water retention, and productivity (Flores Martinez et al. 2015).

The climate is seasonally dry subtropical humid, and receives an average of 1600 mm of rainfall per year, divided into distinct wet and dry seasons (Koleff et al. 2007). The region receives most of its precipitation between July and October, with very little rainfall from November through May. Teotepec is located approximately 25 km from the Pacific coast, making it significantly hotter and more humid than other coffee growing regions in the state. Its relatively high elevation allows for production of high quality “specialty” coffee, but the higher humidity levels promotes coffee leaf rust (*Hemileia vastatrix*) growth, which has inhibited yields or completely destroyed production in recent years. Its proximity to the Pacific Ocean also makes it more vulnerable to extreme weather events, notably tropical storms and hurricanes, which affects coffee production and producers' livelihoods.

The forest surrounding Teotepec is characterized as tropical montane cloud forest (TMCF, or *bosque mesófilo de montaña*), an ecosystem of high priority conservation value due to its high biodiversity across taxa, high species endemism, and sensitivity to degradation from climate change and forest conversion (Ponce-Reyes et al. 2012; Koleff et al. 2007). Tropical montane cloud forests are characterized by persistent cloud or mist cover, and occur within a

narrow altitudinal and topographical range (Bruijnzeel et al. 2011). They make up less than 2.5% of the world's tropical forests, but harbor a disproportionately high species richness (Valencia et al. 2016). In Mexico, TMCFs have the highest degree of plant, amphibian, and reptilian species diversity and endemism of any ecosystem in the country, but occupy less than 1% of the land area (Toledo-Aceves et al. 2011). It is estimated that over 50% of TMCF has been converted to other land use, creating fragmented "islands" of habitat for endemic, endangered, or rare species (Echeverría et al. 2007). In the Costa region of Oaxaca, TMCF forest provide habitat for such iconic species as the margay (*Leopardus wiedii*), azure-crowned hummingbird (*Amazilia cyanocephala*), and the Oaxacan spiny-tailed iguana (*Ctenosaura oaxacana*); the region also harbors high diversity of threatened orchid and bromeliad species (Alfonso-Corrado et al. 2017).

The Chatino coastal mountain region is also sensitive to degradation from climate change, most notably El Niño events, tropical storms, and hurricanes. Under most climate models, these storms are predicted to increase in frequency and severity, exposing the community to greater climate risks and exacerbating vulnerability to market shocks (Schroth et al. 2009). These weather systems bring heavy rains to the area, causing flooding and landslides that destroy not just the coffee crop, but subsistence crops, homes, and local infrastructure as well. In 2015, tropical storms brought devastating rainfall and landslides to Teotepec that wiped out many producers' homes and washed out the only road to Santos Reyes Nopala, the municipal capital.

3.1.2 *Social Aspects and Demographics*

According to the most recent national census data, the population of Teotepec is roughly 1850 people, though local data obtained through the community clinic report that number closer to 2600 (INEGI, Censo de Población y Vivienda 2010, pers. obs.). The Mexican government classifies the community as highly marginalized, with higher-than-average rates of child mortality, food insecurity, and low rates of Spanish literacy (SEDESOL 2010). Teotepec is considered a "high-priority development zone" for social welfare programs, including improving access to health, education, and infrastructure projects (SEDESOL 2014). There is a basic health clinic and public school through the secondary level, but any significant medical treatment or quality education requires travel to Puerto Escondido, the nearest large coastal city and commercial center. Puerto Escondido is a 75 km (45 mile) trip that takes roughly three hours by

private car or shared taxi, which is a substantial cost in time and monetary terms for Teotepec residents.

Access to Teotepec is limited to a rough dirt road from the nearby municipal seat, Santos Reyes Nopala, but the road frequently washes out in the rainy season and many residents do not own a vehicle. Public transportation to nearby towns consists of shared taxis (*colectivos*) or pickup trucks (*pasajeras*), but these are costly, have limited daily trips, and involve long hours in transit. Most houses have electricity and running water, though it is not potable and water infrastructure consists of irrigation lines that deliver water from nearby springs or streams; there is no wastewater treatment in the community. Housing is still relatively basic, with most homes of simple construction of cinder block and concrete. All households cook over wood-fired stoves, many exclusively so, though migration has brought greater wealth for some families, and with it more modern propane stoves. Still however, demand for firewood is high and coffee producers' families rely on certain shade trees within plots to fill this need.

Almost all of Teotepec's population are Chatino, a distinct ethnic group in the Costa and Sierra Madre del Sur region of Oaxaca. Chatino is classified on UNESCO World Languages list as endangered, with only an estimated 2500 remaining native speakers (UNESCO 2017). In Teotepec, most residents speak or understand Chatino as well as Spanish, while older residents may speak Chatino exclusively. Teotepec is unique in the Chatino region because the majority of residents still speak their indigenous language; increasingly however, children are not learning Chatino and Spanish has become more common as the language of daily life, in the home and on the street (pers. obs.). The unique cultural and ecological attributes of the region, coupled with external threats to their sustainability, has prompted strategic livelihood adaptations projects led by the Rainforest Alliance, the cooperative UNECAFE, and other conservation and development NGOs.

The local economy in Teotepec has traditionally been subsistence-based, with the local population primarily engaged in *milpa* cultivation for home consumption or sale within the community. While some households still grow enough staple crops (corn, beans, and squash) to last the year, most foodstuffs must be purchased from outside the community or from the subsidized government DICONSA store. Economic opportunity within Teotepec and the surrounding Chatino region is limited, with coffee being the sole export crop. Other sources of income include employment in construction, shop keeping, or as contract laborers (*mozos*) on

neighbors' farms or in nearby coffee plantations. Due to the limited economic and education opportunities within the community, many residents have migrated out, either to the United States or cities in Mexico in search of work, or to population centers in Mexico for better education.

3.1.3 Local Governance: *Ejido System and Bienes Comunales*

Teotepec is a semi-autonomous indigenous community, and as such is governed locally through constitutionally-recognized institutions that are unique to indigenous communities in Mexico. Land ownership and tenure in Mexico is complex, with indigenous and agrarian peasant communities subject to either *ejido* or *comunal* systems of land management (Wohlgemuth 2014). *Ejido* land is commonly held, but individual farmers hold title to use and transfer or sell individual plots (Brown 2004, pers. obs.). *Ejido* land is broken into three categories: (1) plots of arable land held and farmed by recognized members; (2) communal land, monitored and managed by the *Comisariado*; and (3) land for settlement (Brown 2004). Teotepec is an *ejido* community, and local governance decisions are taken through the Municipal Agency (*Agencia Municipal*) and the Common Property Commission (*Comisariado de Bienes Comunales*), through a system known as *usos y costumbres* (usage and customs).

Reforms to the Mexican constitution in 1992 and requirements of NAFTA changed land tenure regimes in some *ejido* communities. The changes under the 1992 Agrarian Law opened *ejido* land to be fully privatized, rather than remaining strictly communally-held, which meant it could be sold to outside entities, including foreign citizens and companies, upon approval by individual *ejido* governments (Brown 2004). Teotepec elected not to permit full privatization, thus ensuring continued regulation and governance by the community as well as sole use by residents. As such, Teotepec has not experienced extraction or exploitation of natural resources, primarily timber, as has occurred in other *ejidos* in the Sierra Sur (RA2; UNE3).

The Mexican Constitution in 1998 recognized the “Rights of the Indigenous Peoples and Communities in the State of Oaxaca,” which allowed communities a wide degree of autonomous authority for self-governance. The Constitution “lays out flexible guarantees and guidelines for local administrative mechanisms,” allowing for flexible term limits and government positions that fit local context (Mitchell 2006). All residents are required to meet certain communal labor responsibilities known as *cargos* and *tequios*, which fill community needs that would normally

be the role of local administrative governments. *Cargos* are appointed or elected positions of municipal government, or those who maintain local infrastructure or the community's police force, that residents hold for one to three years without monetary compensation. *Tequios* are communal workdays that all residents are required to attend, regardless of age or gender, and consist of public works projects or, in the case of Teotepec, establishment and maintenance of a coffee plant nursery. Residents are required to fill *cargo* positions on a regular, rotating basis, with consequences such as losing rights to communal forest use or being forced to pay in compensation if they are unable, or not present, to fill the positions.

The *Comisariado de Bienes Comunales* is an elected board of landowners that makes decisions about local natural resources, on communal land or privately worked plots, and mediates property or resource disputes. In Teotepec, any resident that owns land may be part of the *Comisariado* regardless of gender, but traditional gender roles still restrict the positions *de facto* to male landowners (RA2, Feb. 6, 2018). Members of the *Comisariado* are elected to three-year terms and manage natural resource public infrastructure projects, manage communal forestland, and enforce local protections or restrictions on resource use (Brown 2004). All natural resource rights-holders, usually heads of land-owning households, meet in an assembly twice a year to review old policies or establish new ones (Bray et al. 2012). In Teotepec, the *Comisariado* has established protections on all pine trees (*Pinus oaxacana*) and large individual trees of other species in order to discourage deforestation and exploitation by foreign enterprise. For example, in order to cut down a pine tree (the preferred timber species), a user must submit a request and obtain official permission, granted on the basis of the tree's location, previous requests by the particular user, and how many other trees have been cut in that year (RA2, Feb. 6, 2018). Hunting wild animals, for subsistence or other uses, is also strictly prohibited.

In Teotepec, individually held plots are used for subsistence-based agriculture, with very little produced for sale outside the community. Farmers cultivate *milpa*, the corn-bean-squash polyculture ubiquitous throughout Mesoamerica, along with *caña* (sugarcane), pasture for grazing cattle, and coffee. Coffee and *panela*, homemade sugar blocks, are the only agricultural products sold outside the community. Local regulation limits the land area in agriculture to individually held plots such that subsistence agriculture or coffee cultivation cannot be expanded further into the communally-held forestland located in a zone farther from Teotepec. The protections against timber harvesting and restrictions on agriculture have kept some of the forest

areas intact, preserving their ecological integrity and attracting attention from the Rainforest Alliance and UNECAFE to concentrate conservation and reforestation projects in the community.

3.1.4 Chatino Environmental Attitudes

Teotepec and the other three Chatino communities have been a focus area for RA and UNECAFE programs in part because of cultural environmental values. Though there is little in the published literature about forest conservation values in Chatino culture specifically, more is known about other indigenous peoples in Oaxaca and Chiapas (Zapotec, Chinantec, and Maya) regarding the importance of environmental integrity to their culture and identity. These indigenous peoples are traditionally subsistence *campesinos*, reliant on traditional *milpa* polyculture and gathering other forest products, in regions that have continually been influenced by human modification (Aguilar-Støen 2017). The community has been relatively isolated throughout its history, and as such has developed dependence on a diversity of tree species and other forest products for all of their livelihoods needs. In consequence, they have developed complex knowledge about plant resources that support daily needs, and the landscapes and seasons most suitable for each species or cultivar, for example selecting certain types of *maíz* for different soils or rain vs. irrigated cultivation (Luna-José and Aguilar 2012). This interdependence is still valued by many residents, who view themselves as forest stewards and feel a strong responsibility to take care of the land and maintain forest integrity, including the ecosystem services that it provides (RA2,6,12;SO10,11;UNE1).

3.2 Non-Governmental Organizations in Santa Lucía Teotepec

3.2.1 UNECAFE: La Unidad del Sector Café Oaxaqueño

I partnered with the Rainforest Alliance and regional growers' cooperative, La Unidad Ecológica para el Sector Café Oaxaqueño (UNECAFE) in order to answer these research questions. The Rainforest Alliance (RA) is an international conservation NGO that administers specialty coffee certification to producers who comply with a rigorous set of production standards. The certification criteria emphasize biodiversity and natural resource conservation, shade coffee cultivation, maintenance of native vegetation, and polyculture agroforestry systems.

RA certifies producers at a range of scales, from large plantations to smallholders growing in home garden plots, but has identified significant challenges in its ability to reach small-scale producers (Milder and Newsom 2015; Newsom, pers. comm. Feb 20, 2017). In addition to certifications, RA coordinates context-specific ‘strategic projects’ in producing communities that are aimed at achieving joint sustainable development and conservation goals. Through contacts in RA, I identified independent certification auditors, certified producers, and cooperatives that I could partner with to gain access to producer communities and that would aid in building relationships with growers to participate in my research.

Unidad Ecológica para el Sector Café Oaxaqueño (UNECAFE) is the only coffee growers’ cooperative in Mexico that carries RA certification. UNECAFE is “an organization of high-quality, sustainable coffee producers that markets this coffee to improve the local economies and quality of life for coffee-producing families” (UNECAFE 2018). The cooperative operates across the state of Oaxaca in southern Mexico, coordinating resources in at least 56 distinct communities (Figure 3.2 below). The organization administers 6 other coffee certifications in addition to RA, including Fair Trade, Organic (for the US, EU, and Japan), Starbucks’ C.A.F.E. Practices, and the Common Code for the Coffee Community (4C). UNECAFE provides material resources, assures higher prices, agricultural extension information, and some access to medical and education resources. The cooperative coordinates and implements coffee development and conservation projects from the Mexican government, and other conservation NGOs invested in the Chatino region of Oaxaca. I coordinated with staff and affiliates of UNECAFE to identify a study community, UNECAFE, who also assisted me in entering the community in the culturally appropriate manner. This study was of interest to both RA and UNECAFE because both organizations work to support smallholder producers’ livelihoods as they adapt to global economic and ecological/climatic change. However, both are constrained by a lack of resources, staff, and capacity to undertake studies at the community scale that would provide information on their programs and resources.

3.2.2 Rainforest Alliance in Santa Lucía Teotepec

UNECAFE has held RA certification since 2007, which has helped the organization build a strong international network with other conservation NGOs (Conservation International, ProNatura Sur) and coffee research and development organizations (CATIE, Coffee Research

Institute, and AMECAFE). The partnership between UNECAFE and RA has also allowed the two organizations to target Teotepec and the Zona Chatina as a strategic region for integrated conservation and development projects. In addition to certification, in 2013 RA started a “climate smart agriculture” project in Teotepec, CO2 Coffee (Café CO2), to reforest plots that had been converted to *milpa* or pasture, with tree species that either have local value (citrus, mahogany) or which are fast-growing. The purpose of this project is for producers to be able to then generate income from their forests through carbon credits on the Voluntary Carbon Standard (VCS) network. This project has provided greater financial investment from RA than certification alone, which has helped fund some community development projects and represents one approach to supporting sustainable livelihood development in the community.

UNIDAD ECOLÓGICA PARA EL SECTOR CAFÉ OAXAQUEÑO S.C

CARRERA OAXACA -ISTMO KM 12.5 TLALIXTAC DE CABRERA, OAXACA. C.P. 68270

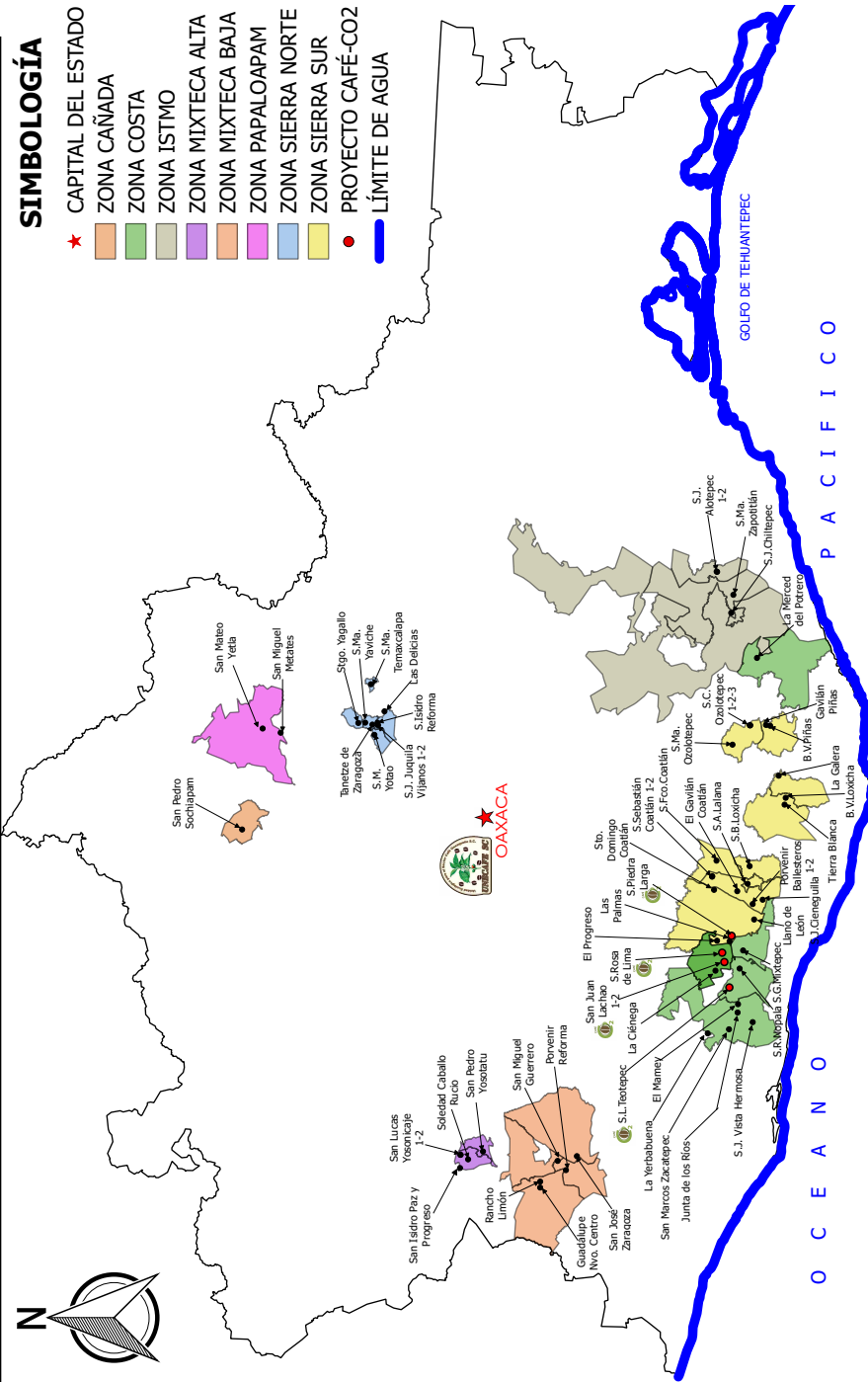



Figure 3.4: Map of UNECAFE Member Communities in Oaxaca.

3.3 *Research Questions*

The ‘coffee crisis’ has persisted for over twenty years, exposing smallholder producers to enhanced risk through market uncertainty and insufficient support from national governments. Smallholders have altered farm management and production practices as well as their overall livelihood strategies in order to adapt to, or cope with, continued market change. In light of the persistence of the coffee crisis and ongoing adaptive responses, this research seeks to analyze the impact of some of those adaptations on producers’ farm management decisions and livelihoods.

1. In what ways have smallholder coffee producing households in Santa Lucía Teotepec responded to the coffee crisis and its ongoing effects?
2. How have smallholder coffee producers in this region used growers’ cooperatives and certifications to adapt to the coffee crisis and restructured coffee markets?
 - a. What are the primary benefits and constraints to cooperative membership, and what opportunities exist for cooperatives and certifications to support producers’ livelihood adaptations?
 - i. Are cooperatives effective at addressing the coffee crisis at the household scale?
 - b. How does the relationship between the cooperative and coffee producers influence participation in the cooperative, and farm management decision-making?
3. How do cooperative membership and associated certifications affect producer decision-making about shade tree management on their coffee farms?
 - a. What are the cultural uses and values of tree species used in shade coffee agroecosystems in Santa Lucía Teotepec?
 - b. What are the primary challenges that producers face in maintaining shade trees on their plots?

3.4 *Methods*

3.4.1 *Qualitative Methods: Primary Source Data Collection*

In order to address the three objectives in an empirical manner, I used a mixed methods approach that combined qualitative critical social science methodology to address social aspects of adaptation with quantitative ecological methods to assess on-farm shade tree management. Field work was conducted over six months spanning from November to May of 2017-2018, a time period which allowed for observation of and participation in critical activities in the coffee

cultivation cycle. This time period included coffee harvest, weeding, and planting preparation, as well as certification pre-audit preparations and the actual audit itself. Spending an extended time in the community also opened up the opportunity to participate in other activities, such as *milpa* cultivation and village festivals, which provided important perspective on the other community obligations that producers hold. During this period, I lived in Teotepec with a respected family that produced coffee and held leadership positions in community government and in the cooperative. By concentrating my time in Teotepec, I was able to build more trusting, honest relationships with producers that allowed for rich data in interviews, access to farms to aid in coffee and other farm labor, and detailed tours of participants' farms to sample shade trees.

I conducted field work in the community of Teotepec, in the Santos Reyes Nopala municipality of the Sierra Madre del Sur, Oaxaca, Mexico (Figure 3.1). The study site was identified in partnership with the cooperative UNECAFE, and is one of only four communities that the cooperative works with that are still RA certified. Teotepec was selected as the most appropriate study community because it has the largest producer population ($n=300$), is the most condensed of possible study communities, and because coffee plots are located on average closer to the village than in the other RA-certified communities. At the time of field work, there were approximately 180 producers who were members of UNECAFE and approximately 120 unorganized producers, or *productores libres*, who were not members of any cooperative. I used a simple random sample design to select producers from the UNECAFE group and unorganized group to participate in a semi-structured interview (SSI) and closed-ended survey. UNECAFE provided lists of current and former members that I used to contact producers and solicit their participation. I selected potential interviewees by assigning each a number and using a random number generator, and if they were unavailable or unwilling, moved on to the next. I excluded producers who lived in outlying *rancherías* (Cerro Niño and Cerro Cuero) due to the difficulty of contacting them, coordinating interview times, and securing a translator. Out of the 300 coffee-producing households, I interviewed 45 UNECAFE *socio* (25% of organized population) and 20 unorganized producers (20%). All participants organized as part of UNECAFE referred to themselves as "*socios*," which translates best as "members" or "partners" in the cooperative. All plots surveyed ($n=30$) for tree diversity and canopy coverage were owned by an interview participant to ensure I had permission to access their plot, and that I was ground-truthing information they provided in interviews.

3.4.2 *Participant Observation (PO)*

Before contacting producers for formal interviews, I spent a few months living in and observing the community, participating in coffee labor, attending cooperative meetings, and engaging in informal conversations with producers, community leaders, and cooperative staff. Participant observation (PO) involves the researcher spending significant time with research participants and communities to “take part in their ways of life” and “immerse in everyday practices and customs, engage in observation and conversation” in order to understand how they carry out their daily activities (Zahle 2012, 54; Hesse-Biber 2017, 184). Throughout field research, I kept detailed notes and daily reflections to aid in contextualizing research objectives, process, and refining my interview guide and survey to be appropriate to community conditions. This first-hand, intentional experience is considered critical to gain deeper insight into the specific opportunities and constraints on farmer decision-making that are specific to local ecological, economic, social, and political context (Creswell 2014).

Participant observation was critical for understanding local context and to build rapport with producers and the community of Teotepec as a whole. UNECAFE employs a local technician in Teotepec, as in many of the communities with which it works, which opened up the opportunity to participate in cooperative operations and helped to form initial relationships with producers. I aided in construction of on-farm infrastructure for certification compliance, helped to process and weigh coffee beans in preparation for sale, and accompanied UNECAFE staff when they made visits to selected farms. I accompanied local technicians on pre-audit and official audit farm visits, which was critical to be able to understand the complicated, ongoing process of certification compliance for both producers and the cooperative.

During harvest season, I also helped a wide range of producers pick coffee, mill and wash the cherries, and dry the beans before being sold to the cooperative. I accompanied cooperative member and non-member producers to their farms, which provided important perspective on differences in farm management practices and access to resources between the two producer groups. Farm visits were also critical to fully understand local means of production, particularly the constraints that labor, farm location, and method of transport present to individual producers. This also opened up the opportunity for extended conversations with producers, allowing for more detailed responses that enriched interview data. Producers often gave me a thorough tour of

their plots, identifying important other natural resources, including fruit trees, timber species, and water sources that shaped adaptation strategies.

PO was an important method of data collection throughout fieldwork, but there are some limitations to the process that are important to note. First, while I was able to attend all cooperative meetings and community events, some were conducted entirely in Chatino. This meant that the only information that I could gather at these meetings was what my contacts chose to translate for me, which greatly limited the completeness of that data. Also, as a female and community outsider, I was not able to attend meetings of the *bienes comunales* council, which would have provided important insight about how local decisions about natural resource management, protections, and conflict resolution between producers are made. Importantly, all of my experiences and observations were interpreted through my personal perspective. While I was careful to try to remain objective in my notes and analyses, my position as a researcher still brings potential biases from my personal views, knowledge, and attitudes (further positionality and other limitations are detailed in Conclusion). Still, PO was a crucial step in entering into the community and establishing credibility with producers, as well as understanding the specific contextual variables that influence producers' adaptations.

3.4.3 *Semi-Structured Interviews (SSIs)*

In-depth, qualitative data was obtained through semi-structured interviews (SSIs) conducted with a total of 65 producers, 45 UNECAFE members and 20 *productores libres*. The UNECAFE members were further broken down into two groups, those with Rainforest Alliance certification ($n=25$) and those whose farms did not carry RA certification ($n=20$). I delineated these two producer groups because the particular criteria of RA certification influence farm management practices, and because certified producers receive different resources from UNECAFE than the producer community as a whole. I determined these two producer populations through documents provided by UNECAFE and through contacts formed during the PO phase of fieldwork in Teotepic. Interviews were conducted with the producer or household member who was responsible for the majority of decision-making regarding coffee production (sometimes, but not always, the head of household). In the cases where multiple family members contributed to coffee labor or decisions were made jointly, interviews were completed with all relevant household members. In some instances, certain portions of the interview were more

appropriately directed at different family members from multiple households, in which cases I conducted follow-up interviews to confirm details with those producers.

Participants were selected at random from amongst the two groups, such that I would contact a producer at random (selected using a random number generator) to solicit their interest in participating, and pass on to the following producer in the event that they weren't available or interested. I excluded producers who lived in neighboring *rancherías* Cerro Niño and Cerro Cuero for logistical reasons. These communities are a half-day's walk from Teotepec, so actually locating the producer and coordinating a time to complete the interview would be challenging. Further, many of these producers speak exclusively Chatino, and coordinating transport for an interpreter was logistically prohibitive. While this biases my sample towards only documenting the experiences of producers who live in Teotepec, I excluded these producers from both groups to minimize variation between the two.

SSIs were an appropriate method for gathering rich data on the opportunities and constraints that producers face in adapting production practices to changing conditions because the open-ended nature of questions allowed for detailed responses and follow-up questions (Hesse-Biber 2017). I developed the interview guide after spending a few months in Teotepec, which ensured that interview topics reflected specific factors that affect farm decision-making, adaptive strategies, and producers' participation in UNECAFE (see Appendix B). While interviews generally followed the guide, they were flexible enough to allow producers to discuss what factors were relevant to their individual situations. I conducted pilot interviews with two producers and the local UNECAFE technician to ensure that questions were properly translated, understandable, and appropriately addressed factors related to adaptation and response. Interviews were conducted in Spanish directly with the participant producer, or in cases where the producer only spoke Chatino, through translation via a trusted, neutral community member. Interviews were reflective, iterative, and reviewed in the field, so that results could be used to further refine the interview guide or develop deeper follow-up questions. Interviews were conducted in a location in which participants felt comfortable and free from distraction, either in their homes or as part of walking tours of their farms.

3.4.4 Closed-Ended Survey

During each SSI, I asked a series of closed-ended survey questions that followed the same format for each producer. The survey included questions about livelihoods strategies, such as sources of income and the relative importance of each; whether the producer had replanted in coffee or changed the area in production; and access to other resources, such as land for *milpa* cultivation or government subsidy programs. The survey also contained a detailed section on fruit or timber tree cultivation, which helped to enrich understanding of access to other key food sources as well as shade tree species management on each coffee plot.

3.4.5 Key Informant Interviews

Finally, in order to fill in details in understanding context of communal, *ejidal* governance in Teotepec as well as details about how UNECAFE functions, I conducted semi-structured interviews with four community leaders in Teotepec who were influential in organizing producers to work with UNECAFE, and four key cooperative staff (two local technicians, and two centralized staff). Key informant interviews allow for in-depth exploration of topics with individuals who are experts on the community or local context, and who can provide contextualized detail on a topic that the average community member may not. Key informant interviews were helpful before, during, and at the end of the data collection process because they helped orient me to the community, clarify information that I did not fully understand, and triangulate or fact-check participants' claims during formal SSIs (Creswell 2017). I used a separate questionnaire for key informant interviews that gave structure to the conversation yet allowed sufficient space for participants to discuss relevant topics that emerged during the interview process.

I interviewed the two central staff members of UNECAFE who coordinated projects with producers in Teotepec, as well as local technicians that work in Teotepec and the other nearby communities that are also RA-certified. These interviews focused on understanding the scope and scale of UNECAFE's projects in Teotepec, the history of the cooperative's relationship with the community, and how the cooperative has supported producers throughout the coffee crisis. I also interviewed community leaders who had held the position of "*Presidente de Bienes Comunales*," or who currently held that position, in the local community government. Interview

topics also covered the history of UNECAFE with the community, as well as protections for and governance of local natural resources, particularly communal forest protections. I also consulted community key informants during the data collection process to corroborate SSI participants' claims or to clarify details that participants did not fully understand, most notably relating to certification management.

3.4.6 Qualitative Data Analysis

Interviews ranged from 20 to 98 minutes in length, with an average time of 45 minutes. Interviews were recorded with the participants' verbal consent and reviewed for making detailed notes immediately following the interviews. With the exception of five interviews, all were recorded for later transcription; those that were not recorded were conducted over extensive farm tours that were not conducive to recording, and only one because the participant did not consent to being recorded. I took detailed notes during all interviews to facilitate appropriate follow-up questions and, in the instances of those interviews not recorded, to ensure accuracy in data collection.

I personally transcribed all interviews, which immersed me again in participants' responses, allowed me to identify recurring themes, and how producers understood adaptations and their relationships with UNECAFE. To protect participants' anonymity and to simplify analysis, each participant was assigned a code corresponding to producer group (i.e. RA1, RA2, SO1, SO2, Independent1, Independent2, etc). I began transcription in the field, which further aided the data collection process by allowing me to incorporate colloquial words and phrases into the interviews. Transcription formed the initial round of coding analysis, which was conducted through a grounded, inductive approach whereby general themes emerged through systematic, iterative coding and analysis (Strauss and Corbin 1998; Hesse-Biber 2017). Codes were compiled as I transcribed each interview, and I recorded interview codes and salient quotations throughout the analysis process.

3.4.7 Quantitative Biophysical Methods: Tree Cover Survey

In order to address how cooperative membership and associated certifications affect producer decisions about shade tree management on their coffee farms, I surveyed farms from each producer group for tree species abundance, density, and indices of species biodiversity, as

well as canopy closure. As explained in previous sections, coffee producers in Teotepec also cultivate a range of tree species within coffee plots for food, fuelwood, and timber resources, as well as for their ecological benefits. Farm site surveys aided in ground-truthing the range of species discussed during interviews.

Each plot surveyed belonged to an interview participant in order to ensure proper permission to access their farms and to guarantee that transects remained within the boundary of the selected farm. Transects represented the range of elevations, slopes, and aspects that producers in Teotepec cultivated. A total of thirty plots ($n=30$) from two producer groups, those who held RA certification ($n=15$) and uncertified, independent farms ($n=15$). Tree species frequency, abundance, dominance, and diversity was assessed using the point-centered quarter method (PCQM) by establishing a random, 100m transect inside each plot surveyed. Ten point measures were taken at 10m intervals using established protocol as outlined in Mitchell (2007). Transects were established at a minimum of 15 m from the edge of the plot, in order to minimize the influence of edge effects. At each point, the distance was measured to the nearest four trees (one per quadrant), the diameter at breast height (DBH) taken, and species identified. While in the field, trees were identified by the common name used by producers, and leaf specimens were taken to the herbarium and Forestry Sciences department at the Universidad del Mar (UMAR) in Puerto Escondido for identification to the species level. Transect data were used to calculate frequency, density, and species diversity indices for each plot, which were then run through a simple t -test to determine statistical difference between RA-certified and non-certified plots. In addition to transect measurements, the GPS coordinates, slope, aspect, and elevation of the transect was also recorded.

Along each transect line, canopy closure was measured using a convex spherical densiometer, which is a portable and robust method of assessing canopy closure (Jennings 1999). Four readings, one in each cardinal direction, were taken at 5 points along each transect, with the readings averaged at each point and the range recorded (Baudry et al. 2014).

3.5 *Terminology, Definitions, and Translation*

All fieldwork and interviews were conducted in Spanish, and I transcribed and coded data in Spanish in order to preserve producers' direct words and more accurately categorize themes that emerged during data analysis. Some vocabulary that interview participants and key

informants used was specific to the region, and may differ from usage and meanings in other locations. During interviews and follow-up conversations with my contacts in the community, I asked clarifying questions to develop working definitions of terms that were commonly associated with coffee production. For instance, those coffee producers who work with UNECAFE refer to themselves as *socios*; this translates directly to associate or working partner, but producers understand it more accurately as “member.” Finally, many producers provided rich details and thick descriptions throughout interview responses that is best understood when preserved in the original Spanish, which may also aid future research on this or similar topics. Throughout the following results and discussion, I provide both the original Spanish as well as English translation for longer quotations that require more complex interpretation. These translations were checked for accuracy with a native Spanish speaker from the region.

3.6 *Positionality and Credibility in Qualitative Research Phase*

In order to establish credibility in this study, I employed multiple methods to “address the same research questions and look for convergence in research findings,” (Hesse-Biber 2017, 349). Through PO, SSIs, and key informant interviews, I was able to search for intersections in results and cross-examine findings. The extended time that I spent in Teotepec allowed me to form trusting relationships with many interview participants, so that responses in formal interviews were more thorough and honest than would have been possible if field work were more limited in scope. This opened space for me to clarify my interpretation of interactions with cooperative staff and in meetings, and ask additional interview questions to augment observational data. Additionally, as salient themes emerged through initial interviews, I was able to revise my interview guide to address these topics in an effort to tailor research questions to the topics that were of concern to producers. For example, PO and initial interviews revealed certain tensions in the relationship between UNECAFE and producers in Teotepec; I was subsequently able to incorporate questions about UNECAFE’s recommendations and producers’ acceptance and use of that information into their production practices. Probing for greater detail often elicited more detailed responses and producers explored connected themes organically. While I was unable to interview all producers in the community, I did reach a point of saturation in interview responses, which suggests that I captured the range of responses and supports the conclusions I was able to draw in data analysis. Finally, plot-level transects and farm tours

allowed me to ground-truth what producers explained were important aspects of their shade management decisions.

My position as an educated outsider, and citizen of the United States, influenced many of my interactions with the community (producers and other residents alike) and may have had an impact on responses during interviews. Residents of Teotepec historically have been wary of outside interference in their community (RA2,6; IND6; UNE1), which may have led to reluctance to provide fully honest or complete answers during interviews. Again, extended time in the community and participation in festivals, meetings, and labor on participants' plots helped build trust and break down barriers.

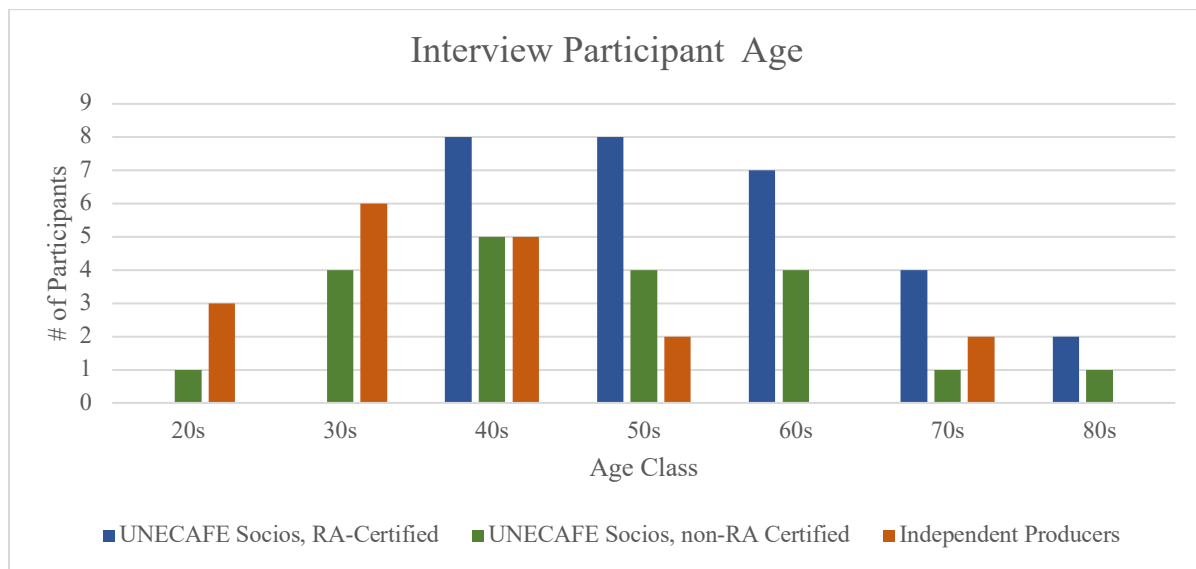
4 OBJECTIVE 1 RESULTS: COFFEE PRODUCER DEMOGRAPHICS AND RESPONSES TO THE COFFEE CRISIS

This section identifies and evaluates the first objective of this thesis, to describe how smallholder coffee producers in Teotepec have responded to the coffee crisis. Following the initial price crash and lowest prices in 2004, the impacts of the crisis persist and are compounded in rural, indigenous communities by pre-existing chronic poverty (Babin 2015). It is important to emphasize that producers' responses are ongoing in response to this severe economic change. Participants' backgrounds, access to resources, and land area under cultivation influence the strategies that they have adopted in reaction to the coffee crisis. Producers here have primarily responded by diversifying income sources, migrating out of Teotepec in search of other economic opportunities, and changing land uses to more adequately support their livelihoods.

4.1 Participants' Backgrounds and Demographics

I completed 65 formal SSIs with 69 coffee producers in Teotepec (4 interviews were with married couples in which both own plots), in which I sought to capture the range of adaptations, production practices, and perceptions about UNCAFÉ and certifications. Participants were all residents of the village, and all identified as Chatino; all participants spoke Chatino, and 32 spoke no Spanish (spoke Chatino exclusively).

Figure 4.1: Age of Interview Participant by Producer Group in Santa Lucía Teotepec

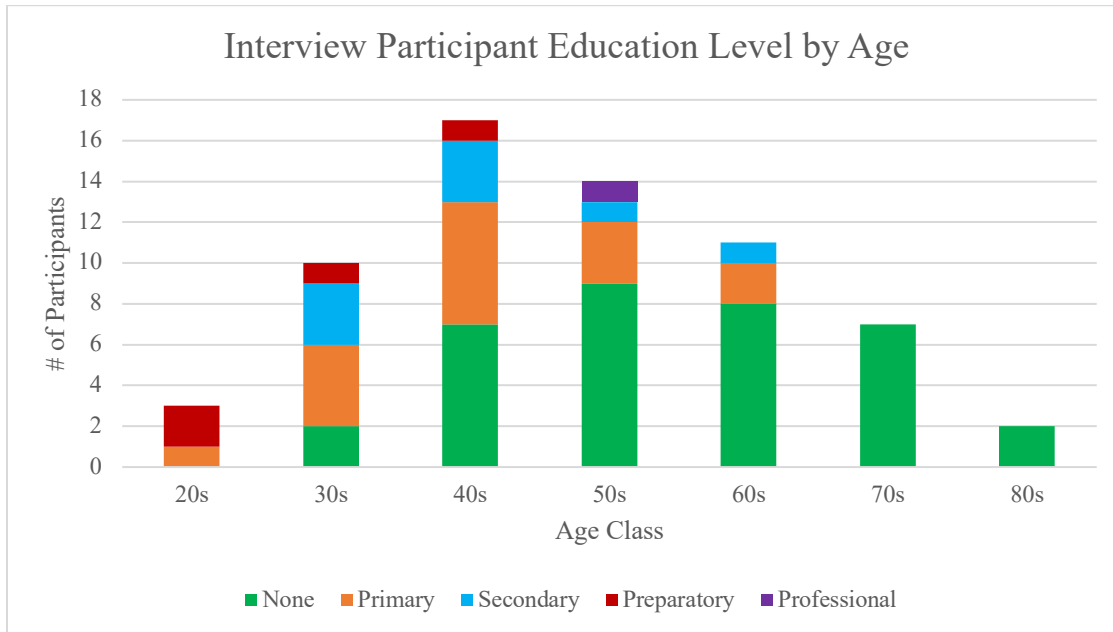


Although the producers sampled ranged in age from 20 to 80 years old, over three-quarters were over the age of 40, with the average age of 56 years (Figure 4.1). Overall, the older age cohort of producers reflects the fact that there are very few young people entering coffee production.

Producers had spent a significant portion of their lives producing coffee, with 27 of the total 65 sampled responding that they had been cultivating coffee for their entire lives. 60% of RA-certified producers explained that they had been cultivating coffee their entire lives, compared with 35% of non-certified and 28% of Independent growers. There were far more new producers, those who had planted for the first time within the last 10 years, in the Independent group; 44% as compared with 4% and 20% for the RA and non-certified groups, respectively.

Education amongst participants was low, which reflected the overall limited education level and access within the community as a whole. Amongst UNECAFE members, 29 of 49 (64%) had never attended school, 5 had completed primary school (6 years), and only 1 had finished high school (5-6 years beyond primary). Independent producers had slightly higher education levels, with only 7 of 18 (40%) with no formal education, 4 completed primary school, and 4 completed high school (preparatory school, 11 years of education). Few participants above age 50 had received any formal education, and only one, the community's nurse, had education past primary school. Those who had attended or completed high school were all in their 20s.

Figure 4.2: Interview Participant Education Level by Age in Santa Lucía Teotepec



The difference in education across age groups could be attributed to a change in accessibility, as there was no secondary or high school in the community until relatively recently. The absence of participants with university or professional education is likely due to lack of opportunity to use higher education skills in the community. Those who have sought advanced education for themselves or their children typically do not return to Teotepec, preferring instead to pursue opportunities with higher, more secure incomes and life in urban areas.

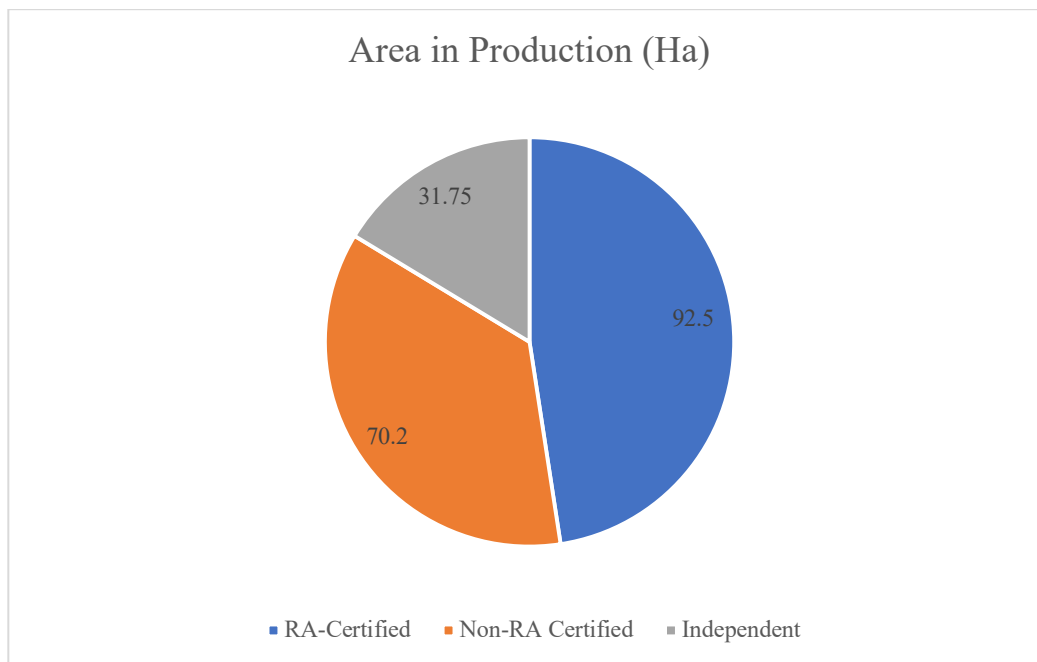
Interview participants also represented a range of genders and household structures. Of the 49 UNECAFE members, 29 (60%) were female heads of household, and the remaining 20 were male; amongst independent growers, 12 (67%) were female and only 6 male. Overall, 45 (69%) of the households sampled were married producers, of which 10 (15%) had a male head of household working in the US. Twenty (31%) of the producers sampled were single women heads of household, responsible for all coffee production decision-making, as well as household labor and in many cases other work outside the home. The wide gender gap amongst producers is largely attributable to the increase in male out-migration from Teotepec. As male heads-of-household have left in search of work, more women have assumed decision-making authority over coffee production. Female UNECAFE members were able to retain their formal affiliation

with the cooperative when their husbands or fathers left by notifying cooperative staff and meeting all future membership requirements.

4.2 *Coffee Area and Production*

As is consistent with coffee-producing regions across Oaxaca, all coffee producers in Teotepec are smallholder farmers, defined as “a producer who primarily relies on family or household labor, or reciprocal workforce exchange with other members of the community” (Rainforest Alliance 2018). The total area currently in coffee production within the community’s entire territory of roughly 4200 ha is about 900 ha, according to plot inventory data collected by UNECAFE (pers. comm., UNE3, April 10, 2018). Independent producers cultivate roughly 400 ha overall, while UNECAFE members cultivate a total of 470 ha; of that, 240 ha are Rainforest Alliance, Organic, and Fair Trade certified, while the remaining 230 ha carry only Organic and Fair Trade certifications. All producers, of all groups, in Teotepec have less than 10 hectares in active coffee cultivation. Of the producers I sampled, UNECAFE members had an average of 3.6 ha, while independent producers held an average of less than 1 ha. There was no significant difference in plot size between RA-certified and uncertified producers. The difference in production area between UNECAFE and independent producers suggests that those producers with greater holdings in coffee may more easily remain cooperative members due to associated higher yields and coffee-derived income.

Figure 4.3: Total Area in Active Coffee Production by Participant Producer Group, in Teotepec



Coffee plant productivity and harvest quantity is quite low in Teotepec amongst all producer groups, compared to national averages of similar shaded, organic production systems (Rossi et al. 2011; Flores and Mcleod 2018). Production has also declined over the past 10 years, with all producers reporting lower harvests, as plants have been impacted by disease (*roya*, or coffee leaf rust), neglect, and are older/lower yielding. Participants involved in coffee production during the height of the crisis (mid-2000s) reported harvests four to five times greater than at present. As one producer remembered:

“You haven’t seen anything like that, the plants had enough coffee to fill a basket from one or two plants. And when you looked out over the coffee plot, it was red, red, red, pure red. It was as if the fruit were red flowers everywhere around Teotepec. But now, there’s just a little, the old plants don’t give coffee, they’re no good...” (RA2).

“No has visto nada de eso, las plantas dieron bastante café, llenaba una canasta con uno o dos matas. Y cuando vea al cafetal, era rojo, rojo, rojo, rojo, puro rojo. Era como las frutas eran flores rojas por todos lados por Teotepec. Pero ahora, solamente queda poco, las matas viejas no dan café, ya no sirven...”

This producers' reflection captures the drastic reduction in coffee productivity, and subsequent harvest volume, and the visual impact that such a dramatic change in production has had on the community and surrounding landscape. Many community members lamented these landscape changes and the loss of forest cover that local-scale responses to the crisis have caused. Producers reported similar harvest volume for the past two harvest years (2016-17 and 2017-18). In 2017-18, RA-certified members of UNECAFE had an average harvest of 198 kg/ha of parchment coffee, while non-RA certified producers harvest was 158 kg/ha. Independent producers reported far lower harvest volumes, an average of 72 kg/ha and 8 out of 18 explaining that their harvest was used solely for household consumption, not for sale. While these producers do not sell coffee for export, cultivating coffee remains an important allocation of household labor and self-sufficiency. Continuing to cultivate coffee for household use is also important to individual, family, and cultural identity; most had inherited coffee plots from their parents and wanted the same connection to the *campo* and forests that they had been taught.

4.3 *Responses and Adaptations to the Coffee Crisis in Santa Lucía Teotepec*

Prior to the coffee crisis, Teotepec, like much of the coastal Chatino region of Oaxaca, was almost entirely dependent upon coffee. Coffee-producing households were able to sustain their livelihoods through income from coffee with some subsistence crop cultivation. Of the producers I interviewed, 50 out of 65 (77%) had been in coffee at the time of the initial price crash and experienced a drastic and sustained drop in household income. Prior to the crisis, producer families were generally better-off than households without coffee, compared to non-coffee households who were more reliant upon subsistence agriculture and generally did not have a source of cash income (RA2;IND6;UNE1). However, following the crisis, coffee producers were forced to make extreme adjustments in how they obtain their livelihoods as conditions changed. Producers primarily adapted to the coffee crisis by shifting income sources, migrating out of the region in search of work, and changing land use strategies. Drawing from informal conversations, community observations, and interviews, the following section examines the nature of these three adaptations that producers adopted in Teotepec.

4.3.1 *Shift in Income Sources*

Before the coffee crisis, producer families were almost entirely reliant on coffee for their livelihoods. In some instances, households also earned income by working as hired labor on nearby coffee *fincas*, or larger-scale farms that are within a days' walk of the community. In addition to augmenting household income, this labor experience often enhanced producers' own cultivation practices, as they would apply the same strategies and crop extension information to their own plots. The interaction between off-farm work and coffee requires compromises in time and labor, but often provides greater flexibility to react to short-term price changes.

The ongoing result of the coffee crisis has been sustained low prices and increased inter-year price variability. Although the price of coffee reached an all-time low of \$.46/lb paid to growers in 2004, prices have not recovered and have pushed producers to diversify household income sources (ICO 2018). Among the producers I interviewed, only 10 still considered coffee their primary income source (9 UNECAFE members and 1 independent producer). Two of these producers (both UNECAFE members) had the largest land holdings in coffee of all participants (11.5 ha), but the remainder were at or below the average across all participants. These producers live “from coffee and the land, from sugar cane and *milpa*, (“*vivían del café y del campo, la caña y la milpa*,” RA14), and did not have another source of cash flow to support their livelihoods. Only a minority of participants explained that coffee was a “significant” source of income, with 15 (60%) of RA-certified UNECAFE members, 7 (35%) of non-RA certified members, and 18 (90%) of independent growers who stated that other sources of income were more significant than coffee.

Households in Teotepec diversified their income sources in a number of ways, both within the community and outside, distinct here from the changes in land allocated to *milpa* (explained in section 4.3.3). In conversations about livelihood strategies, producers conceived of the wide variety of activities to earn cash in the community as “what we do just so that we may eat” (“*...lo que hacemos para que comamos*,” RA2). In Teotepec, producers earn income working in construction, as hired hands on other ranches, or working on the larger *fincas*. This latter strategy is more limited than before the coffee crisis, because the market collapse impacted larger producers as well as smallholders, and a number of the *fincas* went out of business or decreased production. Women have turned increasingly to selling artisanal handicrafts, including

traditional embroidery and dress. Families have also opened small shops selling basic goods, called “*Tiendas de Abarrotes*,” to augment income lost from coffee.

Producer households also earn income by selling foodstuffs within the community, either excess crops (*milpa*, vegetables, fruits) or prepared foods (tamales, tlayudas, tostadas, etc.). Although most producers cited these activities as sources of income, they more constitute trading dollars around the community rather than actually helping to build capital. As one producer explained, the money earned is minimal, “for expenses, nothing more” (“*para gastos nomás*,” RA2), or “it’s what we do so that we may eat,” (“*es que hacemos para que comamos*,” RA6).

Households also rely on support payments from government welfare programs, which provide income for *campesinos* and women and children across Mexico. One program, PROCAMPO, is intended to help smallholder agricultural households adapt to increased competition from subsidized commodity imports from the US and Canada (Barham et al. 2011). The program provides technical and financial assistance for coffee and *milpa* cultivation, based on the area that farmers have in production (Davis and Eakin 2013). Of the producers I interviewed, 52% of RA-certified, 50% of non-RA certified, and 50% of independent producers received payments from this program. Interviewees who received aid from PROCAMPO received limited sums based on the area they had under cultivation, usually between 1000-1500 pesos for .5-1 ha. The program also provides materials for irrigation, grain storage, and seed. While the amount received is modest, equating to a few days’ wages for hired labor (at 200 pesos/day), producers still discussed it as useful to provide a buffer in times of poor harvest.

A second critical support program, PROSPERA, was important specifically for female producers. It provides a cash payment and access to medical care for women who enroll their children in school and ensure they have regular health check-ups. Of the households I surveyed, 80% of RA-certified, 65% of non-RA certified, and 89% of independent producers participated in PROSPERA. Under this program, the maximum that any household can receive is 21,000 pesos/year (1800/month), though most families receive less as they don’t meet all criteria (Dávila Lárrega 2016). Though married and single women with children may be part of the program, for the female producers who were the sole head of household, the program was regarded as especially important to augment yearly cash flow. Both of these social welfare programs provide some cash flow for households, which they incorporate into their overall livelihood strategies, and which some households use to finance coffee production. The sum received under

PROSPERA is substantial, suggesting that these households may only be able to remain in coffee production because of support payments.

4.3.2 Migration

Though the strategies detailed above are certainly important livelihood adaptations, they have not had as significant an impact on the face of the community as international out-migration. Consistent with other studies conducted in coffee-producing communities throughout Oaxaca and Chiapas (Cohen 2011; Wohlgemuth 2014; Griffith et al. 2017), prior to the coffee crisis there was little to no international migration out of the community. Most households were *campesino* families, and supported their livelihoods through local cultivation and “trading work” within the community.

After spending some time in Teotepec, it became apparent to me that the community has been significantly impacted by out-migration. Within the first few minutes of many of my informal conversations, producers would tell me of a family member working in California, New York, Chicago—or that they themselves had spent years working in the US before returning to Teotepec. Within my brief six months in the community, I met three coffee growers who subsequently left on the risky, expensive route to cross the border to *El Norte* in search of work. Although there were some coffee producers whose family members left for work in larger cities within Mexico, overwhelmingly migration has been “to the border,” (“*a la frontera*”), “to the north” (“*al norte*”), or “to the other side of the wall” (“*al otro lado del muro*”). Further, community members from across generations are well aware of the fact that migration was caused, and has continued, as a direct result of the coffee crisis. As one producer explained,

“Before, the factor they call “migration” didn’t exist. There wasn’t much interest in leaving for the US. People worked hard here, they were focused on work in the fields, they didn’t have the idea of going to the US. But now, people still have their needs, and abandon their families to find work on the other side,” (Ind6).

“No existía el factor que se llama ‘la migración.’ No había bastante interés en irse a los EU. La gente trabajaba bien, estaban concentradas en su trabajo en el campo, no tenía la idea de ir a los EU. Pero ahora la gente tiene sus necesidades, y abandonan sus familias para conseguir trabajo al otro lado,” (Ind6).

This quote illustrates how the change in the coffee market precipitated a shift in priorities for the community, initially amongst coffee producers. During interviews, participants across producer groups commonly described migration as “necessary” (“*por necesidad*,” RA1,2, 7, 12; SO2,5,6,10,14,19; IND2,8,14,15) in order to maintain livelihoods in the community. On a walk through the village early on in fieldwork, one close community contact indicated many houses in which the entire family had left (“*todos se fueron*,” RA2). At meetings convened by UNECAFE, the absence of men (and women) of the younger, most productive generations was evident, as these gatherings were dominated by older producers and very young children.

Migration is an attractive adaptation due to the pull of higher wages in the US, which can then be sent back to family in Teotepec in the form of remittances. Younger people are more motivated by the promise of more money, and the opportunity to live in the US, than they are by a life in the *campo* (RA4,11,14; Ind6,12). Amongst 40 out of 65 (62%) of all interview participants, at least one head of household (usually male, but sometimes his spouse as well) had migrated to the US and are either still there or have since returned (Table 4.1).

Table 4.1: Migration Status of Interview Participants in Santa Lucía Teotepec

Head of Household Migrated Internationally	UNECAFE Socios, RA-Certified <i>n</i> (N=25)	%	UNECAFE Socios, non-RA Certified <i>n</i> (N=20)	%	Independent Producers <i>n</i>(N=20)	%	Total <i>n</i> (N=65)	%
Yes	15	60%	15	75%	11	55%	41	63%
Producer has returned to Teotepec	4	16%	7	35%	7	35%	18	28%
Receives Remittance Income	10	40%	9	45%	10	50%	29	45%

Remittances are often reinvested in coffee production, allowing producers to remain in coffee where they might otherwise abandon their plots. Of those households who had sought work in the US, 26 (65%; 40% of sample) regularly sent remittances back to their families. Remittances were “the most significant” source of income for families in 24% of RA-certified, 10% of non-RA certified, and 20% of independent producers sampled, (see Table 4.2).

Overall, remittances are used to complement the suite of income sources that households rely on to sustain their livelihoods in the restructured coffee economy. Remittance income varies greatly by household, and I did not specifically ask how much participants received from migrant

family members. However, one trusted community member told me that she typically receives between 8,000-10,000 pesos (\$400-500 USD) per month when her husband has reliable work. For household who receive comparable amounts regularly, remittances can be substantial and often greater than income from coffee harvest.

In addition to migration by wage-earners to the US, many households have sent their children to cities within Mexico for higher education. Access to education in the community is limited to a primary (elementary) school and secondary school, for a total of nine years of compulsory education. For those students who wish to continue with their studies, they can attend the preparatory or high school, or *Instituto de Estudios de Bachillerato de Oaxaca* (RA6).

Table 4.2: Income Sources and Reported Importance for Interview Participants in Teotepec

Income Source	UNECAFE Socios, RA-Certified <i>n</i> (N=25)	%	UNECAFE Socios, non-RA Certified <i>n</i> (N=20)	%	Independent Producers <i>n</i>(N=20)	%	Total <i>n</i> (N=65)	%
Receives Remittance Income	10	40%	9	45%	10	50%	29	45%
Earns Other Income in Teotepec	18	72%	13	65%	19	95%	50	77%
Remittances are Most Important	6	24%	6	10%	6	30%	18	27%
Other Income is Most Important	10	40%	5	25%	12	60%	27	41%
Coffee Income is Most Important	9	36%	9	65%	2	10%	21	32%

However, the quality of education in small rural community such as Teotepec is poor, so families that are able often send their children to school in urban areas. Higher education is increasingly regarded in the community as important for better livelihoods, but does limit those residents' ability to return to the community. Within Teotepec, there are no employment opportunities for those with an advanced degree, so the next generation of potential coffee producers are gradually leaving and not returning to the community.

4.3.3 Land Use Change

The coffee crisis had pronounced and ongoing impacts on land use and land cover in Teotepec as it has throughout coffee-producing regions of Oaxaca and Mesoamerica in general. Many growers here reacted to sustained low coffee prices by shifting the land area under cultivation, decreasing the hectareage in coffee, abandoning their plots altogether, and converting forest cover to increase *milpa* cultivation. During a visit to one producer's *parcela*, she explained to me the changes to the forest surrounding the community, that "before, it was pure forest when you looked down [the hillside] to the river. And everything that was forest, was all coffee, so in the season of flowering it was all white, pure white, with coffee flowers" (RA2). She proceeded to indicate broad swaths of mountainside cleared of trees, and which were now planted in *milpa*, covered in grass for pasture, or bare rocky ground. While a robust analysis of land cover change is outside the scope of this study, according to community members the coffee crisis has led to a loss of tree cover across the community's territory. Since 2011 when UNECAFE first began working in Teotepec, the number of *socios* has dropped from approximately 400 to roughly 180. Many of these producers abandoned their coffee, exiting the cooperative and the coffee market entirely. Reliable census data on demographic change in Teotepec was not available, but according to key informants in the community, more individuals (both male and female) of working age have left the community, either in the medium term or permanently. This has left a noticeable gap in the community, with mostly young children and the elderly who have remained. Agricultural labor thus falls more heavily on household members who remain, with producers of advanced age (sometimes into their 70s and 80s) still cultivating *milpa*, often with help of younger family members (teens-20s) and hired *mozos*.

Among producers that I spoke with, 8 of the 20 independent growers said that they had abandoned their coffee *parcelas* in full, for either some period of time in the past few years or was still abandoned. I also had informal conversations with four growers who had abandoned or sold their *parcelas* within the last year. In contrast, only one member of UNECAFE who I interviewed had abandoned her *parcela* in full. More commonly, producers decreased the area they actively maintained in coffee: 8 RA-certified and 8 non-RA certified *socios* of the cooperative explained that they had shifted cultivation strategies. Rather than completely abandon their coffee, producers concentrated labor on areas that were easier to access and maintain, dedicating little attention to less productive areas. Many *socios* explained that they

didn't want to fully abandon their coffee in the hopes that prices would rise again, and it would be less costly to re-invest in *parcelas*. These producers left the canopy in abandoned areas intact, maintaining some of the forest cover that might otherwise have been converted to other uses.

As explained above, before the crisis, most producers in Teotepec dedicated less of their land holdings to subsistence crop cultivation, as coffee income made purchasing food a viable livelihood choice. Sustained low prices pushed households into situations of food insecurity and seasonal hunger—periods of the year when providing adequate nutrition was a challenge. To adapt to the altered coffee economy, some producers converted portions of their coffee or native forest areas to *milpa* or *potrero*, the local term for livestock pasture. Producers explained that either they themselves or an immediate family member was responsible for labor to clear, plant, and maintain converted plots. Some also mentioned that they faced a labor shortage for this work, as with coffee, and had to contract *mozos* to care for *milpa*. Although a majority of producers from all groups planted some *maíz*, only 36% of RA-certified, 45% of non-certified, and 40% of independent growers claimed they were self-sufficient in subsistence food production (see Table 4.3). This type of land-use change has longer-term implications than abandonment, signaling that producers were making a permanent shift out of coffee and investing in other ways to maintain their livelihoods.

Table 4.3: Subsistence Crop Production by Producer Group in Santa Lucía Teotepec

	UNECAFE Socios, RA- Certified n(N=25)	%	UNECAFE Socios, non-RA Certified n(N=20)	%	Independent Producers n(N=20)	%	Total n (N=65)	%
Household Cultivates Some <i>Milpa</i>	17	68%	12	60%	10	56%	39	60%
Household is Self- Sufficient in <i>Milpa</i>	9	36%	9	45%	8	40%	26	40%
Household uses Fruit Trees for Subsistence	25	100 %	16	80%	16	80%	61	94%

5 OBJECTIVE 1 DISCUSSION: PRODUCERS' ADAPTATIONS TO THE COFFEE CRISIS

Participants vary in age, education, household structure, hectares in coffee, and access to other resources. These differences are important to consider when evaluating trends or drawing conclusions about adaptations and responses to the coffee crisis. For instance, across household structures and UNECAFE status, there is a clear lack of young (20s-30s) producers and few with higher levels of education. In short, the majority of primary labor age are gone, few young people are entering coffee, or continuing household cultivation and instead are seeking other livelihood options. The combination of advanced age and low education amongst coffee producers is widespread in Mexico (Jaffee 2012; Méndez et al. 2010).

Participants' motivations and responses reflects their backgrounds and access to off-farm resources. Producers' decisions about coping responses reflect the overall range of resources available to them, household structure, and reliance on coffee prior to the crisis. In order to understand the impact that responses have had on producers' ability to continue in coffee, and future opportunities to participate in a cooperative, it is important to understand the interactions between household responses.

5.1.1 Income Diversification

Coffee producers' responses in Teotepec have moved beyond reactions intended to buffer against short-term, acute crisis (Eakin et al. 2006). Due to the longevity of the coffee crisis, farmers have had time to develop livelihoods strategies and adaptations to restructured market conditions. The most common response, across producer groups, has been to seek other income sources, distinct here from . In some cases, producers re-invest this income in coffee production, while for others the new work represents a more permanent move away from coffee and into *milpa* cultivation or livestock, or an abandonment of the *campo* altogether. While the community has sustained a loss of the working-age population, diversification and remittances have contributed to households' income such that they are able to contract *mozos* to replace household labor. Where once families were reliant primarily on core family or kin networks for labor, they now hire more laborers to complete agricultural work. The interplay between income sources and coffee cultivation represents a trade-off in time and labor, but often greater flexibility to react to short-term price changes. By diversifying income sources and labor activities, households can

more easily shift the resources that they dedicate to one income source or crop in response to market and climate change, without detrimental impacts to their overall livelihoods (Smit and Wandel 2006; Eakin et al. 2009).

Across all producer groups, diversification in income sources has been a key response to sustained low prices and increased interannual variability following the coffee crisis. In all three producer groups, farmers have faced similarly low prices, environmental challenges, and opportunities outside coffee at the community level. Producers have been reacting to greater price volatility for over fifteen years, so they regard diversified livelihood strategies as the norm. All producers continue to rely in varying degrees on subsistence crop production, government resources, and outside income. This indicates that regardless of affiliation with UNECAFE and the support resources that the cooperative provides, diversification has proven critical to households' livelihood security.

The frequency at which participants reported incorporating other income into their livelihoods suggests that this has been the most feasible strategy or response. Unlike decisions to migrate or convert land uses, transitioning to other trades or sources of income within the community does not require significant investment of money, labor, or other resources, and is relatively easy to reverse. Sale of prepared foods or handicrafts within Teotepec is a simple strategy to cope with short-term, immediate shortages and does not transcend a household's overall situation. In contrast, developing other skills could not only improve an individual household's income, but transform the community as a whole. Indeed, for some producers, it has meant acquiring more specialized skills in construction or animal husbandry that provide needed services to the community (RA1,2;SO2,5;IND4,6,7). Notably, these responses are flexible, as producers and their families remain in Teotepec, and can more easily shift energy into other work as necessary. Shifting labor to other sectors is an incremental change that doesn't require significant investment of time or money up front, so there are fewer barriers for producer households to incorporate this adaptation (Eakin et al. 2016).

However, income diversification is not accessible to all coffee farming households in Teotepec. Households with working-age males who remained in the community (male head of household, or sons) were more likely to cite in-community income as the most significant. For female-headed household or single-woman producers, coffee or government resources were more significant than earnings from outside sources.

A notable difference between UNECAFE *socios* and independent growers is the degree to which they continue to rely on the income they earned from coffee. I did not feel comfortable asking producers how much they earned from each income source and was cautioned against doing so by key contacts in the community. However, producers did provide responses about which income source was most significant to support their households throughout the year. Amongst both groups of UNECAFE *socios*, just over half responded that coffee was their most significant income source. Producers in this group also held more area in coffee cultivation, suggesting that the larger area in production, and consequently greater harvest volume, are important in allowing them to remain in production.

In contrast, a quarter of independent growers sampled explained that their harvests were for household consumption only, that they did not produce enough for sale. One grower elaborated:

“I want to emphasize to you, my coffee right now is lost—not new plants, not old plants, not abandoned—*lost*. When I planted, twenty years ago, it was for money, because I could earn money from it. The same with other [producers]. But the problem was that the price dropped, and there wasn’t anything to invest in it, to care for it well. It’s a sickness, the *tristeza* (sadness) of coffee, that we don’t care for crops when the price is low, and then we lose them,” (Ind6).

“Quiero darle énfasis que le voy a aclarar que horita son matas perdidas—no son nuevas, no son viejas, no son matas abandonadas—perdidas. Hace 20 años cuando yo lo sembré yo querría gastar dinero, porque sí el café dio buen precio. Pero el problema fue de que el precio bajó, y ya no hay inversión para darle un buen manejo. Es una enfermedad, la tristeza del café, que no nos cuidamos cuando no hay precio, y así los perdemos,” (Ind6).

This participant, like others in the Independent group, no longer invests much labor or financial resources in coffee, yet still considers himself a coffee producer. More participants from the Independent group reported that their harvests were too low to warrant sale and have largely transitioned out of coffee and into other work that they predict will be more stable and profitable. The role of cooperative membership in keeping producers in coffee will be examined in detail in the following sections, but Independent producers’ shift out of coffee suggests that the cooperative may provide benefits sufficient for members’ production to remain substantial enough for sale.

Interestingly, I interviewed four independent producers who were new coffee producers. Based on my informal conversations with other key producers in Teotepec, there are around 30 new coffee producers in the community. These farmers have either purchased land with coffee or decided to plant coffee for the first time within the last three years, with the goal of generating income. Coffee does not begin to produce until it reaches 3-4 years, so these producers do not yet earn income from coffee, but expect that it will become an important part of their livelihood. The interest in entering an unstable price market is unexpected, especially since these new producers have also experienced life in a community that has been re-organized due to the coffee crisis. The new producers that I interviewed decided to invest in coffee because of personal curiosity (SO6; IND4,9,14), or influence from extended family members who produce coffee (RA20; SO2,6,14; IND1,8,18,20). These producers were younger than the average overall age of interview participants, 31 years as opposed to 55. These individuals used off-farm income, from remittances or other labor in Teotepec, for the up-front investment in new plants and labor to establish a new plot or renovate on that they purchased.

5.1.2 Migration

Migration out of Teotepec has fundamentally altered both the local coffee economy and the structure of the community. While some producers had previously relied on off-farm labor for income, chiefly through work in larger coffee plantations, this work was within the region and few people left for opportunities in urban centers or the United States. While Mexico has always been a source of migrant labor for the United States, few Oaxacans participated in the *bracero* program of the 1940s or actively sought to migrate prior to the coffee crisis (Wohlgemuth 2014). However, transformations in the coffee economy, insufficient government support for agriculture, and trade liberalization following NAFTA have driven accelerated migration from indigenous communities such as Teotepec to the point where Oaxaca became the largest migrant sending state (Lewis and Runsten 2008). Individuals from indigenous communities in the region continue to make up a growing percentage of migrants from Mexico to the US (Weeks et al. 2011).

In Teotepec, not only individual, “productive age” family members, but entire families have permanently relocated to the US (UNE1,3). Some migrants from the community are cyclical, working for a few years and then returning to Teotepec, as was the case for 18 out of

the 41 households interviewed where one head of household had migrated. Many migrants used to make two or three trips to the US, where they would work for a few years to save enough money to fund large household expenses and then return, sometimes to serve in governance roles as required by customary *usos y costumbres* institutions (Lewis 2005; Robson and Berkes 2011). However, as the cost and risk of border crossing has increased, more individuals or entire families are electing to stay in the US and have formed permanent communities in a few cities across the country (RA1,2,7;IND2). Some have now established families and have children born in the US, making the decision to return to the village more difficult (RA7,10;IND4;UNE1). Those who stay in the US then serve as a support network for others from Teotepec seeking work, connecting them with opportunities, housing, and in some cases sponsored work visas (IND2,6).

Migration, especially internationally, entails far greater risk and investment than shifting labor to other local income sources. Nearly all migrants from this community cross the border *sin papeles, mojados*, and pay a *coyote* to smuggle them across the border; which from southern Oaxaca costs around \$10,000-12,000 US dollars, and is often a debt that the migrant has to repay (RA10;SO14). Without a visa, migrants are exposed to the dangers of deportation or manipulation by employers. In addition to the up-front cost of crossing, it is nearly impossible or prohibitively expensive to return to visit families. Most producers regarded migration as a long-term or permanent response to the coffee crisis, as the migrant family member typically remained in the US for at least 10 years and sometimes longer (pers. comm.).

Despite the risks, the pull of higher wages, ability to save some of those earnings, and send remittances back to Teotepec, migration is regarded as the only way to “get ahead” (“*no se puede avanzar uno,*” RA7). Some participants explained that a central motivation in migrating was to save enough not just for near-term household needs, such as building a house, but also to be able to support their households as they age (RA1,2). Coffee producing households have come to rely, in part, on remittance income to replace what they had previously earned from coffee. In contrast to income from coffee, which comes in one lump sum at the time of harvest, remittances are disbursed more frequently throughout the year. For producer households who do receive regular remittance income that they can rely on to meet household expenses, it has come to be considered preferable to income from coffee. Income from a migrant family member can then be used to invest in coffee production at critical points in the cultivation cycle, especially

when coffee or other off-farm income falls short. For some households, this provides greater livelihood security (as noted by 19 respondents). One producer explained that the primary motivation for planting coffee was as a way to invest her husbands' earnings in the US, for the family to live on once he returned (SO6). These results suggest that migration is the primary adaptive strategy for many producer households in Teotepec. The amount of money earned and remitted is far greater than wages that could be earned in the community, and more likely to meet immediate and long-term livelihoods needs (Scoones 2009). The interplay between coffee, remittances, and other off-farm income underscores the diversification in livelihood strategies as a process of constant adaptation, or "chronic" coping, to ongoing change (Eakin et al. 2016).

For other households, however, migration of the head of household has had adverse effects. Migrant households that do not receive remittances, or whose remittances are small or irregular, suffer greater livelihood vulnerability. These households have lost a key labor source, and now must rely on hired *mozos* for coffee labor. Migration also entails the loss of productive, wage labor within the community (Eakin et al. 2012). These households may turn to other off-farm income within the community which is often insufficient. In sum, migration may only be effective when the household has sufficient resources to cover the loss in labor and/or the migrant remits sufficient funds.

While migration may be beneficial for individual households, it has had detrimental impacts on labor cost and availability at the community scale. High and sustained rates of out-migration have created a labor shortage in Teotepec, increasing the demand for *mozos*, and driving up the daily wage. *Mozos* now ask for 200 pesos per day, up from 150 pesos per day in 2016, which interviewees consistently identified as a serious challenge in production (RA2,8,21). When combined with persistent low prices and declining coffee income, the rising cost of labor means that many producers operate at a loss (Table 6.2; Beuchelt and Zeller 2011; Griffith et al. 2017). Producers are only able to pay for the most critical labor inputs, coffee harvest and two annual weeding, sometimes in only the most productive areas of their plots (RA6;SO4;IND16; pers. obs.). This minimum investment in coffee productivity contributes to declining yields in a cycle one producer described as the "sickness, sadness" ("*enfermedad, tristeza*") of coffee cultivation in Teotepec.

Out-migration compounds at the community scale to degrade the integrity and strength of customary governance institutions as well. The *usos y costumbres* local government system now

does not have enough people to function as effectively as it did prior to the crisis, and demands more time and resources from individual community members (RA2,7; IND7; UNE1). Previously, adult males would likely have only served one or two appointments to *cargo* or *tequio* leadership positions; now, it is not uncommon to be required to serve three (IND7). During their appointments, community members do not receive income and face greater demands on their time such that it becomes challenging to put the necessary work into maintaining coffee or subsistence crops (RA2,7). Future yields of both may suffer, leading to increased food and income insecurity. Maintaining a sustainable working-age population is critical for the resilience and adaptability of such communal institutions, and in other *usos y costumbres* communities in Oaxaca, migration has led to governance failure (Robson and Berkes 2011).

5.1.3 Land-Use Change

A second response to declining coffee income among producers in Teotepec is shifting land use. Nearly half of all interview participants had either abandoned former coffee plots, while leaving the forest intact, or increased *milpa*, pasture for livestock grazing, or sold or leased their land to someone else. Converting coffee shade cover to another use affects local ecological conditions, the long-term sustainability of subsistence crop production, and future options available to producers.

Land use conversion from coffee and associated shade forests is a decision made by each individual producer, but results in region-wide change. While each producer in the community has relatively little land, cumulatively, individual changes on 1-2 hectares compound to have significant impacts on forest cover, precipitation, and soil stability (Philpott et al. 2008; Eakin and Wehbe 2009). In order to plant *milpa* or pasture grass, a labor-intensive process, producers typically remove all forest cover and burn the vegetation to increase soil fertility. These actions degrade the integrity of forest canopy, habitat connectivity, and long-term soil productivity as they result in a net loss of nutrients, unless plots are left fallow or allowed to undergo secondary succession (Jha et al. 2014). When taken at a landscape scale, the loss of forest cover has resulted in fewer days with cloud cover, less and more erratic rainfall, and soil loss via erosion and landslides (Cerdán et al. 2012). Landslides have also impacted some producers coffee plots, particularly below land cleared for *milpa* and below the primary roadway, during the rainy

season and associated with strong tropical storms or hurricanes (RA4,12;SO5;IND7,20). The multiple biophysical impacts of land conversion compound to increase producer vulnerability and the risk of relying on agricultural products, including coffee, for their livelihoods (Tucker et al. 2010).

A shift in land use to *milpa* for subsistence or to livestock grazing also constrains producers' future options for response and adaptation. Removing shade canopy cover and coffee "represent conscious decisions that, while reversible, entail investment, risk, and commitment on the part of the farm unit to a particular expectation of the future" (Eakin et al. 2006a). Producers cannot easily revert back to coffee in a reasonable time frame if prices recover, as it takes 3-5 years for plants to produce, and decades for shade canopy to fill in. Full sun coffee is extremely challenging in this environment due to steep slopes, erosion risk, and farmers lack the resources to purchase or apply the inputs (esp. fertilizers) necessary to maintain full-sun grown coffee. Further, removing shade canopy puts certification from RA and Organic certifications at risk, and reduces their access to other resources from the cooperative.

The shift to dedicate greater land holdings to *milpa* signifies a relatively permanent reaction to the crisis. Producers anticipate that investing energy in subsistence food production, rather than increasing or intensifying holdings in coffee for greater yields, will be a more reliable strategy to alleviate household food insecurity. This response is consistent with other studies in the region following the crisis, where seasonal hunger and household food insecurity increased due to a loss of coffee-derived income (Morris et al. 2013; Bacon et al. 2014; Fernandez 2015). There is a tension in allocating land to coffee, which could enhance food security through increased income, or growing subsistence crops directly. However, coffee prices have remained consistently low such that increasing yields may not make up the difference in lost income, and producers perceive greater livelihood stability in dedicating land and labor to *milpa* than coffee. This tradeoff further emphasizes producer vulnerability to extralocal changes and the impact that coffee prices and policies set at the international scale has on the livelihoods and land management strategies in coffee communities.

More critically, deciding to produce *milpa* for household subsistence and possibly local sale is also a strategy of increasing household or community sovereignty from influence by external institutions (Altieri and Toledo 2011; Víctor M. Toledo and Barrera-Bassols 2017). In Teotepéc, many residents prefer to purchase *maíz*, beans, and other products grown in the

community because they know that they were produced organically, without chemical inputs, and regarded as safer and of better quality. Rather than grow coffee or other high-value commodities for export, producers are able to exercise control over what they produce, determine its value, and remove themselves to some degree from global commodity markets and associated cross-scalar power structures (Gonzalez de Molina 2013; Bacon et al. 2014).

6 OBJECTIVE II RESULTS: THE COOPERATIVE, CERTIFICATIONS, AND PRODUCER RESPONSE

In Teotepec, coffee producers have traditionally received little outside assistance to support either their production or livelihoods and well-being overall. However, the severity of the coffee crisis prompted a few key leaders to organize and seek the support or partnership with outside organizations as one strategy to mitigate the impacts of the crisis on local livelihoods. Working with a cooperative could provide certain benefits to improve households' adaptations to the crisis and future stress, through more stable prices, lower transaction costs, specialty certified markets, and access to materials or extension information to improve production (Markelova et al. 2009; Méndez et al. 2010; H. Eakin et al. 2012). If effectively, consistently, and transparently administered, each of these resources has the potential to make a substantial impact in smallholder livelihood sustainability. Moreover, these resources (particularly certifications) are ones that smallholders lack the resources to access on their own and which require collective action under a cooperative organization. The advantages and limitations of growers' cooperatives has been extensively studied across products and time periods (Hansen et al. 2002; Alho 2015; Mojo et al. 2017), but the actual benefits that members experience varies by context. This section seeks to answer the questions in Objective II of this thesis:

Objective II: How have smallholder coffee producers in Santa Lucía Teotepec used growers' cooperatives and certifications to adapt to the coffee crisis and restructured coffee markets?

1. What are the primary benefits and constraints to cooperative membership, and what opportunities exist for cooperatives and certifications to support producers' livelihood adaptations?
 - i. Are cooperatives effective at addressing the coffee crisis at the household scale?
2. How does the relationship between the cooperative and coffee producers influence participation in the cooperative, and farm management decision-making?

I draw on qualitative data addressing the complexities of the benefits and constraints of membership in the cooperative UNECAFE in light of the general challenges facing *all* coffee producers in the community. The results presented detail the most important material and social benefits that *socio* producers have received or experienced as a result of membership, as well as the limitations to each of those resources. The discussion focuses on dimensions of the relationship between UNECAFE and producers, as many of the barriers or disadvantages that producers discussed regarding membership centered on their relationship with cooperative staff. At the beginning of the partnership between UNECAFE and producers in Teotepec, all producers in the community were *socios* and all carried the same certifications. Gradually, producers either voluntarily ended their affiliation or lost membership because they could not meet participation requirements such that of the original *socios*, only about 45% are still members. In the following section, I identify producers' perceptions of the challenges of coffee production generally, and then turn to constraints that relate most closely to the cooperative.

6.1 *Barriers to Cooperative Membership*

Although the purpose of organizing to join UNECAFE was to help navigate the coffee crisis, producers in Teotepec who hoped to remain in coffee have faced many barriers to continuing their association with the cooperative. Some of these barriers stem from shortcomings on the part of the cooperative itself, while others are the direct result of producing coffee as a smallholder farmer under changing market conditions. During interviews, producers generally did not distinguish disadvantages of UNECAFE membership from disadvantages of growing coffee in general. Further, UNECAFE provides largely the same resources to Rainforest Alliance-certified producers as to non-certified producers. The primary difference between the two groups is whether they participate in a climate adaptation project, Climate Smart Coffee (Café CO2), which has provided materials specific to that project (Café CO2 materials). I will address the nuances of this certification dynamic in subsequent discussion, but combined these two producer groups in the following results section. When UNECAFE began its targeted development projects in Teotepec in 2011, all producers carried RA certification; however, *socios* have lost it at various points in time as criteria have changed and poor adherence to social criteria (UNE3,4). The random sample of RA-certified, non-certified, and Independent producers

attempts to capture the range of experiences and perspectives as it cannot be definitively determined when producers lost certification and why.

6.2 *Common Constraints to Coffee Production in Santa Lucía Teotepic*

Across the three producer groups, interviewees touched on challenges of growing coffee. In addition, informal interactions with producers during fieldwork, producers and key informants in the community regularly discussed the challenges of working with UNECAFE as synonymous with the challenges of growing coffee in general. These general challenges are factors that constrain production for all producers in Teotepic, regardless of affiliation with the cooperative. It is important to recognize these universal, contextual constraints in order to fully analyze how UNECAFE's programs function to support growers in responding to market and environmental challenges, and to understand why their programs may fall short of producers' needs and expectations.

6.2.1 *Coffee Price*

The most frequently stated constraint coffee producers in Teotepic confront is low coffee prices. During interviews, 21 (84%) of RA-certified *socios*, 14 (70%) of non-certified *socios*, and 18 (90%) of Independent producers said that low coffee prices were a major barrier to coffee production. In this community, RA certification does not guarantee a higher price point, so all cooperative members receive the same price (regardless of RA certification or not). Participants said that "what bothers us most is the price" (RA4), that every year "they [UNECAFE] offer a lower and lower price" (Socio5), such that most producers are unable to make a profit off of coffee. One Independent producer explained that for him, "the problem was that the price dropped, coffee lost its value, and there wasn't anything left to invest," so he shifted to growing avocados because "coffee isn't worth it" (Ind6). The drop in prices paid to producers is so great that the price premiums from Fair Trade and Organic do not bring prices back to a sustainable level, and there is no financial incentive for RA certification.

Further, prices fluctuate every year, and producers don't have access to the information that would help them plan on how much to invest in their coffee. "What will happen the next year? This affects how producers work, affects the coffee quality" (RA17) because producers don't harvest selectively and sell poor-quality fruit (RA6). Coffee prices are determined at the

international scale, and individual producers and those organized into cooperatives alike do not have the power to influence this. Price nevertheless functions as a cross-scalar constraint on producers' decisions, operating not only on market sentiment at the global scale, but also influencing UNECAFE's project priorities and how producers are able to allocate livelihood assets to respond to change. Producers in Teotepec are left vulnerable to swings in price that compound across scales as low prices change both their direct incomes as well as the resources that UNECAFE can coordinate to support them.

This uncertainty affects many producers in the community, wherein low prices provide little motivation to invest in coffee care because it won't result in increased income. The local technician explained that higher prices were necessary to motivate better compliance with certification standards and greater participation in the cooperative. This would be "something to give them motivation, to make producers feel like their work is worthwhile" ("*Sea mejor si haya algo para darles una poca motivación, para que los productores se sientan como vale el trabajo,*" UNE1). Going further, another RA-certified producer elaborated:

"More than anything, we need money, because we put a lot of money in for *mozos*, and the money from coffee *just isn't enough*, they buy coffee at a cheap price and *mozos* are expensive," (RA21).

"*Más que algo, es que necesitamos dinero, porque metemos dinero para los mozos y el dinero del café no alcanza, compraron muy baratos el café y cobran muy caros los mozos,*" (RA21).

During harvest season, the influence of coffee prices in the community is palpable. On walks through the community, I was regularly stopped by producers, *mozos*, and their family members asking what the price was that day, and why it was so low. This "primacy of price" that influences producer motivation results in decline in coffee care, abandonment or neglect of plants, and a further decline in yields (Bacon 2004; Eakin et al. 2006).

6.2.2 Labor Cost and Availability

Low coffee prices also affect the availability and cost of hired labor. As described in the previous section, the onset of the coffee crisis drove many producers to migrate in search of paid work. This has resulted in increasing reliance on contract labor provided by *mozos*, rather than

familial labor, as the primary producer (usually the male head of household) has left the community. Before the coffee crisis, “a lot of producers, and *mozos*, worked in their fields, and now they don’t want to work in the forest, they all leave for the US” (RA6). In recent years, as more people have left, coffee producing households have had to make difficult decisions about shifting labor sources and how they can meet those demands. This producer’s comment that many would prefer better-paid work outside Teotepec rather than continuing in agriculture was a common sentiment in interviews with producers and key informants.

Table 6.1: Coffee Labor Source, by Producer Group in Santa Lucía Teotepec

Labor Source	UNECAFE Socios, RA Certified n (N=25)	%	UNECAFE Socios, non-RA Certified, n(N=20)	%	Independent Producers n(N=20)	%	Total n N=65	%
Dependent on Familial Labor	5	20%	3	15%	5	25%	13	20%
Equal Mix of Familial and <i>Mozo</i> Labor	2	8%	3	15%	2	10%	7	11%
Dependent on <i>Mozo</i> Labor	18	72%	14	70%	13	65%	45	69%

Overall, only 13 (20%) of all interview respondents said that they were primarily dependent on familial labor, as compared with 45 (69%) who relied primarily on hired *mozos* (See Table 5.1). Local *mozos* have also migrated or shifted away from agricultural labor, preferring instead to pursue “town work,” such as construction, rather than work in the fields. This has further constrained labor availability, and 26% of participants explained that they faced increased competition in contracting with laborers, making it difficult to complete coffee labor during the appropriate season.

Labor constraints have driven up labor costs. Many producers explained that each year *mozos* charge more than the previous year. Average daily wages have increased from 100 pesos per day between 2014-2016 to 150 pesos per day in 2016-2017. In 2017-18, the average daily wage for *mozos* was 200 pesos for most coffee labor (harvesting, weeding, re-planting), sometimes less if they had a relationship with the producer or more for chemical application.

Table 6.2: Coffee Farm Profitability by Producer Group, 2017-2018 (in Mexican pesos)

Producer Group	Average Labor Costs (at 200 pesos/day wage)	Renovation Costs	Harvest Volume (Parchment Coffee, kg)	Coffee Income (45 pesos/kg)	Net Income
UNECAFE Socios, RA Certified	28,630	400	730	32,850	4,220
UNECAFE Socios, non-RA Certified	27,650	575	1,115	25,200	-3,025
Independent Producers	10,500	150	130	5,850	-4,800

When combined with consistently low prices and declining yields, many producers explained that they could not make a profit off of coffee any longer. The price from coffee “just isn’t enough” to cover labor costs, that it doesn’t meet their needs (*“El precio no alcanza, casi alcanza para los trabajadores y nada más,”* RA12). Many producers echoed this sentiment, that “the price is very cheap, it simply *isn’t enough* because now, *mozos* charge 200, 250 pesos a day,” and they aren’t able to meet that investment (Socio17). The combination of rising labor costs and persistently depressed prices compound to create challenges for producers as they seek to make decisions about how, and if, to continue to incorporate coffee in their livelihood strategies.

Finally, labor cost and availability impose a particular subset of constraints on female producers. Many producers and *mozos* who have migrated are male, leaving spouses as the heads-of-households and responsible for coffee labor decision-making. Out of the 65 producers sampled, 67% were female and 31% single women heads of household. Female producers are constrained by traditional gender roles in the community, responsible for both coffee production and reproductive labor in the household. Female heads of household explained that they only visited their plot every few months, less frequently than they felt they should, because so much of their time was tied up with family care (RA6,17,18;SO4,19;IND1,3,17,18). In Teotepec, it was generally accepted and common for female producers to harvest, weed, and plant coffee, but not to remove shade trees, apply chemical inputs, or prune coffee. These tasks were left to hired labor, imposing an added cost on female producers. Further, many single female producers I spoke with voiced another set of concerns, that “because I am a single mother” (*“porque soy*

madre soltera,” RA6) and “because I am a widow,” (“*porque soy viuda,*” RA12), it was even more challenging to find available *mozos* willing to work, and come up with the money to pay them. Although this study did not take a critical gender perspective, the prevalence of female producers means that the specific constraints that they face need to be factored into the overall analysis.

6.2.3 *Environmental Constraints: Disease and Extreme Weather Events*

Biophysical ecological factors limit coffee harvests for all producers in Teotepic. The community has faced severe losses due to *roya*, coffee leaf rust, consistent with coffee farmers across Mexico. Overall, 46 of 65 interview participants (71%; 17 RA-certified, 16 non-certified, and 13 Independent growers) reported that they had experienced harvest losses from *roya* in 2015, the year that coffee rust was especially destructive (Harbert and Flores 2015). “*Roya* fell hard on my coffee,” one RA-certified producer explained to me, “it killed almost everything. In parts of my plot, the places that didn’t have a lot of shade, everything died,” (RA13). The devastating degree of harvest loss in the 2015/2016 year drove many producers out of coffee at the local level (UNE1,3). Those who did not suffer severe losses due to *roya* (19 interview participants) had either already replanted with rust-resistant coffee varieties, sprayed with anti-*roya* fumigants, or regulated shade levels to reduce the humid conditions under which *roya* is more aggressive (De Melo Filho Virginio and Astorga Domian 2015).

Producers across groups have also experienced extreme weather events. Three strong hurricanes (Paulina, Carlotta, and Manuel) brought severe winds, flooding, and landslides since the onset of the coffee crisis.

“First came Hurricane Pauline, and that destroyed *allllllllll* of the [coffee] plants, and washed away the good soil too. And then came Carlotta, and then Hugo, and then the earthquake, and all of those destroyed harvest too. The earthquake destroyed the forests, down went the coffee, it demolished everything, demolished the shade, rocks, the soil, and there went the coffee plants, under the earth,” (RA4).

“Primero vino el huracán Paulina, y destruyó toooooooooodas las plantas, y ya se llevó el abono también. Y luego vino Carlota, y luego Hugo, y luego el sismo, y todos destruyeron la cosecha también. Porque cuando vino el sismo, destruyó los

bosques, se derrumbó el café, se derrumbó todo, la sombra, las piedras, el abono, y ya se fueron las matas bajo de la tierra” (RA4).

Many producers were motivated to join UNECAFE due to benefits they hoped would help them adapt to an array of environmental and market constraints. Producers across groups face substantial losses from such discrete weather events, as well as the compounding effects of disease such as *roya* and pests, like *broca*, the coffee borer beetle. In general, producers lack the capacity to bounce back from such shocks and stresses, which they hoped that cooperative membership would help alleviate.

6.3 *Benefits of Cooperative Membership*

Interviewees identified benefits they experienced from membership in UNECAFE, despite the general challenges of coffee production. During interviews, I asked about both benefits they expected from the cooperative as well as the advantages they had experienced from UNECAFE’s projects. Participant responses regarding advantages were nuanced and complex, and many often put qualifiers on those benefits, suggesting that they were either insufficient to meet basic needs or to have a transformative impact on livelihoods. Advantages were grouped into two broad categories, material benefits and social benefits, which subsequently broke down under more narrow codes.

6.3.1 *Material Aid Packages*

Producers from both the UNECAFE *Socio* group and Independent group discussed the benefits, or advantages, of participating in UNECAFE’s programs. As explained above, when UNECAFE first began working in Teotepec, all coffee producers were *socios* and were uniformly certified (Fair Trade, Organic, and RA). UNECAFE is also the only NGO that works in the community, so is widely associated with initiating development projects that the community as a whole recognizes. Because of previous or current affiliation with the cooperative, producers across groups all had opinions about material benefits that they had received. Notably, however, Independent group participants had far fewer responses about cooperative benefits as compared with UNECAFE members. This is unsurprising, as

Table 6.3: Material Support Resources Provided by UNECAFE to Producers in Teotepec

Material Support/Benefit	Assistance Included	Goals, Purpose, Addressing the Coffee Crisis
Coffee Plants	<ul style="list-style-type: none"> • <i>Marsellesa</i> variety, bred to resist <i>roya</i> • Sold to growers at 1 peso/plant 	Designed to incentivize renovation (re-planting) of coffee farms, as most plots are upwards of 25 years and have severely declined in productivity
Material Inputs	<ul style="list-style-type: none"> • Hand tools for coffee cultivation (shovel, rock bar, pruning shears, machete) • Organic fertilizers • Fungicides (to control <i>roya</i>) • Foliar sprays to promote floration • Backpack sprayers and protective equipment for chemical application • Large, communal, gas-powered wet mill 	Inputs necessary to improve the quality and ease of coffee cultivation, free of charge to the <i>socio</i> producer Chemical inputs (fertilizers, pesticides, fungicides) are all certified Organic, aimed at protecting against harvest losses from disease and providing for higher yields, and increased farm income
Extension, Training, Workshops	<ul style="list-style-type: none"> • Designed to improve producers' knowledge of coffee cultivation • Aimed at increasing coffee harvest quantity and improving quality • Information on how to properly treat pests (coffee berry borer) and disease (<i>roya, ojo de gallo</i>) 	Agronomists and forestry engineers conduct trainings and workshops to improve producer knowledge of coffee cultivation to improve harvest quality and quantity, ideally to allow them access to niche markets and higher prices/income.
Houses	<ul style="list-style-type: none"> • Houses and "eco-latrines" for selected producers as part of disaster recovery following 2013 flooding 	Tropical storm in 2013 destroyed houses throughout Teotepec, this was a recovery project to assist producers with the cost of rebuilding.
Support Payments	<ul style="list-style-type: none"> • "Social Premium" (<i>Premio Social</i>) required by Fair Trade • UNECAFE has administered support payments for coffee from the Mexican government, including coffee impulse programs (PROCAFE) and the Ministry of Agriculture (SAGARPA) 	Additional payment determined by the harvest weight sold in the previous year to UNECAFE (<i>Premio Social</i>) or area in coffee (SAGARPA), the goal of these programs is to provide increased resources to invest in coffee production to boost future yields and keep producers in coffee, ideally so that they are not producing at a loss.
Sell Coffee Locally	<ul style="list-style-type: none"> • Office (<i>bodega</i>) for coffee transactions (sale, storage of other materials) • Scale to take coffee weight 	Designed to eliminate the cost of transporting coffee to sell in Nopala (closest market), and to provide growers transparency and trust with weight, price, and payment.
Higher Prices	<ul style="list-style-type: none"> • UNECAFE pays a higher price/kg parchment coffee above the conventional coffee price 	Incentivizes membership and ensures that producers sell to the organization instead of to an outside buyer (<i>coyote</i>). Higher prices are designed to buffer producers from inter-annual volatility and price crashes.
Community Services	<ul style="list-style-type: none"> • School supplies for producers with school-aged children • Computers for the preparatory school • Dental services free of charge, available for the entire community 	Address social and health welfare, provide access to resources that are not accessible in the community or are prohibitively costly, designed to improve overall quality of life at the community level.

Independent producers no longer receive cooperative assistance, which suggest the cooperative does not play a major role related to their coffee production or overall livelihoods strategies.

Producers most commonly discussed the advantages of participating in UNECAFE in terms of the supports or aid (*apoyos*) that the organization had given them. Overall, the suite of benefits that UNECAFE has been able to provide from third-party certifiers, government agencies, private companies, and other NGOs has been more beneficial than any one particular support alone. Table 6.3 explains how I grouped each support category, based on participants' responses, and outlines which aspect of the local coffee trade they are targeted at. Table 6.4 details the number and percentage of participants who mentioned that material benefit during interviews.

Table 6.4: Producer Responses about Material Benefits from UNECAFE Membership

Material Support/Benefit	# Responses, UNECAFE Socios (n=45)	%	# Responses, Independent Group (n=20)	%	# Responses, All Groups (n=65)	%
Coffee Plants	41	91%	4	22%	45	71%
Material Supports	34	76%	4	22%	38	60%
Extension Trainings and Workshops	25	56%	3	17%	28	44%
Houses	24	53%	2	11%	26	41%
Price Supports	22	49%	4	22%	28	44%
Sell Coffee Locally	16	36%	2	11%	18	29%
Higher Prices	11	24%	0	0	11	18%
Community Services	10	22.2%	0	0	10	16%

Socio and independent participants differed with regard to the types of supports they identified as an advantage of working with UNECAFE. *Socios* overwhelmingly mentioned receiving new coffee plants as beneficial (91%), suggesting that the cost of re-planting may be a barrier to remaining in coffee production. “They’ve given us coffee plants that don’t cost much, very little really, we only pay for transport if the *parcela* is far,” (“*Nos han dado café, matitas de café que no cobran mucho, poco, puro en pasaje si la parcela queda lejos, RA2*). UNECAFE

coordinates with other organizations to provide *roya*-resistant coffee plants at half the market price (1 peso/plant) in order to “renovate” and replace old, unproductive plants (see Table 6.5 below).

Table 6.5: Renovation Details by Producer Group in Santa Lucía Teotepec

Producer Group	Has Renovated in Past (# of respondents)	% of Producer Group	Plans to Renovate this Year (# of respondents)	% of Producer Group
UNECAFE <i>Socios</i>	39	87%	32	71%
Independent Producers	12	60%	10	50%

Over the past 5 years, producers have replaced some of their coffee, and young plants are starting to produce and increase yields for many producers (pers. obs.). The high participation in renovation (92% of participants), and desire to plant more in the coming year (84%) suggests that producers do want to remain in production if there are resources to do so (Table 6.5).

The coffee plants that UNECAFE provided were mentioned far less frequently by Independent growers (22% of participants), as they were not a support provided to non-member producers. Five Independent participants purchased new coffee plants without assistance from an organization or other support (Ind2,4,6,9). One Independent producer explained that for his household, they wanted to be “self-employed” in coffee, not to “always have a boss that manipulates us, I want to do it by my own motivation. I’m just not interested in working with [UNECAFE]” (Ind6). Whether due to perceptions of “manipulation” or just lack of interest, for Independent producers, the material supports that UNECAFE provides are not sufficient to outweigh the barriers to membership, such as time, lack of interest, or desire to maintain independence. Some producers from both groups regarded the supports as handouts that perpetuated dependency on the cooperative, rather than building production capacity or independence amongst growers (RA11;SO15,17;IND2,6,7).

UNECAFE *socio* participants also discussed the material inputs for coffee production as being notable benefits they had received. The cooperative has provided various tools for coffee cultivation, including machetes, shovels, rock bars, and scissors for pruning, which 34 participants identified as being beneficial to coffee production. When discussing these supports,

many participants (from each group) often qualified them as being “very little” (*muy poco*), or explained that tools were useful but that they often already had them (Socio5,10). Further, for producers who received organic agrochemical inputs, they did not always receive monetary support to pay laborers to use them, nor the equipment (backpack sprayers, personal protective equipment) necessary to apply them. For these inputs to be beneficial, most producers had to invest more than just the chemicals themselves.

6.3.2 *Extension Services, Workshops, and Appropriate Technology*

UNECAFE is the only source of extension information for producers in Teotepec. The cooperative serves the important role of providing recommendations specific for individual producers in their plots, as well as workshops to teach adaptive cultivation practices and processing techniques that preserve higher coffee quality (UNE3). Fifty-six percent of participants said that extension workshops (“*cursos*” or “*talleres*”) were a benefit of membership. Further, three participants new to coffee said that they decided to purchase a coffee plot or plant for the first time because they attended a workshop and became interested in the process (SO6; IND12,16). Participants explained that they liked that UNECAFE emphasized coffee plant health, to maintain clean plots, how to treat diseases and pests without chemical pesticides, and how to process coffee after harvest (RA4,10; SO4,5,7,12). According to one producer, “working with UNECAFE, the work is nicer, cleaner, producers pay better attention. Producers work more in their plots than before also,” (“*Ya el trabajo con UNECAFE es más bonito el trabajo, más limpio, los productores ponen más atención. Los productores trabajan más en sus parcelas que antes también,*” RA7). While this may mean that UNECAFE’s requirements result in greater labor requirements, some producers regard it as positive because it reflects their values in terms of care for the land. A few interview participants explained to me that UNECAFE’s requirements meant that *socios* had to invest more time in their labor to carry out tasks properly and resulted in better quality land management (RA2,7,11,19; SO6,16).

Independent producers, and those in nearby towns who are not affiliated with the cooperative, do not have access to such extension resources. A relative of a key producer leader, who lives in a nearby village, explained that in his community, there are no cooperatives, other NGOs, and it is rare that government technicians visit them. Instead, he relies on information from UNECAFE’s *socios* in Teotepec if he has disease, yield, or other cultivation questions,

information which he then shares with other producers in his community. UNECAFE staff are well integrated with coffee research and development centers throughout Central America, and seek to implement new, often climate-adapted, technologies when they learn of them through this network (UNE3,4).

6.3.3 Houses

One important livelihood benefit that UNECAFE has provided to *socios* (24 participants) are houses and composting toilets, part of a large-scale disaster recovery project. Many homes and structures were destroyed in 2012 during Hurricane Carlotta, which brought devastating flooding to the Costa mountain region. UNECAFE leveraged partnerships with private companies and other NGOs to rebuild houses, composting toilets, and ecological stoves for roughly 300 families, at a value of more than 35 million pesos (UNE3). Individually, the cost of these resources would have been about 125,000 pesos, an expense that most families would have been unable to afford. The houses were part of a recovery project open to the community as a whole, including households who were not members of UNECAFE, as an overall community development effort. Interviewees and other residents who had received them regarded the project positively. However, not every community member who had lost their home received this aid, including UNECAFE *socios*, which has created tensions within the community and between *socios* and UNECAFE. Some *socios* explained that they felt treated unfairly because they did not receive a house, even though they were cooperative members and turned in all necessary documents, and there were Independent producers or non-producing households who did receive a house (RA13; SO17; IND11).

6.3.4 Local Sale of Parchment Coffee

UNECAFE has provided a secure way of buying and selling coffee locally, which is accessible to all producers regardless of affiliation. Prior to 2011, producers had to transport coffee to Santos Reyes Nopala, a 20 km trip that takes 45 minutes, on a rough road prone to washing out. Furthermore, most producers do not have a vehicle, so either had to hire a truck or transport their coffee by donkey, which could take an entire day. UNECAFE helped coordinate resources to build a small *bodega* (shop) and scale where coffee could be stored and weighed,

and then comes to Teotepec periodically to purchase, eliminating the cost and risk of transport. In Teotepec, coffee is sold in parchment form, where the fruit has been removed and the coffee seed (bean) dried in the sun so that it can be safely stored until UNECAFE can come to purchase it. Sale in this form, rather than in full cherry, is more reliable to preserve the quality of the crop and increases the likelihood that their product will reach higher-valued specialty markets. Sixteen UNECAFE participants (36%) and two Independent participants (11%) explained in detail that this was a major improvement. Participants regarded local sale as “easier” (Socio 11,12), “that now there is more trust” (RA7) and “we don’t feel cheated like we did with the *coyotes* from Nopala,” (RA6).

6.3.5 Higher Prices and Support Payments

Participants of both groups did not mention higher prices or price supports as an advantage of working with UNECAFE as frequently as other material supports. Price support payments were cited more frequently than the higher price/kg of dry parchment coffee that UNECAFE offered. Twenty-two UNECAFE *socios* (24%) and four Independent participants (25%) explained that support payments were an advantage, while only eleven (24%) of *socios* and no Independent participants discussed higher prices. In 2017-18 UNECAFE purchased coffee at 45 pesos/kilo (roughly \$1.07 USD/lb), only five pesos above the price that Independent growers were offered (\$.95 USD/lb). The marginally higher prices, coupled with low yields over the past few harvests, have combined to minimize the impact that a higher price point could provide (see Barriers/Constraints section).

In contrast, support payments were regarded as more beneficial than higher prices, and some participants emphasized that they were much more useful than material supports. As one producer described,

“I use the support for coffee, because I don’t make enough money off of coffee to care for the coffee, and really the support payment isn’t enough to invest in the coffee either,” (Ind14).

“Uso el apoyo para el café, porque no me alcanza el dinero del café para cuidar el café, tampoco el apoyo para invertir al café,” (Ind14).

Participants frequently used the phrase “*no alcanza*” or when describing coffee prices and support payments. This translates directly to “it does not reach” or “it does not cover,” but also is used as a phrase of desperation, meaning “it will never catch me up” or “there isn’t enough to go around.” Producers used this much stronger phrase rather than others that translate more closely in meaning and tone to “not enough” or “insufficient,” emphasizing the pressing economic situation that they have been in throughout the crisis.

Participants elaborated that support payments allowed them to pay *mozos* for necessary coffee labor, similar to the way that they invest other income into coffee. Participants also said things like “we mostly need money for coffee” (RA21) and “we need support to keep working in coffee, there isn’t enough to pay workers,” (RA2). These explanations emphasize the “primacy of price” and the overall decline in farm profitability that all producers face. Support payments come from certification premiums (*Premio Social*), which UNECAFE partially distributes back to growers or invests in infrastructure at the cooperative level (UNECAFE transparency documents). UNECAFE also helps administer support payments from SAGARPA, the Mexican Ministry of Agriculture. Both payments have declined or stopped altogether since 2015, and participants did not distinguish between the two.

6.4 *Social Benefits of UNECAFE*

In addition to the tangible, material benefits and supports that UNECAFE has provided for producers, the cooperative has also coordinated resources to further broader social benefits. Interviewees expressed a range of opinions over the services, UNECAFE provided to the Teotepec community. UNECAFE members more frequently noted the developments the cooperative had invested in than Independent participants (20 *socio* participants and 4 Independent). I coded these social benefits as “Knowledge or Capacity Building,” “Community Leadership and Organizing,” “Empowerment,” and “Local Employment.”

During interviews, producers who had been growing when UNECAFE began working with the community expressed pride in how they had organized to work with the cooperative.

“I felt like a foundation of the organization here in my town. And because I helped out early on, I helped to organize other producers, it was almost a requirement to be a member,” (RA8).

“Yo me sentía como una fundación acá en mi pueblo. Y porque yo ayudaba al inicio, ayudaba y organizaba los productores, casi fue un requisito a ser socio,” (RA8).

Two other participants, who had been local organizers, also expressed fulfillment at having brought this positive, supportive relationship to the community (RA 1,19). Another participant had been asked to be part of a local committee to help organize coffee purchase and told me she felt she had better capacity, training, because she worked with UNECAFE (RA2). Other participants had been sent to trainings (*capacitaciones*) in Oaxaca, learned more advanced coffee care, and were able to apply it on their farms and teach other producers (RA2,7,11,19). One producer who had only joined UNECAFE the previous year explained that she felt empowered by even the few trainings she had attended, saying that she now “had the desire” (*tengo las ganas*) to be more involved in coffee (Socio6).

A final social benefit that UNECAFE has provided is local employment, of technicians who extend the cooperative’s capacity both in Teotepec and in the other communities UNECAFE works with across Oaxaca. UNECAFE has been able to employ one lead technician in Teotepec, who coordinates meetings, workshops, and trainings; inspects plots for certification compliance; manages transactions for coffee purchase; and represents the community at coffee-related conferences across the country. In addition to the lead technicians, who are also younger coffee growers UNECAFE has also employed a handful of other youth in the community to help implement larger-scale projects. Though limited, the opportunity for local employment related to coffee has aided these youth in staying in the community, providing a more fulfilling alternative to *campesino* labor, shopkeeping, or migration (UNE 1,2,3).

6.5 Barriers to UNECAFE Membership

When producers discussed the benefits of support programs and aid that they had received from UNECAFE, they frequently qualified that there were barriers or disadvantages as well. In many cases, those barriers served to limit the programs’ effectiveness or the producers’ ability to participate fully in those programs. In other instances, producers expressed discontent, frustration, or anger at the challenges they had experienced as *socios* of UNECAFE. The constraints noted had driven them to either leave the cooperative or limited their participation to the point that they lost membership. The combination of constraints specific to UNECAFE and

the challenges to coffee production have resulted in a dramatic loss of *socios*. Participants across groups discussed insufficient support resources or aid, the lack of appropriate capacity-building and training, poor communication, and loss of trust in the cooperative as disadvantages of membership.

6.5.1 *Insufficient Support Resources and Aid*

UNECAFE has administered a number of material aid resources for *socios* in Teotepec. Almost all cooperative members had received materials in various ‘technical packages,’ which included tools and chemical inputs, but explained that that these items were either insufficient or not actually useful. A common phrase used to describe tools was that they “weren’t good for anything” (“*no sirven para algo*,” RA2,10,14; Socio 10) or that they “don’t do us any good” (“*no nos sirven*,” Socio7). One producer elaborated this sentiment further, that “we have tools already, but what we need are seeds, or plants, to plant more, or resources to pay *mozos*,” (“*Sí, nos dieron herramientas, ya hay herramientas, pero lo que necesitamos son semillas, o plantitas, para sembrar más, o unos recursos o algo para pagar a los mozos para limpiar*,” RA2). Participants did recognize that the materials they received from UNECAFE played a role in their coffee production, but in many instances did not address more important needs.

“Well, for my part, I would say, I could be a *socio*, or I could not be a *socio*, it makes no difference for me. Because although I am a *socio*, I’ve found nothing, nothing, nothing useful in their programs. Nothing has changed, it’s the same as before—we still do what we must so that we may eat, we still have needs, and those needs aren’t being met.” (RA11)

“Pues yo por mi parte digo, puedo ser socio, o no puedo ser socio, no hay diferencia para mí. Porque aunque soy socio, es lo mismo que antes. Nada ha cambiado, es igual que antes—todavía hacemos lo que tenemos para comer, todavía tenemos necesidades, y no alcanza para estas necesidades.” (RA 11).

This participant was a long-standing producer who had been growing coffee through all of the contemporary government impulses, has one of the largest plots in production (11 ha), and was an early leader in organizing producers to join UNECAFE. His explanation of the persistence of basic livelihood security needs defines how producers regarded UNECAFE’s material aid and

support programs: that really while they do provide some benefits to enable *socios* to remain in coffee, they make no difference in the full context of producers' livelihoods.

Participants from each group expressed frustration that there had been a change in support from UNECAFE, from payments that they could invest in coffee to materials. Working with the cooperative “is better and worse at the same time, because we do receive materials, but the aid and the price aren't enough, there isn't anything to invest,” (“*Es mejor y peor a la misma vez, porque recibimos materiales, herramientas, pero el apoyo y el precio no alcanzan, no hay para invertir,*” (RA12). Producers used to use the support payments (both the Social Premium from certifications and from SAGARPA) to pay *mozos*, who would make use of material inputs, but with insufficient support payments this is no longer possible. Producers across groups cited support payments as a benefit of UNECAFE, but nearly half of all participants (48%; 27 UNECAFE *socios* and 4 independent producers) said that these payments had declined or ceased. “The disadvantage is that they took away the support [payment], and now they only send us chemicals... We have to contract *mozos*, but there isn't money anymore to pay the *mozos*,” (“*La desventaja es que nos quitaron el apoyo, y ahora nomás mandan químicos...tenemos que contratar con los mozos, pero para pagar a los mozos ya no hay dinero,*” Socio4). The loss of this critical production resource is a constraint to growers and limits farm profitability.

Producers also reported receiving support resources unequally, and without explanation of why certain *socios* received material inputs or training resources while they themselves did not. For example, some producers received material aid packages (tools, external inputs, processing equipment) while others did not, even though they fulfilled the same membership requirements (RA12,13; SO4,7). Further, producers explained that they did not receive an explanation of why they did not receive the same materials, contributing to a sense of inequity and favoritism from the cooperative (IND3,13). A frequent comment that *socio* participants had when asked about material resources from UNECAFE was that “no, they didn't give that to me—to others, yes, but to me nothing, and they never told me a reason,” (“*...no, no me dieron esa—a otros productores sí, pero a me nada, y no me dijeron razón,*” RA19). This sentiment was especially frustrating for the older producers who were long-standing UNECAFE *socios*. They often expressed exasperation at the cooperative, that they did not receive the same benefits even when they had played a central role in organizing other producers, frequently attended

meetings, and still maintained their plots “clean and with good management” (“*limpio, con buen manejo,*” RA19; RA15,18,19; SO6,7,17; IND7,11,13,17).

6.5.2 *Support Resources Inappropriate to Context*

In addition to being insufficient to meet producers’ needs, many participants explained that the material resources, workshops, and trainings that UNECAFE provided were inappropriate. Notably, the cooperative provided agrochemical inputs (permitted under Organic and Rainforest Alliance certifications) for improved coffee health to producers at low or no cost. However, many UNECAFE *socios* expressed resistance to applying them because of fear that the chemicals would damage their coffee, wariness of other environmental effects, or because they could not afford the extra labor. Some participants said they had heard from other producers that “later, they will harm the plants” (RA1), or because they learned cultivation practices from a family member who did not use them (RA5;RA16). None of the Independent producers I spoke with used chemicals on their coffee because they were too expensive to purchase at full cost (Ind4,7). Overall, participants expressed pride that their coffee was “100% organic” (“*cien por cien orgánico*”) and that they never used chemicals (RA2). UNECAFE has continued to directly supply or administer programs from SAGARPA to provide soil amendments, foliar sprays, and agrochemical inputs, even though most producers do not want to use them on their coffee. Yet, UNECAFE continues to promote such practices that could benefit yields, even when it seems to undermine their legitimacy amongst producers. The shift from receiving monetary aid to chemical inputs that frequently were not applied caused some frustration between producers and UNECAFE (Socio4).

UNECAFE has also used trainings, demonstrations, and workshops to teach new cultivation methods to improve coffee plant health, quantity of harvest, and to control disease. While some producers considered these trainings a benefit, others felt they were repetitive, too general, or impossible to use.

“The courses are useless, they’re too basic, and we already know how to plant, prune, and pick, we know all this, but again and again they come and teach the same things! And every year it’s the same, the same, the same, they don’t give us new information about if there are new practices for cultivating coffee...”
(Socio17).

“Los cursos no sirven, son más básicos, ya lo sabemos como sembrar, podar, pisar, pero ya sabemos todo eso, ¡y otra vez ellos vienen a enseñar lo mismo! Y cada año es lo mismo, lo mismo, lo mismo, y no nos dan nueva información sobre si hay nuevas practicas para el café...” (SO17).

This participant, like others (RA20; SO9,18) expressed frustration that trainings do not progress or aid to their production knowledge. In this participant’s opinion, UNECAFE claims that the workshops and extension information increase producer capacity and knowledge of production, but in reality “there is no capacity-building,” (“no nos desarrollan la capacidad, SO17). It should be noted, however, that one reason that these workshops are repetitive is because of low attendance or non-adoption of the cultivation information that courses address (UNE3). For example, one participant explained that she did not use some of the soil conservation practices that she learned because her plot is too steep to be able to apply what UNECAFE taught. Another participant explained that he did not believe the workshops actually increased producers’ knowledge or capacity, despite what UNECAFE claimed (SO17).

6.5.3 *Poor Communication and Lack of Accountability*

i. Participation Constraints

Many of the disadvantages that participants expressed about working with UNECAFE resulted from communication challenges. In some instances, producers do not receive critical information because they are unaware that UNECAFE is holding a meeting. In Teotepec, information is largely disseminated via loudspeaker announcements, covering anything from sale of fresh tamales to important local government meetings to a visit from UNECAFE staff. If producers do not hear the announcements, and do not receive word from other community members, they do not receive that important information. This was a common reason that participants gave for why they were unable to attend meetings, that they did not hear the announcement and did not know that the meeting was occurring (RA10,13,17,21,22,24; SO9,10,11,12,14,15,16,18; IND17).

Meeting attendance and workshop or training participation is an important constraint to membership, and a common reason that members transition to non-compliance (“*Baja*”) for UNECAFE membership and certification requirements. About twenty *socios* have lost

membership between 2016 and 2018 because they did not regularly attend meetings. This can also result in producers not receiving material resources, as they often have to note their need or submit official documents prior to such materials being disbursed. Non-attendance is an especially acute constraint for producers who do not live within Teotepec proper; there are two outlying communities (*rancherías*) near Teotepec (Cerro Niño and Cerro Cuero) who are organized as part of Teotepec's territory. However, these communities are separate from Teotepec, they do not receive the same announcements, generally do not have access to modern communication technology (i.e., phones or internet), and residents only visit Teotepec on an errand. Producers in these communities often do not know when a meeting is scheduled to take place, and incur greater expenses of time and resources to travel to Teotepec to attend the meeting. While the local technician is sometimes able to coordinate separate meetings or workshops with these *rancherías*, attendance is still low, and many producers who have lost membership are from these communities (UNE1).

ii. Cooperative is not local

Another factor that constrains communication between UNECAFE staff and producers in Teotepec is that the cooperative is not a local, grassroots organization. UNECAFE's offices and staff are in the capital of Oaxaca, roughly 8 hours away from Teotepec when travel conditions are favorable. The organization works at a statewide level, so only visit the community every few months and are unable to stay for an extended time to support growers (RA6,10,11; SO5,16). During such trips, staff typically only go to select plots to advise producers or for certification audits, such that producers may go years without receiving individualized, contextually appropriate extension information. Some participants expressed frustration at this dynamic, because they were unable to seek additional information and UNECAFE staff did not take the time to visit their coffee plots frequently (RA21;SO4). UNECAFE staff are outsiders to the community, and producers widely feel that they don't fully understand local ecology, so some producers are reluctant to adopt recommendations about cultivation practices (RA2,11,18;SO15;IND16).

Although UNECAFE does employ one local technician in Teotepec (along with other local technicians in UNECAFE's other partner communities) who extends the organization's capacity, she expressed similar frustrations at the limitations that location presents. For instance,

UNECAFE frequently planned visits to Teotepec that the technician helped coordinate, but usually arrived late and did not stay as long as they originally planned (pers. obs.; RA14). *Socios* then missed meetings due to other obligations, leaving the responsibility to the technician to make individual visits to producers to disseminate the information. She explained to me that to be effective, UNECAFE needed to spend more time in the community and with producers individually, to better support producers and her role as technician alike (UNE1).

iii. Unclear Expectations of Membership

Some interview participants, primarily Independent producers, did not know why they had lost membership (*'baja,'* or dropped in membership). A few had lost membership before I began interviews and had not yet been informed, while others reported that UNECAFE did not give them a reason (IND3,10,12,13,18,20). Staff at the cooperative that I interviewed explained that most producers lose membership due to non-compliance with 'social' requirements of certifications, most commonly non-attendance of meetings (UNE3,4). However, if producers find this information unclear or are unaware of requirements, it presents a significant challenge for them to remain in compliance.

6.5.4 *Lack of Capacity-Building*

A final set of constraints related to the challenges of communication and insufficiency and inappropriateness of support resources, is a widespread attitude that UNECAFE has not provided the benefits that it had promised to producers. For example, one participant explained that UNECAFE had told them that they would receive "financial aid, materials, they would start on projects, but it hasn't arrived. 'Mañana,' they tell us..." (*"Apoyo de dinero, de materiales, que van a empezar en proyectos, pero ya no ha llegado. 'Mañana,' dicen..."* RA9). Other participants also said that UNECAFE had promised things that never happened (RA11;SO17;IND7,17,18), or that they were "all meetings, more meetings than action" (*"...bastantes reuniones, más reuniones que acciones de ellos,"* RA11). The "all talk, no action" attitude was a reason that five Independent participants chose not to work with UNECAFE (IND4,6,7,14,18). This reluctance, then, limits UNECAFE's ability to expand its programs to more producers in Teotepec and may disincentivize existing *socios* from fully complying with requirements.

The stated purpose of UNECAFE's training workshops and technical assistance is to improve grower knowledge and competencies (UNECAFE brochures). Some producers thought that the content of these workshops was ill-suited to their context, so felt that the information did not improve their capacity as producers because they could not apply what they had been taught (RA10,17,23; SO4,13,19). In addition, program effectiveness is limited because the same opportunities are not offered to all growers (RA1,8,24;SO15,17). This has created resentment amongst some *socios* who have not been offered the same learning opportunities, because they feel that UNECAFE privileges some producers over others (SO4;IND7,14). The technicians and producer committee members said that they were similarly under-resourced, and that they thought they could be more effective working with producers if they were given more training (UNE1,3).

7 OBJECTIVE II DISCUSSION: COOPERATIVE ROLE IN PRODUCER LIVELIHOOD SUSTAINABILITY

Producers in Teotepéc responded to the coffee crisis reactively, coping with the shock of price drops by diversifying income sources, migrating, and shifting land use from coffee and into subsistence crops and livestock. However, the community also joined the growers' cooperative UNECAFE to connect to resources outside the community in order to buffer the effects of the crisis and to allow them to respond proactively to future crises. Consistent with other case studies conducted in the region during and after the worst years of the crisis (Bacon 2004; Tucker 2008; Méndez 2013), producers expected certain benefits for their coffee production and livelihoods by joining a cooperative. UNECAFE has offered coffee plants, material inputs, access to improved production information through extension workshops, local employment opportunities, better prices, lowered transaction costs, and community development projects. Such benefits have the potential to expand producer capacity to respond to future crises or stressors, and move towards more sustainable livelihoods (Chambers and Conway 1992; Eakin et al. 2014).

For rural coffee smallholders, resources from cooperatives can help households respond proactively and adapt to future crises by increasing income stability, food security, aiding natural resource management, and supporting community integrity (Scoones 2009). In Teotepéc, UNECAFE's projects have attempted to help producers move out of a cycle of chronic coping to ongoing stressors and build capacity to weather dramatic change at the household level. Each

“benefit,” or support resource, that UNECAFE has provided respond to particular aspects of the coffee crisis and local-level stressors. However, these resources are insufficient, often inappropriate to context, and limited by the relationship between UNECAFE and producers. The constraints that producers experience in accessing cooperative benefits, and the limits to what those resources can actually provide, reflect inequities in power and priorities across the coffee sector. The following section discusses the benefits and disadvantages of UNECAFE membership, and places them in the broader context of characteristics that constrain cooperative function.

7.1 *UNECAFE Benefits for Livelihoods Adaptations and Sustainability*

Producers who joined UNECAFE in response to the coffee crisis have experienced some livelihood benefits that have helped them cope with restructured markets. These resources have evolved as the effects of the crisis have deepened and as UNECAFE has formed more partnerships with external organizations. While a few of the resources UNECAFE provides have had positive impacts on livelihood security and adaptability, most are regarded as limited. This suggests that overall, UNECAFE membership and participation in certifications are not effective mechanisms to move producers from reactive, chronic coping to survive economic stressors to proactive adaptation.

7.1.1 *Coffee Plants and Material Inputs*

The most frequently discussed advantage of membership in UNECAFE was that the cooperative provides coffee plants and material inputs to coffee production. Consistently low prices over the past fifteen years, combined with rising labor costs, have limited producers’ ability to invest in this aspect of their livelihoods (Vellema et al. 2015). Regardless of affiliation with UNECAFE, producers discussed financial cost and time barriers to giving coffee the proper management that would result in higher yields. According to producers and to key informant cooperative staff, developing a “renovation plan,” purchasing new plants, and the labor required for replanting is the most expensive aspect of coffee production (RA19; UNE3,4). To address the shock of the coffee crisis, and the continued stressors of low prices and declining harvest volumes, UNECAFE has provided plants to producers at greatly reduced cost. Without this support, fewer producers would be able to remain in coffee production, and would likely lose

this source of on-farm cash income that provides varying degrees of support for household livelihoods.

A specific advantage of the coffee plants that UNECAFE provided is that they are hybrids (*Oro Azteca* and *Marsellesa*) that are bred to be resistant to rust and drought, and therefore better adapted to changing climatic conditions (UNE3,4; World Coffee Research 2016). Older, weakened plants were more susceptible to coffee leaf rust (*roya*), which destroyed up to 100% of harvest in the community in 2015 (UNE1,3). The further loss of cash flow increased many households' vulnerability, an exposure that has continued as production has not returned to pre-rust levels. Some producers in the sample reported replanting with new varieties prior to 2015 and had not experienced the same degree of coffee leaf rust damage. The shock and stress of the coffee crisis has been further compounded by coffee disease epidemics in Teotepac as it has across Mesoamerica (Avelino et al. 2015).

UNECAFE has tried to extend producers' capacity to recover harvest quantity, as well as to proactively respond to future damage from disease or changed climatic conditions. By providing production inputs, UNECAFE is facilitating some degree of intensifying coffee production, to maximize production in an environment of economic and ecological stressors (Amekawa 2011; Bacon et al. 2010). Independent producers do not have access to these supports, and may therefore be less secure in their livelihoods due to continued decline in production and exposure to future disease outbreaks. They may also elect to transition fully out of coffee, either selling their plots (IND19,20) or converting to another use, and turning to other work to generate income. Independent producers have not been able to renovate to the same degree as UNECAFE *socios* due to cost constraints and difficulty of accessing inputs.

The benefits of other material inputs (tools, soil amendments, and foliar sprays) are less than those of the coffee plants. The tools most commonly used in coffee cultivation were items that most producers already had, and the cultural resistance to applying external inputs precludes widespread chemical use. In order for material resources to have an impact on livelihoods, they need to be valued (both in terms of cost and importance) and actually alleviate household resource needs.

7.1.2 Extension Workshops, Trainings, and Appropriate Technology

Access to agricultural extension and appropriate technology resources is a common constraint for smallholder producers, and is frequently discussed in other case studies as an advantage of cooperative organization (Bacon 2004; Abebaw and Haile 2013). Producers in Teotepec, as elsewhere in Mexico, have historically had limited access to agricultural extension resources from the public and private sector that could help improve production (Renard 2010). UNECAFE's workshops are aimed at increasing harvest quantity, decreasing loss to disease, and improving harvest and processing practices that contribute to higher quality and better purchase prices (UNE3). The production practices that they promote are founded on ecosystem-based adaptation research for coffee, and have the potential to enhance livelihood security by increasing and stabilizing household incomes (Harvey et al. 2014). Membership in the cooperative allows producers to access the best available science and knowledge in coffee cultivation and processing, which is increasingly addressing climate change and changes in consumer preference. By incorporating these production strategies, producers in Teotepec may be better equipped to respond to future price swings or climatic events.

Extension resources also seek to enhance producer sustainability by addressing ecological aspects of coffee cultivation (Vignola et al. 2015). These include maintaining soil productivity, organic approaches to disease and pest management, retaining shade tree cover, and proper disposal of coffee cherry processing waste (Harvey et al. 2018). Previous studies have demonstrated strong, positive effects of training and extension services on adoption of adaptive production technologies (Abewaw and Haile 2013; Bro et al. 2017; Abate et al. 2014). However, as producers in Teotepec expressed, there are significant barriers that limit adopting practices that could have livelihoods benefits. In order to be effective, extension programs need to be appropriate to local cultural and ecological contexts. If producers experience barriers specific to their plots, such as challenging terrain, or household resources, especially labor, they may be less likely to implement new practices even if they believe the recommendations to be beneficial. Further, adaptive production practices can have high establishment and maintenance costs in communities like Teotepec with high labor costs and labor shortages. In order to increase adoption of adaptive practices and facilitate livelihood benefits into the future, cooperatives need to address implementation and management costs over the short and long term (Jha et al. 2014; Vignola et al. 2015).

7.1.3 Local Technician Employment

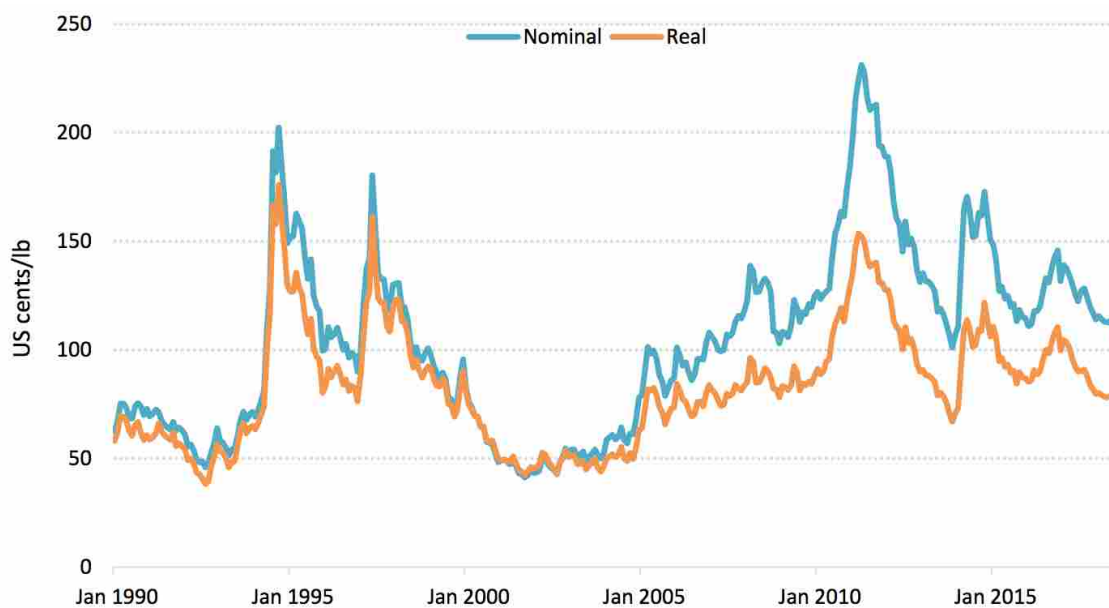
To increase the likelihood that producers will actually implement such adaptive production practices and extension information, UNECAFE employs knowledgeable community members who extend the cooperative's operating capacity. These local technicians have long-standing, trusted relationships with producers, are more accessible than cooperative staff, and speak the local indigenous language. Because these technicians are from the communities, they have more contextualized understanding of the specific social (at the familial and community scale) and biophysical constraints that individual producers face. Thus, they are better equipped than external staff to address individual producer needs and adjust approaches as necessary to facilitate adoption of improved practices or new certification criteria. For example, local technicians have been able to actually construct some of the farm-level improvements required by new certification criteria for producers who are unable. This allows the cooperative as a whole to remain certified and continue to provide resources from certifications to all producers. Further, full-time or seasonal employment for technicians is a direct benefit of UNECAFE's partnership with RA, as the NGO provides the funds necessary for their positions. Without this strategic partnership, UNECAFE would not be able to pay such positions and would either have to seek other grants or rely on local volunteers (UNE3,4).

Local technicians also play a role similar to the "farmer-promoter model" that smallholder cooperatives have consistently implemented across contexts (Knowler and Bradshaw 2007). While the lead technician in Teotepec did not yet have her own coffee plot, her family produces coffee and she also "was born into coffee" (UNE1) and had observed how producers in the community had responded to change. This context-specific, local knowledge allowed her to implement new practices with key producers in the community who themselves served the "farmer-promoter" role. Local promoters are early adopters of new production practices who can demonstrate successes (or failures) to other producers, increasing overall implementation of appropriate technologies (Cochran and Bonnell 2005). Providing local employment opportunities provides another strategy for livelihood sustainability, as an alternative way of earning a living outside of direct coffee production (Chambers and Conway 1992).

7.1.4 Price Benefits

Consistent with work across coffee-producing regions, smallholders in Teotepec joined UNECAFE for the higher price point that sale to the cooperative guarantees (Raynolds et al. 2004; C. Bacon 2004; Jaffee 2007). While *socios* did receive higher prices from UNECAFE (45 pesos/kg from the cooperative, compared with 30-40 pesos/kg to outside buyers), this has not necessarily translated to higher incomes for producers. The price of coffee overall has dropped to less than half of what it was when the community began working with UNECAFE in 2011, to levels comparable with the years immediately following the crisis, as figure 7.1 shows (ICO 2018). Coupled with the rising labor costs of production, the possible profits from coffee production are being squeezed from both ends.

Figure 7.1: Global Coffee Price Fluctuation for Mild Arabica Coffee, 1990-2018



*Prices deflated using the UN index of manufactured goods exported by developed economies

From International Coffee Organization Market Report, (ICO 2018).

This has translated to a loss of real income for producers, negating the potential benefits of higher prices from the cooperative. The ambivalent effect of price premiums on farmer

livelihoods has been consistently documented across study contexts (Barham and Weber 2012; van Rijsbergen et al. 2016; Jena et al. 2017). In order for producers to achieve livelihood security, and move toward sustainability, their overall income-generating strategies need to be profitable (Bacon et al. 2008; Jena et al. 2012). Programs like RA, which does not guarantee a floor price or premium (of which neither are received in Teotepec), need to address this shortfall if certifications are to have meaningful benefits and if they want to reach more smallholder producers. One strategy that could make floor prices or premiums more effective would be to adjust them to producer context, to reflect the full cost of production specific to smallholders in a given country. This could allow producers to make medium-term investments in production that would move them away from immediate, short-term coping responses to price fluctuation.

7.1.5 *Local Coffee Sale: Lowering Transaction Costs*

One benefit for producers in Teotepec that connects clearly with other studies on cooperative organization benefits has been the ability to sell their coffee directly to UNECAFE, *in* Teotepec. Prior to membership, producers faced high transaction costs in transporting their coffee to markets in Santos Reyes Nopala, or further, to Puerto Escondido or Pochutla. These transaction costs take the form of both the opportunity cost of time spent bringing their coffee to market and finding a buyer offering an acceptable price, as well as direct costs of hiring transport (Jena et al. 2012). Instead, the cooperative comes to the community and handles purchasing and transport for *socios*, spreading out these transaction costs amongst the entire membership and eliminating the need to search for outside buyers (Marcos-Matás et al. 2013). This method of coffee sale is less risky, because the price is set prior to purchase, producers do not have to negotiate with *coyotes*, and producers know they will be paid up front when they bring their coffee to the cooperative (Méndez 2013).

However, in 2017-18, UNECAFE greatly decreased the visits that it made to Teotepec to purchase and transport coffee to the processing warehouse in Oaxaca, without advance notification to producers. This left many *socios* with coffee they could not sell to UNECAFE, and who were forced to coordinate and pay for transport to distant commercial centers (Puerto Escondido or Pochutla) to find a willing buyer. These producers thus incurred the very transaction costs that UNECAFE membership claimed to absorb. This experience has negated the benefit of reduced transaction costs that was an expected benefit of UNECAFE, and which is

frequently discussed as an advantage of cooperative membership more broadly (Marcos-Matás et al. 2013; Alho 2015; Altman 2015).

The inability to sell all of their harvest at guaranteed certified prices also exposed these *socios* to increased vulnerability in the purchase market. This portion of their harvest was sold at uncertified (lower) prices to a purchaser with whom they did not have the same contractual, trusted relationship. Producers explained that they felt their confidence in UNECAFE had been violated, that they felt a lack of accountability, and that they were less likely to participate in future meetings and programs. Not selling coffee to the cooperative also places their access to future resources at risk, as distribution of coffee seedlings and material inputs is based on a list of producers who sold coffee to UNECAFE in the previous year (UNE1,3). The damaged relationship may thus compound other collective action problems and participation in the future, limiting the cooperative's successful performance and ability to improve member producers' livelihoods (Markelova et al. 2009).

7.1.6 *Community Services*

The association between UNECAFE and Teotepec has provided some benefits for livelihood security for the community as a whole, beyond just *socio* producers and their households. Such projects have included the housing and disaster recovery project following Hurricane Carlotta in 2012, coordinating specific medical support within the community, and small-scale community development. These resources were provided not only to *socios* and their families, but rather UNECAFE opens the opportunity for the community as a whole. From the cooperative's perspective, these projects are intended as an investment in the health, well-being, and livelihoods sustainability of the community as a whole, not just producer households (UNE3). UNECAFE recognizes that coffee production alone does not sustain Teotepec, and that livelihood sustainability entails investment in community function beyond individual households. The community services that the cooperative has coordinated are intended to be holistic at the community scale, and furthering overall livelihood sustainability by enhancing their capacity to recover from natural disaster (shock), and increasing their stability and resilience to other stressors (health-related livelihoods challenges) (Scoones 2009).

7.2 *Constraints on progress toward sustainable livelihoods*

While UNECAFE has provided some benefits to producers, overall there are limitations on each particular form of assistance that constrain potential benefits for future adaptation and livelihood sustainability. Participants' explanations of the disadvantages of working with UNECAFE frequently centered on the relationship that the cooperative held with the community. A common challenge to cooperatives whose leadership is not local is building trust, maintaining accountability, and transparency between staff and producer members (Ruben and Heras 2012). In Teotepec, the strained and distant relationship between UNECAFE and producers has contributed to the opinion that the cooperative is not sufficiently invested in building local capacity or improving producers' livelihoods. In other studies, strained relationships and weak social capital between producers and cooperative leadership were found to negatively influence whether producers accept information as legitimate, and detracted from their motivation to invest more labor and resources in coffee production (Snider, et al. 2017). A lack of strong social capital between the organization's management and producers can also contribute to weak incentives for participation in meetings, workshops, or adoption of improved production practices (Reed and Hickey 2016). Further, poor relationships between producers and the cooperative in Teotepec are emblematic of distribution of power, the scale at which sector governance occurs, and which actors in the commodity chain make decisions and set priorities. In order for cooperatives to successfully implement adaptation and sustainability projects, such as certifications, they need to have positive relationships with and demonstrate interpersonal investment in member producers (Hansen et al. 2002; Reed and Hickey 2016).

7.2.1 *Constraints to Building Capacity: Relationship between Cooperative and Producers*

A significant constraint to the impacts UNECAFE's projects and certifications could have on livelihood sustainability is the relationship between cooperative staff and producers, including both current and former *socios*. The benefits of cooperative programs are dependent upon producer participation, and on individuals utilizing the resources and information provided. However, as previous studies have found, if producers do not feel trust, accountability, or reciprocity in relationships with the cooperative, they are less likely to invest the time, labor, and financial resources necessary to fully access benefits (Hansen et al. 2002; Ruben and Heras 2012). Such factors internal to the relationship between cooperative management and member

producers can potentially negate the expected benefits and motivations for organizing to join a cooperative in the first place (Ruben and Heras 2012).

Administering and enforcing certifications is one important piece of UNECAFE's projects in Teotepec, and there are specific constraints that limit the benefits that certifications could have for producers. One important limitation of certification is that producers aren't aware that their coffee is certified, or what it means to produce certified coffee. Asking producers about what they knew about certifications revealed that they did not know their product was certified, or that they recalled being told but forgot what it meant (SO14). The process of administering, enforcing, revising, and auditing is managed by UNECAFE, as are the premium payments and resources associated with each certification (Pinto et al. 2014). Producers who are unaware of certifications may compromise their ability to make informed decisions about changing management practices on their farms, and may perpetuate dependency on the cooperative for direction. In theory, decisions about both RA and Fair Trade certification are supposed to be made democratically, with participation from member producers (Dragusanu et al. 2016). However, the lack of communication, transparency, and direct representation in decisions limits the impacts that certifications may have on individual livelihoods (Snider et al. 2017). While low levels of education amongst producers could contribute to limited understanding and awareness of certifications, it does not fully explain the lack of transparency between producers and the cooperative. Under UNECAFE, this is most evident in the distribution of the Fair Trade premium payments, which are supposed to go to community development projects (Valkila 2009). Without a voice in influencing how those payments are used, they cannot guarantee transparency or accountability that they are used for what would be most beneficial for livelihood security or sustainability (Ibnu et al. 2015). Producers consider it a violation of trust that decisions are made for them, further decreasing their motivations to participate.

Over recent years, the relationship between UNECAFE and member producers has become strained, negatively impacting trust and contributing to a decline in participation. Since the beginning of Teotepec's affiliation with UNECAFE in 2011, the cooperative has consistently lost membership, such that fewer than half of original *socios* are still affiliated. During the six months that I conducted fieldwork, UNECAFE lost further members due to low participation or non-compliance (UNE3). Low participation constrains UNECAFE's success as an NGO, because the ability of their agricultural and livelihoods development projects to improve local

conditions is contingent upon producer participation. In a comparison between different cooperative organizations, Bacon (2015) also found that cooperatives lacking in resources or strong relationships with communities had poorer outcomes promoting improved production practices. In order for large-scale sustainability initiatives like certifications to have the intended benefits for producers, it is necessary for the intervening cooperative to invest energy in building trust amongst members (Hansen et al. 2002). Further, such benefits need to be substantial enough to make tangible improvements in producers' lives.

UNECAFE attempts to build capacity amongst *socios* in Teotepec, an advantage that producers expected from membership but which has not been realized by all *socios*. The programs that UNECAFE has provided to build capacity amongst producers include the workshops, trainings, and demonstrations of improved or adaptive cultivation and processing practices. An important constraint to increasing productive capacity of producers is mistrust in the information and new technologies that they are exposed to (Snider et al. 2017). Participants reported that they had lost trust in UNECAFE staff and did not feel that the cooperative invested enough in building capacity amongst producers, and that they did not trust the information that cooperative staff provided (RA10,12,15,20; SO16,17,18; IND7). Producers' experience of workshops that are repetitive, basic, and do not actually teach anything new erodes trust in the cooperative, as producers may not think that management is seriously investment in improving their production capacities (Ruben and Heras 2012; Bro et al. 2017). As with the *socio* who felt that UNECAFE's trainings only claimed to build capacity but the content did not reach expectations (SO17), the perception of low investment from the cooperative becomes reciprocated from producers. In this case, *socios* who feel that there is mistrust, lack of accountability, and low investment of time and resources relative to producer needs is manifested in low rates of participation. While workshops and trainings are intended to increase producer capacity and be adaptable to changing conditions, these intentions are meaningless if producers do not accept the information as useful or legitimate.

7.2.2 *Experiences of Inequity*

One notable constraint that has detrimental effects on the relationship between the cooperative and member producers is an experience of inequity in investment of time and resources amongst growers. An important characteristic of more successful cooperative models

is equal treatment of members, which builds social cohesion within the membership group as well as a sense of reciprocity with cooperative managers (Alho 2015; Altman 2015). Such inequity prevents marginalized producers from realizing the livelihood benefits of the resources and constrains overall cooperative performance. Producers who do not receive consistent visits from extension technicians, for example, may have a problem on their plot that they are unaware of or do not know how to address. Without personal investment from cooperative staff, the problem may persist or worsen, threatening that producers' harvest and, in the case of disease, spread risk to neighboring plots. This can mean that they are in the same or more precarious situation of livelihood insecurity and vulnerability as they would have been without membership or investment in the cooperative.

Unequal distribution of benefits also harms the relationship between the cooperative and members because it contributes to beliefs about corruption, both of UNECAFE management staff and of local employees. Producers discussed projects that either never occurred, or that were diverted to certain households because of familial or kin connections to leader producers rather than distributed to all producers (R2;IND7). During interviews and follow-up conversations, I elected not to delve into claims of corruption because I did not want such questions to impact my relationships in the community, with the cooperative, and the quality of the data; nevertheless, some producers did bring it up. Corruption, either real or speculated, discourage full participation in the cooperative, as members feel their time and labor investments will not be reciprocated equally (Woubie 2015). In order for the development resources and extension projects to reach their full intended benefits, each producer needs to be given adequate attention from cooperative staff and provided equitable access to material resources. While this will undoubtedly require greater capacity on the part of the cooperative, findings in this study indicate that perception of equal treatment among members is crucial for positive performance (Alho 2015).

Some of the inequity in resource distribution stems from insufficient resources and inappropriate cooperative management, some results from the complexity of programs that UNECAFE coordinates. For example, one of the primary distinctions between RA-certified or non-certified producers is whether they qualified to participate in the CO₂ Coffee climate adaptation project. Those who qualify receive other benefits, including trees, tools, extension workshops, and financial assistance pertinent to reforestation and adaptive production practices

(UNE1,3). Qualification is based in part on land size, use, and forest attributes, which precludes participation from the entire *socio* population, and is one source of the unequal resource distribution. Though I did not specifically investigate the dynamics of this project, it influences producers' perceptions of the disadvantages and limitations of working with UNECAFE. While the attributes that qualify producers for these resources are somewhat out of producers' control, but the fact that participants did not understand that these were why they did not receive particular resources supports the finding that there is low transparency and accountability between UNECAFE and producers.

7.2.3 *Limitations to Lowered Transaction Costs*

A key motivation for producers to join UNECAFE, as with cooperatives in other contexts, was that membership reduces transaction costs of transport to market and finding a buyer willing to offer an acceptable price (Marcos-Matás et al. 2013). However, in 2017-18, UNECAFE greatly decreased the visits that it made to Teotepec to purchase and transport coffee to the processing warehouse in Oaxaca, without advance notification to producers. This left many *socios* with coffee they could not sell from Teotepec, and were forced to coordinate and pay for transport to distant commercial centers (Puerto Escondido or Pochutla) to find a willing buyer. These producers thus incurred the very transaction costs that UNECAFE membership purported to absorb. This experience has negated the benefit of reduced transaction costs that was an expected benefit of UNECAFE, and which is frequently discussed as an advantage of cooperative membership more broadly (Marcos-Matás et al. 2013; Alho 2015; Altman 2015).

The inability to sell all of their harvest at guaranteed certified prices also exposed these *socios* to increased vulnerability in the purchase market. This portion of their harvest was sold at uncertified (lower) prices to a purchaser they did not have the same contractual, trusted relationship. Producers explained that they felt their trust and confidence in UNECAFE had been violated, and that they were less likely to participate in future meetings and programs. The damaged relationship may compound other collective action problems and participation in the future, limiting the cooperative's program success and ability to improve member producers' livelihoods (Markelova et al. 2009).

7.2.4 *Lack of Representation in Cooperative Structure—Accountability, Transparency*

Another constraint to realizing livelihoods benefits through cooperative membership is the scale and organizational structure of UNECAFE. Because the organization works with so many member communities across the state, it more closely resembles a second-level marketing cooperative or a cooperative union, rather than a grassroots first-level cooperative or farmer's organization (Bro et al. 2017). UNECAFE serves the role of agricultural extension as well as a channel for commercialization, marketing, export, and networking with international markets (Ruben and Heras 2012). The organization did not develop organically within the community around livelihoods goals specific to context. Rather, it tries to adapt externally designed projects to local context. Producers are less likely to be informed of or involved in cooperative planning and projects, which decreases the likelihood that they will fully participate (Jena et al. 2012).

UNECAFE's program staff are not representative of the small communities that they work with; most are not from the communities, and only one is a coffee producer (UNE3,4). While there is an advisory committee composed of community representatives, each community is not always represented and the committee does not necessarily participate in project development or implementation (UNE1,2). Thus, organization decisions are not democratic nor participatory, and producers do not play a lead role in designing how projects will be implemented. UNECAFE employs a vertical structure in decision-making, which limits producers' voice and provides few avenues for dissent or critique (Ruben and Heras 2012). This runs contrary to best practices in literature on cooperatives' role in livelihoods sustainability. In order for cooperatives' programs to translate to improvement in smallholder livelihoods, they need to be representative of producer communities, include local or indigenous knowledge, and be accountable to producers (Bacon et al. 2008). Further, the more that cooperative members identify with cooperative staff, the more they tend to trust its leadership, and the more likely they are to participate in the cooperative's programs (Borgen 2001).

The low levels of accountability and transparency between UNECAFE and producers reflects awareness of and disenchantment over where and how decisions about cooperative, certification, and overall coffee sector governance are made. While UNECAFE does coordinate resources that fit into producers' livelihood context, these projects are constrained by misalignment of priorities between producer livelihoods, the cooperative, and international NGO partners like RA. Coffee is a buyer-driven commodity chain, and therefore actors such as RA

and UNCAFÉ are beholden to prioritize the qualities that roasters, importers, and green coffee-buyers value in order to compete in the market (Muradian and Pelupessy 2005). Governance decisions about what criteria will be incorporated into certifications are determined by RA staff, typically ‘experts’ in conservation, ecology, and coffee, but not in local community needs or constraints. RA and UNCAFÉ are also subject to the requirements of international funding mechanisms and donors in consuming countries, which skews their priorities away from producer livelihoods. Smallholder *socios* are left to comply with requirements they have no voice in setting in order to access the benefits of UNCAFÉ membership and associated certification, and are without an outlet to represent their interests and what would be most appropriate to context (Otto and Mutersbaugh 2015).

7.3 *Conclusions, Implications, and Recommendations for Policy and Future Research*

Smallholder coffee producer cooperatives and the product certifications they administer have the potential to improve livelihoods by expanding producer capacity to adapt to economic shocks or stressors, if prices and other benefits are sufficient. Cooperatives are a mediating factor in connecting many marginalized, isolated, smallholder producers and their communities with broader-scale conservation and development initiatives (Bacon 2015). However, the benefits that these projects actually have for improving livelihood security or moving towards livelihood sustainability is dependent upon how well the cooperative actually implements the programs (Ibnu et al. 2015; Bro et al. 2017) and if the premiums are sufficient to support producer households (Weber 2011; Jena et al. 2017). It may be advantageous for individual smallholders to join cooperatives to gain access to material resources, obtain better prices from specialty export markets, build capacity and knowledge about production, and reduce transaction costs (Mojo et al. 2017). In this case study, UNCAFÉ has provided these benefits to smallholders in Teotepec to some degree. However, findings demonstrate that there are many complex factors that limit how effective certifications are on the ground and to what extent they actually improve livelihoods or minimize household vulnerability.

While producers joined UNCAFÉ for the support of an organization that could help improve their capacity to respond to the coffee crisis and be able to adapt to future crises, membership has not met their expectations overall. The overwhelming scale of the coffee crisis and the fact that the crisis is structural rather than cyclical has meant that the supports

UNECAFE has provided are insufficient. Coffee prices have stayed low, so even though UNECAFE offers a higher price than conventional buyers, producers' income is still lower in real terms than before the crisis (van Rijsbergen et al. 2016) and too low to secure household livelihoods. Support resources are also constrained because they are not matched with producers' needs. Producers in this study explained that they were more limited by the inability to invest in the labor needed to maintain coffee, rather than by tools or other materials used in production. In order for UNECAFE's programs to achieve their intended outcomes, they need to be sufficient and appropriate to context.

Although prices and yields have declined, and labor costs have climbed such that many producers no longer profit from coffee, the product has come to define much about daily life and Chatino culture. Coffee continues to be a source of pride for many, as a product that allows them to continue to work in the *campo*, maintain forest knowledge and cultivation, and produce something that is of local value. The Independent producers who explained that they do not sell their coffee any longer still maintain enough for household consumption and indicated that they planned to continue to do so. Producers view coffee as an important activity in their livelihoods, regardless of economic profitability, which may create opportunity for future conservation and development projects developed in partnership with Teotepac. Such projects should build on producers' motivation for producing coffee and explore what other opportunities that producers themselves may identify.

The impact of certifications and other cooperative resources on household livelihoods in this context is dependent upon the relationship between cooperative management and producers. Investing in building capacity and improving cooperative organization may be key to ensuring that producers experience the full intended benefits of the suite of resources that cooperatives coordinate. Although UNECAFE's programs were constrained overall by a lack of communication, trust, and transparency with producers, the organization has taken steps to overcome these barriers. Leadership recognizes the importance of building relationships with producers, and have maintained consistency in staff who work with the community. As skeptical as some producers continue to be of external information and the benefits that UNECAFE provides, the organization still has been able to build continuity in their programs over time (RA2,12; UNE1,2,3). UNECAFE has also recognized some key producers as more amenable to adopting new technologies and who may serve as formal "farmer promoters" for future

recommendations. Some of these producers have adapted extension information to their context, incorporating local knowledge about what may have been tried previously and where there may be alignment between traditional values and new cultivation techniques. Working more closely with these early adopters could both preserve local knowledge as well as build rapport with producers.

Moreover, locally-based technicians help to enhance relationships between the cooperative and the community, and the cooperative does to some extent support building capacity in the few technicians it is able to employ in order to maintain relationships. UNECAFE staff also recognize the strength of cultural practices in Teotepec. As such, they have not tried to rapidly change production practices, but instead work to gradually introduce new practices that are intended to be adaptable to changing conditions.

The factors enabling or constraining UNECAFE's projects, including certification, reflect findings in other research on cooperative organization and collective action, and provide lessons for future policy and research. Despite the cooperative's efforts to build relationships and maintain trust with producers, there are still a number of organizational characteristics that limit project success. Successful cooperatives are characterized by their ability to overcome barriers by strengthening interpersonal bonds, improving accountability, investing in long-term planning, and increasing communication with members (Borgen 2001). Because UNECAFE is not integrated into its partner communities, interpersonal bonds are relatively weak and there is no mechanism for direct accountability to producers. Staff only visit the community once every few months, and do not stay long, which hinders communication with the community. Further, they do not involve producers in decisions about implementing projects or resources, which lends itself to decreased producer investment in utilizing the supports. The lack of democratic participation in cooperative decisions weakens the organization overall and may contribute to lower food security, constrained economic benefits, and increased household vulnerability.

Specific community characteristics also influence how viable a grassroots cooperative may be in the long run. In many respects, the very attributes that have made Teotepec a strategic partner community for UNECAFE would also contribute to strong internal cooperative organization. According to key informant community members, producers, and UNECAFE staff, the local government (*Agencia* and *Bienes Comunes*) are well-organized, effective, and responsive to community concerns (RA2,3,12; UNE1,3,4). A cooperative could build off of pre-

existing capacity for organization, participation, and governance, specific to making change for producers.

In contrast with resources from UNECAFE that are inappropriate to context, producers discussed ideas for what they needed that they thought would be beneficial and readily adopted. While many participants expressed frustration at the redundancy of extension workshops, they also recognized that specialized information could improve production. Many *socios* explained that they actually wanted more extension workshops and trainings that focus on what other practices they could use to increase yields and improve plant health. Producers also were interested in other value-added products to cultivate alongside coffee, primarily honey and cacao, but wanted to know about other things that would be suitable for their climate and have domestic demand. Further, producers placed priority on being able to grow agricultural products for Teotepac *first*, for the benefit of local food security, before focusing on export markets. Others expressed interest in building a brand for coffee from Teotepac for regional consumption in Oaxaca, to allow them to compete with other coffee-producing centers in the state for domestic consumption markets. UNECAFE and partner NGOs could improve their programs by taking producers' perspectives and desires into account and designing projects for which there is local motivation. Producers have more complete and nuanced knowledge of their own communities, and should be valued as a resource throughout project planning and implementation.

The strained relationship between the cooperative and the community has important implications for broader certification and conservation initiatives. Rather than consistently changing certification criteria or developing new initiatives, organizations like the Rainforest Alliance need to invest resources in building capacity in cooperative organizations (Bacon et al. 2008). Certifications are administered through these institutions, and without organizational accountability, transparency, and local representation, they will continue to have limited impacts on livelihood sustainability. In contexts such as this where NGOs like the Rainforest Alliance are not local, managers and project coordinators need to spend more time in local communities, invest in building relationships, and develop programs based on site-specific considerations.

Current trends in the coffee market and climate change conditions indicate that depressed coffee prices are likely to continue (ICO 2018) and disease and weather events will likely constrain future production (Bunn et al. 2015; Avelino et al. 2015). The ability to effectively respond to continued economic stressors and climatic shocks will be critical to future household

livelihood security and require outside partnerships to access resources necessary foster livelihood adaptations. In light of the foreseeable trends in economic and climatic stressors, UNECAFE will likely continue to play a critical role in administering resources aimed at enhancing producer sustainability in Teotepec. Increased investment both internally and from international partners on improving cooperative capacity to support producers may help ensure that the benefits of broad-scale certifications actually reach producers.

8 OBJECTIVE III: SHADE TREE MANAGEMENT BY COFFEE PRODUCERS IN SANTA LUCÍA TEOTEPEC

In Teotepec, coffee has traditionally been grown under full shade, in a complex mosaic of forest gardens, subsistence crop cultivation, and primary pine-oak forest across the regional landscape (Hite et al. 2017). This approach to coffee production has persisted into the present, and producers still maintain a dense, diverse tree canopy that provides multiple benefits for coffee and producers' livelihoods. In this cultural context, integrating coffee into pre-existing forests supports the community's values of environmental stewardship and the connection to forests that is central to Chatino identity. There is an extensive body of work on the ecological benefits of shade-grown coffee (Moguel and Toledo 1999; Perfecto et al. 2005; Jha et al. 2014), but the connections between livelihoods, cultural values, and shade tree maintenance varies based on context (Jha et al. 2011, Mathews et al. 2011). Growers' cooperatives and coffee certifications may affect producers' decisions to maintain trees for direct use, cultural significance, and are beneficial for coffee cultivation. This section seeks to answer the questions in **Objective 3** of the thesis:

- 1) What are the local uses and cultural values of shade tree species used in coffee agroforestry systems in Teotepec?
 - a. What are the primary challenges that producers face in maintaining shade trees on their coffee plots, and what opportunities exist to overcome these challenges?
- 2) How do cooperative membership and associated certifications affect producer decisions about shade tree management on their plots?

I draw on qualitative data concerning the local uses, cultural values, and producer decision-making processes regarding shade tree management, as well as plot-level measurements of tree diversity and shade biophysical variables, on Rainforest Alliance-certified and non-certified

plots. Biophysical ecological metrics aided in determining whether there was a difference in overall species diversity and shade levels on certified (UNECAFE members) and non-certified plots. Regardless of membership in UNECAFE and certification status, producers discussed benefits for coffee production, livelihoods uses, and cultural practice as motivations for managing shade trees.

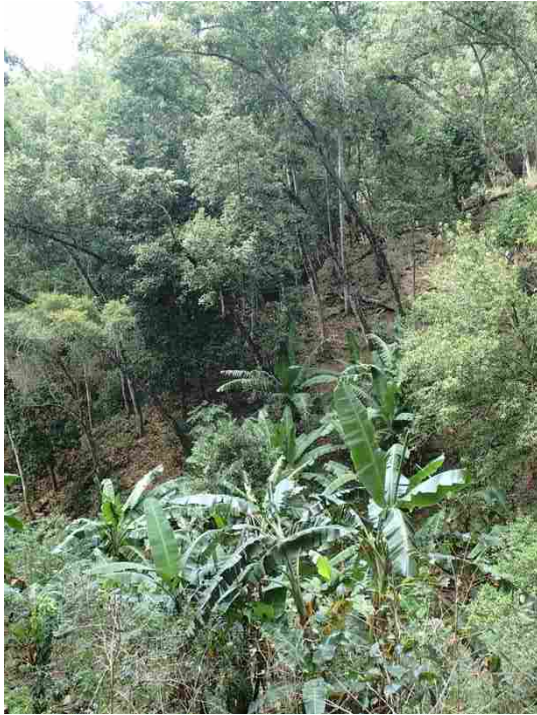
8.1 *Local Uses and Cultural Values of Shade Tree Species*

Producers from all three groups discussed specific local uses of 75 tree species that they maintain on their plots. Respondents discussed both the direct benefits that shade trees provided for their livelihoods, including coffee cultivation and daily household activities, as well as sustaining cultural ties to forests and local ecology. UNECAFE *socios* recognized a wider range of benefits and values, and with greater frequency, than did Independent producers. Participants from each group reported different approaches to managing shade on their plots, reflecting a variation in knowledge and the resources to actively regulate shade that did not correspond to cooperative affiliation.

Figure 8.1: Traditional shaded coffee plot in Teotepec



Figure 8.2: Shaded coffee interplanted with banana in Teotepec



All coffee, with the exception of one plot, in Teotepec is shade grown, typically with a dense overstory and diverse canopy of native shade trees. All plots are “traditional polyculture,” or coffee garden, as defined by Moguel and Toledo (1999). Plots exhibit a range of canopy complexity and components, with both tall overstory trees, mid-level trees, and shrub-like (*arbusto*) plants growing amongst coffee. The following results address part (1) of Objective 3, and discuss the local uses and cultural values of shade trees, including the rich descriptions that producers offered about the benefits and importance of shade trees to their livelihoods and community.

8.1.1 Context: Historic Land Use

The territory around Teotepec has experienced a reduction in primary forest cover over the past few decades, consistent with trends in coffee-producing landscapes across Oaxaca (Aguilar-Stoen 2017). The coffee crisis pushed many former producers to convert their plots to *milpa* or pasture to enhance household food security, which has resulted in a patchwork of forest cover across the mountainsides. According to participants, these hillsides were recently covered

in dense forest, with most *milpa* production farther down in the valley where terrain is less steep (RA2,6,13).

Figure 8.3: Patchwork landcover around Santa Lucía Teotepec



The UNECAFE technician explained that along the road leading into Teotepec and paths to outlying *rancherías*, “everything was white, white, pure white with coffee flowers, and thick forest, and everything smelled like coffee flowers and rich soil. Now during [the dry] season the same places are dusty, brown, and hot because the coffee and forest are gone,” (UNE1). There are some local governance rules that regulate land use to some degree, protecting pines and older-growth trees, as well as preventing agricultural expansion into outlying primary forest. The change in land cover has happened rapidly, and the community has not been able to respond with regulations to protect primary forest on individually managed plots. Loss of primary forest cover accelerated after the coffee crisis, such that community members of the younger generations remember thick, contiguous forest cover on mountainsides that are now *milpa*, pasture, or fallow, as depicted in the photos above.

8.2 Material Uses of Shade Tree Species

Table 8.1: Local Uses and Benefits of Shade Trees in Santa Lucía Teotepec

Shade Tree Benefit	UNECAFE Socio, RA Certified <i>N</i> (<i>n</i> =25)	%	UNECAFE Socio, non-RA Certified <i>N</i> (<i>n</i> =20)	%	Independent <i>N</i> (<i>n</i> =20)	%	Total Responses, All Groups <i>N</i> (<i>n</i> =65)	%
Coffee Plant Health	23	92%	19	95%	18	90%	60	92%
Natural Compost (<i>Abono</i>)	13	52%	12	60%	13	65%	38	58%
Firewood	17	68%	15	75%	16	80%	48	74%
Fruit	19	76%	13	52%	13	65%	45	69%
Timber	6	24%	5	25%	4	20%	15	23%
Remedies, Medicinal Uses	2	8%	0	0%	0	0%	2	2%
Shade Suppresses Weeds	1	4%	0	0	1	5%	2	3%
Flowers	0	0	1	5%	2	10%	3	5%

8.2.1 Coffee Plant Health

Participants from each producer group most frequently (95% of respondents) discussed the direct benefits that shade provides for coffee plant health, yields, and longevity. Overwhelmingly, producers from all groups named ‘coffee plant health’ as a principal benefit of shade trees. The majority of participants said that they left shade intact “so that the coffee doesn’t die,” (“*para que no se seque el café*”). Too much sun “burns” coffee leaves, and the heat from intense sun affects the quality of the fruit (RA13;SO6,17;IND12). Participants elaborated that with a balanced level of shade, coffee plants will live longer and produce longer than in heavy sun (RA6;SO15;IND14). Producers also recognized that coffee yields are higher under shade (RA6,8,9;SO11,15,17; IND5,8,11,14), and that these yields are more sustained over time than under more open sunlight. Higher shade levels were also recognized as beneficial because they reduced producers’ labor costs, by shading out herbaceous understory weeds and making the plot easier to clean (RA6; IND2,7; Soto-Pinto et al. 2002). Trees favorable for coffee production were characterized as “fresh” (*fresco*) or “low” (*bajo*), referencing the cooler temperatures and lower light quality with more complex shade strata (RA25). Producers

preferred a mix of fast-growing shrub (*arbusto*) species (in Appendix A), which provide quick shade, and tall tree species, that ensure more sustainable shade and cooler temperatures within plots.

Shade trees are valued because they improve soil quality, for the benefit of coffee and other plants, because their leaf litter provides crucial organic matter (“*abono*”) and soil nutrients. The preferred shade trees are of the *Inga* genus, nitrogen-fixing trees in the legume family, because the leaf litter decomposes quickly ((Méndez et al. 2010); see Appendix A for inventory of tree species and preferred uses). These preferred species drop their leaves throughout the year, rather than seasonally, which producers prefer because leaf litter reduces weed growth and lessens the labor of plot weeding (Aguilar-Støen et al. 2011). Participants across groups recognized that oak species (*Quercus spp.*, encino) were among the least beneficial for coffee and soil health, because their leaves resisted decomposition (“*son muy duras las hojas,*” RA7;SO16;IND9) and were considered to be lower in nutrient content. Trees considered less desirable are those that produce “ahuates,” small spiky hairs, that damage coffee plant leaves (*Cecropia obtusifolia*, guarumbo; *Cnidoscylus acotifolius*, hoja de calabaza). Only six participants, from the non-RA certified UNECAFE and Independent groups, said that they did not know which trees were beneficial for coffee. Most of these participants were new to production, had taken over from a family member who migrated, or had not learned coffee care from their family.

Only one coffee-producing household in Teotepec is sun-grown, but it would be more accurately characterized as a polyculture with early-successional, managed shade. In this plot, coffee is interplanted with avocado trees (*Persea Americana*, used for local sale) and banana (*Musa spp.*, also for local sale) along the edges of the plot. According to this producer, they had initially cleared the forest cover to plant *milpa* but shifted their management goals and planted coffee and avocados. This decision followed a government development “impulse” program, from the Commission on Development of Indigenous Pueblos (La Comisión de Desarrollo para los Pueblos Indígenas, CDI) that provided avocado seedlings for larger-scale cultivation. This household decided to interplant avocados with coffee and banana, even though they were aware that cultivating coffee with greater sun exposure could increase risks in production. According to this producer, recommendations from UNECAFE did not influence their land use decision; rather, they were motivated by the multiple income sources from each tree crop (SO5). This

producer's decision seems to be an anomaly in the community, as no other participant discussed plans or motivations to remove shade for a similar purpose.

While most participants emphasized the benefits of shade trees for coffee, most also discussed other material benefits. For some, these uses were even more important than their benefits for coffee, that “We know that shade is good, but we also know that you have to cut some trees down, to be useful for something else. We think more about the other uses, if the tree will be useful for another need,” (“*Sabemos que hay que tumbamos algunos palos, para que sirve para otro. Pensamos más en los otros usos, si sirven para otra necesidad,*” RA11). Another *socio* of UNECAFE maintained almost exclusively fruit and firewood trees on their plot, and explained that “we want every tree to have a purpose, that we can derive some benefit, a use, a fruit from every single tree,” (“*Queremos que cada árbol tiene un uso, que podemos sacar una ventaja, un uso, una fruta de cada árbol,*” SO5).

8.2.2 Firewood

The most frequently mentioned use of shade trees was for firewood (*leña*), cited by 74% of all participants. In Teotepec, cooking is done almost exclusively with wood as very few residents own gas stoves. Some participants did not rely on their coffee plot for firewood, either because their plot is too far from town or because they are physically unable to go to their land themselves, and must purchase it or pay someone to gather it for them (RA11,14,17;SO4;IND3). Consistent with findings in other rural, indigenous coffee communities in Oaxaca, the ability to harvest this daily necessity is a critical livelihood resource (Ventura-Aquino et al. 2008). Maintaining species preferable for firewood can further conservation goals, as producers harvest fuelwood at sustainable rates to maintain overall forest canopy cover (Ibid.)

8.2.3 Fruit

Coffee producers, like most residents in Teotepec, maintain fruit trees on their land, both within coffee plots as well as other farmland (*ranchos*) and in home orchards (*huertas*). Common species cultivated included banana (*Musa spp.*), various types of citrus (*Citrus spp.*), mango (*Mangifera indica*), nanches (*Byrsonima crassifolia*), guajinicuil (*Inga jinicuil*), and guava (*Psidium guajava*). Other tree species are used for food or in food preparation, including leaves

of guarumbo (*Cecropia obtusifolia*) and aguacatillo (*Ocotea caudata*). These taller trees are recognized to serve a dual purpose, by providing shade as well as fruit for household consumption and, in some instances, local sale. Shorter trees or shrub species provide edible flowers, such as those from guachepil (*Diphysa robinoides*) and maguey (*Yucca spp.*). All UNECAFE *socio* households and 16 (80%) of Independent producer households reported using fruit from coffee plots for household consumption, and only a minority across all groups who harvested for local sale; none is exported out of the community. Producers harvest other edible plants from the understory of their coffee plots, and maintain areas favorable for things like *quelites* (a general term for edible herbs), *camotes* (various tubers, such as from *Yucca spp.*), and chiles. For some, the ability to harvest fruit and other foods helps alleviate food insecurity and seasonal hunger (Bacon et al. 2014). However, food security has improved in part due to market access and improved transportation, which has lowered the cost of transporting fruit from outside the community. As a result, there has recently been an increase in small fruit vendors selling affordable produce, which has reduced reliance on fruit grown in coffee plots or *ranchos*.

8.2.4 Timber

A minority of producers discussed harvesting timber, wood for smaller household construction needs, and medicinal products from their plots. The preferred species for large timbers are pine (*Pinus oaxacana*), aguacatillo (*Ocotea spp.*, *Persea spp.*), and mameyito (*Clethra mexicana*). For fence posts or smaller household construction needs, producers prefer guachepil (*Diphysa robinoides*) or oak (*Encino spp.*). Only 15 participants (23%) stated that they harvested trees for timber. This number was limited because of the protections that local government (*Bienes Comunales*) has placed on all pine trees and larger individuals of other species. Residents who want to remove a tree for timber use must formally request permission from *Bienes Comunales*. The council takes into consideration that households previous use of pines as well as other recent requests in deciding whether to grant permission. Protections on forest cover are not unheard of in indigenous communities in Oaxaca, but they are not common and are not always respected or enforced at the community scale (Ventura-Aquino et al. 2008; Bray et al. 2003).

8.3 *Environmental Attitudes and Cultural Values of Shade Trees*

In addition to direct, material use values, participants discussed broader environmental values and cultural motivations of maintaining shade trees over coffee. The environmental benefits (similar to ‘ecosystem services’) mentioned ranged in specificity, and producers frequently elaborated that they recognized the benefits in relation to coffee, other crops, and the regional environment as a whole.

Table 8.2 : Environmental or Cultural Values of Shade Trees in Santa Lucía Teotepec

Cultural Value of Shade	UNECAFE Socio, RA Certified N(n=25)	%	UNECAFE Socio, non-RA Certified N(n=20)	%	Independent N(n=20)	%	Total Responses, All Groups N(n=65)	%
Water Conservation	23	92%	14	70%	14	70%	52	80%
Rainfall, Cloud Cover	1	4%	1	5%	2	10%	4	6%
Air Quality	7	28%	3	15%	4	20%	14	22%
Soil Conservation	1	4%	1	5%	3	15%	5	18%
Future Generations	6	24%	1	5%	3	15%	10	15%
Prohibited by <i>Bienes Comunales</i>	6	24%	4	20%	2	10%	12	18%
General Environmental Health	3	12%	3	15%	4	20%	10	15%
Habitat	1	4%	0	0	1	5%	2	3%
Feeling of Freshness	5	20%	3	15%	3	15%	11	17%
Intrinsic Value of Trees	3	12%	1	5%	1	5%	5	8%

8.3.1 *Water Conservation*

The most frequent environmental values cited by participants were water conservation and water quality. Almost all (90%) RA-certified UNECAFE *socios*, and a majority of non-RA certified *socios* and Independent producers (70% of both groups) included water conservation as a benefit of shade trees. “We leave trees to care for water, so that water sources don’t dry up,”

(“*Dejamos los árboles para cuidar el agua, para que no se seque,*” RA11). Many participants had either a spring or stream that flowed through their plot, and thought that removing forest canopy would cause these water sources to dry up. Another participant drew an analogy in how she considered the impact of tree cover:

“It’s like when you eat a big piece of fruit, full of water, and you feel full of water after. It’s the same with trees, that when there are trees everything is full of water, the same with the soil.”

“Es como cuando come uno una fruta, llena con agua, y después se siente llena de agua. Es lo mismo con los árboles, que cuando hay árboles todo está llena de agua, igual con los suelos,” (SO15).

Producers connected the quantity and quality of water sources and groundwater to the overall integrity of forest cover in the area. A few participants discussed that they wanted to keep water sources clean, and that they learned from their family or from UNECAFE technicians that leaving trees near water sources would benefit that goal (SO12).

Since the coffee crisis, there has been a net loss of primary forest cover around Teotepec, reflecting the change in land use discussed in previous sections and consistent with other areas in southern Mexico (Aguilar-Støen 2017; Hite et al. 2017). A few participants associated the loss in tree cover with decreased cloud cover, lower rainfall, and general “drying” (“*todo está secando ahora,*” IND6) of the region, observations which motivated them to maintain shade cover. One producer explained the community restrictions on harvesting timber, that “here they don’t give permission to cut down pine trees, because it is from the pines that the rain is born,” (“*Aquí no dan permiso a cortar pinos, porque de los pinos nace la lluvia,*” RA19).

8.3.2 Air Quality

Producers from all groups also recognized air quality benefits from shade trees. Older producers discussed “fresher, cleaner air” (“*que el aire es más fresco y queda limpio con la sombra,*” RA24), while younger producers or those who had years in formal schooling explained air quality benefits in terms of oxygen production (RA12;SO6;IND11). One Independent producer considered air quality benefits at a global scale, that “it’s a huge benefit for the world,

because our forests give oxygen for everyone,” (“*Es una ventaja muy grande para el mundo, porque nuestros bosques dan oxígeno para todo*,” IND14).

Another theme, related to air quality, that emerged was an overall preference for forest cover because of the cooler temperatures and comfort that shade provides. Participants explained that the tree canopy provided a respite from the heat of town, because “out here in the coffee forest, it’s shade, pure shade. You have to maintain the forest, it’s better when you walk out and pass under big trees and feel fresher, comfortable,” (“*Aquí con el café, hay sombra, pura sombra. Que mantenga el bosque con la sombra, mejor cuando caminas y pasas por un árbol grande se siente más fresco, cómodo*,” RA7). Daytime temperatures in the sun top 30°C (90°F) throughout the year, making farm work in open sun uncomfortable and even hazardous. For this reason, participants explained that they preferred coffee labor to working in *milpa* or ranching, because both of those activities required them to stay in open sun all day. This also motivates them to continue in coffee, to be able to obtain farm income that, while labor-intensive, is not as strenuous as *milpa* cultivation nor does it entail the exposure of construction in town. For some, these benefits outweigh the risks of fluctuating prices, disease, or severe weather events.

8.3.3 Future Benefits

Finally, participants from across groups emphasized the values they placed on planting trees for future generations and the strength of Chatino culture. Ten participants (15%) overall explained that they left shade trees intact or planted trees not for their own benefit, but for their children, grandchildren, or future of Teotepec:

“I like the big trees for the little kids, I leave them for the youngsters down the road, I don’t do it for me. There are people in Teotepec who don’t want to plant, because they don’t think about the future. First, you have to think about the young ones...and because of that I give them the example, so that they will continue planting,” (RA1).

“A mí me gustan los árboles grandes para los chamacos, los dejo para los chamacos que vienen adelante, no lo hago para mí. Hay gente en Teotepec que no quiere sembrar, porque no piensan en el futuro. Primero hay que pensar en los chamacos...y por eso yo doy ejemplo a ellos para que sigan sembrando,” (RA1).

Notably, that these benefits will be enjoyed far into the future was expressed by participants across age groups, not only by older respondents. Overall, 67% of participants said that they actively planted trees in their coffee plots for use benefits or just because they “enjoyed planting things, taking care of the land,” (“...*me gusta sembrar árboles, o hacer algo para cuidar el campo,*” RA19). Other participants expressed similar motivations for maintaining shade cover for general environmental health (“*para cuidar el ambiente*”) that aligned more with other environmental values (Luna-José et al. 2016).

Another young producer explained that this attitude “is very strong in Chatino culture, to take care of the land, not for us now but for the future. It’s not for the money from coffee either, it’s for those who will come,” (“*Es algo muy fuerte en la cultura Chatina, es cuidar el terreno, no para nosotros ahora pero para el futuro. Tampoco no es para el dinero del café, es para ellos que vienen,*” RA12). Participants across age and producer groups discussed the value of planting and caring for the forest, for the intrinsic value of the trees themselves (RA5,13;SO6,15;IND16). The sense of responsibility to steward or maintain their land for what they understand to be consistent with ecological health extends to an aversion to using any external inputs in coffee (and *milpa*) cultivation. Although UNECAFE has, at various points, provided soil amendments such as calcium or organic treatments for coffee leaf rust, these products frequently go unused (pers. obs.; KI1). Producers are “not accustomed” to applying any external inputs in their production, regardless of whether they are organic, because they do not trust that these products will not result in harmful impacts on coffee, the overall environment, or human health (RA2,24;SO10,11; IND2,4).

8.4 ***Disadvantages/Constraints to Maintaining Shade Cover***

Participants were aware of and discussed challenges and risks to maintaining shade cover on coffee plots. Participants characterized these disadvantages in terms of the risks that shade trees pose for coffee plant health or productivity. Notably, none of the producers I interviewed recognized a cultural disadvantage or constraint on the use values of shade trees. Although participants did recognize risks of maintaining shade cover, many also expressed reluctance and doubts about whether removing shade would actually be beneficial.

Table 8.3: Disadvantages of Traditional Shade Coffee Cultivation in Santa Lucía Teoteppec

Disadvantage of Shade	UNECAFE, RA Socio	%	UNECAFE, non-RA Socio	%	Independent	%	Totals	%
Too much shade is bad for coffee	14	56	10	50	7	35	31	48
High humidity	5	25	0	0	3	15	8	12
Promotes coffee disease	5	25	0	0	5	25	8	12
Wind Damage	4	16	2	10	1	5	7	11
Certain trees are bad for coffee	0	0	4	20	4	20	8	12

Participants in all groups noted that too much shade cover can decrease yields, and that they needed to regulate shade for overall coffee health (56% RA-certified; 50% non-RA certified; 35% Independent). Producers qualified the benefits of shade for coffee by explaining that full forest shade was not beneficial. Many responded that “too much shade is bad for coffee,” but did not elaborate on why, which may suggest that these producers did not have a nuanced understanding of how shade impacts coffee. Rather, what they actually sought was a level that was “neither too much nor too little, but at a balanced level” (“*ni tanta sombra ni muy poca, pero al nivel balanceado,*” RA11). Socio producers explained that technicians from UNECAFE, or previous government agronomists, often recommended that they cut down trees or prune branches to regulate shade levels in order to increase yields.

Specific risks of shade cited by some producers included that heavily shaded plots are more humid, which potentially increases the prevalence or effects of coffee pathogens. After the most recent coffee rust (*roya, Hemilaiea vastatrix*) outbreaks and consistent effects from *ojo de gallo (Omphalia flavida)*, extension experts recommended removing shade to decrease humidity (Avelino et al. 2015). UNECAFE workshops regularly address cultivation practices that can reduce coffee rust prevalence (SO5), including removing shade in order to promote air flow and reduce humidity. These recommendations are consistent with extension information that has been more widely promoted in the region since recent coffee rust outbreak has spread since 2010 (Valencia et al. 2018). However, despite the risk of increased disease severity, many participants said that they did not follow cooperative technicians’ recommendations, and actually did very little to remove shade. This is either due to labor availability or cost constraints, as removing shade constitutes extra work, or because they are skeptical of whether the practice will actually be beneficial. Further, producers who also expressed strong attitudes toward environmental

stewardship or conservation said that they never cut out shade because they believed the trees to be more valuable than the benefits they might see for coffee.

Those participants who did remove shade trees on a yearly basis explained that they targeted certain species that were less beneficial for coffee. One common species, mameyito (*Clethra mexicana*), is valued for good shade quality, height, and wood quality, but some participants believe this species to increase risk from *ojo de gallo*. Oak species are also selected for removal to decrease shade, because they do not provide preferred soil nutrients and are preferred firewood (Lorena Soto-Pinto et al. 2000). Oaxacan pine was another species that was widely reported to be bad for coffee plant health, because it acidifies the soil and stalls plant growth. However, due to community protections on pines, producers cannot cut down pines even for the benefit of their coffee harvest.

A final risk from shade that producers recognized was damage due to wind. Not only do high winds damage coffee flowers and fruit themselves, but also frequently blow down trees or large limbs that destroy coffee plants. Seven (11%) of the participant producers said that maintaining shade increased their risk of wind losses, and prioritized removing certain species (guarumbo, *Cecropia obtusifolia*; mameyito, *Clethra Mexicana*) to cut down because they do not sustain high winds.

8.5 *Conservation and Biodiversity of Shade Tree Species*

In order to comprehensively document producers' management and conservation of tree species and shade canopy cover in Teotepec, I also collected biophysical data on species composition, canopy structure, and shade canopy closure on coffee plots owned by UNECAFE *socios* and Independent producers. Thirty 100-m line transects were completed, 15 on Rainforest Alliance-certified plots and 15 on non-Rainforest Alliance certified plots. Biophysical measurements included the elevation and structural complexity of shade trees, and frequency, density, and species identification. These data were used to calculate basal area, importance value, and species diversity and richness among certified and non-certified plots. These data were used to calculate basal area, importance value, and species diversity and richness among certified and non-certified plots.

Tree Biodiversity Transect Sites

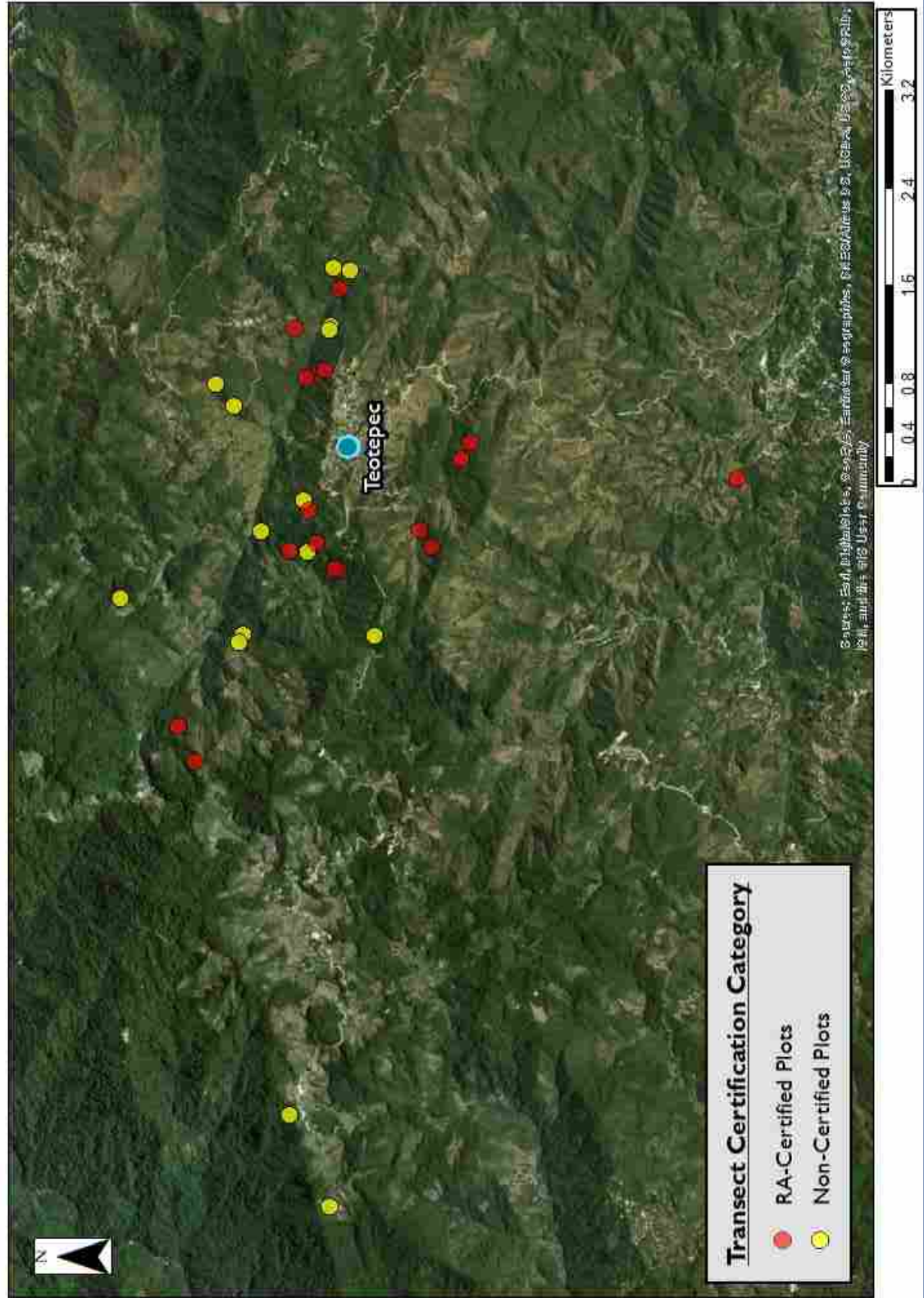


Figure 8.4: Tree biodiversity transect sites on RA-Certified and Non-Certified plots around Santa Lucia Teotepec.

In each group (RA-certified and non-certified) of plots sampled, shade cover varied from rustic shade-grown to traditional polyculture, as described by Moguel and Toledo (1999). On the edges of plots and in areas that are less maintained, the shade is best characterized as rustic, where the lowest vegetation level is removed, and coffee bushes are planted under original tree cover. Towards the center and more actively managed areas of plots, it is a traditional polyculture system, where the lower strata are removed and native forest canopy is manipulated to give preference to beneficial species, while eliminating those considered detrimental to coffee or which do not have another recognized use. Plots varied in structural complexity, with an average of three canopy layers: one dense overstory of trees approximately 30-40 m in height; one mid-layer of trees 15-20 m in height; and a shrub layer, of understory *arbustos* up to 10 m high. This layer also sometimes included coffee plants, as many were old and had been left to grow much taller and provided shade for newly renovated coffee plants underneath.

Tree samples totaled 1183 individuals, representing 71 species and 33 families over all plots. A total of 63 of the species were identified, and local names in Spanish and Chatino were documented where possible. The 8 species that were not identified lacked sufficient material to be identified, as specimens were collected at a time when no reproductive parts were present. Of all species documented, at least 55 are native and 8 are exotic (excluding the 8 unidentified species; see Appendix A for a complete list of species). The only introduced species are fruit trees, including various *Citrus* species, mango, loquat, and roseapple. Sampled plots ranged from 1050-1500 m above sea level and varied in steepness (from 5°-30°) and aspect both across plots and within individual plots. While the impact of slope and aspect on species composition will not be analyzed here, it is worth noting that steeper plots present challenges to maintaining coffee and shade that producers take into account when making management decisions.

Measures of tree species diversity, calculated using the Simpson's diversity index, and shade canopy closures were taken for each plot, and averaged to compare differences between RA-certified and uncertified groups. There was little difference in species richness between certified and uncertified plots, with an average of 12.27 and 12.5 species measured in transects, respectively. There was also no significant difference ($p=0.341$, $t=2.048$) in species diversity between the certified and uncertified plots; RA-certified plots had a mean diversity index of 0.842, and uncertified plots had a mean of 0.867. This indicates that RA-certified plots are not

significantly more diverse in terms of species composition than uncertified plots, supporting participants' responses of similar values and management strategies.

Producers across groups maintained densely shaded plots, with canopy closures far above the minimum required for RA certification, and indeed higher than what is considered most beneficial for yields. RA and other coffee research organizations in the region recommend about 40% shade cover within plots (Center 1999). During plot inspections, UNECAFE technicians frequently utilize indicator photographs or grayscale cards to estimate shade cover relative to the desired 40%, and make recommendations to producers. However, even though these tools indicate heavier than optimal shade, producers choose to maintain very dense canopies. Transect measurements yielded an average of 70.91% for RA-certified plots, and 73.68% for non-certified plots. There was no significant difference in shade measurements between the certified and non-certified plots ($p=0.3629$, $t=2.048$). This finding supports interview responses, in which RA-certified and non-certified producers did not express differences in shade management strategies. It also strengthens qualitative results that producers value shade, and the trees that create it, for reasons other than coffee—and that they will maintain shade cover even though it may result in lower coffee yields (RA12).

9 DISCUSSION: SHADE TREE SPECIES USE AND CONSERVATION

Amongst coffee producers in Teotepec, producer households across groups (certified, cooperative members and independent producers) manage a high level of tree species diversity and recognize a range of material and cultural benefits that trees provide. Producers discussed over 75 tree species that they maintain for shade, ecological benefits, household use, or other cultural reasons. Producers discussed livelihoods benefits including firewood, fruit, and timber, as well as cultural values like environmental quality (ecosystem services) and the livelihoods of future generations. The use values reflect findings in previous studies conducted in the region (Bacon 2004; Méndez et al. 2010); however, the cultural importance of shade trees to community identity has rarely been addressed (Ibnu et al. 2015). Notably, producers did not discuss UNECAFE membership nor certification as motivations for maintaining shade trees. Plot-level measurements of tree species biodiversity and shade canopy cover showed no difference between RA-certified, cooperative-organized plots and plots belonging to independent producers. This

reinforced findings in qualitative results that imply that producers' management strategies do not differ based on cooperative affiliation.

These findings indicate that it is household uses and cultural values of trees, rather than certification or cooperative membership, that influence their decisions and preferences regarding shade tree management. Further, there was no difference in species diversity, canopy closure, or shade management strategies between RA-certified UNECAFE *socios* and Independent producers. Results from this study contradict findings in other research, where producers organized with cooperatives were found to have better shade management practices than those who sell to private buyers (Giuliani et al. 2017). This suggests that certification and cooperative membership does not induce changes in shade management practices; rather, it is pre-existing management strategies and cultural values of shade trees that allow for certification (Bose et al. 2016).

9.1 *Supporting Livelihoods*

Shaded coffee plots are an important element of multiple-use agroecosystems that shape local ecology and livelihoods in Teotepec, as in other coffee-producing landscapes across southern Mexico (Perfecto and Vandermeer 2010; Bacon et al. 2010). As smallholder peasant farmers, producers have few other resources (assets or capitals, in the livelihoods framework) to support their livelihoods apart from coffee plots, *milpa*, or other *rancho* land (Jha et al. 2011). Thus, shade coffee plots are much more than simply sites of coffee production. Shade trees offer key products that coffee-producing households rely on to meet their daily needs, that they do not have to use limited resources to purchase, and which may provide additional sources of income (SO5;IND6; Toledo et al. 2003). Only one producer in Teotepec has a plot in sun-grown coffee, and even this plot is a polyculture including short tree and shrub species with multiple uses. Further, no other producer discussed any intent or desire to remove a large amount of shade, indicating that producers do not consider sun-grown coffee to be a viable management option (Eakin et al. 2012). Elsewhere in Oaxaca, smallholders have been found to have neither the resources nor the desire to convert to sun coffee, because it would mean losing access to the other resources that shade coffee plots provide, and that households therefore do not have to purchase (Jaffee 2007).

In addition to material benefits, producers considered a complex set of criteria regarding species' suitability for coffee, including quality of shade, leaf litter, growth rate, and impact on disease incidence (Lorena Soto-Pinto et al. 2007). Some of the species that producers preferred for shade (permanent and temporal), soil health, and water conservation (*G. ulmifolia*, *Saurauia spp.*, *S. andina*, amongst others) have not been documented in similar studies in the region. While determining whether these species are endemic to the region was outside the scope of this study, the detailed knowledge of maintenance and use of these species indicates that producers have experimented with different species throughout the history of coffee cultivation.

Moreover, such specificity indicates complex ecological knowledge that has been developed locally and passed along, rather than learned from an outside technician. One participant explained the complexity of his strategy of determining shade composition in contrast to the advice from UNECAFE or government technicians. While he considered the steepness of the slope, proximity to water source, and location of particular trees relative to the summit, the technician merely told him that he “had too great of tree density and needed to regulate shade,” (RA11). The tendency of outside technicians to follow prescriptive recommendations rather than incorporating producers' specific practices undermines local knowledge and results in their advice being regarded as illegitimate.

Maintaining shade is considered an important strategy to decrease risks of production, as plants are not exposed to sun damage and do not require external chemical inputs to remain productive. Thus, retaining shade trees gives households the flexibility to adapt to changing circumstances, be it economic stress of low prices or the shocks of extreme weather events that could damage harvest (Tucker et al. 2010). In considering these factors, producers sometimes make compromises in selecting tree species to favor or remove. Some species that are preferable for their use or cultural value are detrimental to coffee production, notably oak and pine species. Producers held context-specific knowledge of unsuitable species similar to preferred species noted above; many of the oaks found in plots have also not been noted in previous studies. Yet, they are explicitly incorporated into Chatino language in a manner that reflects their use; one oak species, “oak of the earth” (*encino de tierra*, or *jka-yüü*) was so named because it decomposes better than other oaks, and is less preferable for firewood. The prevalence of these “unsuitable” species supports producers' explanations about what other resources they obtain from shade

trees. This tradeoff corroborates trends in other smallholder coffee communities where producers have retained shade cover over their coffee (Bacon et al. 2010; Jha et al. 2011; Ibnu et al. 2015).

Interview participants from both groups did not discuss advantages or risks of shade trees that were distinctly different, nor did they report different management strategies. This indicates that UNECAFE membership, technical recommendations, and RA certification are not important factors in producers' decision-making practices. Based on producers' stated motivations for maintaining shade species, certification is unlikely to induce change in production practices (Blackman and Naranjo 2012). While this is beneficial from an ecological standpoint as producers leave more forest intact, in other contexts it could result in a reduction in forest cover or continuation of "shade in name only" production (Barham and Weber 2012).

Rather, the diversity and richness of tree species reflects the needs and livelihoods assets that each individual household has access to (Méndez 2013). Species composition also reflects previous land uses and the time that the particular plot had been planted in coffee. Although the small transect sample size precludes statistical analysis, there was an apparent difference in species composition and canopy complexity between plots that had "always been in coffee" (i.e., primary forest) and those that were in secondary succession transition. Producers whose coffee had been in *milpa* explained that they "rested" the plot for a few years to let early-transition shade tree species grow, then cleaned the plot before planting coffee and suitable long-term shade species. This strategy of managing and enriching natural succession also required less investment on the part of the producer, reducing production costs (Tuinstra and Deugd, n.d.). Recognizing the role that landowner management plays in the future biodiversity and species composition of forests in this region will be important for future conservation or development initiatives (Lorena Soto-Pinto et al. 2007; Millard 2011).

Participants demonstrated complex local knowledge about shade coffee plots and changes in their local environment. Producers considered attributes of tree species, specifically regarding water quality, soil conservation, and interactions with coffee pests and diseases (Lorena Soto-Pinto et al. 2007). Participants provided particularly detailed considerations of their management strategies on water quantity and quality, preferring to leave much of the canopy intact because it was beneficial for rainfall and ground water (RA1,4,12; Cerdán et al. 2012). Producers also explained that they left trees closer to streams and springs, and preferred species with wider root systems in these spots because they stabilized the soil and prevented erosion. This level of place-

specific knowledge is beyond the detail of recommendations they receive from UNECAFE, though it is shared with the best management practices that UNECAFE, RA, and other case study findings (Cerdán et al. 2012). By examining where there are congruencies between recommendations and local knowledge, UNECAFE may be able to better identify where they may be able to most easily facilitate adaptations and which new technologies (for example, external inputs) will be least likely to be adopted.

9.2 *Sustaining Culture*

In addition to the material livelihoods benefits that shade trees provide, traditional coffee cultivation methods also support Chatino cultural sustainability. While there is a large body of research on material benefits of shade grown coffee farms, there is very little on the environmental attitudes of coffee-producing communities and the cultural values that they may assign to agroforests. Across indigenous communities in Mesoamerica, complex agroforests or “forest gardens” have been traditional subsistence land uses for millenia (Hecht 2010). Integrating coffee into these systems was congruent with traditional values, because as a shade-tolerant crop it can be incorporated into existing forest cultivation practices (Toledo et al. 2003). In Teotepec, this has also allowed the cultural connection to forests and trees to persist, an ethic that continues to inform how producers manage their coffee plots.

The importance of tree species is tied to Chatino culture and is reflected in their local institutions. At least ten years before the coffee crisis (1970s), most of the forest around Teotepec was predominantly pine forest (*Pinus pseudostrobus*), but forest cover was gradually degraded as residents cut down pines for timber. Producers discussed the prohibition by *Bienes Comunales* on cutting down pine trees and large individuals of other species in order to prevent deforestation. It is possible that, given the strength and severity of the crisis, the community has prioritized food security (increasing *milpa*) over retaining forest cover, and therefore has not passed regulations preventing individual plot conversion. Although interplanting coffee under pine trees is detrimental to yields due to the acidified soil, these particular trees are of greater importance to the community than coffee yields (Soto Pinto 2000). The community has also restricted the area of communally-owned (*ejido*) land that can be used for agricultural purposes, in order to protect the territory’s forest integrity. Although such *ejido* protections are not common, they are not unheard of in Oaxaca (Ventura-Aquino et al. 2008; Hite et al. 2017). The

value that the community has placed on intact forest ecosystems has limited other livelihood options, as agriculture for subsistence or sale cannot be expanded. The limitations on land area have contributed to coffee intensification as one coping strategy, as producers seek to maximize planting density on their plots (UNE3; Chambers et al. 1992). However, these restrictions have also allowed the community as a whole to retain the integrity of its forests, and cultural ties to the ecosystem. Producers converted many plots closer to Teotepec to *milpa* and pasture for subsistence and survival, but were prohibited from expanding into communal forest farther to the north and west, so those areas have remained more intact (see Figure 8.3).

Participants emphasized the value of trees for future generations, demonstrating a desire for the future sustainability and strength of their community and culture. The effects of the coffee crisis and flow of migrant labor to the United States, and the preference of youth to seek opportunities outside of agriculture, has eroded the strength of this “culture of planting” (RA2,12,19; IND6). It is possible that such community-wide changes have increased producers’ desire to continue to invest energy in maintaining coffee forests, in order to emulate and preserve these practices.

In addition to the products derived from shade trees themselves, coffee plots were a source of non-timber resources that contribute to livelihoods. These may define seasons, as with *chapulines* (grasshoppers) or *chicatanas* (ants) that emerge in the dry or wet seasons, respectively, which are an important traditional food source as well as the marker of local festivals. Producers also gather specific roots (*camotes*, yucca roots), *quelites* (wild greens), and *huitlacoche* (edible corn fungus) in specific seasons, for use in traditional dishes or ceremonies. While this study did not seek to document the links between agrobiodiversity and Chatino cultural practices, it was clear that shade coffee plots supported more than the material aspects of producers’ livelihoods (Toledo et al. 2003).

All but ten of the identified tree species had names in Chatino, and all those with local names were considered “tolerable,” though not beneficial, for coffee production. Further, there were only two species encountered in transects that the producer could not identify by any common name (Spanish or Chatino). These findings indicate a high level of producer knowledge of local biodiversity, and a more detailed link between language and plant diversity than has been documented in similar work in the region (Aguilar-Støen et al. 2013; Soto Pinto 2000).

Not only are coffee forests important to sustaining Chatino culture, but coffee itself has come to play a prominent role in daily life and individual identity as a Teotepec Chatino. In this community, as in other rural indigenous communities in Southern Mexico and into Guatemala and Honduras, “indigenous knowledge has literally appropriated an exotic crop” into polycultural forest garden systems (Moguel and Toledo 1996). In addition to the ease with which it is integrated into traditional subsistence cultivation, coffee is central to daily life in Teotepec. Everyone—adults and children alike—drinks coffee with nearly every meal, prepared weak and sweetened with *panela*, locally-produced sugar (Jaffee 2007). Many community members that I spoke with, across age groups and occupations, believed that coffee would always be produced in Teotepec because of how central it has become to Chatino culture (RA1,2,12,23;SO6;IND6,7; (UNE1,2). Even if prices dropped further, producers would still harvest enough for their households and to trade within the community (Jaffee, 2007; Margarita Fernandez et al. 2015). Many of the younger residents of Teotepec are motivated to turn their community into a regional tourist destination, based on the ecological value of their forests, Chatino culture, and the production of high-quality coffee (RA2,7,12,23). Maintaining the integrity of shade coffee forests would be integral to achieving this vision.

9.3 *Shade Coffee Conservation: What Role for Cooperatives and Certifications?*

Producers in Teotepec have traditionally maintained shade cover, comprised of a highly biodiverse species composition, on their own accord, without incentives or recommendations from government extension technicians, UNECAFE staff, or specialty certifiers. Participants from each group interviewed were accustomed to receiving recommendations to regulate shade within their coffee plots. However, these recommendations often run contrary to producers’ local environmental understanding and cultural values. They have preserved dense, diverse shade cover *in spite* of what would be considered ‘agronomically beneficial’ and which would result in higher yields, and higher incomes, from coffee (UNE3,4). The strength of traditional environmental knowledge and cultural values of shade indicates the need for cooperatives and conservation and development incentive programs to incorporate local practices into planning and projects (Méndez et al. 2010).

None of the interview respondents, from any of the producer groups, discussed UNECAFE’s recommendations or certifications as a reason that they kept shade cover intact on

their coffee plots. In Teotepec, producers already have strong cultural ties to their forests and endogenous motivations for maintaining shade trees, for the multiple material and cultural benefits that they provide. This reflects the persistence of established coffee production practices and a resistance to changing cultivation strategies (Mercer 2004). More importantly, it points to limitations of cooperatives and certifications to change production practices (Bose et al. 2016). For RA certification specifically, it indicates that certain criteria are too rigorous, and the incentives too weak, for many smallholders or cooperatives to participate (UNE3,4). In Teotepec, it is not environmental practices but rather social and participation criteria that preclude certification across the entire community. Rather, these findings suggest that certifications are rewarding conservation production practices, however limited the benefits may be, but that they are ineffective at increasing social or participatory capacity amongst smallholders

The 180 RA-certified producers in Teotepec are the *only* smallholders in Mexico with RA certification (Figure 3.3). Further, according to cooperative staff, the only reason that some producers in the community are able to retain certification is due to pre-existing conservation practices, shade management, and higher capacity for community organization (UNE3). Global-scale conservation NGOs could potentially improve program outcomes by partnering with cooperatives that already have rapport with producers, understand their livelihoods strategies and needs, and have the capacity to administer such projects (Altman 2015; Ibnu et al. 2015). Alternatively, in places like Teotepec where the cooperative is not local, outside organizations may support such institutions in changing structures and approaches to better serve producers' interests and involve them in cooperative management.

As has been consistently indicated in previous research on coffee cooperatives that administer certifications, there is a need to work closely with local communities to adapt broad-scale conservation initiatives to context (Bacon et al. 2008). Producers in this study demonstrated complex knowledge of shade trees that provide multiple benefits, and a strategy to manage both primary and secondary successional forests for coffee and livelihoods. This knowledge needs to be valued as a resource, and incorporated into conservation plans (Lorena Soto-Pinto et al. 2007). In comparison to global-scale NGOs that design certifications or other conservation incentives, cooperatives like UNECAFE have enhanced understanding of context and the factors that influence producer decisions (Vignola et al. 2015). Cooperatives therefore are in a unique

position to adapt external resources to local context more effectively than the international NGOs themselves, to the extent that they are able to establish and maintain trusting, accountable relationships with local communities (Giuliani et al. 2017).

In Teotepec, one tangible strategy for cooperatives and international conservation NGOs (such as the Rainforest Alliance) to support producers' maintenance of shade coffee systems is to invest in product diversification. Producers in Teotepec already obtain a variety of fruit from their coffee plots to support household food security, consistent with smallholder coffee communities across the region (Bacon et al. 2014; Babin 2015; Morris et al. 2013). Further, producers expressed both receptiveness and motivation to incorporate other food crops into their coffee plots at a scale beyond simply subsistence (RA12,20;SO5; IND6). Most of the loss of forest canopy in Teotepec and across the region has not been due to conversion to sun coffee, but rather abandonment of coffee and planting *milpa* or pasture because of drop in coffee income (Jaffee 2007). Thus, an effective conservation incentive that addresses livelihood sustainability would invest in products that can be incorporated into traditional shade systems and which have local market demand.

One producer explained that her husband's family, in Chiapas, had worked with their cooperative to install beehives in their plots. Bees provide multiple benefits as well, including pollination services that enhance coffee harvest (Ricketts et al. 2004) and alternative income, through honey and value-added honey products (beeswax candles, soaps, and other cosmetics) (Toledo and Barrera-Bassols 2017). There is already local demand for these products in Teotepec, and growing markets regionally. Other opportunity may exist for products processed locally to add value, such as dried fruit, cinnamon or cacao. Fresh fruit also has high local demand, and many residents prefer to purchase what has been grown within the community. In Teotepec, avocados for local consumption have the potential to be incorporated into shade coffee plots and provide a profitable income stream for producers. One interviewee who grew avocados to sell in Teotepec explained that a typical harvest yielded about 5,000 kilograms (100 kilos per tree, in an orchard of 50 trees), and he could sell his harvest at about 40 pesos per kilo, for an annual income of 200,000 pesos. He sells his crop only within Teotepec, marketed to the community via loudspeaker, and typically sold out within the day of harvest (pers. obs., IND6), suggesting opportunity for expansion to other producers.

Identifying other products that can also be integrated into existing cultivation systems and which have similar local demand could be a viable adaptive strategy. Community members explained that they preferred to purchase crops (fruit, *maíz*, beans, *panela*) that had been grown within Teotepec whenever possible, even if they were more expensive; these products were regarded as more nutritious, more flavorful, and were more likely to be organically grown (RA2,7,12,23; IND2,7; UNE1). Many producers already cultivate some produce, and have taken advantage of government impulses for avocados and greenhouses, suggesting motivation to invest labor and money into agriculture. Further, not all residents are engaged in subsistence agriculture, indicating that there could be sufficient local demand for products integrated into coffee agroforestry systems. However, the question of whether local demand and price points for given products would either cover costs of production or the quantities produced remains, and warrants further participatory research and trials for specific products.

9.4 ***Conclusions: Implications for Policy and Directions for Future Research***

Results from interviews and plot-level measurements support conclusions in other studies that traditional shade coffee agroforestry systems have the potential to conserve species biodiversity while simultaneously supporting livelihood adaptations (Méndez 2004). In Teotepec, producers maintained a diversity of native tree species beneficial for coffee cultivation, but which they also valued for a variety of ecosystem functions. The range of species that they manage have advantages for livelihood strategies, providing goods that as a result do not need to be purchased, and by enhancing household security during times of economic stress or shock. The detailed and highly contextual knowledge that most producers hold about local species uses and values adds to our understanding of local knowledge and practices in indigenous coffee-producing communities (Soto-Pinto et al. 2007; Toledo and Moguel 2012; Cerdán et al. 2012; Jha et al. 2011). Improving resources that support traditional management practices and facilitate sharing site-specific knowledge with new producers is necessary to ensure livelihood sustainability and conservation benefits of shade coffee systems over the long term.

As was evident in interviews and supported through transect measurements on certified and non-certified plots, cooperative membership and participation in certification programs did not influence species diversity or shade canopy closure. This supports findings in other studies that indicate certification does not significantly influence shade management practices (Bose et

al. 2016). Further, certifications and cooperative affiliation have not resulted in reducing shade cover for potential agronomic benefits due to local values that would be lost. Revising certification standards should provide livelihood support that is appropriate to context, reflecting particular communities' site-specific uses, values, and motivations for conserving their natural resources (Calo and Wise 2005), including shade cover. For communities that have pre-existing desires to maintain native forests, certifications and cooperatives should shift their focus to supporting traditional management practices. Moreover, participants in this study emphasized making progress toward community food security, through increased cultivation of fruits, vegetables, and *milpa*, before developing crops for export markets. This likely reflects their experience with the coffee crisis and the risks of being predominantly dependent on commodity prices for income. Although the food security or food sovereignty approach to agricultural production may result in lower incomes, it may contribute to more positive outcomes for household and community sustainability. Future assistance programs need to incorporate producer preferences of crops or other non-timber forest products, which reflect local cultural and ecological knowledge.

The conservation focus of Rainforest Alliance certification and the mission of UNECAFE are congruent with the Teotepec's ethic of environmental care. This suggests that partnerships between RA, UNECAFE, and the community have the potential to realize important conservation gains. In order for global-scale certifications to support communities that already have strong conservation practices, resources need to be appropriate to local contexts and household needs (Jha et al. 2011; Morris et al. 2013; Bacon 2013). Increased extension support and training on cultivation practices that are adaptable to local ecology and minimize risks from disease, storms, or drought could be particularly useful (Hausermann and Eakin 2008). In Teotepec, as across other coffee producing communities in Oaxaca, increasing support for forest product diversification for household incomes could help producers survive coffee commodity price swings (Eakin et al. 2012). Initiatives directed to support product diversification in Teotepec are likely to be met positively, as producers express interest in and desire to plant additional tree species with local market demands (RA1,7,12,19,22;SO5,6,17;IND76,7). In this region, most of the loss of forest canopy has been due to conversion to other land uses, like *milpa* or cattle grazing, that producers think will be more beneficial to meet household needs. Policy programs that seek to support conservation need to provide sufficient direct advantages for

livelihood security and sustainability to avoid conversion to other land uses (Méndez et al. 2010; Jha et al. 2011).

This study suggests opportunities for future research on local ethnobotanical knowledge in the Sierra Chatina of Oaxaca. There are no other studies in the published literature that document material uses, local knowledge, and cultural significance of forests in Teotepec, and in Chatino culture more generally. Producers in the community demonstrated deep knowledge of local ecology, specific tree and other plant species, and motivation to continue forest cultivation even when it was not necessarily economically profitable to do so.

10 CONCLUSIONS AND RECOMMENDATIONS

This research analyzed the range of responses coffee producers in Teotepec have adopted in reaction to the coffee crisis, explored producer perceptions of opportunities and constraints of cooperative membership, and evaluated the impacts of cooperative participation on producer livelihoods. The study also documented traditional shade-grown coffee cultivation practices including how they contribute to livelihood security and the role that certifications play in shade management decisions. Results reveal that coffee producers in Teotepec face common social, economic, and environmental challenges that profoundly affect livelihood strategies, regardless of affiliation with the cooperative UNECAFE. While cooperative membership and associated certifications confer some benefits to producers (e.g., coffee plants, materials, higher prices, and extension resources), they are regarded as insufficient, inappropriate, and do not incorporate rich local knowledge and practices. Interview responses reveal that producers rely on shaded coffee plots to support their livelihoods. These practices have helped producers adapt to the coffee crisis by providing material uses and other benefits to buffer households against economic change. Drawing on these findings, it is clear that addressing structural challenges in cooperative management, matching support programs with livelihood context, and incorporating traditional ecological knowledge and customary practices and institutions are critical components in certification programs or other conservation and development initiatives.

10.1 *Conclusions: Producer Responses to Crisis*

Coffee producing regions of Oaxaca rank high on global measures of biocultural diversity, and the management practices on coffee farms impact both ecological and community

sustainability (Bray et al. 2002; Hite et al. 2017). Yet, the scale and magnitude of the coffee crisis continues to threaten producers' livelihood security and traditional land management strategies (Bezaury 2007; Jurjonas et al. 2016). In Teotepec, producers responded primarily through reactive, coping strategies (i.e., income diversification, migration, and shifting land use) in an attempt to survive the crisis, with little capacity for proactive adaptations. Diversifying income sources from off-farm work within the community has been the easiest adaptation, as it does not require large investment of resources and is easily reversed if they do not increase livelihood security (Eakin et al. 2016). Moreover, diversification also has the greatest potential to be adaptive and increase household resiliency to future shock and stress. Producers who diversified were able to take advantage of other opportunities within the community, such as skills in modern carpentry, electricity, internet and technology infrastructure, and veterinary services, and thereby reduce dependence on external markets and price volatility. Such activities increased household adaptive capacity by developing more reliable cash flows that allow producers to more easily respond to local demands and external markets and climatic drivers (Carpenter and Brock 2012).

Out-migration, however, has had mixed effects, in some cases negatively impacting livelihood security and, for some households, increasing vulnerability due to the loss of labor available for coffee and other livelihood activities. Migration requires significant investment and risk, and has a high likelihood of failing to provide increased cash flow or food security (Robson and Berkes 2011; Cohen 2011). In Teotepec, the scale of migration (mostly to the US) has been maladaptive at the household and community level as it has required many producer households to hire workers at unaffordable high daily wages. The community as a whole has lost so much of its working-age population that labor cost and availability are significant constraints on producers' ability to maintain coffee production (Barnett and O'Neill 2010). In addition, migration has eroded community sustainability, as it has contributed to the loss of Chatino knowledge, language, and ways of life. Few young people are entering coffee production or taking over responsibilities from their parents, preferring instead to seek better incomes and livelihoods elsewhere, as has occurred in other coffee communities in Mexico (Renard 2010). Future studies would benefit from focusing on how younger generations have experienced the coffee crisis and scale of change in the community, particularly those who remained and who returned, and their motivations for doing so. Such investigations could illuminate how local

knowledge is being transferred, or not, and explore opportunities to facilitate community sustainability in the face of migration.

Although this study did not take a critical gender perspective, the prevalence of female producers means that the specific constraints that they face need to be factored into the overall analysis. As male out-migration continues, women are likely to increasingly become the heads of household and primary coffee producer such that incorporating them into site-specific projects will be increasingly important. Currently, women do not occupy decision-making positions in local government (*Bienes Comunes*), but their roles may change if trends continue. Building relationships with female producers may require different strategies than working with male producers, particularly with regard to what has been termed “time poverty” in cooperative governance (Lyon et al. 2017). Female producers are already occupied with productive coffee labor, as well as reproductive (household) labor responsibilities, so soliciting their participation in leadership or governance in cooperative programs adds another burden on their time. Incorporating their perspectives and specific experiences is critical, but requires a nuanced understanding of the constraints they face in decision-making.

Consistent with other research on rural, indigenous smallholder coffee communities in Mesoamerica, producers in Teotepic responded to the crisis by changing land use strategies (Eakin et al. 2012; Aguilar-Støen 2017). By converting coffee plots to *milpa* or livestock, producers have attempted to enhance food security and increase resilience against future risks. While converting coffee agroforests to other uses is ecologically undesirable, it indicates that producers are seeking to improve food security through subsistence agriculture and bolster livelihood sustainability by reducing their dependence on the coffee export market. However, this response may prove to be maladaptive at the household and community scale in the long term. Removal of shaded coffee forests can result in increased erosion, altered local weather patterns, and reduced soil fertility and productivity (Haggard et al. 2013).

10.2 *Integrate local preferences into conservation and development plans*

Programs that build upon and support traditional forest and land management knowledge and customary resource governance could contribute to ecological and cultural conservation in this region. Such programs should support existing diversification strategies and focus on products that can be produced within traditional shade coffee systems, and which are congruent

with local, or indigenous, customary institutions. Participatory research is needed to explore opportunities for products that are appropriate to ecological and cultural contexts, and for which there is clear local interest and market demand. Interviews and informal conversations revealed that many households in Teotepec are interested primarily in production for local household and community needs first, and then for regional or international markets. Projects built upon local demand are more likely to result in producer investment than those focused on other export crops, such as cacao, as UNECAFE is currently exploring, or cinnamon, or vanilla. While this approach may be less financially lucrative, it is likely to be more successful because it is context appropriate. Such a development strategy would also require significant investment in participatory research, materials, and extension technology for each product in order to develop a strategy that is context-appropriate.

10.3 *Increase local representation and community-based resources from cooperatives*

Collective action through cooperative organization is one strategy that can help smallholders adapt to changing economic or ecological circumstances (Marcos-Matás et al. 2013; Bro et al. 2017). Participants in this study joined UNECAFE to address persistently low coffee prices and the withdrawal of state support for coffee production. While UNECAFE does manage specialty certifications and other support programs that have provided some access to higher priced markets, adaptive cultivation methods, and aid for disaster recovery, these benefits have serious limitations. As has been consistently documented in literature on farmers' cooperatives (Markelova et al. 2009; Altman 2015; Snider, Gutiérrez, et al. 2017), UNECAFE has had limited effectiveness because it is not based in the community, does not have local representation in management, and does not give producers a participatory role in developing or administering projects. These structural attributes contribute to a lack of trust between producers and cooperative managers and concerns over the legitimacy of information. If producers do not think that production practices will result in improved harvests, they are less likely to invest the resources necessary to implement them (Hansen et al. 2002). Though new approaches to cultivation may increase resilience to economic and climate changes, the benefits cannot be realized if producers do not adopt them. Future livelihood adaptation initiatives will continue to be constrained if structural limitations in cooperative administration are not addressed.

10.4 *Local representation and decision-making power for producers*

Thus, cooperatives need to increase local representation in management or give producers meaningful influence in developing projects intended to improve livelihoods. In cases such as this, the overall cooperative structure could remain outside the community, and still be effective, *if* producers were involved in making decisions about project planning and implementation that they understand to be of greatest benefit. This requires that cooperative management spend more time in communities and facilitating workshops with producers, but would be more likely to result in stronger relationships and greater participation in the cooperative. This study also demonstrates the continued need for partner NGOs and government agencies to invest in building capacity within cooperative organizations as a keystone objective in conservation and development initiatives.

While there are significant constraints to UNECAFE's programs, the organization has adopted some strategies to increase support for producers in its partner communities. They provide local employment for one year-round technician, and seasonal employment for others, which both extends cooperative capacity and helps build relationships with producers. One key benefit of UNECAFE membership that producers value is access to technician support. The cooperative could further develop capacity among producers by working with those already identified as amenable to new production practices and who implement new information relatively independently. UNECAFE has already identified producers who are "early adopters" of sustainable cultivation practices but has not fully implemented a "farmer-to-farmer" or promoter model. This approach has been consistently documented in agricultural development and adaptation literature as an effective approach to disseminating knowledge and conservation-based technologies (Cochran and Bonnell 2005). UNECAFE could enhance trust and sustainability by establishing demonstration plots to test locally appropriate strategies and build trust amongst producers (Morris et al. 2013). There is opportunity in Teotepec for applied conservation and development research to incorporate these concepts and explore strategies for implementing them in partnership with producers and the cooperative. More broadly, initiatives from either the coffee or conservation sector that seek to increase adoption of sustainable or adaptive practices need to support best management practices documented in case study literature (Eakin et al. 2006a; Bro et al. 2017; Glasbergen 2018).

10.5 *Certified prices reflect true production costs*

While cooperative membership and certifications have resulted in coffee prices higher than conventional markets, for many producers in Teotepic coffee is still not profitable. Prices remain lower in real terms than before the crisis, and the cost of labor has risen such that most producers are unable to invest in practices that could enhance production and sustainability. Secure income is crucial for livelihood security, and households will likely seek other income sources if coffee remains unprofitable. In order to improve livelihood security, certifications must ensure prices reflect the cost of production (Ric Rhinehart SCA podcast). Future research that addresses smallholder economic sustainability through policy or market mechanism should incorporate producers' preferences or motivations in cultivating coffee, and what they would envision as fulfilling their livelihoods needs.

10.6 *Build capacity for participation amongst cooperatives as well as producers*

A key conclusion from this research is that cooperative management and structures can limit benefits that producers experience from certifications. For smallholders without sufficient resources, knowledge or capacity to access certifications on their own, it is critical that cooperatives manage such programs effectively (Pinto et al. 2014). If cooperatives lack the capacity or organizational structure to assure certification benefits, these already limited schemes will be of little value to producers (Morris et al. 2013). Similarly, research that only focuses on certification schemes and not the institutions through which they are administered will provide only partial understandings of *why* programs are insufficient or inappropriate. Some studies conducted during the worst years of the coffee crisis examined cooperatives' roles in managing certifications (Bacon 2004; Méndez 2004; Murray et al. 2006; Jaffee 2007), yet most studies do not critically analyze these institutions (Bacon et al. 2008; Rueda and Lambin 2013; Pinto et al. 2014; Bose et al. 2016). Applied conservation and development projects that target smallholders will face similar barriers if cooperative institution structure and governance are not addressed. For NGOs such as the Rainforest Alliance, more attention needs to be given to actually building capacity within the organizations that manage existing certifications, rather than continually developing new certification criteria.

10.7 *Place producer livelihoods as primary focus*

This study suggests that changes in cooperative and certification management and structures could increase producer benefits from participation. For both UNECAFE and third-party certifiers, without a sustainable supply of high-quality coffee, they “would not have a reason to be” (UNE3). This perspective automatically places the focus of initiatives and programs on the *product*, rather than on the *producer* and their need for secure livelihoods. Participants in this research made it clear that while certification programs have allowed some to remain in coffee, they have not made an appreciable improvement in their household livelihoods. If certification schemes or other integrated conservation and development projects seek to improve livelihood security and sustainability, they need to focus on smallholders’ realities and needs *first*, and the product secondarily (Martínez-Torres and Rosset 2014; Bacon et al. 2014). Specifically for this study, UNECAFE and the Rainforest Alliance need to prioritize producers’ livelihoods, as envisioned by producers themselves, and then on the products that may be part of this overall strategy. This may mean that the most appropriate and sustainable livelihood strategies do not include coffee, or that smallholders identify factors that constrain coffee production are not addressed in current certification foci. Making smallholders’ needs and experiences the focus of projects will increase the likelihood that they enhance sustainability and adaptability of producer households and communities.

10.8 *Solicit producer solutions to their own livelihoods needs*

Producers in this study offered a range of ideas about the types of resources that would benefit their livelihoods, both directly related to coffee production and overall community development. Coffee processing infrastructure (*patios* for drying, mills, a silo for storing dried coffee), group meeting spaces, and demonstration or test plots were frequently mentioned as necessary improvements. Other suggestions were related to knowledge and capacity-building, in the form of more workshops that teach crop diversification, cultivation practices for higher quantity and quality yields. Some participants explained that the challenges of coffee production, particularly rock-bottom prices, had demoralized the community, and that building up Teotepec as a destination on the local coffee agroecotourism routes would re-energize producers. Community members often have well-developed ideas such as these about projects that would result in improvements to their livelihoods. By valuing and incorporating this type of local

knowledge, cooperatives like UNECAFE would be better informed about what types of projects would garner support and thereby be more likely to be implemented.

10.9 *Incorporate traditional knowledge and values into certifications*

Finally, this study documents the material and cultural motivations and practices for maintaining rustic, shaded coffee agroforests in Teotepec, and the influence that cooperative membership has on management decisions. As has been documented in other studies on the multiple benefits of traditional shade coffee systems, smallholders relied on shade trees for a variety of material household needs as well as marketable products that aid in adapting to economic shock and stress (Méndez 2004). Producers also recognized complex ecological benefits from shaded systems which are congruent with local cultural traditions (Jaffee 2007; Martinez-Torres 2006). Previous research has primarily focused on material uses and ecological benefits of shade trees, with less attention to the deeper cultural ties of shade-grown coffee systems. These culturally specific relationships present opportunities for ecological certifications and conservation initiatives that build upon existing values, traditions and institutions. Focusing on communities such as Teotepec in conservation and development efforts is pragmatic as they would not have to transform management activities to the same degree as communities and cultures that lack or have lost traditional ecological knowledge and practices. All conservation and development efforts need to incorporate the local, site and culturally specific spectrum of uses and values of shade coffee systems and explore strategies that reflect, support and build upon traditional knowledge and practice.

10.10 *Opportunities for future research*

The degree of local ecological knowledge and strength of local governance institutions in Teotepec exhibit characteristics of adaptive, resilient systems. Notably, shade coffee management in Teotepec reflects local context, incorporates a diversity of resources to increase livelihood security and minimize risk, and fits within a management system that is “locally crafted and socially enforced by the users themselves,” (Berkes et al. 2000: 1259). While this study did not incorporate resilience theory, the results raise interesting questions for future research. Further investigations regarding how traditional values and natural resource management systems in smallholder coffee communities impact household vulnerability and

resilience could provide interesting insights into how conservation and development initiatives might support existing knowledge and practice.

Current trends in the coffee market and climate change suggest that depressed coffee prices are likely to continue (ICO 2018) and that impacts from disease and severe weather events will continue to constrain production (Bunn et al. 2015; Avelino et al. 2015). The ability to respond to continued economic stressors and climatic shocks will be critical to future household livelihood security, and may require stronger outside partnerships to access resources to facilitate adaptive management. In light of the gloomy economic and ecological outlook for the coffee sector, it is essential to support strategies appropriate to local contexts. For smallholders in communities like Teotepec where income and product diversification have been locally developed, assisting producers in accessing markets for other products compatible with shade coffee systems may be valuable. Such partnerships need to involve producers in all aspects of project development, support projects appropriate to local livelihood contexts, and incorporate local knowledge in order to meaningfully benefit smallholders and their communities.

11 REFLECTIONS: LIMITATIONS AND POSITIONALITY

This study comprised in-depth research of one coffee-producing community in southern Oaxaca, Mexico. I chose to use qualitative methods, particularly semi-structured interviews, to capture a deeper understanding of the daily realities of marginalized, indigenous smallholders and the dramatic transformations in livelihoods that have resulted from the coffee crisis. Smallholders' perspectives continue to be sidelined in the coffee industry and discussion of specialty certifications, though these are the very people that such programs are intended to benefit (Ibnu et al. 2015). Qualitative methods allowed for greater flexibility and more nuanced understanding than quantitative methods to analyze how the coffee crisis has changed producers' livelihoods and the community of Teotepec as a whole. Semi-structured interviews facilitated detailed discussion of opportunities and constraints of membership in UNECAFE, which illuminated the nuances of trust, accountability, and transparency in the relationship between the cooperative and producers. A qualitative approach was appropriate for developing themes that seek to put producers' preferences and experiences at the center of research and discussion about the benefits of certifications. Yet, this study was not without limitations that may have impacted the results.

Research in international contexts invariably brings challenges that influence data quality and reliability. Language and interpretation are important factors in critical social science studies, and the researcher must consider the merits and effects of research conducted in a second language. I completed all interviews (and PO data) in Spanish, and only used an interpreter in the instances where the producer spoke only Chatino. I chose not to use a Spanish-English interpreter in order to facilitate trust with producers, and to reduce the levels of data interpretation. This proved to be quite challenging, because although I am proficient in Spanish and had lived in a Spanish-speaking country before, it is still my second language. Although I took measures to address this limitation, notably by piloting and recording interviews, it still likely affected data collection, interpretation, and analysis.

There were some interviews with producers who spoke only Chatino, in which I did need to use an interpreter to translate into Spanish. Like many other indigenous languages, Chatino is very place-based, and some concepts do not translate readily. Thus, while I sought rich and accurate descriptions from participants, sometimes these proved challenging for my interpreter to convey. I used either a trusted family member or one particular community member who was familiar with coffee production but unaffiliated with UNECAFE as an interpreter. It is possible that this person introduced their own biases into the interpretation process, perhaps skewing interview responses in a manner that reflected their opinion rather than that of the producer.

Another limitation to this study concerns my position in Teotepec. I had been informed prior to beginning fieldwork that the community was accustomed to international visitors who were invited by UNECAFE, but I was only the second foreign researcher to live in the community. As described throughout this study, many undocumented migrants to the United States come from Teotepec which creates complex and uneasy dynamics for conducting research. While I attempted to keep interview topics germane to coffee, many invariably strayed into questions of inequality in immigration rights. Some producers were suspicious, because I was legally permitted to conduct research in their community with ease, but it was nearly impossible for them to travel to the US. Again, I attempted to address this challenge by building relationships with community members and having honest conversations about the local impacts of US-Mexico relations. While I had candid conversations and genuine interviews with producers, my role as a visitor from a position of power must still be accounted for as a factor in this research.

Another factor that warrants consideration was my decision to record interviews. I requested verbal consent prior to recording, and in only one instance did the producer refuse (in which case I took detailed notes). I explained to participants that the recorder was only so that I could accurately and completely relay producers' responses in their own words, which most participants were receptive to and appreciative of. Key informants told me that most adults were accustomed to being recorded for other projects, as linguists had visited Teotepec previously to document Chatino. I never had the impression that the recorder influenced interviews, as participants seemed to forget that it was there, yet it may still have affected respondents' willingness to provide honest responses. Some interviews could not be recorded due to logistical constraints, as they were conducted while walking around a producers' plot and using a recorder would have been inappropriate. Further, while I tried to conduct interviews in producers' homes to maintain confidentiality, sometimes household responsibilities would intervene and distract the participant from the interview. All of these factors may have impacted the quality and thoroughness of the data.

In light of what I learned about the contentious relationship between UNECAFE and producers, the manner in which I entered into the community may also have biased responses. It is customary to have an official introduction to many *ejido* communities in Mexico, either through an NGO, government agency, or academic affiliation, to gain official permission from local government to stay in the community. UNECAFE was my contact in developing this research, and staff accompanied me on my first visit to Teotepec to introduce me to officials, producers, and others. My affiliation with the cooperative seemed to be mostly positive, and producers often turned to me for logistical information on when meetings would be held, what coffee prices were, and when they would be purchasing coffee. However, given that not all *socios* had positive relations with the cooperative, it is possible that some producers did not want to fully share their perspectives. Further, throughout fieldwork, I stayed with a relatively prominent family, of which the female head of household was the only nurse in the community, and the male head of household was the current president of *Bienes Comunales*. The nurse was very respected throughout Teotepec, and while I never heard negative comments about *Bienes Comunales* members, it is their responsibility to mediate land and natural resource disputes. Participants may not have discussed their opinions or experiences as openly with me because of my association with such a prominent and locally influential family.

Throughout this study, I encountered limitations in the information that the cooperative was willing to share with me. I had hoped to integrate more complete information about how UNECAFE administers resources from certifications, in order to further develop how certifications benefit producers, but never received answers to these requests. My experience communicating with the organization verifies what producers told me about problems of poor communication, transparency, and accountability. One theme that I chose not to explore was the perception of corruption in how UNECAFE administers its programs. Although a number of participants made such claims, I did not feel it would be beneficial for the cooperative or this research, and could have jeopardized my position in the community and my other research interests, if I had asked more explicit questions about this. While I think I still received detailed, rich responses from participants, it is important to note that certain dynamics impacted UNECAFE's projects that I could not explore. When conducting work in sensitive communities with a history of tense relationships with outside actors, it is critical that researchers consider how these factors may influence the research project and results.

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APPENDIX A: TREE SPECIES FOUND IN COFFEE PLOTS IN TEOTEPEC, WITH LOCAL NAMES, USES, AND VALUES

Scientific Name	Common Name (Spanish)	Chatino Name	Primary Use	Secondary Uses	Tree/Shrub
<i>Quercus repanda</i>	Encino de cucaracha	jka squaá	F		Tree
<i>Quercus coccolobifolia</i>	Encino de tierra	jka yüü	F		Tree
<i>Quercus asistata</i>	Encino de lumbre	jka kyëé-kí	F		Tree
<i>Quercus sartorii</i>	Encino blanco	jka shchyé	F		Tree
<i>Inga jinicuil</i>	Cuajinicuil	jka ndá	S	FR	Tree
<i>Inga pringlei</i>	Cuajinicuil delgado	jka nda shkö	S	FR	Tree
<i>Inga spp. (I)</i>	Cuajinicuil de castillo	jka nda kíi	S		Tree
<i>Inga spp. (II)</i>	Cuajinicuil ancho	jka nda tnöó	S		Tree
<i>Pinus pseudostrobus</i>	Ocote/Pino	jka jityeé	T	S	Tree
<i>Clethra mexicana</i>	Mameyito	jka mtí shíi tum	S	T	Tree
<i>Pouteria sapota</i>	Mamey	jka jii-lá qüii-yää	FR	S	Tree
<i>Cecropia obtusifolia</i>	Guarumbo	jka kyëé muü	S	FO, R	Tree
<i>Guazuma ulmifolia</i>	Yacua	jka thá	S		Tree
<i>Cupania dentata</i>	Guanchal	jka slá kyää	S		Tree
<i>Ocotea caudata</i>	Aguacatillo	jka ssöö schó	S	FO, T	Tree
<i>Persea chiapensis</i>	Aguacatillo	jka ssöö schó	S	T	Tree
<i>Ocotea spp.</i>	Aguacatillo	jka ssöö schó	S	T, F	Tree
<i>Beilschmeidia mexicana</i>	Aguacate de Piedra	jka ssöö	S	FR	Tree
<i>Persea cinerascens</i>	Aguacate negrito	jka ssöö	S		Tree
<i>Persea donnell-smithii</i>	Aguacate criollo	jka ssöö	S	FR, FO	Tree
<i>Persea spp. (I)</i>	Aguacate delgado	jka ssöö	S		Tree
<i>Persea spp. (II)</i>	Aguacate blanco	jka ssöö	S	FR	Tree
<i>Salix spp.</i>	Sauces	<i>Local name unknown</i>	S	W	Tree
<i>Populus spp.</i>	Memeyín	jka memeyín	S		Tree
<i>Siparuna andina</i>	Palo de Conchuda, Limoncillo	jka snöö	S	R	Shrub
<i>Saurauia spp.</i>	Palo de Uva, Moquillo	jka ntí shnäá	S	FR	Shrub
<i>Calphyllum rekoi</i>	Palo de Humo	jka sníi	S	FR	Shrub

<i>Cordia alliodora</i>	Palo de pájaro	jka jníí	S		Tree
<i>Bursera simaruba</i>	Palo de mulatto	jka beé	S	R	Tree
<i>Solanum wrightii</i>	Cuernevaca	jka kuáh	S	FL	Shrub
<i>Sambucus mexicana</i>	Cinco negritos		S	FR	Tree
<i>Yucca mixteca</i>	Maguey		S	LF, FO	Shrub
<i>Diphysa robinooides</i>	Guachepil	jka ftyaá	FO	T	Shrub
<i>Macarium spp.</i>	Uña de gato, acacia		S		Shrub
<i>Cnidoscylus acotifolius</i>	Hoja de calabaza, árnica	jka shquá	S (I)	R	Shrub
<i>Cedrela odorata</i>	Cedro	jka la jyóó	T	S	Tree
<i>Tabebuia rosea</i>	Macuil	jka que tuaá	T	S	Tree
<i>Enterolobium cyclocarpum</i>	Parota	jka lacksú	T	S	Tree
<i>Platymiscium dimophandrum</i>	Hormiguillo	jka työ tiéé	T	S	Tree
<i>Tabebuia donnell-smithii</i>	Primavera		T	S	Tree
<i>Citrus sinensis</i> var.	Naranja-limón	jka shaá	FR	S	Tree
<i>Musa spp.</i>	Plátano	jka jüü-á	FR	S(I)	Tree
<i>Citrus sinensis</i>	Naranja	jka shaá	FR	S, R	Tree
<i>Citrus limón</i>	Lima	jka yumä	FR	S	Tree
<i>Citrus aurantifolia</i>	Limón	jka shtyié	FR	S	Tree
<i>Citrus reticulata</i>	Mandarina	jka shaá mandarina	FR	S	Tree
<i>Acrocomia aculeata</i>	Palma de corozo	jka mbyáá	FR	S; M	Tree
<i>Mangifera indica</i>	Mango	jka mango	FR	S	Tree
<i>Syzygium jambos</i>	Puma rosa	jka nsuí sliíya	S	FR	Tree
<i>Eriobotrya japonica</i>	Níspero	jka níspero	FR	S	Tree
<i>Byrsonima crassifolia</i>	Nanches	jka tsíí	FR	S,R	Tree
<i>Psidium guajava</i>	Guayaba	jka nsuíín	FR	S(I)	Shrub
<i>Carica spp.</i>	Papaya silvestre	jka mtií	FR	S(I)	Shrub
<i>Theobroma cacao</i>	Cacao	jka ndiaáh	FR	S(I)	Tree
<i>Heliconia collinsiana</i>	Platanillo	jka kuwah	FO	S(I)	Shrub
<i>Annona muricata</i>	Guanábana	jka schuüá	FR	S	Tree
<i>Leucaena spp.</i>	Guaje		FO	S(I)	Tree
<i>Croton draco</i>	Palo de Sangre		S(I)		Tree
<i>Trema micrantha</i>	Unknown		S		Tree

<i>Calophyllum spp.</i>	<i>Unknown</i>		S		Tree
<i>Unidentifiable</i>	Palo de cobre		S		Shrub
<i>Unidentifiable</i>	Palo de zopilote		S(I)		Shrub
<i>Unidentifiable</i>	Palo de pajarito	Jka knií	S(I)		Shrub
<i>Unidentifiable</i>	Palo de sal	jka djeé	S(I)		Shrub
<i>Unidentifiable</i>	Cuaresmal	jka ti clióó	S(I)		Shrub
<i>Unidentifiable</i>	Espinas de corona de Jesús	shtyá-jka	<i>Undesirable</i>		Shrub
<i>Unidentifiable</i>	Árbol de quelite blanco		FO	S(I)	Shrub
<i>Unidentifiable</i>	Hierba Santilla		FO	R, S(I)	Shrub
<i>Unidentifiable</i>	Palo de paloma	jka chacuú	FO	FL, S(I)	Shrub

KEY: S=shade; S(I)=intermediary shade; F=firewood; FR=fruit; FO=food; FL=flowers; T=timber; R=remedies; LF= live fence;
W=water conservation/erosion; M=household materials

APPENDIX B: INTERVIEW GUIDE AND INFORMED CONSENT

Interview Guide and Informed Consent (in Spanish)

Explicación de las investigaciones

Hola, me llamo Meghan Montgomery y soy estudiante posgrado de la Universidad de Montana en los Estados Unidos. Estudio y trabajo en un proyecto sobre la producción de café y programas certificaciones como Rainforest Alliance (Red de Agricultura Sostenible), orgánico, y comercio justo. Tengo interés en sus experiencias, opiniones, y pensamientos como cafetalero/a con los programas certificaciones y los impactos de estos sistemas de certificación en usted, su medio de vida, y el proceso de cultivación de café en su finca.

Me gustaría saber lo que usted piensa son las ventajas y retos de programas certificaciones, específicamente con el programa de RAS (Red de Agricultura Sostenible), y por que usted elige participar o no participar en las programas. Sus experiencias y opiniones como productor/a son importantes, y la información que pueda ofrecer podrían ayudar a organizaciones a mejorar sus programas certificaciones para aumentar los beneficios por los productores, específicamente los pequeños cafetaleros, en el future.

Si usted elige participar en este Proyecto, primero nos decidiremos juntos en un lugar seguro y cómodo para una entrevista entre 1-2 horas. La entrevista incluye algunas preguntas de detalles diferentes; unas preguntas serán sobre su granja o cafetal, mientras otras solicitarán información sobre sus opiniones o experiencias con programas certificaciones de café y como miembro en la cooperativa. También se pedirá si pueda guiarme en su granja y cafetal, por eso pueda enseñarme los aspectos ecológicos o de recursos naturales que son importantes. Pueda elegir a participar solamente en la entrevista, o en los dos, la entrevista y la gira, si no quiera o no tenga tiempo. Su identidad permanecerá confidencial y yo no usare su nombre en ningún informe, publicación, ni presentación.

Por favor, dígame si le gustaría participar en este proyecto y se distribuiré la encuesta, y después arreglaremos una entrevista. No dude a contactarme si tiene preguntas. Gracias por su tiempo, y espero que podríamos platicar más.

Introducción a la entrevista y consentimiento informado verbal

Hola y gracias por participar en este proyecto y para su ayuda en las investigaciones. Si está bien con usted, me gustaría grabar nuestra conversación para ayudarme traducir y asegurarme que yo entiendo todo lo que me cuenta sobre sus opiniones y experiencias. Su identidad permanece de confianza durante el proceso del proyecto, y solamente yo escucharé a las grabaciones y las borraré permanentemente cuando termina las investigaciones. Esta bien si enciendo la grabadora?

El propósito de este proyecto es entender su perspectiva sobre programas certificaciones como un/a productor/a pequeño/a de café. Tengo interés en su perspectiva sobre los programas certificaciones, y sus opiniones sobre las ventajas y retos de los programas. Voy a compartir los resultados de nuestra entrevista con organizaciones de certificaciones y es posible que los resultados podrían aumentar los beneficios por los productores, especialmente cafetaleros

pequeños, en el futuro. Su identidad permanecerá confidencial, y yo no usare su nombre en ningún informe, publicación, ni presentación.

No hay riesgos previstos de su participación en este proyecto, pero si tiene preocupaciones, podríamos hablar de ellos. Su participación es completamente voluntario. Usted puede negarse a contestar preguntas y optar retirarse de este entrevista en cualquier momento por alguna razón.

Tiene preguntas o preocupaciones antes de comenzamos? Esta de acuerdo que es voluntario a participar en este proyecto?

Historia del Café en la Familia

- 1) ¿Por cuánto tiempo han sido productores del café?
 - a) ¿Cuándo sembró el café por primera vez?
 - i) Compró la parcela de alguien otro, o usted sembró?
 - ii) O ¿quién en su familia lo sembró por primera vez? (papás, abuelos, suegros)
- 2) Aunque el mercado para café ha cambiado mucho en años recientes, ¿siempre mantenía la parcela?
 - a) ¿Ha cambiado las hectáreas en que cultiva el café?
 - i) ¿Cómo ha cambiado? (Cuántas hectáreas antes, cuántas ahora)
 - ii) Abandonó partes de ésta parcela, o de otras?
 - b) ¿Cómo describe la productividad de las matas de café?
 - i) ¿Cuántos bultos de café seco fue la cosecha éste año?
 - ii) ¿Cuánto fue la cosecha en el año pasado?
 - iii) ¿Cómo compara éstas cosechas con los años anteriores?
- 3) ¿Recibe Usted o su familia otros ingresos o ganancias, de otro trabajo, además del café?

Prácticas para Cuida la Parcela

- 1) En un año normal, visita la parcela frecuentemente? ¿Con qué frecuencia--cada semana, cada mes, o menos?
 - a) Describame cómo cuida el café durante el año.
 - b) Por ejemplo: (1) limpa; (2) poda; (3) tumba o poda árboles de sombra; (4) aplica productos, líquidos, cal; (5) siembra nuevas matas
- 2) ¿Quién normalmente cuida la parcela?
- 3) ¿Quién más en su familia le ayuda con decisiones sobre trabajo en la parcela, o sobre cómo cuida la parcela
- 4)
- 5) En el año pasado, cuántos días ocupan para:
 - a) Limpiar; pisar; podar; sembrar; aplicar productos, abono, cal, líquidos
 - b) Cuántas personas para cada trabajo

- 6) ¿Trabaja más en el cafetal ahora que hace 5 o 10 años pasados?
 - a) Por qué?
- 7) ¿Quiénes otros le ayudan con el trabajo entre el cafetal?
 - a) ¿Es solamente personas en su familia?
 - b) ¿Contrata Usted con mozos para trabajo en el cafetal?
 - i) ¿Para cuál trabajo?
 - ii) ¿Cuántos normalmente necesita?
- 8) ¿Cuándo busca trabajadores, están disponibles? ¿O es difícil a encontrar personas para trabajar?
 - a) Por qué?
- 9) ¿En los años pasados, cayó una plaga, por ejemplo la roya?
 - a) ¿Qué fueron los impactos?
 - b) ¿Habían efectos diferentes en diferentes matas entre el cafetal?
 - c) O, ¿habían impactos diferentes en diferentes parcelas?
- 10) ¿Cayó otras plagas que afectaba el café?

Sombra

- 1) ¿Por qué deja crecer los árboles que tengan sombra en el cafetal?
 - a) Ha beneficiado la sombra de los árboles para las matas del café?
 - i) Para la cantidad de la cosecha? Para controla de las plagas?
 - b) ¿Qué son otras ventajas de la sombra en el cafetal?
 - c) ¿Hay otras? (para cuidar la tierra, suelos, agua, aire; pájaros)
- 2) En su parcela, ¿cuáles árboles sirven para...
 - a) Sombra, abono, suelos, leña, madera, muebles, remedios
 - b) ¿Cuáles no sirven en la parcela?
- 3) ¿Ha sembrado otros tipos de árboles entre la parcela?
 - a) ¿Qué tipos?
 - b) ¿Para cuáles usos?
 - c) ¿Hay otros beneficios que considera cuándo escoge otros árboles para sembrar en el cafetal?
- 4) ¿Ha cortado o podado árboles para abrir o quitar la sombra?
 - a) ¿Qué árboles?
 - b) ¿Hay árboles que nunca quiere cortar? Por qué?
 - c) ¿Qué son los beneficios de quitar la sombra?
- 5) ¿Hay desventajas con la cultivación del café bajo árboles de sombra?

Experiencias y Percepciones de Certificaciones

Para Socios

- 1) ¿Por qué decidió usted ser socio de UNECAFE?
 - a) ¿Hay otros productores en la comunidad quiénes influían su decisión de ser socio?
- 2) ¿Qué beneficios o ventajas esperaba usted de su asociación con UNECAFE?
 - a) ¿Habían otros beneficios? Describame en detalle, por favor.
 - b) ¿Hay otros beneficios o ventajas que ha recibido?
- 3) Describame sobre los recursos o apoyos que ha recibido
 - a) Cursos? Sobre qué?
 - b) Asistencia técnica? Sobre qué?
- 4) ¿Asiste usted las reuniones de la cooperativa?
 - a) ¿Ha usado la información para cambiar cómo cuida el café?
- 5) Participa en otro programa para apoyar el café, por ejemplo un programa de SAGARPA o CDI?
- 6) Si usted fuera personal de la cooperativa (ingeniero o técnico), ¿qué cursos, información o apoyo pedría para ayudar a los productores en Teotepec?
 - a) ¿Qué otros recursos, cursos, o asistencia técnica necesita para mejorar cómo cuida el café?
- 7) ¿Hay desventajas de ser socio?
- 8) Para todos los socios:
 - a) ¿Tiene sugerencias para algo manera de mejorar las certificaciones?
 - b) ¿Recomendaría a otros productores a ser socios, o a participar en los programas?

Tiene preguntas para mi?

Para productores quienes no son socios:

- 1) En el pasado, ¿fue usted socio de UNECAFE?
 - a) ¿Por qué decidió terminar su asociación con la cooperativa?
 - b) ¿Cuáles eran las ventajas de ser socio?
 - c) ¿Cuáles eran las desventajas de ser socio?
- 2) Quieres llegar a ser socio en el futuro?
- 3) Ahora, ¿participa usted en otra programa que apoye la producción del café, con SAGARPA, PROCAFE, CDI, u otro?
 - a) Sí: qué son los beneficios de éste programa?
 - i) Han llegado otros beneficios?
 - b) No: por qué?

APPENDIX C: CLOSED-ENDED SURVEY FORM

Formato del Campo Encuesta

Fecha
Hora
de Muestreo
Categoría

Nombre del Productor
Nombre del Entrevistador
Edad
Nivel de Educación

Detalles de la Parcela

No. de cafetales en la familia
Hectareas
Ubicación (cerca o lejos?)
Uso Anteriormente:
1
2

Otro Terreno

Uso
Hectareas
Ubicación
1
2
3
4

Detalles del Café

Variación
Edad/Año Sembrado
Plantas
1
2
3
4
5

Otros Cultivos

¿Cuáles?
Autoconsumo o venta?
Palos de Fruta
Otros
milpa, frijol, calabaza, caña, tomate, cebolla, chaote, chilar
Ganado

Renovación

Si no: ¿por qué?
¿Quiere sembrar este año?
¿Cuántas?

Otros ingresos/ganancias

Notas

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