

SMALL-SCALE COFFEE FARMERS' PERCEPTIONS OF AND LIVELIHOOD RESPONSES TO COFFEE RUST EPIDEMIC IN MAYA VINIC COFFEE COOPERATIVE, MEXICO

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Tiivistelmä/Referat – Abstract

A plant disease called coffee rust, caused by a fungus (Hemileia vastatrix), swept across coffee lands of Central America and Mexico in 2012. It turned into the most severe coffee rust epidemic ever experienced in the region, having serious impacts on coffee farmers' livelihoods. The aim of this Master's thesis was to gain knowledge of small-scale coffee farmers' perceptions of coffee rust and their responses to it. These farmers belong to Maya Vinic coffee cooperative of indigenous smallholders operating in Chiapas, Mexico.

This case study applied an ethnographically-oriented livelihoods approach, influenced by Participatory Action Research (PAR). The data was gathered between March and May 2014, and consists of 24 semi- structured interviews, informal discussions, and observations. In analyzing the data, a modified version of Frank Ellis' Framework for Livelihood Analysis was utilized.

This study found that all the farmers had some knowledge about coffee rust, and they perceived the epidemic as a major livelihood shock. Coffee rust was causing damage to farmer households' central livelihood asset, coffee trees, leading to crop losses and a decline in the annual income. A drop in income compelled many households to cut back on consumption goods and basic food expenditure, and was likely to affect their capacity to invest in productive assets. The situation caused anxiety and confusion among farmers.

The results show that despite of the heightened risk of crop losses in the forthcoming production cycles, coffee farmers were determined to continue with coffee production. The control methods they were applying, such as different cultural methods, aimed at securing the role of coffee farming as a key livelihood activity also in the future. Alternative livelihood activities seemed to have less importance in coping with the epidemic. These findings suggest that not only economic but also cultural and social factors play an important role in livelihood construction.

The findings further show that certain forms of capital may either hinder or facilitate households' efforts to cope with coffee rust. In particular, limited landholdings ('natural capital'), and constrained access to different sources of information and education ('human capital') proved to be limiting factors, while membership in Maya Vinic ('social capital') helped to buffer negative impacts of the epidemic, and prepare for the future.

This study suggests that stakeholders' perceptions and the notion of social capital deserve more attention in different livelihood approaches. It also calls for more research and cross-sectoral initiatives which would aim at assisting small-scale coffee farmers in coping with coffee rust. These efforts should be keyed to work on climate change adaptation.

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Coffee rust, Livelihoods approaches, Rural livelihoods, Small-scale coffee producers, Mexico, Chiapas

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Tiivistelmä/Referat – Abstract

Kahviruoste on sienen (*Hemileia vastatrix*) aiheuttama kasvitauti, joka vuonna 2012 tauti alkoi levitä vauhdilla Meksikossa sekä Keski-Amerikassa ja kehittyi alueen historiallisesti vakavimmaksi kahviruoste-epidemiaksi. Epidemia on aiheuttanut mittavia taloudellisia ja sosiaalisia vahinkoja viljelijöille. Tämän pro gradu -tutkimuksen tavoitteena oli tarkastella pienviljelijöiden käsityksiä kahviruosteesta sekä heidän selviytymis- ja sopeutumiskeinojaan. Tutkimukseen osallistuneet viljelijät ovat Chiapasin osavaltiossa, Meksikossa, toimivan Maya Vinic -kahvintuottajaosuuskunnan jäseniä.

Tutkimuksessa käytettiin maaseudun elinkeinojen tutkimiseen soveltuvaa lähestymismallia, joka ammensi etnografisesta tutkimuksesta ('ethnographically-oriented livelihoods approach') sekä osallistavasta tutkimuksesta ('Participatory Action Research'). Aineisto kerättiin maalis-toukokuussa 2014 ja se koostuu 24 puolistrukturoidusta haastattelusta, epävirallisista keskusteluista sekä havainnointiaineistosta. Aineiston analysoinnissa hyödynnettiin muokattua versiota Frank Ellisin elinkeinojen tarkasteluun suunnatusta mallista ('Framework for Livelihood Analysis').

Tutkimus osoittaa, että kaikilla viljelijöillä oli jonkin verran tietoa kahviruosteesta, ja he pitivät epidemiaa merkittävänä uhkana pääelinkeinolleen. Kahviruosteen tuhot osuivat suoraan viljelijöiden keskeisimpään tuotantovälineeseen, kahvipensaaseen, mikä johti sadon pienenemiseen ja madaltuneisiin tuloihin. Tulojen kaventuminen pakotti monet kotitaloudet säästämään arjen kulutustuotteista sekä ruokamenoista. Tulojen lasku vaikuttanee kielteisesti myös viljelijöiden mahdollisuuksiin sijoittaa tuottavaan omaisuuteen. Tilanne aiheutti levottomuutta ja hämmennystä viljelijöiden keskuudessa.

Riskeistä huolimatta viljelijät olivat halukkaita jatkamaan kahvintuotannon parissa ja säilyttämään kahvin pääelinkeinonaan myös tulevaisuudessa. Vaihtoehtoisilla elinkeinoilla oli vähäisempi merkitys epidemiasta selviytymisessä. Tulokset viittaavat siihen, että taloudellisten tekijöiden lisäksi kulttuurisilla ja sosiaalisilla tekijöillä on merkitystä toimeentuloon liittyvässä päätöksenteossa.

Kotitalouksien käytössä olevat resurssit ('capitals'/'assets') vaikuttavat strategioihin, joilla kotitaloudet pyrkivät selviytymään kahviruoste-epidemiasta. Tulokset osoittavat, että erityisesti maanomistukseen, taloudelliseen pääomaan, sekä tiedonsaantiin ja koulutukseen liittyvät rajoitteet supistivat viljelijätalouksien mahdollisuuksia. Jäsenyys Maya Vinicissä sen sijaan synnytti sosiaalista pääomaa, joka auttoi lieventämään epidemian kielteisiä vaikutuksia ja valmistautumaan tulevaisuuteen.

Tämä tutkimus esittää, että tutkittavien näkemykset ('perceptions') sekä sosiaalinen pääoma tulisi paremmin huomioida elinkeinojen tutkimuksessa. Tarvitaan myös lisää tutkimusta sekä toimialojen rajat ylittäviä toimenpiteitä tukemaan pientuottajia kahviruosteesta selviytymisessä. Tämä työ tulisi nivoa ilmastonmuutossopeutumiseen liittyvään työhön.

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1. INTRODUCTION

1.1 Locating the study

We are standing at a plot of a small-scale coffee farmer in the highlands of Chiapas, the southernmost State of Mexico, looking at the steep hillside. I cannot help thinking there is something apocalyptic about the sight. Rows of dried twigs and branches stick out where bright green coffee trees used to flourish. With sadness in his voice the farmer explains how a large share of the trees have dropped their leaves and berries already before the harvest, leaving his family with a reduced yield. What makes the situation worse is the prospect of having even less coffee to harvest in the forthcoming production cycle(s) (Avelino et al. 2015, 307).

I heard and witnessed similar stories over and over again during the two months I spent visiting communities of small-scale coffee farmers in Chiapas. These farmers, belonging to the Maya Vinic smallholders' cooperative, were facing the same tragedy as many other coffee farmers in Central America and Mexico. Since 2012, a plant disease called *coffee rust,* caused by a fungus (*Hemileia vastatrix*), had been sweeping across coffee lands of these countries, threatening producers' livelihoods and causing severe economic and social impacts in coffee-growing communities.

Coffee rust has been tormenting farmers all over the world since the 19th century when the disease led to the abandonment of coffee as a commercial crop in Ceylon (now Sri Lanka) (Vandermeer et al. 2009, 636). Also Central American and Mexican coffee farmers have had several encounters with coffee rust since the 1970s, some of these escalating into serious epidemics. However, the most recent one has shown to be the most severe epidemic ever experienced in the region. In 2013, the situation was considered so serious that Honduras, Guatemala and Costa Rica declared national emergencies (Avelino and Rivas 2013, 3–4).

Coffee rust is a complex disease escaping simple explanations or solutions (e.g. Avelino et al. 2015). Therefore, it is impossible to estimate how the epidemic will behave in the future. It is possible that coffee rust becomes less aggressive in the forthcoming cycles, while the opposite may be equally true. Whichever the case, coffee producers in the

affected areas will have to adjust their livelihoods to changing conditions by adopting different coping and adaptation strategies.

1.2 Research questions and structure of the thesis

At the time of my field work in March-May 2014, coffee rust epidemic was still a fairly recent phenomenon in Chiapas. What made the situation unique – and also alarming – was that the Maya Vinic farmers had no prior experiences of coffee rust, and thus had no mechanisms in place to deal with this specific shock. In this context, which would have allowed for a wide range of research settings, I decided to explore how smallholders perceived the epidemic that was directly affecting their livelihoods, and how they were responding or planning to respond to it.

There are two main reasons for focusing on perceptions. First of all, it permits us to expand our understanding of coffee rust from the perspective of those affected by the disease, and thus acquire experiential knowledge. Second, I assume farmers' perceptions have an important role in shaping their adaptive responses, which is another field of interest in this thesis (see Bebbington 1999, 2022; Tucker et al. 2010, 23; Frank et al. 2011, 66). To gain knowledge of smallholders' perceptions of coffee rust I have posed the following questions: (1) *how do farmers describe the disease and its causes?*; and (2) *how do they perceive the impacts of coffee rust epidemic?*

As noted above, this study also seeks to get insights of farmers (potentially diverse) responses to the disease. Thus, another research question is (3) *what strategies farmers are applying or planning to apply in order to cope with coffee rust epidemic at its initial stage?* Evidence from livelihoods literature shows that people's decisions regarding their livelihoods depend on a wide array of factors and processes, including assets and access to theses as well as a number of complex 'conditioning factors' (Ellis 2000a, 37; see Chapters 1.3 and 3). This notion leads to my last research question: (4) *what factors mediate farmers' adopted or planned strategies?*

Agriculture is a nexus of society and ecology which produces social, cultural and ecological landscapes (e.g. Bacon et al. 2012, 41). This complexity implies that

agriculture-related questions may be best understood by analyzing these from a multidimensional perspective and by crossing disciplinary boundaries. In this case study, I have applied an ethnographically-oriented livelihoods approach (see also Nygren and Myatt-Hirvonen 2009, 850) to find answers to my research question. The study has also been inspired by Participatory Action Research (PAR) which aims at breaking traditional roles in doing research, and building knowledge which has relevance for the stakeholders.

As I discuss in section 3 of this chapter, there is a growing body of studies on different aspects of coffee rust conducted especially in the fields of natural sciences. However, livelihood impacts of coffee rust have received less attention. In order to gain more understanding of coffee rust, its livelihood implications, and the diversity of farmers' responses, I argue that we need more experiential and locally-specific empirical studies applying a transdisciplinary approach. The present Master's thesis, located in the field of Development Studies, aims at enriching the literature in this regard. This study also seeks to produce timely knowledge that could be used in designing informed policies and practices for combating coffee rust and helping famers' to sustain their livelihoods.

Before moving on to literature review, I briefly present the structure of my thesis. In Chapter 2, I describe how the study was conducted, and the methods I applied in gathering and analyzing the data. Chapter 3 focuses on the theoretical framework, namely Frank Ellis' (2000a) Framework for Livelihood Analysis and my modification of it. In Chapter 4, which serves as a bridge to the analysis chapters, I discuss the wider context in which small-scale coffee producers make a living. Chapters 5 and 6 are dedicated for presenting the findings of this research: the former discusses farmers' perceptions on coffee rust and livelihood implications of the disease; the later focuses on farmers' responses. In the last chapter, I make concluding remarks of my findings and make recommendations for future research.

1.3 Literature review

The analysis of my empirical data builds on existing body of literature on small-scale farmers' livelihoods and coffee rust, as well as on theoretical literature on livelihoods. In

the following, I first offer a look at the development of 'livelihood' as a concept and how it has been applied in theoretical frameworks used for analyzing multifaceted aspects of rural livelihoods. This theoretical discussion will be continued in Chapter 3.

Next, I locate my study in relation to prior literature on small-scale coffee producers' livelihoods. I provide an overview of what we already know about smallholders' livelihood realities, and focus specifically on studies conducted during or after major shocks affecting coffee producers' livelihoods. The geographical emphasis is on Latin America, although it is worth noting that there are a number of interesting studies conducted in the coffee lands of Asia and Africa as well (e.g. Ambinakudige 2009; Agergaard 2009; Blackmore et al. 2012).

Discussing livelihoods as a concept

Livelihood as a concept as well as a basis for multidisciplinary and cross-sectorial approaches, methods and frameworks has been central to Development Studies and development interventions since the 1990s. The concept arose from a need to understand better the diversity of ways people make a living – or simply try to survive – in low income countries, which had been partly overlooked in discussions on 'subsistence', 'income' or 'employment', and on income-based definitions on poverty[1] (Chambers & Conway 1992, 3; Bebbington 1999, 2021; Ellis 2000a, ix; Scoones 2009, 171–2; Fernandez et al. 2013, 8). Scoones (2009, 172) asserts that livelihood as a term is flexible and mobile, as it can be attached to other terms to construct "whole fields of development enquiry and practices". These can relate to occupations (e.g. farming livelihoods), locales (e.g. rural or urban livelihoods) or dynamic patterns (e.g. sustainable livelihoods) (ibid.).

As with any other concept, there are a number of definitions on livelihood (e.g. Chambers and Conway 1992; Scoones 1998, 2009; Bebbington 1999; Ellis 2000a, 2000b), all of which have been widely applied in the livelihoods literature. Chambers'

[1] Or as Bebbington (1999, 2022) puts it: "I argue that it is important to have a wide conception of the resources that people need to access in the process of composing a livelihood, perhaps especially in a context where peoples livelihoods shift from being directly based on natural resources, to livelihoods based on a range of assets, income sources and product and labor markets."

and Conway's (1992) definition on 'sustainable livelihoods' is often cited to be the starting point for more comprehensive analysis on (rural) livelihoods[2]. They propose:

> A livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living: a livelihood is sustainable which can cope with and recover from shocks and stress, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to other livelihoods at the local and global levels and in the short and long term.

Other scholars have largely built on this definition, while making some modifications in order to achieve new insights into livelihoods processes. For instance, Scoones (1998) specified the notion of assets, and added under it different types of capitals, namely natural, economic, human, social and physical capital. Bebbington (1999) also focused on capitals, putting particular emphasis on the importance of social capital as a means of accessing resources. Furthermore, he included the dimension of 'meaning' to the livelihoods concept. In his words: "people's capitals are not merely *means* through which they make a living: they also give *meaning* to the person's world" (ibid., 2022). Ellis (2000a, 9), in turn, wanted to bring out the notion of access more strongly, and thus modified the original definition to better include this dimension (see Chapter 3).

Common to these – and other – livelihood definitions is a focus on assets/capitals, activities and access. Assets/capitals can be seen as "the basic building blocks" or resources which households own, control, claim, or in other way access, in order to build livelihoods or sustain material well-being (Scoones 1998, 7; Bebbington 1999, 2022; Ellis 2000a, 31). Chambers and Conway (1992) as well as Bebbington (1999) draw from Amartya Sen's (1981, 1997, 2009) work on poverty, and apply his term 'capabilities' to further explain different dimensions of assets. Capabilities as a concept refers to people's ability to realize their potential as human beings, or as Sen (2009, 1959) puts it "the ability of human beings to lead lives they have reason to value and to enhance the substantive choices they have". In livelihoods analysis, this translates into people's or households' ability to get hold of and utilize different livelihood

[2] Yet, Scoones (2009, 173) notes that the history of cross-disciplinary livelihood perspectives go way back, although they were not labelled as such.

opportunities, as well as to cope with shocks and stress[3] (Chambers and Conway 1992, 4).

The second important component of any livelihood definition is activity. While assets refer to the potential of achieving secure livelihoods, activities correspond to the realization of this potential through a set of income-generating activities (Ellis 2000a, 40). In Ellis' (ibid., 10–11) definition, 'income' includes both cash and in-kind contributions that generate the means of household survival and enhance – or hinder – its welfare. Especially in rural areas, households' livelihood portfolios are typically composed of different combinations of activities (Chambers and Conway 1992, 7; Ellis 2000a, 40; Ellis 2000b, 291). They are also dynamic, meaning that their composition is dependent on a range of factors, such as seasonality, unexpected events and available asset/capital portfolio (Scoones 1998, 10).

For a livelihood analysis, also the notion of access is central. In brief, it refers to households' concrete possibilities to combine, control and use assets for the purpose of obtaining employment, food, income or information and technology, for example (Chambers and Conway 1992, 8; Scoones 1998, 8). Access is mediated by a range of factors, including social norms, institutional arrangements, power and politics, and distribution of control over resources. Adding to these, certain 'axes of difference', such as gender, ethnicity and age, can have a major impact on access. (Scoones 1998, 8; Ellis 2000a, 9; also Davis 2008, 71). Bebbington (1999, 2028) notes that vital rural livelihoods are often characterized by household's success to sustain or increase access to different types of resources (or assets) and opportunities to turn these into sources that strengthen their livelihoods.

Livelihood approaches and their critique

Located at the intersection between academic debate and practical action, livelihoods-oriented approaches are used as analytical as well as prescriptive or normative tools

[3] The concept 'capabilities' is inherent in many of the most used definitions on livelihoods, such as that of Chambers's and Conway's (1992). Ellis (2000a, 7) argues that the usage of capabilities within livelihood analysis overlaps with assets and activities, and thus Sen's ideas are only implicitly present in his definition.

(Scoones 2009; Fernandez et al. 2013, 8). Based on different livelihood definitions discussed above, they aim at providing a more holistic picture on the complexities and dynamics of rural and urban livelihoods, and "explore how people make a living and how they make it meaningful" (Bacon 2005, 506). These types of approaches are also used for improving the quality and effectiveness of development interventions which aim at poverty alleviation and livelihood improvement (Bebbington 1999, 2022; Scoones 2009, 171–2; Fernandez et al. 2013, 8).

There exists a range of livelihood approaches bringing together different perspectives and methods across disciplinary and professional boundaries[4]. Among the most well-known are Chambers' and Conway's (1992) pioneering work on livelihoods, Scoones' (1998) Sustainable Livelihoods Approach (SLA), Bebbington's (1999) 'capitals and capabilities' framework, and Ellis' (2000a) Framework for Livelihood Analysis, all of which have been widely used in research (e.g. Jha et al. 2011; Barham et al. 2011; Donovan and Poole 2014) and in development interventions. These and other related frameworks have been influenced by an array of disciplines and development approaches, such as anthropology, political ecology, economics, gender analysis, farming systems research, geography, an participatory rural appraisal (Scoones 2009).

Livelihood approaches typically put a heavy emphasis on the household asset status[5] and on actors' agency (Ellis 2000a, 28). Critiques of livelihood approaches have attacked this focus. They claim that the emphasis on assets and micro-level negotiations over livelihoods has diverted attention from big shifts in global markets, long-term shifts in rural economies, and questions of power and politics (Scoones 2009, 180–1; see also Nygren and Myatt-Hirvonen 2009, 829). To put it another way, livelihood approaches have been claimed to "focus much more on opportunities than on constraints, more on actor's agency than on structure, more on neutral strategies than on failed access due to conflicts and inequalities in power" (de Haan 2012, 349).

[4] I will not go deeper into the history and development of livelihood approaches or the differences between these, although these debates would surely deserve their own chapter. For a more detailed account on these topics, see Scoones 2009, de Haan 2012 and Fernandez et al. 2013.
[5] In Ellis' (2000a, 28) words, most livelihood approaches tend to "regard the asset status of poor individuals or households as fundamental to understanding the options open to them, the strategies they adopt for survival, and their vulnerability to adverse trends and events".

In their articles on the history and development of livelihood approaches Scoones (2009) and de Haan (2012) discuss these and other perceived failings of livelihood-oriented approaches. Both agree with some of the points raised by the critiques, and propose improvements to address questions that have been dismissed in livelihood debates. However, they argue that the criticism has, to some extent, become outdated as the livelihood literature is constantly enriched with new contributions originating from different disciplines and development approaches. De Haan (ibid.), for instance, provides a long list of innovative studies linking analysis on power relations to livelihoods, and illustrates how the fields of political ecology, gender studies and studies on political arenas have been central in making the connection more visible. Scoones (ibid., 181) further points out that livelihood-oriented approaches have been successful in opening up new perspectives by linking the notion of livelihoods to debates on agrarian change, human rights, and governance, among other themes. In order to develop livelihoods-oriented research, Scoones (ibid.,183–90) claims that livelihoods perspectives need to be 're-energized' by linking these better to concerns of knowledge, politics, scale and dynamics. De Haan (ibid., 352), in turn, asserts that studies on livelihoods-related issues should move beyond local level and aim at presenting generalized trends.

Studies on small-scale coffee producers' livelihoods

Coffee is an important commodity worldwide, as will be discussed in Chapter 4. Due to its importance within the global markets as well as for national and local economies it has received much attention from scholars of different disciplines. Many of these studies explore the multiple dimensions of small-scale coffee farmers' livelihoods (e.g. Jaffee 2007; Bacon et al. 2008a; Jha et al. 2011; Jha et al. 2014).

Morris et al. (2013, 424) point out that since the global coffee crisis[6], especially smallholders' vulnerabilities have attracted attention among researchers (Daviron and Ponte 2005; Eakin et al. 2006; Ponette-González 2007; Jaffee 2007; Bacon et al. 2008a; Eakin et al. 2009; Tucker 2009; Renard 2010; Barham et al. 2011; Bathfield et al. 2013; Hausermann 2014; Donovan and Poole 2014). These studies reveal that, due to a

[6] What is often referred to as the global coffee crises can be dated back to the turn of the millennium when the coffee prices dropped to all time low (Jha et. al 2011, 153).

complex set of micro- and macro-level factors, smallholders tend to face persistent livelihood difficulties. One common outcome is food insecurity, which in recent years has attracted more attention in research (e.g. Méndez, et al. 2012; Fernandez et al 2013; Morris et al. 2013; Bacon et al. 2014; see Chapter 4.3). For instance, a research conducted among smallholders in El Salvador shows that 97 % of households suffered from food shortages at some period of the year (Morris et al. 2013).

There is also a rich body of literature exploring small-scale coffee farmers' coping and adaptation strategies during and after severe livelihood crisis. Researchers from different disciplines have conducted empirical studies on livelihood impacts and coffee farmers' responses in context of major declines in global coffee prices (Bacon 2005; Eakin et al. 2006; Jaffee 2007; Ponette-González 2007; Bathfield et al. 2013; Hausermann 2014), exceptional climatic events (Eakin et al. 2012), or a combination of multiple stressors (Eakin 2005; Saldaña-Zorrilla 2008; Tucker et al. 2010; Castellanos et al. 2013). Also climate change adaptation within coffee-growing communities has increasingly inspired researchers (Schroth et al. 2009; Frank et al. 2011; Campos et al. 2014; Quiroga et al. 2015).

Eakin et al. (2009, 401) note that the volatility of coffee prices has historically been a source of economic insecurity for small-scale producers. Many studies have explored the social, economic and ecological impacts of price declines, especially after the restructuring of international coffee regime since late 1980s and the subsequent global coffee crisis at the turn of the millennium (Bacon 2005; Jaffee 2007; Ponette-González 2007; Bacon et al. 2008a; Eakin et al. 2009; see Chapter 4.3). These studies show that smallholders' dependency on coffee, a condition created to a great extent by national and international policies, put producers in highly vulnerable situation, and the declining coffee prices forced them to seek livelihood alternatives. Farmers resorted to different coping and adaptation strategies such as migrating to the US for work, engaging in non-agricultural labor, planting alternative crops, intensifying subsistence production, and/or shifting to organic coffee production. Many households also cut down coffee production costs or abandoned their plantations.

Similar livelihood responses have been reported after extreme climatic events, such as Hurricane Stan causing significant damages in rural areas of Southern Mexico in 2005. A case study conducted in three coffee-growing communities in Chiapas indicates that

in order to cope with the negative effects of the hurricane, a number of households intensified subsistence production and resorted to agricultural day labor and/or non-agricultural informal source of income. Although the importance of coffee in households' livelihood portfolio generally declined, none of the households had or was planning to abandon coffee entirely (Eakin et al. 2012). Eakin et al. (ibid.) further show that when the hurricane hit, farmers in the study area were already suffering from low prices, declining yields and problems with coffee quality, making them vulnerable to any additional hazards.

These studies, conducted in context of different livelihood shocks or stressors, have increased our understanding of famers' perceptions of risk and their adaptive strategies in times of crisis. They demonstrate that farmers' strategies are diverse, and they are embedded in a "complex web of institutional, ideological and economic relations" (Eakin et al. 2009, 409; see also Blaikie et al. 1994; Eakin 2005; Ponette-González 2007; van den Berg 2010; Eakin et al. 2012). To put it differently, farmers' livelihood strategies are mediated by a wide array of social, economic, environmental, cultural and political factors. The literature suggests that in order to build more knowledge on the diversity of farmers' responses and drivers behind these, it is important to conduct more case studies within coffee-producing communities (e.g. Eakin 2005; Ponette-González 2007; Tucker et al. 2010).

In the case of the current coffee rust epidemic, there is a clear absence of empirical research on farmers' reactions and responses. Coffee rust has provoked substantial amounts of studies in recent decades, and in particular researchers in the fields of natural sciences have explored the complex mechanisms behind the disease (Avelino et al. 1999; Vandeermeer et al. 2009; Ghini et al. 2011; Jackson et al. 2012; Avelino et al. 2012; Avelino and Rivas 2013; Vandeermer et al. 2014; Avelino et al. 2015). Also a number of journalists, NGOs and research centers have published many interesting and important reports and other materials related to coffee rust and the recent epidemic (e.g. Cressey 2013; PROMECAFE and IICA 2013). Yet, there is a lack of interdisciplinary approaches combining a scientific knowledge with an analysis on the livelihood impacts of the disease. To my knowledge there are some researchers working on the impacts of

current coffee rust epidemic, but during the time of writing my thesis, I had not come across any published peer-reviewed studies on the livelihood impacts[7].

This thesis aims at complementing our current knowledge of coffee farmers' perceptions of risk and their responses in times of a major livelihood crisis. The study also seeks to fill a gap in coffee rust literature, and offers a starting point for developing a better understanding of farmers' responses to coffee rust and other epidemics. Lastly, I hope this study will encourage more participatory, interdisciplinary and cross-sectorial research on coffee rust which would have a clear goal of facilitating farmers' livelihood adaptation processes.

2. CONDUCTING THE STUDY

2.1 Maya Vinic

I conducted my field work in Maya Vinic, a cooperative of small-scale coffee and honey producers operating in Chiapas. When starting to plan a field trip to Mexico, I contacted a professor from a local university whom I had met on my prior visit to Chiapas a year before. He suggested me to approach Maya Vinic, whose work I did not know previously, and was kind enough to establish the first contact with them. After an extensive email correspondence with the representatives of the cooperative, they agreed to receive me.

Maya Vinic, meaning 'Mayan Man' in Tsotsil language, is a mid-sized cooperative comprised of 641 coffee farming households out of which 123 families produce honey as well. The farmers are located in 52 communities across seven municipalities. Most of these are situated in the Chiapas Highlands ('Altos Tsotsil-Tseltal' or more commonly,

[7] There exists, for instance, a MA thesis which partly deals with the impacts of the coffee rust in Southern Chiapas (Castiaux et al. 2014). Furthermore, a Norwegian student of social anthropology is currently writing her MA thesis regarding farmers' perceptions on coffee rust in Costa Rica.

'Los Altos'), while the rest are located northeast, west and southeast from San Cristóbal de las Casas[8], the "cultural capital" of Chiapas (see Appendix A).

Maya Vinic has an office and a coffee shop in the town of San Cristóbal de las Casas, and its coffee is also roasted and ground there. The headquarters, warehouse and coffee processing facilities, as well as a little general store, are located in the community of Acteal, the birthplace of Maya Vinic. The cooperative employs nine full time and another seven to nine part-time workers. Furthermore, ten technical field advisors ('técnicos') are hired for a period of one month per year to conduct trainings and workshops in the communities. All the paid workers are members of the cooperative themselves or children of the members.

Maya Vinic exports a large share of its quality coffee mainly as green coffee ('grano verde' or 'café oro') to the United States, Japan and Switzerland, and its honey to Belgium. It has also a substantial and growing national market for roasted and ground coffee to an extent that on some years the demand exceeds the production capacity of the cooperative. Maya Vinic produces organic coffee[9] which is certified by a national certification body, Mayacert, and the coffee for exportation also has the Fairtrade certificate[10]. The added value gained through the specialty coffee markets and the stable relations with the buyers permit the cooperative to pay the farmers a price exceeding that paid by the middlemen ('coyotes'). The cooperative organizes trainings for the farmers and conducts regular visits to the plots to verify that the criteria of the certifications are met, and that the quality remains uniform. Those farmers who do not comply with the norms of the certification bodies and/or those set by the cooperative are sanctioned, for example, by banning the right to sell the coffee through Maya Vinic for two years.

Maya Vinic holds democratic decision-making, traditional forms of self-government and transparency in high value, which is also reflected in its organizational structure and working methods. The Board of Directors is chosen for a two-year term, and being a

[8] Chiapas is divided into 15 socioeconomic regions, 'Altos Tsotsil-Tseltal' being one of them. San Cristóbal de las Casas is the biggest town of the Highlands.
[9] Some of the farmers are "in transition", meaning that their coffee does not yet meet the requirements of organic coffee.
[10] The coffee for national market does not have the Fair Trade certificate, as that would imply an extra cost. I was told that it would not bring any added value in the Mexican markets, since most consumers do not recognize the certificate.

member the Boards is considered as an honor and a service for the cooperative[11]. The Assembly of Community Delegates works closely with the Board and consists of delegates from each producer community. It meets once a month to discuss and decide on focal matters. Lastly, the General Assembly brings together the representatives of each community once a year to go through the financial statement, and select the new Board every two years. On technical, administrative and financial matters Maya Vinic cooperates with its trading partners, other cooperatives, associations and NGOs, universities, and communities of faith.



Image 1 Maya Vinic farmer family in their garden.
Photo: Janica Anderzén

[11] It is also a demanding and time-consuming position, as the work load is rather high and the members do not receive other compensation apart from travel and other immediate expenses.

All the members of Maya Vinic are indigenous Mayan, belonging to Tsotsil, Tseltal and Chol ethnic-linguistic groups. The households typically comprises several members from two or three generations, all of whom take part in the farming activities. Image 1 shows a Maya Vinic farmer family in their garden, while image 2 illustrates a farmer walking to his plot with his youngest son.



Image 2 Farmer and his son heading to a coffee plot. Children get introduced to coffee farming since from a very young age and take part in different farming activities alongside school work. Photo: Janica Anderzén

In plots of an average one hectare[12] in size Maya Vinic farmers cultivate different varieties of Arabica coffee, such as *Typica* (also known as *Criollo* and *Arábico*), *Bourbon*, *Caturra*, *Gárnica* and *Mundo Novo,* under a dense shade canopy consisting largely of native trees. The annual production per hectare ranges between 520 and 920 kilos which is above the average among smallholders in Chiapas[13]. The household

[12] In Chiapas, 62 % of all coffee farmers manage plots of one hectare or below in size (Robles Berlanga 2011, 29).
[13] In 2014, the average yield in Chiapas was approximately 460 kg per hectare according to The Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA 2014, 1).

income from coffee depends on the size of the plot, quantity of yield, and the price level[14], the latter two being subject to annual variations.

Chiapas is one of the poorest and marginalized states in Mexico. It is lagging behind most other states when using as indicators school attendance, housing conditions and income level, for instance (CONAPO 2011; SEMARNAT 2012). All the communities I visited during my field work suffered from poor infrastructure, such as bad roads and lack of healthcare facilities. The situation is not new in any way, and the current conditions can be seen as a continuum of a long history of economic, social and political repression of the inhabitants of Chiapas, in particular those belonging to different indigenous groups (Zamora Lomelí 2003).

Also the roots of Maya Vinic rise from a history of oppression and violence. The cooperative was formed in 1999 by members of a pacifist association called Las Abejas (‘The Bees’) as a response to an armed conflict terrorizing rural areas in Chiapas. As Zamora Lomelí (2003, 153–4) explains, the situation escalated in 22 December 1997 in the infamous Acteal Massacre when a group of paramilitaries associated with the ruling party killed 45 Tsotsils gathered in a church. Besides this incidence there was another important reason for forming the cooperative, which can be traced to structural inequality: after the major changes in the international and national coffee regimes, and the subsequent liberalization of coffee trade, the prices of coffee fell drastically (see Chapter 4.1). The farmers also had limited opportunities of commercialization of their product, as the middlemen (‘coyotes’) were controlling the markets. The cooperative was, thus, seen as an alternative to have control over the means and terms of production and sale, improve the living standards of the producers, fight against prevalent injustice, and promote autonomous development (ibid.)

[14] In 2014, Maya Vinic paid farmers 45 pesos per kilo for organic coffee. A staff member of Maya Vinic calculated that a household owing less than a hectare and producing around 400 kilos would gain a net income of approximately 15 000 Mexican pesos (850 euros) with this price.

2.2 Gathering the data

Setting the foundations

The field work for this research took place between March and May 2014. This was a good time of the year to visit a coffee farmers' cooperative, as the harvest season had nearly come to an end, and both the staff members and the producers had more time to spare. Also, spring is an ideal season for visiting Chiapas, as the weather is mainly sunny and dry; the rainy season starting at the end of May makes travelling on the winding mountain roads as well as walking up and down the steep slopes complicated.

During the two months long stay I was renting a flat in San Cristóbal de las Casas in the Highlands. This was suggested by the cooperative's staff who considered it best to have a base close to Maya Vinic office so that I could join them to field visits, take part in different activities of the cooperative, and get to know the whole process of coffee production. This was a good arrangement also because it helped me to collaborate closely with the staff members and other key figures of Maya Vinic, and have their support in all stages of the research. Without this tight collaboration this research would not have seen the light of the day – nor made sense, for that matter.

On the first week of my stay in Chiapas we sat down with the staff to discuss about the goals, topics and methods of the research. My original research ideas, focused on food security, were received with polite hesitance. Instead, the conversation led us to talk about the coffee rust which, I was told, was the most pressing issue for the farmers at the moment. The disease had been advancing steadily over the previous months and there was a lot of confusion among the farmers as for the possible livelihood implications of the disease. After a thorough conversation, we agreed I would focus on coffee rust instead, and assess farmers' perceptions and experiences on the disease as well as evaluate their strategies for confronting the disease.

Obviously, changing the research topic meant that I had to reframe my research questions, and learn more about the disease I was barely familiar with. But even with the delays it caused it was an important part of the process, and reflected the kind of research I aimed to do: I wanted to avoid any top-down approach in which I would impose ideas or be another researcher who appears on the spot, collects the data, and disappears. Instead, I wished to conduct a research that would actually benefit the

cooperative and the farmers, and rise from their needs. I also found it important that the research process would be based on reciprocity and mutual learning. Therefore, between the field visits I spent the extra week days at the office helping out in office work and other tasks[15]. The same principal of reciprocity and sharing was present on my visits to the farmers' communities (see below).

My approach was inspired by Participatory Action Research (PAR). PAR is a way of doing research that aims at breaking traditional roles in the social construction of knowledge and, as the name implies, strives for more participatory development of knowledge. The research is seen as an interactive rather than extractive process which is designed together with the stakeholders, respecting their needs and expertise. All stages of the research are marked by openness and transparency between the parties (Babbie 2008, 329–30; Fernandez et al. 2013, 13–4). This type of approach is common, for instance, in agroecology, a transdisciplinary field studying different aspects of agricultural systems. Agroecology sees agriculture as a "complex social-ecological system" and seeks to incorporate "contributions of knowledge constructed outside of the western scientific paradigm" (Méndez et al. 2013, 6).

Furthermore, the methodological approach of this research was influenced by the tradition of ethnographic research[16], which studies people, groups and phenomena in natural conditions of social realities. The focus is on people's views, perceptions and actions, and the aim is to provide a rich and holistic picture of the research object, or "thick descriptions" as Clifford Geertz (1973) puts it. The construction of knowledge builds on participation, collection of different kinds of data, and the interaction between data and theory (Hammersley and Atkinson 2007, 3; Huttunen 2010, 43-44; Rastas 2010, 65). Hammersley and Atkinson (2007, 4) summarize these dynamics as follows:

> "-- as a set of methods, ethnography is not far removed from the means that we all use in everyday life to make sense of our surroundings, of other people's actions, and perhaps even of what we do ourselves. What is distinctive is that it involves a more deliberate and systematic approach than is common for most of us most of the time, one in which data are specifically sought to illuminate research questions, and

[15] For example, I helped to compile a training material for the farmers, wrote reports, and made suggestions for the improvement of the website of the cooperative. I also took part in packing coffee, and on some days helped out at the coffee shop.

[16] As Hammersley and Atkinson (2007, 2) point out, there is not one definition what ethnography means, as it is used in various ways in different disciplines. The following description in a synthesis and does not necessary do justice to the diversity of ethnography.

> are carefully recorded; and where the process of analysis draws on previous studies and involves intense reflection, including the critical assessment of competing interpretations."

As will be discussed in detail in Chapter 3, my theoretical framework is based on Frank Ellis' Framework for Livelihood Analysis which allows for a number of methodological adoptions depending on the research setting and the purpose of the research (Ellis 2000a, 194). Guided by an interest in farmers' perceptions and responses at the initial stages of the epidemic, I chose to apply methods which allowed me to gather data on farmers' subjective feelings and aspirations, as well as households' assets and access to these. Thus, I collected my data using a set of qualitative methods, mainly interviews and observation. Both of these are common also in PAR and ethnographic research (Hammersley and Atkinson 2007; Babbie 2008, 329) which, as mentioned above, offered analytical and methodological insights for my research.

Interviews

I believe farmers' perceptions, experiences and pursued livelihood strategies can be studied best by hearing out what the farmers have to say (see Rastas 2008, 83; Tucker et al. 2010, 25). Therefore, I decided to use interviews as a primary method. My interview data consists of 24 semi-structured, open-ended interviews with members of the cooperative, their family members, as well as Board and staff members of the cooperative. The informants include 19 men and 5 women, youngest of them being 20 years old and the eldest a bit over 60.

The majority of the interviews were conducted with people from the Highlands region, namely the municipalities of Chenalhó (18 interviewees), Chalchihuitán (1 interviewee) and San Cristóbal de las Casas (1 interviewee), while the rest were done with farmers from the municipalities of Salto de Agua (3 interviewees) and Ocosingo (1 interviewee) (see Appendices A and B). The Highlands was, in my view, the most suitable and practical choice within the rather short period of time I had on my hands: it forms the geographical and administrative heartland[17] of the cooperative, and most of the farmers'

[17] And also in many ways, the "spiritual" heartlands.

communities in the region are relatively close to San Cristóbal de las Casas. Moreover, during my stay, most of field visits that I was invited to were directed to the communities in this region, which offered good opportunities to do interviews and have informal conversations with the farmers.

The selection of the informants was based, for the most part, on the recommendations of those staff and Board members with whom I worked most closely and whom I accompanied to the field visits. I am aware that this type of sampling might have caused bias into the study[18] (Ponette-González 2007, 291). On the other hand, it was essential that Maya Vinic staff members established the first contact as this was the only way to build necessary trust with the farmers. As Eakin et al. (2012, 478) point out, in Chiapas accessing the communities for research purposes can only be achieved by developing trust and "collaborative relationships" with community members.

I interviewed both members of the cooperative as well as their family members because, even if their official status within the cooperative differs, they all take part in the coffee-growing activities and depend largely on coffee for their livelihood. Three of the interviewees are also Community Delegates, which was very useful since they are familiar with the conditions of all the (member) farmers within their community. Moreover, I interviewed all four Board members[19] and most staff members of the cooperative, as I assumed they could provide a broader perspective about the impacts of the coffee rust within the cooperative. Since they are all farmers themselves[20], they could talk also about their personal experiences and perceptions about the disease. In the following chapters I use the term 'staff' to refer both to persons working at the office as well as Board members, as together they formed the core decision-making body of the cooperative.

Some of the interviews were conducted at the office and others at the communities after reunions or workshops. The latter made a good setting to meet producers, as there were often several members present. I also felt more comfortable in this type of context, as my presence would fit in the normal activities of the cooperative. On four occasions I had the opportunity to spend two to four days in the communities with farmer families.

[18] For instance, all the interviewees are farmers who own very small plots (<2 ha). Their experiences on coffee rust might be different from those farmers owning bigger plots (see Chapter 5.2).
[19] I did two interviews with the President of Maya Vinic.
[20] With the exception of one staff member.

This gave me the possibility to conduct several interviews in a day, and to get to know much better the interviewees and their families. It also provided a space to have a number of informal conversations, as well as to observe and take part in the day-to-day life of the farmers.

The interviews were preceded by introductions in which usually one of the staff members would present me to the interviewee(s). After this I presented myself as well as the aims and objectives of my study, and explained how and to which purposes the information gathered in the discussion would be used. In this way I made sure I had the informed consent from each of my informants. I also asked for the permission to use a digital voice recorder during the interviews, which was accepted by all. Only in two interviews I did not use the recorder as I did not have it with me.

The duration of the interviews ranged between 25 and 80 minutes, although in many cases they were followed by lengthy informal conversations. Many of them were one-to-one interviews, while in other cases I interviewed two to four persons at the same time. The reason to conduct group discussions was often practical: either there was limited time available which made a group interview a more effective (or only) option, or there were communication difficulties due to the language. In the latter case, one of the interviewees would help with the translation from Spanish to Tsotsil, and often responded the questions himself as well. If there were no time or language restrictions, I preferred one-to-one interviews.

I was using an interview guide which I had divided into three thematic parts (Hirsjärvi and Hurme 1982, 42). The aim of the first part was to gather general information about the interviewee and his/her coffee cultivation. The second part was focused on farmers' perceptions and experiences on coffee rust and its impacts, and the measures they have applied or will apply in combating the disease. In the third part the emphasis was on the farmers' livelihood opportunities and challenges, and how these relate to the current epidemic of coffee rust. Lastly, I asked a few questions about farmers' history in Maya Vinic and their relationship with the cooperative (see Appendix C). The structure remained the same throughout the interviews, but I modified and specified the questions as I came to understand more about the disease and farmers' realities (see Huttunen 2010, 42). I formulated the questions in a way that gave the informant the possibility to

give either a short or a more descriptive answer. I also asked extra questions whenever something new came up that might shed light to my research questions.

I tried to avoid unnecessary stiffness, and make the interview situations as natural as possible. Therefore, the interviews were eventually more like conversations in which the discussion would flow and evolve, and which would include an aspect of reciprocity[21] (see Huttunen 2010, 41; Babbie 2008, 336-337). I sought to be as specific as possible, and to use terminology that would be understandable for the informants. On more than one occasion there were misunderstandings both ways mainly due to the language, so in those cases I either tried to reformulate the question, or asked the informants to explain their ideas in an alternative form. Moreover, as Hirsjärvi and Hurme (1982, 76) point out, the informants might often understate their knowledge on the interview topics, which is why I always emphasized that my interest was specifically in the perceptions, experiences and opinions of the informants.

I complemented the interview data with a number of informal conversations with the informants, staff members, and other people I met in the activities of Maya Vinic. In some of these conversations I used purposive sampling, that is, selected certain people whom I thought might contribute appropriate data (Babbie 2008, 204); on many other occasions the conversations were very casual and often occurred on the initiative of the interlocutor. These informal conversations helped me greatly to widen my understanding on the research topic as well as the lives of the farmers. They also enabled me to cross-check or specify some of the information gained from the interviews or other sources. Like in the interviews, in these informal conversations I made sure I had the permission to use the information in my thesis, in particular in those cases where there was something sensitive about the topic (e.g. Rastas 2008, 68).

In the analysis chapters, after each quotation I mention the gender, community and municipality of the interviewee as well as a number which refers to a list of all the interviewees (see Appendix B). In the quotations I apply the following symbols:

> [--] when I make the comment shorter by leaving out something which is not relevant to the point I want to illustrate.

[21] Even if I shared my own experiences or opinions on some of the topics, I tried not to influence the informants' comments with my own views or perceptions. As Babbie (2008, 336) points out "if you're talking more than 5 percent of the time, that's probably too much".

[ ] my own interpretation or comment

JA: my initials

Participant and nonparticipant observation

Other central method I used in my field work was observation, both in participant and nonparticipant roles (Gillham 2000, 53–4; Eskola and Suoranta 2005, 99–103; Jaffee 2007, 279–80). Like the informal conversations, observation was an important method for complementing and cross-checking the information gained through interviews, as well as for expanding my understanding on the wider context of coffee production and the realities of the producer families. Both types of observation fitted well with the nature of my field work, as I was fortunate enough to have the possibility to participate in a wide range of activities of Maya Vinic, and spend time in the farmer communities. The observation was both a conscious part of my research as well as a very natural way of interacting with people.

In particular, the longer visits to the communities offered an interesting opportunity to observe the natural course of living of the coffee producers, and to take part in their daily routines. For instance, I helped out my host families in different tasks, such as weeding, carrying wood and bricks, and manually sorting coffee beans. I was also invited to eat at the homes of other member families of Maya Vinic, and to take part in different community festivities. Also the situations in which I took a nonparticipant role, such as certain cooperative meetings and loading of coffee sacks into and off the truck, offered valuable insights into different practical aspects of coffee production.

I carried a notebook with me and took notes during the visits to the communities, walks in coffee plots as well as in the reunions and other events I was invited to[22]. In the evenings I wrote up in detail my notes and other reflections about the visits as well as the interviews. I was also writing a blog while I was in Mexico with the purpose of structuring my observations and thoughts, as well as sharing with my networks information about the situation in Chiapas.

[22] Altogether, I visited seven communities and 15-20 coffee plots on more than ten occasions (see Appendix A).

Other data

My other data consists of written sources, such as government documents, reports, books and academic articles[23], as well as various on-line sources. This complementary data, which I subjected to textual analysis, allowed me to triangulate my findings, and thus enhance the validity of the results (Babbie 2008, 123).

I also supplemented my data through conversations – either by email or in person – with researchers and other professionals working on topics related to coffee production. We exchanged materials, ideas and experiences in particular on coffee rust and its impacts, which was an inspiring part of the research project. Not only have I gained useful information and materials, but also created links with other people working on a topic which I find extremely important. My plan is to disseminate results of the present study within these networks, and continue looking for ways of collaboration which, I hope, will result in practical initiatives for managing the disease.

2.3 Critical reflections on the field work

The field work was in many ways an intensive, interesting and inspiring experience, full of unexpected turns and constant learning. One of the most challenging aspects was to position myself as a researcher (and as a fellow human being) vis-à-vis the farmers. I found myself frequently balancing between the roles I was taking, partly due to the lack of experience in doing this type of research, partly because of the complexity of human existence which escapes simple, one-dimensional roles. I felt it was vital to use all my senses in conducting the study, and not to distance myself too much from the people I was dealing with[24]. Yet, I was also conscious of the importance of not becoming too attached to the people or the research topic, as this might bias the results of the study (on the roles of the researcher see Gillham 2000, 53–4; Eskola and Suoranta 2005, 101; Babbie 2008, 317–21). Therefore, in order to avoid any extremes I most often assumed a role which perhaps could be described as that of a curious and respectful guest.

[23] These were gathered from various on-line sources, libraries and bookstores. Before and after my field work I spent some days in Mexico City and Guadalajara where I got hold of useful materials which are not easily available in Finland.

[24] This kind of positioning appears to be common in ethnographic research (Rastas 2010, 67).

Obviously, my role or position was not something I could simply define or create myself as there are a number of factors which differentiate me from my informants[25]. This, of course, is not to say I do not have anything in common with the farmers, but I do believe our realities differ in significant ways, and our means of conceptualizing and making sense of our surroundings can be quite different. These differences very likely influenced our interactions on many levels, and perhaps caused some misunderstandings both ways.

For example, the question of language and communication is quite evident. As Spanish is not the mother tongue of almost any of us, it is possible that some nuances were lost along the way or that we understood some conversation topics differently. I was cautious of this also when analyzing the recorded interviews. Moreover, I noticed it was not only about the language but the way of conveying ideas: I realized my manner of putting forward thoughts, questions and ideas was, especially in the beginning, a bit too direct and perhaps even confusing. Other researchers working with indigenous communities have reported similar cultural and linguistic challenges (e.g. Castellanos et al. 2013, 25; Ponette-González 2007, 291).

In order to be welcomed by the farmers, construct functioning communication, and consequently do well my research, I tried to find ways to express my thoughts as clearly as possible and be very explicit about the aims and objectives of the research. I also tried to adjust my behavior and forms of communication to the surroundings in the best possible way, yet without compromising too much my personality. Furthermore, I worked hard to keep my mind open to any information obtained through listening and observing, in order not to squeeze my observations into predefined categories or frameworks which might in reality be quite alien to the experiences of the farmers. This was perhaps the hardest thing to do.

As already mentioned earlier, the reciprocity was a central principle in all stages of the research. Therefore, whenever I felt it was appropriate, I was happy to talk about my own life and my home country, as well as share my expertise in practical matters that might benefit the farmers or the cooperative. I also tried to learn some basic phrases in Tsotsil, so that I could communicate at least a bit with those people who did not speak

[25] These intersecting factors include sex, ethnicity, age, marital status, education, and language, among others.

any Spanish, and to show respect to their mother tongue. I believe these very simple acts of reciprocity helped to create, at least to some extent, an atmosphere of mutual trust. In fact, it was often the most ordinary moments, such as sitting by the fire eating and talking or weeding a plot side-by-side in silence, which in a way proved to be the most insightful. Furthermore, the fact that I had previously visited coffee lands in Chiapas[26] smoothened interactions with farmers.

Lastly, one big challenge I faced during my field work was the scarcity of time. Even if I extended my stay with a few weeks, it would have been beneficial in many ways to spend an even longer period of time with the farmers. I believe it would have helped me to gain a deeper understanding on the social, cultural, ecological and economic context of the livelihood questions and the coffee rust. It would have also enabled me to apply my research methods in a more thorough manner and perhaps combine qualitative and quantitative methods. Possibly this is a common source of frustration among Master's students working on their thesis, and one has to accept certain limitations. I hope in the future I will have the opportunity to continue with this research topic and fill in the gaps.

2.4 Data processing and analysis

After returning home from Mexico, I started going through the recorded interviews. I listened each interview two to three times and transcribed them in detail, which resulted in a bit more than a hundred pages of transcribed material. While listening to the recordings, I made notes and drew mind maps of themes, topics and discourses that arose from the interviews, paying specific attention to repeating elements or patterns among the data.

The next step was coding. I read the transcriptions three to five times while drafting a matrix of categories, codes and sub-codes which I found relevant as per my research questions. The coding became more and more detailed after each systematic reading of the interviews. Apart from themes and topics stemming from the interview material, my original field notes and preliminary analysis as well as concepts arising from the

[26] As a member of Pro Fair Trade Finland, I visited various coffee cooperatives in 2004 and conducted interviews with farmers.

theoretical framework guided the coding process (Eskola and Suoranta 2005, 155–7). Eventually, this process resulted in a matrix consisting of ten larger thematic categories and a bit over 50 codes or sub-codes, which served as a vital tool for classifying the interview material.

As Ruusuvuori et al. (2010, 19) point out, the interview data does not "speak for itself", but needs to be linked to other type of data and sources. Therefore, in the analysis I was examining the classified interview material side by side with my other data as well as relevant theoretical and empirical literature. This type of triangulation, or a constant dialogue between different sources and my own interpretations, brought thickness to the description and analysis. I also believe triangulation helped to avoid biases in analyzing the data and thus strengthened the validity and reliability of the results (see also Babbie 2008, 343–4).

3. THEORETICAL FRAMEWORK

3.1 Framework for Livelihood Analysis

Setting the framework

As discussed in Chapter 1.3, a number of livelihood approaches have been developed for the purpose of studying rural livelihoods. In this thesis, I apply Frank Ellis' (2000a) Framework for Livelihood Analysis (FLA; see Figure 1) which – due to its flexibility, clarity and logic – I found the most suitable for the analysis of my data. The FLA is a complex model which can be applied in different kinds of research settings and modified accordingly. In Chapter 1.3, I presented briefly some of the elements of the framework. Yet, in order to understand how the framework can be applied in research, it is important to explore more thoroughly different components of the columns and see how these are interrelated. Therefore, in this chapter, I will discuss more in detail the key elements of the framework. In section 2, I will present my own version of Ellis' model which consists of the same elements as the FLA, but is modified in order to make it more applicable for this study.

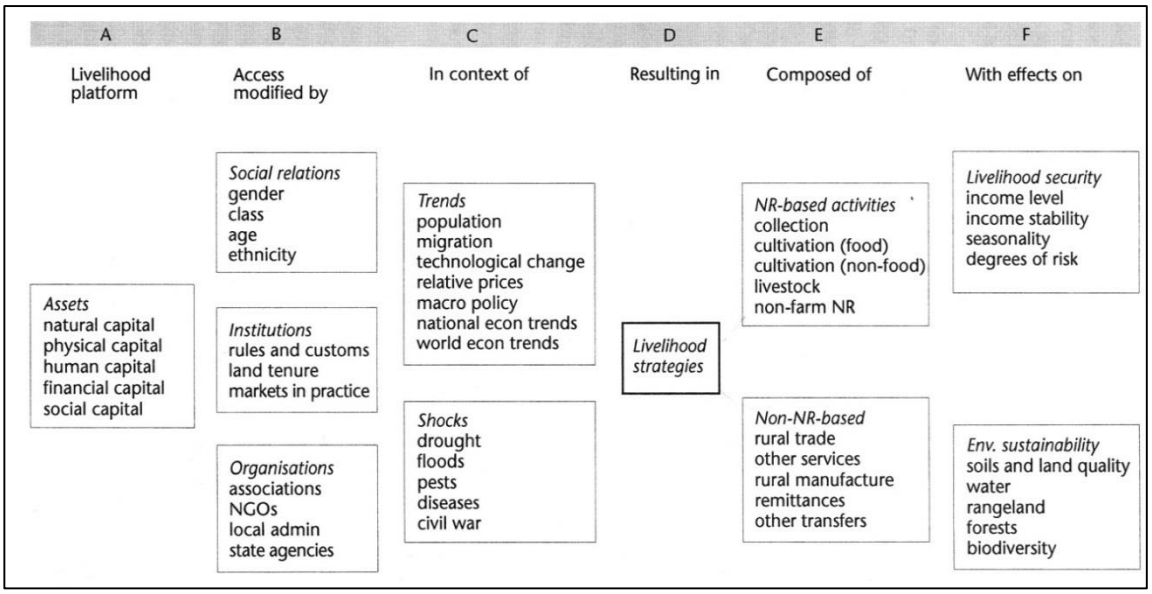


Figure 1 Framework for Livelihood Analysis (Ellis 2000a, 30)

The FLA is a version of the 'assets-mediating processes-activities' framework, which Ellis (2000a, 28) uses as a general term to refer to a range of approaches aiming at analyzing livelihoods from different perspectives. Due to these common analytical and theoretical roots, Ellis' model is very similar to other livelihoods frameworks: it explores the linkages between capitals and livelihood strategies, and connects these to broader structural and institutional factors (see Chapter 1.3). At its core is Ellis' (ibid., 10) definition on livelihoods which builds on Chambers' and Conway's well-known definition presented in Chapter 1.3[27]:

> A livelihood comprises the assets (natural, physical, human, financial and social capital), the activities, and the access to these (mediated by institutions and social relations) that together determine the living gained by the individual or household.

In short, Ellis' framework invites us to ask: What combination of livelihood resources (different types of 'capital') result in the ability to follow what combination of livelihood strategies (combination of different types of activities) and with what outcomes (sustainability/insecurity)? What kind of structures and processes (social relations, institutions, organizations, trends and shocks) mediate the ability to carry out such strategies and achieve (or not) such outcomes?

[27] In his book, Ellis (2000a, 7–10) explains in detail why and how he came up with his own definition on livelihoods, and how it differs from the earlier definitions.

Assets as capitals

Households' ability to pursue different livelihood strategies depends on various types of assets they have in their possession, which puts assets in a central role in livelihood analysis. Assets, as mentioned previously, can be understood as households' capital base consisting of different types of capitals (Scoones 1998, 11). These capitals have a twofold characteristic: they can either exist as a stock (e.g. farm land) that generates output, or can be brought into being whenever surplus is created between production and consumption. In this way stocks of capital enable investments in future productive capacity (Ellis 2000a, 31). Following Amartya Sen's line of thought Bebbington (1999, 2022) further explains that capitals are not merely resources that households use for constructing livelihoods: they also form the basis for proactive action, such as challenging the structures under which one strives for making a living (see also Chambers and Conway 1992, 4).

Different authors have identified a number of relevant categories of capitals. Here I will follow the categorization into natural, physical, human, financial and social capital, which is the one used in Ellis' framework (column A, table 1). Firstly, natural capital refers to the natural resource stocks (e.g. soil, land, water and biological resources) and environmental services (e.g. hydrological cycle, pollination and carbon sequestration) that people utilize in generating means of survival (Scoones 1998, 7; Ellis 2000a, 32). These are fundamental for all human beings, but their importance is highlighted in rural settings. Physical capital, in turn, can be seen as 'human-made' capital which often substitutes natural capital, and allows for creating "a flow of outputs into the future". It includes physical assets such as machines, tools, roads and buildings (Ellis 2000a, 33).

Human capital describes different aspects of the labor available to the household, such as education, skills and health. This type of capital can be increased by, for example, investing in education and training, while good health and physical capability are important for the effectiveness of the labor. Also financial capital is crucial to the pursuit of different livelihood strategies. It refers to stocks of money (e.g. cash, access to credits and savings) which are not productive forms of capital as such, but can be converted into other forms of capital, or into consumption (Ellis 2000a, 33–4).

Finally, social capital can be understood as a bundle of social resources (e.g. social relations, networks, affiliations) that individuals can draw on. This is perhaps the most contested capital category, as it is rather abstract and can be described mainly in qualitative terms (Scoones 1998, 8; Bebbington 1999, 2036; Ellis 2000a, 34–6). However, some authors consider it to be a highly relevant dimension in livelihoods construction. For instance, Bebbington (1999) asserts that social capital is closely linked to access to resources, as this type of capital often facilitates actions that may enhance households' livelihoods (see also Chapter 1.3). He (ibid., 2037) explains:

> these actions can be understood as enhancing people's ability to access and defend resources, transform them into income, and access institutions and organizations in the spheres of markets, state and civil society in such a way as to facilitate resource access, defense and transformation.

For example, at the local level different kinds of social networks, such as farmers' cooperatives, can be crucial for facilitating access to financial capital which, in turn, may enhance accumulation of other types of capitals. This kind of networks may also help to shift power relations in favor of individuals or groups who have been previously on the margins of decision-making (Bebbington 1999, 2037; see also Bacon 2005, 501). On the other hand, social relationships may also constrain households' livelihood opportunities, as Nygren and Myatt-Hirvonen (2009) demonstrate in their study.

It is important to take into consideration that assets, or stocks of capitals, are not static and their composition vary across time and space. Even within a seemingly homogeneous community there might be great variations between the assets households possess as well as in the access to these. Therefore, in livelihood analysis it is essential to identify which assets are central to the households, and also how these assets relate to one another (Bebbington 1999, 2031–2). For example, are households capable of substitution between assets in pursuing different livelihood strategies or in coping with shocks (Ellis 2000a, 42–3)? Do certain types of assets enable or constrain livelihood opportunities (see Nygren and Myatt-Hirvonen 2009)?

Livelihood strategies

Livelihood strategies are composed of one or several activities which generate the means for households' survival (Ellis 2000a, 41). In his framework, Ellis (ibid.) divides activities into natural resource based and non-natural resource based activities (column E) which consist of different types of income sources, namely farm income, off-farm income and non-farm income. He (ibid. 11–2) explains that farm income is typically generated through farming and raising livestock, and comprises the cash income obtained by selling the output as well as the consumption-in-kind of farm products. Off-farm income consists of wage or exchange labor conducted within agriculture, including labor payments in kind. Finally, non-farm income comprises non-agricultural income sources, such as non-farm rural wage or salary employment, non-farm rural self-employment, remittances, and other types of transfers.

Scoones (1998), in turn, has identified three broad clusters of livelihood strategies which are open to rural people. These include agricultural intensification (more output per unit either through capital investment of labor inputs) and extensification (more land under cultivation), migration, and diversification. Looking at this typology side-by-side with Ellis' classification on different types of income-generating resources, it can be said that agricultural intensification/extensification as a strategy relies mainly on on-farm income sources, while migration and diversification are strategies composed largely of off-farm and non-farm income sources (ibid., 9; see also Ellis 2000a, 11–2).

Ellis (2000a, 41) does not fully agree with Scoones' typology, as he sees diversification as a cross-cutting element in different livelihood strategies rather than a separate strategy. This is evident in his definition of rural livelihood diversification which he sees as "the process by which rural households construct an increasingly diverse portfolio of activities and assets in order to survive and to improve their standard of living" (ibid., 15). In the present study, I will use the term 'livelihood diversification' as Ellis understands it, while also making use of Scoones' categories, when appropriate.

Livelihood construction is typically a fluid process which individuals and households adapt to changing conditions, pressures and opportunities (Bebbington 1999, 2033). For

instance, in case of unexpected shocks households often have to resort to coping strategies. These refer to a set of methods which are applied as short-term responses in order to survive with adverse impacts of shocks or hazards. This type of strategies are typically easily reversible. Livelihood adaptation, on the other hand, refers to strategies aiming at reducing livelihood vulnerability to shocks or other stressors, and thus enhance long-term livelihood security (Ellis 2000a, 41, 45; Ellis 2000b, 297-298; Tucker et al. 2010, 28; see also Blaikie et al. 1994, 62). Both coping and adaptation strategies may either enhance of hinder households' livelihood security and sustainability (Ellis 2000a, 45; see also Bebbington 1999, 2033).

Mediating processes

Mediating processes refer to a series of contextual and complex structures and processes mediating the translation of assets into livelihood strategies (Bebbington 1999, 2035; Scoones 1998, 11; Ellis 2000a, 37). Ellis (2000a, 38–9) groups mediating processes into 'social relations', 'institutions' and 'organizations' (column B) which he sees as predominantly endogenous social factors, and to 'trends' and 'shocks' (column C) which he defines as mainly exogenous factors of economic trends, and unexpected livelihood shocks. Although this division is not clear-cut, Ellis (ibid., 38) finds it useful for distinguishing those external factors which even countries do not often have control over from those factors that are closer to the every-day realities of individuals and households.

Social relations, institutions and organizations are crucial, as they either facilitate or inhibit access of households to different assets, and this way, to activities. As such, they are closely linked to the notion of social capital (Ellis 2000a, 39; see Chapter 1.3). In this context, social relations can be understood as the social positioning of individuals and households within the society they form part of. The range of factors defining social positioning, such as gender or religion, can have very different livelihood implications depending on the context (ibid., 38.).

Organizations, such as associations and NGO's, can be seen as groups of individuals who share collective goals (Ellis 2000a, 38). Organizations differ from institutions

which Scoones[28] (1998, 12) describes as "regularized practices (or patterns of behavior) structured by rules and norms of society which have persistent and widespread use". As such, they set certain constraints on human interaction (Ellis 2000a, 38). Institutions are either formal or informal, and they are constantly being shaped and reshaped as a result of social negotiation and power struggles. Moreover, individuals give different meanings and interpretations to the institutions present in their society (Scoones 1998, 12).

In Ellis' framework, trends refer to those factors which impact to varying degree on the livelihoods of households, but are often happening "out there", beyond immediate reach of individuals or households. This type of factors include, for example, the intensity of out-migration from rural areas, relative prices, and national and international economic trends. For instance, in case of small-scale coffee producers, global coffee prices or major shifts in coffee value chain often affect their livelihoods directly (Ellis 2000a, 39).

Lastly, shocks are those unforeseen events that threaten livelihood security and sustainability. As a difference to 'stresses'/'stressors' which are often continuous and cumulative (e.g. seasonal food shortages), shocks are normally sudden, unpredictable and traumatic. Shocks can be either individual or social in scope. Droughts, pests, famines and collapse of a market are examples of shocks affecting the whole community, whereas individual shocks comprise sudden sickness or death of a family member, job loss, and so on (Chambers and Conway 1992, 10–1). Livelihood sustainability is challenged by these types of unforeseen events, as they often destroy households' assets directly, or lead to erosion of assets (Ellis 2000a, 40; Bacon 2005, 501). As discussed above, households are often compelled to resort to a range of coping strategies in order to deal with immediate impacts of livelihood shocks and secure their livelihood sustainability in the future (Ellis 2000a, 44).

Livelihood vulnerability and sustainability

Finally, other relevant dimensions to be considered in a livelihood analysis are those of 'vulnerability' and 'sustainability'. These are important considerations in analyzing the

[28] following Giddens (1979).

myriad of factors affecting households' livelihood strategies (in particular columns A, B and C). They are also significant – although to some extent vague – parameters when assessing livelihood outcomes of adopted strategies (column F).

In simple terms, vulnerability refers to susceptibility to loss or harm. More specifically, it can be seen as a dynamic and context-dependent process embedded in a complex social-ecological system (Adger et al. 2003, 181; Eakin et al. 2009, 399). As noted by Eakin et al. (ibid.), it consists of "exogenous risks, household responses to risk, and the outcomes of these responses in terms of individual or household welfare" (also Adger 2006, 267). Households' degree of vulnerability can be assessed, for instance, by looking at households' capacity to mitigate and cope with exogenous risk and stress factors, such as unexpected shocks (Blaikie et al. 1994, 9; Ellis 2000b, 298).

Vulnerability is often an on-going condition which means that households living with high levels of vulnerability are constantly trying to cope with shifting risks, and to strengthen their adaptive capacity in order to enhance livelihood security (Bohle 2007, 9; see also Eakin 2005, 1924). Blaikie et al. (1994, 58) assert that households are "vulnerable in differing degrees to different hazards", meaning that a household vulnerable to one type of livelihood shock or hazard is likely to be vulnerable to others as well.

Lack of assets/capitals, limited substitution capabilities between assets and activities, as well as a limited access to social support systems or other kinds of networks are among factors maintaining or increasing household vulnerability (Bebbington 1999, 2028; Ellis 2000a, 42; 2000b, 298). Blaikie et al. (1994, 48) put a specific emphasis on access: restricted access to fundamental livelihood resources may lead to increased vulnerability and force households to combine various low-return livelihood activities. On the other hand, individuals or households with better access qualifications have more income opportunities to choose from and can choose ones with lower risks (ibid., 48, 51).

The opposite of vulnerability is livelihood security, an inseparable dimension of livelihood sustainability (Ellis 2000b, 298; Bohle 2007, 11). Sustainable livelihoods are those having the capacity to resists risks and shocks, and to recover from these without compromising the natural resource base or otherwise risking the future survival. In

pursuing sustainable livelihoods and thus reducing vulnerability, it is fundamental that households have opportunities to enrich their asset/capital portfolio and seek more diverse livelihood strategies[29] (Chambers and Conway 1992, 10; Bohle 2007, 14; see also Bebbington 1999, 2028; Eakin 2005, 1935; Ponette-González 2007, 298). Household efforts alone are rarely sufficient in building sustainable livelihoods; these need to be complemented with public action that tangle with exogenous factors impacting households' livelihoods and well-being (Chambers and Conway 1992, 10–1; see also Eakin et al. 2012, 486).

Stemming from the fields of agroecology and ecology, a related concept to vulnerability and livelihood security is that of 'resilience'. Resilience can be understood as "the ability of an ecological or livelihood system to 'bounce back' from stress or shocks" (Ellis 2000a, 62–3). The concept is applied to evaluate, for instance, how human systems are prepared for shocks and stress related to natural hazards, and how they are able to cope with the impacts of these (Klein, Nicholls and Thomalla 2003). Ellis (2000a, 62–3) asserts that robust livelihood systems typically show more resilience than the more vulnerable ones, and both in natural and human systems, diversity often contributes to the resilience of a system. Learning, self-organization and adaptiveness are also considered as characteristics of a resilient systems (Eakin et al. 2012, 477).

3.2 Applying the Framework for Livelihood Analysis

As noted above, the Framework for Livelihood Analysis is a complex model which offers a range of opportunities for conducting research on livelihoods, and allows for a great variety as per the scale, perspective and units of analysis (Ellis 2000a, 29). This flexibility, in my opinion, is an advantage although it compels the researcher to make trade-offs between the dimensions included in the analysis. In this study, I will apply what Scoones (1998, 13) calls the principle of 'optimal ignorance', and in my quest for "seeking out only what is necessary to know" focus on a limited set of aspects which I find relevant regarding my research questions (see Figure 2). I am also conscious of

[29] As Ellis (2000b, 299) points out, diversified livelihoods are often more sustainable and less vulnerable to risks. On the other hand, Eakin et al. (2012, 485) assert that economic diversification is not fail-safe in all cases; for instance, a livelihoods portfolio consisting of various sporadic and/or poorly paid activities is not likely to enhance livelihoods security.

Ellis' (2000a, 29) advice to look at the framework as a dynamic tool which only implies interactions between its components, not states them. I believe going back to relevant livelihood-oriented literature will help to avoid the potential pitfall of following the framework too rigidly. The existing livelihood literature is, of course, important also in reflecting the research findings.

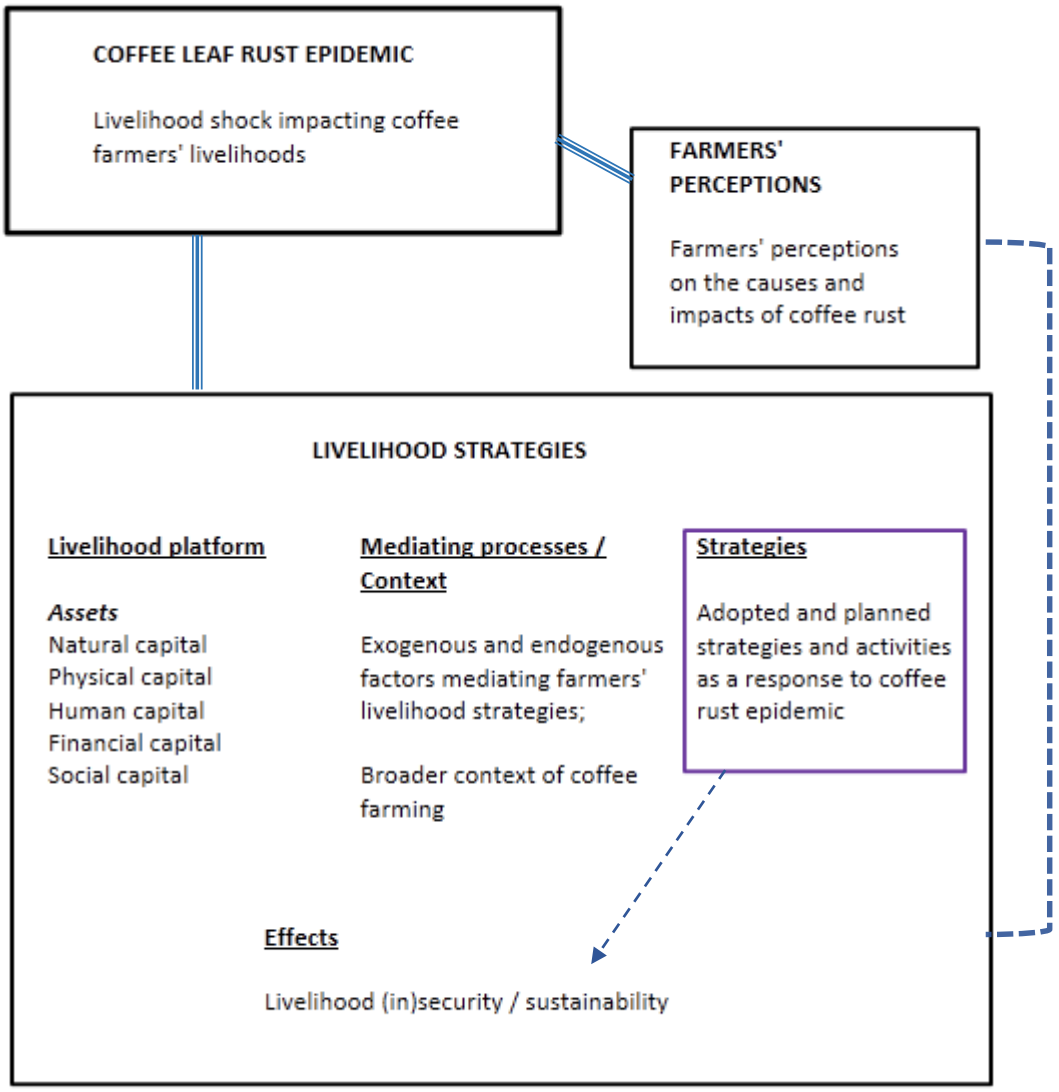


Figure 2 Modification of Ellis' (2000a) Framework for Livelihood Analysis

Figure 2 presents my modified version of Ellis' model (FLA) which I use as a tool for analyzing my data. It seeks to capture those dimensions – and relations between these – which I believe to be relevant as per the aims and objectives of this research. The analytical categories and underlying theoretical assumptions are similar to those in the

FLA, although I have narrowed them down to fit the scope of this study. As illustrated in the graphic, the focus of the analysis is on farmers' perceptions of coffee rust epidemic and its impacts, as well as on livelihood strategies farmers are planning to adopt in coping with coffee rust[30]. A specific emphasis is on the ways different form of capitals and access to these[31] affect farmers' livelihood decisions.

'Farmers' perceptions' is a dimension I have amended to Ellis' model. As discussed in Chapter 1.2, I believe it is important to take into account farmers' perceptions of coffee rust when analyzing their responses to the disease. Inspired by Bebbington's (1999) thinking, the addition of farmers' subjective accounts and experiences allows us to move beyond material and economic focus on livelihoods, and get a more nuanced understanding on farmers' livelihood decision-making processes (see also Chapter 1.3). It also helps us to explore variations in farmers' perceptions of risk (e.g. Tucker et al. 2010). Thus, instead of focusing solely on 'what' and 'how' type of questions, we should also ask 'why'.

In conclusion, in my quest for understanding farmers' perceptions of coffee rust and their coping methods, I am applying an action-oriented approach. Thus, the emphasis is on farmers' views and experiences, their livelihood strategies, as well as the asset portfolios they manage. In order to draw a more holistic picture of the situation I will complement the analysis by keying it to an evaluation of structural and institutional factors affecting directly or indirectly farmers' livelihood decisions (see Chapter 1.3 for the critique of livelihood approaches; also Eakin et al. 2009, 406). This approach is inspired particularly by agroecological research and political ecology (see e.g. Blaikie et al. 1994; Méndez et al. 2013). Lastly, I will also present some estimates of the possible outcomes of the livelihood strategies in the context of coffee rust[32].

As argued earlier, farmers' decisions are structured by an array of economic, social and political factors on a local and global scale. Thus, following Ellis' (2000a) line of thinking, I find it important to also explore the wider context in which small-scale coffee farmers of Chiapas are trying to make a living, and identify some key elements

[30] corresponding to columns D and E in the FLA (Ellis 2000a)
[31] corresponding to column A in the FLA (Ellis 2000a)
[32] corresponding to column F in the FLA (Ellis 2000a)

mediating farmers' livelihood decisions and strategies[33]. In the following chapter I discuss some facets of coffee production on a global scale and in Mexico, and examine factors contributing to smallholders' marginalization and vulnerability. In the same chapter, I also provide an overview of our current knowledge on coffee rust.

4. COFFEE PRODUCTION AND ITS RISKS AND CHALLENGES

4.1 From Southern shades to Northern consumers

Coffee is one of the most valuable legally traded commodities from developing countries, and an important source of revenue for many national economies. It is estimated that more than 25 million people along the commodity chain – from farmers and laborers to rosters, distributors and coffee shop employees – depend on coffee for their livelihoods (ICO 2014a). Around 2 billion people are estimated to be regular coffee drinkers (Toledo and Moguel 2012, 354) and the number is steadily increasing. Perhaps not surprisingly, the highest consumption of coffee is within the importing countries (ICO 2014a).

This popular crop has its origins in Ethiopia from where it spread through the colonial world, gaining foothold in many Latin American, African and Asian countries (Jha et al. 2011, 145). A period between 1970 and 1990 saw a rapid increase in the global coffee area and average yields. In the following 20-year period the global area decreased but the production climbed 36 %, which was caused by the overall intensification in some countries, abandonment of coffee in others, and the fast expansion of high-yield coffee in new producing countries (Jha et al. 2014, 416). In 2014, coffee was cultivated as a cash crop in approximately 70 countries (ICO 2014a; see Appendix D), occupying an area of around 10 million hectares (FAO 2014).

Coffee belongs to the genus *Coffea*, which includes two species of commercial value, *Coffea arabica* and *Coffea canephora* ('robusta'). The former dominates the coffee

[33] corresponding to columns B and C in the FLA (Ellis 2000a)

lands, as it is generally preferred for its taste qualities (Jha et al. 2014, 416). The production of coffee requires specific ecological and environmental conditions (e.g. high altitude), which limits the regions where it can be grown. It is notable that many of these regions overlap with areas considered as biodiversity "hotspots", meaning that the crop has an important impact on the biodiversity of these areas (Donald 2004, 23-26.) As a perennial crop, it needs between four to six years to start producing the ripe cherries for harvesting and further processing. The processed cherry, the coffee bean, can be stored for months, making the value chain of the crop flexible compared to many other tropical agricultural products (Jha et al. 2011, 143-145).

The vast majority of global coffee is produced by smallholders farming less than 10 hectares (Jha et al. 2011, 140). In reality, most producers for example in Mesoamerica are substantially smaller, farming less than 2 hectares (ibid., 152). Many of these so-called micro-producers belong to given indigenous cultures, and reside in culturally megadiverse countries or areas[34] (Toledo and Moguel 2012, 360). They are dependent on unpaid family labor, although during harvest season they often hire extra labor. A relatively large share of their annual income comes from coffee production (Eakin et al. 2009, 400).

Toledo and Moguel (2012, 355–63) explain that there are several ways to grow coffee, all of which reflect a range of biological, sociocultural and agronomic factors[35]. In the 'traditional' coffee-growing practices the crop is grown under a multilayered and multispecies canopy of native forest trees in high to moderate shade, and is mainly managed by indigenous, small-scale farmers. In many cases these type of systems are inserted within already existent agroforestry systems, and form part of larger land-management practices. For example, in Mexico shade coffee is often managed alongside maize fields ('milpa'). Furthermore, the coffee plot is commonly used for growing a number of other plants, such as fruits and nuts for subsistence or for sale, which provides important livelihood support. 'Traditional' systems generally have a

[34] Based on the geographical distribution of languages, Toledo and Moguel (2012, 360) estimate that "some 820 indigenous cultures live in coffee regions of 17 countries with large tracts of shaded coffee".
[35] These different systems are often described in general terms as sun- and shade-grown coffee, or "modern" and "traditional" coffee-growing systems. Toledo and Moguel (2012) consider these categorizations an oversimplification, and developed in the 90s a detailed typology to describe the diversity within the coffee-growing landscapes. The following paragraphs are based in this typology.

positive ecological impact, as they for example store carbon, reduce deforestation, and play an important role in biodiversity conservation.

There are also more intensified shade-grown coffee plantations in which one or several planted tree species offer shade to coffee bushes. In these more commercial systems, the use of synthetic agrochemicals is more common than in the 'traditional' ones. Lastly, at the other end of the vegetation management continuum, there is 'sun-grown' coffee which is grown in full sun without shade vegetation. These monocultural plantations require genetically improved varieties, high inputs of agrochemicals, machinery and intensive labor (Toledo & Moguel 2012, 355–6). Although the production of 'shade-grown coffee' is slightly higher globally, the share of sun-grown coffee is growing steadily[36] (Jha et al. 2014, 419) as in suitable conditions it can produce higher yields per unit area. This type of more intensified and less ecological production has also been encouraged and supported by many national governments (Donald 2004, 24).

4.2 Coffee production in Mexico

Coffee was introduced into the Western part of Mexico in the late 18th century, and in the Southern state of Chiapas the first large coffee estates started their production at the end of the 19th century. The 20th century saw a major shift in the social context of coffee farming in Mexico. Indigenous people and peasants working in large estates learned about coffee production and processing, and took this knowledge as well as seeds back to their communities. Thus, a crop originally grown in large monocultural plantations, coffee went to become a peasant product primarily grown by small producers (Zamora Lomelí 2003, 119-120; Jaffee 2007, 39-40; interview with a producer 6 May 2014).

Today, coffee is cultivated by some 350 000 to 500 000 Mexican producers[37], while the whole coffee production chain employs some additional four million people in the country. Out of the 15 producing states, Chiapas, Veracruz and Oaxaca are the most important when measured by the number of producers, land area under coffee

[36] In 2010, a comparison between 19 coffee-producing countries show that approximately 41 % of coffee area was managed without shade, 35 % with a sparse shade and 24 % with a traditional shade (Jha et al. 2014, 419).
[37] The exact number depends on the statistics used (Robles Berlanga 2011, 8).

cultivation and production volumes (Robles Berlanga 2011, 12). On a global scale, Mexico is among the ten biggest exporting countries (see Appendix D), and one of the leading countries in certified organic coffee (ICO 2014a)[38].

Mexican coffee is produced mainly in mountainous and biodiversity-rich regions (Moguel and Toledo 1999, 18). Moguel and Toledo (ibid.) observed in the late 90s that over two-thirds of the Mexican coffee is shade-grown, following 'traditional' coffee-growing practices. A more recent study, conducted in Chiapas, also indicates that shade-grown coffee remains important, although more technified management systems and the application of agrochemicals are also common in these coffee landscapes (Martínez-Torres 2008, 102-104; see also Eakin et al. 2012, 477). The roots of the "technification" of the coffee production can be traced to the 1970s and 1980s when the Mexican Coffee Institute (INMECAFE) controlled the national coffee sector and promoted this type of production systems (Jaffee 2007, 50; Jha et al. 2011, 164). The trend has continued since, despite of the dismantling of INMECAFE in 1989.

A significant share of Mexican all coffee is produced by smallholders, the majority of them belonging to different indigenous groups. These small or micro producers cultivate the crop in small plots rarely exceeding two hectares[39] (Jaffee 2007, 40; Robles Berlanga 2011, 28; Eakin et al. 2012, 477). The share of smallholders is substantial compared with other producing countries: Mexico has considerably more small farmers in absolute numbers than for example the world's leading producer country, Brazil (Jha et. al 2011, 151), and its proportion of very small farmers is the highest in Latin America. Having said this, it is important to note that the productivity of the small and micro producers is rather low, and around one-third of the national harvest is produced by large plantations constituting less than one percent of Mexico's farms. On the other hand, although the productivity is generally low, farmers are efficient in other ways, such as in sustaining local communities and ecosystems (Jaffee 2007, 40).

[38] Mexico exports a vast majority of its production, mainly as 'green coffee' instead of processed coffee (ICO 2014a). Another point worth mentioning is that the national consumption in Mexico is very low (a bit more than 1 kg per capita) compared to other producing countries (Robles Berlanga 2011, 14).
[39] In 2006, approximately 84 % of Mexican coffee producers had less than two hectares under coffee production, which corresponded to some 47 % of the total area under coffee production in Mexico (Robles Berlanga 2011, 28).

4.3 Vulnerable livelihoods of small-scale coffee producers

Factors contributing to smallholder' vulnerability

A number of studies indicate that small-scale coffee producers in different parts of the world face persistent livelihood difficulties and are often among the most socially marginalized and cash-poor sectors of the society (Bacon 2005; Jaffee 2007; Ambinakudige 2009; Valkila and Nygren 2009; Tucker et al. 2010; Jha et al. 2011; Caswell et al. 2012; Morris et al. 2013; see Chapter 1.3). There is a vast range of macro- and micro-scale factors contributing to the vulnerability of smallholders, some of which I will discuss in the following.

One central cause are the unequal power relations within the global commodity chains and markets. Until the late 1980s, an international agreement (International Coffee Agreement ICA) allowed national governments to influence coffee markets and prices paid to the producers. Since the dismantling of ICA, subsequent liberalization of the coffee sector, and the coinciding triumph of neoliberal policies pushed by multilateral institutions, power in the coffee trade has more markedly concentrated in the roasting and international trading segments of the commodity chain (Daviron and Ponte 2005, 121–2; Jaffee 2007, 42–4; Jha et al. 2011, 153). This means that producers in developing countries receive a minute compensation for their product compared to coffee roaster companies and marketers in the US and Europe (Petchers and Harris 2008, 49).

On a micro level, the power imbalance is intensified by smallholders' inability to access the markets directly[40], a lack of access to agricultural credits and an over-dependency on one source of income (Petchers and Harris 2008, 43). Other elements feeding farmer families' livelihood insecurity include constant and often abrupt price fluctuations in the global markets, rising cost of food and goods, crop diseases, and family health problems (Morris et al. 2013, 426). These vulnerabilities have negative effects on farmer households' and their communities' welfare, health, social stability (Tucker et al. 2010, 24) as well as food security (Jaffee 2007; Caswell et al. 2012).

[40] In the producing countries the large coffee estates and/or transnational companies are often in control of the exports and buy coffee at a low price from small and micro producers (Jha et al. 2011, 150; Rodríguez Rivera 2011, 272).

Mexican small coffee farmers face similar livelihood challenges as smallholders elsewhere. The national coffee sector is characterized by a stark power imbalance: the markets are largely in the hands of big transnational companies and other middlemen (often called 'coyotes' by farmers), while the small-scale farmers have limited negotiating power (Rodríguez Rivera 2011, 272–3). The contrast has been particularly blatant since the late 1980s when the dissolution of ICA as well as INMECAFE, a government agency regulating the coffee marketing and production, left smallholders exposed to an unregulated market[41] (Jaffee 2007, 50–1; Renard 2010, 23–4). Apart from reducing smallholders' negotiating power, these changes in the international and national coffee regimes narrowed down smallholders' possibilities to accumulate resources, and left them without insurance and technical assistance (Eakin 2005, 1926).

Furthermore, fragmentation of land, lack of rural credits[42], weak infrastructure and poor educational level are some of the factors maintaining coffee producers among the most cash poor and marginalized sectors in rural Mexico (Saldaña-Zorrilla 2008; Robles Berlanga 2011; see Chapters 5 and 6). It is also important to note that in the case of Chiapas, the history of social and political tensions and conflicts contributes to the marginalization of peasant farmers, in particular those belonging to indigenous groups[43] (see Zamora Lomelí 2003). This is a topic that was raised often during interviews and informal conversations with the farmers.

Lastly, climate change is impacting the livelihoods of small coffee farmers in many coffee-growing regions, and it is likely that the effects will be intensified in the future [44] (Tucker et al. 2010, 24; Frank et al. 2011, 68; GAIN 2014; Jha et al. 2014, 424; Quiroga et al. 2015, 54; see also Ghini et al. 2011). As the coffee plant is sensible to major climate variability, any large-scale climate events hitting coffee lands will impact the

[41] The dismantling of INMECAFE inflicted a major drop in prices and caused poverty and debt among smallholders (Jaffee 2007, 52).
[42] The lack of rural credits is also partly a result of changes in Mexican agricultural policies in the late 80s (Saldaña-Zorrilla 2008, 584).
[43] Many social movements, such as las Abejas (see Chapter 2) and Zapatistas, have emerged as a counter reaction to the economic and social exclusion (e.g. Rodríguez Rivera 2011, 292).
[44] For example, in Mesoamerica the farmers have experienced extraordinary weather since the late 90s and the frequency of extreme weather events is estimated to increase (Tucker et al. 2010, 24). All in all, climate change is predicted to affect disproportionally regions populated by small farmers (Windfuhr and Jonsén 2005, 107).

farmers' livelihoods (Lin et al. 2008, 851). In the case of Chiapas, it is estimated that climate change will increase the occurrence of landslides, fires, and variations in temperature and precipitation over the next decades (Schroth et al. 2009, 606). These occurrences can have negative impacts on coffee plant physiology, flowering and fruiting, and cause alterations in the quality and quantity of coffee. They may also increase the costs for growing, harvesting and processing the crop, and increase pest and disease pressures (ibid., 606, 617; see also Eakin and Wehbe 2009, 363; Frank et al. 2011, 68; Quiroga et al. 2015, 55). Recent studies indicate that due to the estimated climate change patterns, coffee production might seize to be a viable option for smallholders in many parts of Chiapas[45] in the future (Schroth et al. 2009, 623; Ovalle-Rivera et al. 2015, 13; see also Jha et al. 2014, 424). Many farmers have already started to prepare for adverse impacts of climate change, for instance, by changing to coffee varieties that are more resistant to drought or excess moisture (Frank et al. 2011, 69).

Coping with vulnerability

Similarly to other export crop producers, coffee farmers are aware of the risks and challenges posed to their livelihoods, and have experience in coping with these adversities (Ellis 2000a, 50). Although the dependency on coffee remains strong, smallholders typically have a number of mechanisms in place which help to prevent or buffer negative effects of sudden livelihood shocks or other stress factors (Jaffee 2007, 41).

One important strategy, which I will discuss in detail in Chapter 5, is livelihood diversification. In coffee-growing regions, it is common for households to manage diversified livelihood portfolios consisting of a combination of livelihood activities (Jaffee 2007; Bacon et al. 2008b, 353). Prior studies have noted that agricultural and off-farm labor, crop diversification, as well as remittances from migrants and government subsidies[46] are among the most prevalent income-generating options (Jaffee

[45] The same might be a reality for Veracruz where the production is estimated to drop some 34 % by 2020 (Gay et al. 2006, cited in Ghini et al. 2011, 122). In Mexico, the total decrease in the area suitable for Arabica coffee cultivation is estimated to be 29 % by 2015 (Ovalle-Rivera et al. 2015, 13).
[46] Robles Berlanga (2011, 20) criticizes these subsidies. He notes that they are often channeled through poverty-reduction campaigns (e.g. subsidies for increasing school attendance) instead of being directed at

2007; Ponette-González 2007; Barham et al. 2011; Jha et al. 2011; Frank et al. 2011). It is also noteworthy that in Mexico, subsistence farming forms an important component of diversified farming systems, in particular within indigenous coffee-growing communities (Eakin 2005, 1930; Jaffee 2007; Ponette-González 2007; Robles Berlanga 2011, 15; see also Bacon 2005, 504).

Secondly, many small farmers have joined farmers' cooperatives in order to have better access to markets, information and technology, receive a better pay for their product, and have more negotiating power (Eakin and Wehbe 2009, 364; Renard 2010, 28–9; Jha et al. 2011, 187; Frank et al. 2011, 69). The importance of cooperatives and other farmers' associations has increased significantly after the era of INMECAFE (Eakin and Wehbe 2009, 364). Many of these cooperatives have entered into the 'specialty coffee' markets, which have seen a rapid expansion over the last 20 years. These value-added markets encompass a number of 'alternative' or 'sustainable' coffee certifications, such as *Fair Trade*, *organic* and *Bird Friendly*, which differentiate the specialty coffees from the bulk coffee on the basis of certification-specific factors (Jha et al. 2014, 421).

In Mexico, especially certified organic production[47] has been growing in scale over the past few decades, and the original pioneers of the organic production, the mainly indigenous small farmers and their cooperatives from Chiapas and Oaxaca[48], continue to be the protagonists of organic farming (Martínez-Torres 2008, 99; López López and Caamal Cauich 2009; Toledo and Moguel 2012, 365). Organic production offers a viable alternative for small-scale farmers to strengthen their livelihoods: the investment in organic technology is relatively "cash cheap", and the labor-intensive production allows the farmers to use the abundant family labor (Martínez-Torres 2008, 115).

In recent years, a number of researchers have explored sustainable coffee certifications and their impacts on smallholders' livelihoods (Bray et al. 2002; Bacon 2005; Jaffee

productive activities which would help the small farmers to improve their farms and thus increase the production (ibid., 20).

[47] The methods used in the organic farming resemble those of 'traditional' production, although there is a more intensive use of organic inputs and human labor (Martínez-Torres 2008, 104).

[48] The growth of organic production is partly due to the major changes in the national and international coffee regimes. The dismantling of International Coffee Agreement (ICA) and Mexican Coffee Institute (Inmecafé) left farmers on their own to face the impacts of sharply declining prices and made them look for alternatives (Jha et al. 2011, 164).

2007; López López and Caamal Cauich 2009; Valkila and Nygren 2009; Méndez et al. 2010; Barham et al. 2011; Bacon et al. 2012; Bacon et al. 2014; Donovan and Poole 2014). These studies suggest that specialty coffee markets tend to bring some benefits to farmers and/or growers' cooperatives, such as a somewhat higher price for their product (e.g. Jaffee 2007, 98; López López and Caamal Cauich 2009, 195–6; Barham et al. 2011, 142). However, although the alternative certifications might offer some alleviation to smallholders' economic and/or social conditions, they cannot alone solve broader livelihood challenges (Jaffee 2007; Bacon et al. 2008a; Valkila and Nygren 2009; Jha et al. 2011, 184; Barham et al. 2011). In his book, Jaffee (2007) offers an analysis on the role of *Fair Trade* in global markets and the effects it has on indigenous coffee farmers' livelihoods in Oaxaca, Mexico. He concludes that Fair Trade clearly brings some benefits to organized famers holding the certification. He also asserts that the system has its limitations, and Fair Trade must be made far fairer in order to have a deeper effect on smallholders' lives[49].

4.4 Coffee Rust

The most severe coffee rust epidemic in the region

Adding to the ongoing livelihood challenges discussed above, coffee producers are sensitive to sudden and unpredictable shocks (Jha et al. 2011, 182). These can increase livelihood vulnerability and cause unexpected devastation in a short period of time. This is the case with coffee rust that hit large parts of Latin American coffee lands in 2012, Central America and Mexico being among the worst affected (Cressey 2013). Although *roya*, as the disease is commonly known in Latin America, has been tormenting farmers also in the past, the current epidemic is the most severe ever experienced in the region[50] (Avelino and Rivas 2013, 3). It has caused unparalleled economic and social damage, including a decline in household income for a large number of farmers, food insecurity,

[49] Bacon, Méndez and Fox (2008, 340) also point out that the specialty markets remain inaccessible to many small-scale farmers.

[50] The rapid spread of the disease surprised all – the producers, scientists, and the producing countries. For example, John Vandermeer et al. (2009, 636) wrote three years before the major break of coffee rust: "While the coffee rust disease remains a major threat to producers all over the world, it has largely become more of an irritant than a disaster, with farms throughout Latin America showing low levels of infection almost every year." In 2014, they concluded that, although much is known about the mechanisms of the disease, it is not certain why the coffee rust is now causing more devastation than for example in the 1980s (Vandermeer et al. 2014, 210).

as well as a loss of employment for landless laborers working on coffee plantations. It has also had negative implications to national economies of the producing countries (PROMECAFE and IICA 2013, 2; Avelino et al. 2015, 307).

In 2012-13 cycle, coffee rust affected 55% of the area dedicated to coffee-cultivation in Nicaragua, Costa Rica, Panama, Dominican Republica, Jamaica, Guatemala, El Salvador and Honduras (PROMECAFE and IICA 2013, 2). Also in Mexico large parts of the coffee producing regions in the country have been hit since 2012. In Central America, the production decreased by 16 % for the 2012-13 harvest compared with 2011-12, while the percentage for Mexico was approximately 10 %[51] (ICO 2015).

In 2014, Chiapas was among the worst struck states in the country (SENASICA 2014a, 2014b). The staff members of Maya Vinic estimated that 60 % of the coffee lands in their working area had been affected to some degree since 2012. The reduction in cooperative's total coffee production was around 40 % for 2013-14, and the yield was expected to further decrease for 2014-15[52]. Interestingly, there were considerable variations between the communities, despite of the close geographic proximity of some of them. In some communities, farmers reported up to 90 % losses, while in others the damages were minimal.

Characteristics and control

Coffee rust is caused by a fungus (*Hemileia vastatrix*) which attacks most commercial coffee cultivars, and leads to premature drop of infected leaves and eventual crop losses. Images 3 and 4 illustrate impacts of the disease on coffee trees. As the photosynthetic capacity of the plant gets reduced, the disease has a debilitating effect on coffee also during the successive cycles (Arneson 2000). The fungus operates in a complex web of ecological interactions (Vandermeer et al. 2014), and there are many factors contributing to its propagation, such as temperature (dependent on elevation), wind, rainfall and wetness (Ghini et al. 2011, 126; Avelino and Rivas 2013, 13; Jha et al. 2014,

[51] Of course, there are also other reasons affecting the variation in the production (Avelino et al. 2015, 306).
[52] I received this information from a staff member via email November 26, 2014. In March 2015, another staff member reported that coffee rust has caused a situation in which there is more demand for their coffee than they are able to deliver (personal communication March 20, 2015).

420). For instance, Chiapas experienced anomalies in rainfall both in 2012 and 2013, which offered favorable conditions for the outbreak and spread of coffee rust[53] (CONAGUA 2012, 19; CONAGUA 2013, 7; SENASICA 2013a, 3).



Image 4 Yellow-orange lesions on coffee leaves are easily noticeable symptoms of coffee rust. Photo: Jacques Avelino.



Image 3 A severly affected coffee plot in Heredia, Costa Rica. Photo: Jacques Avelino.

[53] In 2012, there were heavier rainfalls than normal in Chiapas between October and December (CONAGUA 2012, 19); while in 2013, the annual rainfall was higher than the average (CONAGUA 2013, 7).

Prior studies on coffee rust indicate that also local agronomic management practices play an important role in the behavior of the disease. For example, proper fertilization and renewing of coffee plantations might hinder the spread of the disease, while the lack of fertilization and prevalence of aged coffee plants[54] and/or varieties susceptible to coffee rust are likely to have the opposite effect (Arneson 2000; Avelino and Rivas 2013; PROMECAFE & IICA 2013, 2; Avelino et al. 2015, 310). Related to the notion of management practices, it is important to add that also economic factors are strong drivers of the epidemic. Avelino et al. (2015, 303) explain that all the intense epidemics over the 37 years in Central America and Colombia have concurred with periods of low coffee profitability. The low profitability has led to "suboptimal coffee management" resulting in "increased plant vulnerability to pests and diseases" (ibid.).

There are no simple solutions for controlling the disease, and in any control effort the complex ecological interactions as well as the agronomic management practices of the crop need to be considered (Vandermeer and Perfecto 2013; also Jha et al. 2014, 420). In coffee rust literature, among the most commonly recommended control and prevention methods are effective agronomic management practices (e.g. pruning, shade management), production of coffee rust resistant varieties, renewal of old or susceptible plantations, monitoring and chemical control (e.g. Arneson 2000; Vandermeer and Perfecto 2013; Avelino et al. 2015). In the context of the current epidemic, Avelino et al. (2015, 314–5) emphasize the importance of establishing early warning systems to prevent future epidemics.

Vandermeer and Perfecto (2013) warn that some of the above-mentioned control mechanisms might offer short- of medium-term solutions at best, and can also turn out to be counter-productive. For instance, clearing of the shade trees may either hinder or facilitate disease propagation (Avelino and Rivas 2013, 18–9; Vandermeer et al 2014, 215; Avelino et al. 2015, 310; personal communication with Jacques Avelino, June 2, 2015). Fungicides, in turn, have a negative effect on *H. vastatrix*, but at the same time they also kill natural enemies of the fungus which are essential for the biological control

[54] In Mexico, the majority (88%) of coffee trees are more than 20 years old (Virgínio Filho 2013).

of the disease (Ghini et al. 2011, 128; Vandermeer and Perfecto 2013; Vandermeer et al. 2014, 215–7).

Another popular control alternative, replacing old or damaged plants with resistant varieties, might not be a sustainable long-term option either, as the coffee rust can in the future develop mechanisms to attack the previously resistant varieties (Arneson 2000; Vandermeer and Perfecto 2013; see also Avelino & Rivas 2013, 10). In the current situation, different actors are looking for fast solutions and are releasing resistant varieties without a long-term plan. Avelino (personal communication May 28, 2015) asserts that the release of resistant varieties should be guided by a clear strategy in order to increase the duration of the resistance. Otherwise, there is a risk that within a short period of time today's resistant varieties will become susceptible to coffee rust. Avelino et al. (2015, 315–6) call for more research on resistant varieties as well as on ecological control[55] of the disease. This development work should be done in cooperation with farmers and their associations.

Against this backdrop it is interesting to look at the actions taken by the Mexican government. In 2013, The National Service of Agroalimentary Health, Safety and Quality (SENASICA) launched a national campaign against coffee rust in the major coffee producing states of the country, namely Chiapas, Veracruz, Puebla and Oaxaca, which aims at creating technical and operative guidelines to halt the epidemic. Among the recommended control measures are the application of good agronomic management practices, planting of resistant varieties and renewal of plantations. Also the use of copper-based fungicides is heavily promoted, while no mention is made about the biological control of the disease. What is interesting is that the operative and technical manuals do not contain any discussion, for example, of the risks related to the recommended control methods (SENASICA 2013a; SENASICA 2013b). What is also lacking from these guidelines is a longer-term commitment to improvement of the coffee sector capacities, an objective incorporated in a regional plan for fighting the disease in Central America (Avelino et al. 2015, 313).

[55] This includes biological control and natural fungicides (Avelino et al. 2015, 316).

Adapting to coffee rust, adapting to climate change

It remains to be seen to what extent climate change will affect the behavior of coffee rust (Ghini et al. 2015). Recent research shows that climate change will increase pest and disease pressures, thus augmenting the possibility of large-scale epidemics (Avelino and Rivas 2013, 34; Ovalle-Rivera et al. 2015, 1). What is equally certain, as seen in section 3 of this chapter, is that climate change will impact coffee plantations in different parts of the world, and cause a major decrease in suitability of coffee-producing areas within the next decades (Jha et al. 2014, 424; Ovalle-Rivera et al. 2015).

The current epidemic is an outcome of complex dynamics which the experts have not yet completely unraveled (Vandermeer and Perfecto 2013; Avelino et al. 2015). Due to the multifaceted nature of the disease, it is difficult to estimate what will be the magnitude and impact of coffee rust in the future. It is possible that in the forthcoming cycles the disease will become less aggressive. On the other hand, it might remain a chronic disturbance for the farmers and have a long term impact on their livelihoods. In that case, farmers would have to adopt mechanisms and strategies to adapt to new conditions (Vandermeer and Perfecto 2013). Which ever might be the situation, Avelino and Rivas (2013, 35–6) point out that the current epidemic can be seen as an opportunity for smallholders to start preparing also for changes climate change is likely to cause in order to avoid any severe economic and ecological damages. In developing sustainable livelihood solutions, participation of different actors along the supply and marketing chain as well as government agencies is important (Avelino et al. 2015, 316).

5. Coffee rust: farmers' perceptions and livelihood impacts

For the Maya Vinic farmers that I interacted with, the sudden outburst of coffee rust represented a major livelihood shock triggering a range of social and economic implications in the short- and long-term. In this chapter, I will first explore farmers' perceptions of coffee rust epidemic. How do the farmers describe their experiences?

What do they see as key drivers behind the disease? Thereafter, I assess some of the impacts of the epidemic on farmer households' livelihoods and well-being, and evaluate possible outcomes of the disease in the future.

5.1. Perceptions on coffee rust

Describing the disease

Maya Vinic farmers first started detecting coffee rust in August-September 2013 in communities belonging to the municipality of Las Margaritas. During the following months the disease broke out in other municipalities with Maya Vinic farmers, and by early 2014 a majority of the coffee-growing communities had been affected by coffee rust. During my field trip in April-May of the same year, all the producers with whom I interacted had observed symptoms of the disease in their plots.

The outbreak of coffee rust took everyone by surprise. The initial reactions were those of confusion and disbelief, as the disease was previously unknown to the majority of the farmers. In the past, other pests and plant diseases had been tormenting their plots, but this was the first time a plant disease was spreading so widely and was having such large-scale effects on their crop.

Most farmers told me they were baffled when the first symptoms appeared. Some had heard about the disease from other producers or through the cooperative but were skeptical to a certain degree until their own plots got infected; others had no prior information about the coffee rust and did not understand what was going on. In some cases coffee rust was confused with *ojo de gallo* ('rooster's eye'), another plant disease with similar symptoms. Yet, as the disease kept on spreading among Maya Vinic farmers and experiences accumulated from different parts of Chiapas, it became clear that they were dealing with a disease they had not faced before.

By the time I was conducting interviews with the famers, it was evident that all of them had received some information about coffee rust and thus had an idea what had infected their plants. Maya Vinic staff members based in San Cristóbal de las Casas had the most knowledge about the disease since they have access to various sources of information.

They shared this knowledge with the community delegates in the monthly meetings who then passed the information on to the farmers in their communities. Also, staff members talked directly with farmers during trainings or visits to coffee plots. However, my findings indicate that that there were vast differences between the farmers in their level of knowledge, and many of them still expressed a rather limited understating about the disease[56].

Maya Vinic staff members were aware of the gaps in farmers' knowledge. What seemed to worry them in particular was that some members of the cooperative were still unwilling to acknowledge the fact that coffee rust had attacked their plots. They noted that the farmers as well as the cooperative had been slow in reacting to the disease, and neglecting the situation was further hindering the struggle against the disease. One staff member described these concerns as follows:

> **Interviewee**: [--] as people had not known roya before or had information about it, they do not really believe it exists, but well..
> **JA**: So, there are still producers who do not believe that the disease exists?
> **Interviewee**: Yes, there are still producers who do not know if it is true or not, what is going on. But, as roya is increasing in Maya Vinic, we now know it is roya.. But, unfortunately too late." (Male, Tzajalhukum, Chenalhó, 24)

Although the specific mechanisms of the disease were unknown to most producers, in my interviews they gave detailed descriptions of the symptoms based on their personal observations and experiences. These observations were, to most part, consistent with the accumulated knowledge about the behavior of coffee rust (e.g. Avelino and Rivas 2013; Avelino et al. 2015): The first symptom famers noticed were yellow spots on the surface of the leaves of coffee trees. This was soon followed by a premature falling of leaves, leaving the trees with dried twigs. Consequently, the coffee berries did not ripen properly and/or fell off before the harvest, which lead to severe yield losses in 2014.

The effects of the disease appeared to be more severe in coffee trees bearing large quantities of coffee cherries, and according to some farmers also a dense shade vegetation exacerbated the impacts. Contrary to this, some farmers testified having

[56] This is well illustrated, for instance, in the myriad of ways they called coffee rust, such as 'la enfermedad' or 'las enfermedades' ('the disease', 'the diseases'), 'las royas' (plural for 'roya', the popular Spanish term for coffee rust).

observed more damages in those parts of their coffee plot with less dense shade vegetation[57].

Farmers reported young coffee shrubs showing some resistance to coffee rust, while older trees got damaged more severely and in some occasions died[58]. The disease attacked nearly all coffee varieties that Maya Vinic farmers cultivated, such as *Arábico* and *Mundo Novo*. The only exception was a less popular variety, *Gárnica*, which according to many farmers was left virtually uninfected. This is an interesting finding, as this particular variety is not mentioned in the coffee rust literature I had come across by the time of writing my thesis (see Chapter 6.1).

Although a number of coffee trees suffered significant damages, optimism was raised by fresh shoots observed in some plots. One female farmer described:

> Now you can see there are no more leaves left, it is almost dry. But there are parts where the leaves are recovering, there are fresh shoots. Not all trees are destroyed, they are recovering little by little. (Female, Ch'ixiltón, Chenalhó, 20)

Está lluviendo un chingo…"[59] – Explaining the causes

Most farmers associated the outbreak and spread of the disease with weather-related factors. In particular, most farmers named the exceptionally heavy rainfalls they had experienced in 2013 and early 2014 as the principal cause for the outbreak. It was repeatedly mentioned in my interviews that the rainfalls did not follow "normal" patterns: The rainy season lasted much longer than normal, usual breaks between the rains did not occur, and the precipitation was heavier than usual. Since these atypical rainfalls coincided with the first signs of coffee rust and the subsequent spread of it, a commonly expressed belief was that heavy rains had triggered the epidemic. The following testimonies evince this point:

> I do not know how coffee rust came about, I do not know, we think it is because of the rain, the cold, I do not know. But last year... every year it rains, but the coffee endures. But this year it did not endure, and coffee rust broke. (Male, Ch'ixiltón, Chenalhó, 15)

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[57] See Avelino and Rivas 2013, and Avelino et al. 2015 for discussion on the role of shade vegetation in behavior of coffee rust.
[58] Some farmers had coffee trees as old as 40 to 50 years, but according to one staff member nearly all of these were killed by the fungus.
[59] It is raining a lot' ('un chingo', derived from the verb 'chingar', is a colloquial expression commonly used in Mexico). On the etymology of the verb, see Octavio Paz (1950).

> I believe coffee rust came because of the rain [--]. Year 2013 was not normal. It was raining, raining and raining, even the firewood was not burning well. It was raining, heavily. (Male, Ch'ixiltón, Chenalhó, 14)

A few farmers also mentioned that torrential rains had caused other types of damage to the coffee plants. It was outside of the scope of this study to look deeper into these observations, but it is possible that the damages of coffee rust were intensified by other rain-induced impacts. After all, it is well known that coffee is sensitive to climatic extremes (Frank et al. 2011, 69).

For rural livelihoods optimal (and predictable) climatic conditions are important, and farmers are highly perceptive of any major climatic variability (see Tucker et al. 2010; Frank et al 2011; Castellanos et al. 2013). Some interviewees told me they had been observing anomalies in weather over a longer period of time. The heavy rains in 2013-2014 were only one manifestation of these exceptional weather conditions which according to some farmers were likely caused by climate change.

Climate change was not only seen as one possible cause for the spread of coffee rust, but some producers also expressed concerns about the negative impacts it was having on their other production, such as maize, bean and honey. One interviewee explained:

> What can we do, it is because of the climate change. There are months when it is raining too much, and then there are months when it is not raining at all. It is not like before when everything was well calculated: it rains and then the rain stops, so it went, but not anymore. There are months when the rain does not stop even for one day. So, that is where the plant diseases come from. Not only coffee, but also the maize and beans do not produce a good harvest. (Male, Tzajalchen, Chenalhó, 7)

Other explanations

Besides the weather-related factors, farmers gave a range of other possible explanations for the outbreak of coffee rust. For example, the use of agrochemicals was believed to be related to the sudden appearance of the disease. As organic producers, Maya Vinic farmers are not allowed to use any agrochemicals; yet, it was common that their neighbors applied them on their plots. This was seen as debilitating soil and lowering resistance to plant diseases. Apart from these accounts, in more than one interview

farmers discussed the role of God. They said coffee rust might be a God's punishment, because “people were not believing anymore”.

Only on a few occasions the interviewees made a connection between the development of coffee rust and their own farming practices, such as management of soil and shade vegetation (see chapter 4.4). The scarce references to farming practices were related to the age of coffee plants: three interviewees explained to me that many Maya Vinic farmers were managing fairly old coffee trees which are more susceptible to coffee rust. One staff member further explained that coffee rust had not only revealed the vast quantity of aged coffee trees but also exposed outdated farming practices, both of which pointed to a need for renovation. In his words:

> From an agronomic perspective, coffee rust reveals the quantity of aged plants; from an economic perspective, the disease reveals outdated practices. We need not only to renew the coffee plantations but also our way of thinking about coffee production, about rural livelihoods. (Male, San Cristóbal de las Casas, 9)

In conclusion, farmers’ responses about the possible causes behind the epidemic focused mainly on environmental factors, in particular the exceptional rain patterns. The reason for this could be that the formulation of the interview questions may have lead farmers to look for external causes for the development of the disease instead of considering, for example, their own crop management practices. On the other hand, atypical rainfalls probably offered the most logical explanation as these occurred more or less simultaneously with coffee rust, another anomaly.

As discussed above, my data also indicates that many farmers showed a limited knowledge of the disease. Although the cooperative was active in informing farmers about coffee rust, it was evident that the information did not reach all farmers evenly. I also noticed that the flow of information had some traits of Chinese whispers, as the original information about the disease had often transformed on the way. These findings point to constraints that rural people living in remote areas can have in accessing information. Furthermore, they suggest that farmers’ coping and/or adaptation strategies, which I will explore in the following chapter, may be based on relatively scant knowledge about the drivers and characteristics of coffee rust.

5.2 Coffee rust as a livelihood shock

Contextualizing the coffee rust epidemic

When I asked the interviewees to name the "greatest difficulty" they were facing as coffee producers in 2014, all of them stated coffee rust. This is hardly surprising, as the disease had such immediate and concrete effects on their livelihoods: It lead to a significant decrease in the yield for most Maya Vinic farmers (see section 1 and Chapter 4.4). These losses accumulated in the cooperative level: out of the 300 tons of coffee Maya Vinic had estimated to produce in 2013-14, it was able to reach only 167 tons. It is important to note, though, that the estimation always turns out to be somewhat higher than the final result at the end of the harvest. As the staff members explained me, different factors affect the quantity of coffee that farmers deliver to the cooperative, such as plant diseases, unfavorable climatic conditions, and coffee sold to middlemen ('coyotes')[60]. Yet, in 2014 it was clear that the outbreak of coffee rust was the major cause for the decline.

With the exception of one interviewee, all farmers had experienced severe crop losses. Their estimations ranged between 25-70 %, a percentage indicating a decline from what they had expected to produce in 2013-14. The variation in the crop losses reflect the development of coffee rust in the region: the disease reached some areas faster than others, thus leading often to greater losses in the earlier infected areas. Furthermore, even within the same community the impacts were unevenly distributed with some farmers reporting higher losses than others. For example, the sole interviewee whose yield did not decline almost at all told me that nearly all other farmers in his community had been hit by the disease.

The extent of the crisis can be better understood by exploring the importance of coffee for farmer households. A number of empirical studies conducted in the coffee lands of Mexico and Central America show that coffee contributes significantly to the overall income of smallholders (Jaffee 2007, Méndez et al. 2010; Bacon et al. 2008a; see Chapter 4.3). Although price fluctuations and a possibility of a failed harvest, among

[60] Although middlemen generally pay less than the cooperative, some farmers sell part or all of their yield to them. The reason behind this is that the middlemen typically pay immediately for the product, while the cooperative often pays the farmers only after the harvest season is over. The middlemen also accept coffee which has not been processed according to Maya Vinic standards.

other factors, makes coffee all but a stable source of income, it still remains a central component of coffee farmers' livelihood portfolio. As Jaffee (2007, 41) explains, coffee provides a modest but important income which allows the farmer households to acquire necessary supplies and services, such as food, clothing and medicine. It also serves as a "shock absorber" in times of livelihood crisis.

In Maya Vinic, there are only few farmers producing enough coffee to able to get by for the whole year with coffee-related income[61]; other producers with smaller plots and/or lower productive capacity need to seek for other livelihood activities to complement the household economy. All my interviewees belong to the latter group (see Chapter 2.2). In the conversations, farmers told me that coffee was not a very profitable livelihood activity[62], and commonly used the expressions "suffering" and "struggling" to describe their lives as smallholders.

Yet, despite of low annual profits, farmers considered coffee as the most significant source of income for their household. As many explained in my interviews, the profits from coffee (and honey) sale are important for covering the basic needs of large households. Coffee also allows to gain a minimal income that can be invested in assets, such as tools, construction materials for a house, or new coffee plants[63]. Some of these assets are decisive for enhancing future productive capacity (Ellis 2000a, 31). The following quotes illustrate how farmers perceive the role of coffee in the household economy:

> The production of coffee and honey are the only options for earning money, as maize and beans are only for family consumption. With the sale of coffee and honey we can buy clothes, shoes, stuff for the kitchen, for women, all that. That is why we are fighting, that is how we are working. (Male, Tzajalchen, Chenalhó, 8)

> I grow maize and beans to survive. It is because I cannot buy them, it is too expensive. If I do not manage to sell my handicrafts, I cannot buy any food items. Apart from the coffee sale, there are no sources of income, only coffee. So, it is better that that I work on coffee. (Female, Ch'ixiltón, Chenalhó, 20)

[61] A Maya Vinic staff member estimated that those farmers producing minimum of 1000 kilos of coffee per year could survive on coffee only. Most farmers in Maya Vinic are producing considerably less.
[62] Although as cooperative members they receive a better price for the product than unorganized farmers.
[63] Interestingly, no one said they would invest any possible surplus in education of their children.

> We produce [subsistence crops] here. Well, money is important if we want to buy something, build a house, buy medicine if someone gets ill. If there is no money, we need to ask for loan. But since we have coffee, it helps a bit. (Male, Tzajalchen, Chenalhó, 16)

Diversified livelihood portfolios

In coffee-growing regions, farmer households often manage diversified livelihood portfolios to complement the coffee-related income (Bacon et al. 2008b, 353). All the farmers I interviewed were engaged in multiple livelihood activities consisting of both income-generating and subsistence activities. These include honeybee management, general stores and other small businesses, and the sale of crafts. Many farmers also reported selling locally their agricultural products, such as eggs, chicken, and in some rare cases beans and maize. An interviewee from the municipality of Salto de Agua explained that in his community some farmers also raise cattle. Image 5 shows three farmer women weaving crafts for sale.

Apart from these on-farm activities, it is common that farmers and their family members seek day labor in other farms or in construction nearby, which often pays the minimum salary of less than 70 pesos per day. Sometimes one or several members of the household migrate to larger cities in Mexico, such as Cancun or Mexico City, to look for work. This tends to be temporary (or 'pendular') type of migration which means that those leaving normally return home when most help is needed in agricultural activities. Lastly, the cooperative employs a number of its members or their family members at the office, the coffee shop and in the warehouse (see chapter 2.1). [64]

[64] It is likely that there are other livelihood activities that Maya Vinic farmers are engaged in; these are the ones that came out in the interviews or through observation in the communities I visited.



Image 5 Women of three generations making crafts for sale. Photo: Janica Anderzén

Two or more of these livelihood activities typically construct the livelihood portfolios of the farmers I interviewed. Due to limited time and resources I was not able to conduct household surveys which would have provided quantitative data on the components of farmers' livelihood portfolios. Yet, my data shows similarities with another study conducted in the South of Mexico: The study shows that in the Highlands area of Chiapas, coffee remains the most important source of income[65]. Other important sources of income include remittances from migrants, wages and returns from non-agricultural activities, and government subsidies (Barham et al. 2011, 136). What is perhaps distinctive in my data is that no one said – or at least admitted – to be receiving government subsidies. This, I was explained, is inflicted by the mistrust many indigenous people have towards the local and federal governments, and the wish to be independent of them[66]. I was told that there are Maya Vinic farmers who do receive this

[65] The sample was quite low in the study; yet, it is indicative of general trends.
[66] In his report, Héctor Manuel Robles Berlanga (2011, 20) criticizes these subsidies. He notes that they are often channeled through poverty-reduction campaigns (e.g. subsidies for increasing school attendance) instead of being directed at productive activities which would help the small farmers to improve their farms and thus increase the production (ibid., 20). Also many of my interviewees

type of subsidies, but approximately 1/3 of the farmers are “in resistance” and do not apply for them.

In Mexico, subsistence crops, in particular maize, form an integral part of the diversified farming systems, while coffee often constitutes a minor land-use component (Jaffee 2007, 40; Robles Berlanga 2011, 15). All my interviewees told me that they are producing maize and beans for family consumption. Furthermore, my data shows that fruit trees and other edible plants growing in the coffee plots and in the gardens around the houses make a significant addition to nutrition of the family (see also Ponette-González 2007, 300; Jha et al. 2011, 185).

Subsistence crops are important for the overall wellbeing of the families: they contribute to the food security of the households and decrease the expenditure on food. It is also important to note that subsistence farming does not only have instrumental value, but also a deep cultural meaning (see also Jaffee 2007, 169). My interviewees took a lot of pride in growing a large share of maize and beans for home consumption, and often criticized those farmers who had abandoned this tradition.

In conclusion, coffee is a vital source of income for the smallholders I interviewed. Although there are many risks involved in coffee production, it still represents a relatively steady source of income for the farmer households compared to other livelihood activities which often are more sporadic in nature and provide a more modest income. In the current situation with the spread of coffee rust and subsequent crop losses, many farmer families were facing a significant drop in their income. This was likely to have a myriad of impacts on farmer households’ livelihoods and wellbeing, which is a topic I will examine next.

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mentioned that the subsidies were nothing but handouts which did not do much to help families living in poverty.

5.3 Impacts of coffee rust epidemic on farmers' livelihoods and wellbeing

For smallholders, coffee trees represent a key livelihood asset and a form of natural capital farmers manage for generating output, i.e. financial capital. Financial capital, in turn, is important for the wellbeing of the family as it can be converted directly into consumption or other forms of capital (Ellis 2000a, 32-34). In the current crisis, coffee rust is directly affecting this important means of production farmers rely on: damaged coffee trees produce less harvest and consequently generate less revenue. Thus, the deterioration of farmers' key productive asset impacts negatively households' financial capital which, in turn, triggers varying social and economic impacts.

With the outbreak of coffee rust, farmers were particularly worried for the decline in household income. Since the harvest takes place only once a year, a decreased yield caused a notable gap in farmers' expected annual income. Although the cooperative was paying a fairly high price to its farmers in 2014 – at the end of the harvest the payment was 45 pesos per kilo for organic parchment coffee[67] – it was not enough to compensate for the monetary losses. Furthermore, considering that the outbreak of coffee rust was unpredicted and fairly sudden, most farmers were unable to prepare for the losses or compensate them with other types of income. Maya Vinic staff members explained to me that especially those farmers who are heavily dependent on coffee and/or do not have other substantial sources of income were looking at difficult times.

Besides the immediate crop losses and the subsequent drop in income, farmers were also alarmed by the possibility of coffee rust representing a long-term problem. The damages they had been observing in their plots, such as defoliation and drying of branches, pointed strongly to the likelihood that coffee rust would continue causing devastation in the future. Also certain controls of the disease, such as heavy pruning of coffee trees, would lead to a decrease in the yield as these trees would be producing less fruit in the following few years (see chapter 6).

[67] Farmers who did not belong to cooperatives were paid between 15-30 pesos per kilo for their coffee, depending of the buyer as well as the time of the year.

The current situation and the prospect of even harder times to come inflicted a sense of desperation and anxiety among farmers:

> I think this year there will still be some production as the coffee cherries were already big when the disease hit. But, it is very likely that next year we are going to harvest even less, because there are no leaves left. This month of April it is the flowering time, but the coffee trees are not flowering [--]. That is why were are thinking that next year we are not going to produce any coffee. (Male, Tzajalchen, Chenalhó, 7)

> Next year there will be not be any production. Coffee rust made the leaves fall, and that is why we are now screwed, that is why we are worried. (Male, Chivaltic Nuevo, Salto de Agua, 4)

> There is a lot of sadness. We are farmers and there is no harvest anymore. (Male, Ch'ixiltón, Chenalhó, 15)

As discussed earlier, farmers are continuously balancing between scarce resources and constant expenses. The cash received from coffee sale helps to maintain the fragile balance, or to "survive", as the farmers often said themselves. Now, with the drop in the household income – which for many households was quite sharp – farmers were worried that they would not be able to cover many of the basic needs of the household, such as clothing, medicine and food (see also Bacon 2005, 506; Jaffee 2007, 72). One farmer described these concerns as follows:

> If the disease will persist for the whole year we will be left without money, without clothes, without food. That is why farmers will be miserable. Where are they going to find their food? Where are they going to look for the clothes? (Male, Ch'ixiltón, Chenalhó, 18)

Clothes, shoes, soap, kitchen supplies and other basic items play an important role for the farmer households in terms of quality of life. Medical expenses, on the other hand, do not typically represent a constant expense, but can become a big cost in case of illnesses or accidents in the family. Farmers often mentioned in my interviews that even under "normal" conditions, health problems tend to cause additional economic pressure that can drive households into taking high-interest loans or sell assets to make ends meet (see also Jaffee 2011, 110–1). Thus, a drop in household income may aggravate these types of pressures.

Financial capital is important also in terms of livelihood construction. It can be invested in productive assets which may help to generate alternative flows of income (Ellis 2000a, 34). My findings suggest that coffee rust is likely to have negative effects on farmer households' capacity to strengthen or diversify their livelihood portfolio. A drop in coffee-induced income means that many households have less money to invest in future productive capacity, such as alternative crops or small businesses. In the light of the existing literature, this can create pressures to intensify migration, sell productive assets or take high-interest loans, all of which were seen as undesirable options among the interviewees[68] (see Ponette-González 2007; Jaffee 2007; Saldaña-Zorrilla 2008; Tucker et al. 2010; Chapter 6).

Another important factor to consider is food security. A growing body of literature indicates that coffee-growing communities throughout Mesoamerica face seasonal food insecurity (Jaffee 2007; Caswell et al. 2012; Fernandez et al. 2013). Interestingly, in my data none of the interviewees reported facing food shortages or deficient nutrition. On the contrary, it was frequently mentioned that there was always enough food available, and in case anyone was suffering from hunger it was because that person "did not want to work"[69].

Farmers rely largely on subsistence farming for covering the basic food needs of their families. Yet, the subsistence production rarely suffices for a whole year's needs, and farmers have to buy a part of the food for home consumption. In the current situation, this raises two important considerations. Firstly, a reduced income due to coffee rust might create a situation in which families are not able to buy food to complement the family consumption. Especially those farmers with low production of subsistence crops are in a risky position. As one interviewee explained:

> There are producers who do not grow their own food. Where are they going to go when there will be no coffee left? (Male, Ch'ixiltón, Chenalhó, 5)

[68] This is a topic which will require further research.
[69] The assessment is based on farmers' perceptions about their food security and on their understanding about "normal" or adequate nutrition. It is possible that in some years they do face seasonal scarcity of food.

Furthermore, any crop failure affecting the most important subsistence crops, such as maize or beans, would likely weaken farmer households' food security. During my field trip, there were some signs of this alarming possibility. Many farmers reported having experienced losses in maize yield in 2013-14. Others said the yield had been declining over a longer period of time and did not show signs of recovery. Some farmers believed that a plant disease caused recent losses, whereas others linked them to the heavy rains in 2013-14 or to changes in weather due to climate change. Whatever the causes behind the losses, affected farmer households were compelled to purchase more maize than normal.

6. RESPONSES AND STRATEGIES

I am not losing hope. [--] it is like the life of plants. If a plant is about to die, it can still recover and survive. That's how I see it.
(Male, Tzajalhukum, Chenalhó, 24)

In this chapter, I first examine different control mechanisms the farmers were applying or planning to apply against coffee rust. Secondly, I explore strategies farmers intended to pursue in order to secure their livelihoods and family wellbeing. I will link these findings to the livelihood framework, and focus specifically on different forms of capitals and how these influence farmers' strategies.

It is important to note that my field work took place at very initial stages of the epidemic when farmers were barely starting to take up different strategies. Therefore, the strategies discussed in this chapter should be taken as a 'snapshot' of farmers' aspirations, plans and perceptions at the initial stages of the epidemic. Further studies need to be carried out in order to understand farmers' responses during the years following the crisis.

6.1 Controlling coffee rust

Cultural practices and copper sulfate

Farmers reported in my interviews that they had applied or were planning to apply a range of management methods to discourage rust development and renew damaged coffee plots. The most commonly used were so-called cultural methods, which refer to a set of agricultural practices aiming at enhancing crop health and preventing pests and diseases without using chemical substances (Mouen Bedimo et al. 2007, 392).

Nearly all farmers mentioned pruning as an important control method. Some had already started pruning their coffee while others were waiting for the end of the harvest, which is typically the season for this cultural practice. As explained by farmers, the method consists of removing damaged parts of coffee trees in order to prevent the spread of the disease. They also expected plants to recover vigor so that the damaged coffee trees would start producing again in the upcoming cycles. Yet, those farmers who had done heavy pruning in their plots were aware that this practice would lead to a reduced harvest in the upcoming cycles, as intensively pruned trees were going to produce less before reaching their maturity again.

Pruning appeared to be an attractive solution especially for those farmers who were still hesitant about the control methods they would use. Perhaps this is due to the fact that pruning is an agricultural method farmers apply in their plots also under normal conditions. It is also cost-effective and does not require any special equipment or skills.

Another popular disease management practice was planting new coffee, either by replacing severely damaged trees or occupying sparsely planted parts of coffee plots. This was done to compensate for the damages and avoid major crop losses in the forthcoming production cycles. In most cases this strategy involved replacing the previously cultivated coffee varieties with *Gárnica*, a variety which farmers believed to be resistant to coffee rust (see Chapter 5.1). This belief was based mainly on other farmers' accounts and experiences, as most of my interviewees had not been growing that particular variety.

A majority of the farmers I interviewed were planning to or had already started transplanting new coffee trees in their plots. However, many of them still wanted to wait and see if the existing plants would begin to recover and sprout again after pruning. A certain wariness stemmed from the risks farmers associated with changing the variety: according to their knowledge, *Gárnica* is more short-lived, produces less cherries and has a poorer cup quality than the dominant varieties. Especially the staff members said it was important to be patient and not to abandon completely the varieties with a longer history in the region. The following quotes, selected from interviews with staff members, summarize some thoughts and observations about replacing old coffee trees with new ones:

> Some farmers were eager to change the variety quickly. Some said they are going to wait for another bit, because what if roya is only temporary? We are not going to wipe out Arábico (Male, Chixiltón, Chenalhó, 23).
>
> The intention we have in Maya Vinic is to continue taking care of the original varieties, not to lose them completely. Although we are renewing our plots it is important to take good care of the original coffee [--] because those varieties, like Árabe and Mundo Novo[70], produce a high-quality coffee with a good taste (Male, Canteal, Chalchihuitán, 6).

Only few farmers named other cultural practices as possible control methods against coffee rust. One farmer, with a long history in coffee production, talked extensively about the importance of good maintenance of the plot, involving regular pruning, weeding and applying compost soil. He was also the only one to mention control of shade vegetation as an alternative for managing the disease[71]. One staff member called for a comprehensive renewal of coffee plots, which would include replacement of aged plants with young ones as well as more effective maintenance of coffee trees and the soil. He saw this as a long-term strategy that the cooperative should take up.

Apart from cultural methods, Maya Vinic staff was promoting the application of copper sulfate, a fungicide commonly used for controlling coffee rust (Arneson 2000). Although not completely environmental-friendly, it is approved by organic certification bodies, making it an authorized product for Maya Vinic farmers. For its application,

[70] These are some the most common varieties among Maya Vinic farmers. *Árabe* and *Árabigo* (mentioned in the previous quote) refer to the same variety, also known as *Typica* (see chapter 2.1).
[71] This is hardly surprising, since as seen in chapter 5, nearly no one made a connection between the shade vegetation and the spread of the disease.

cooperative's trading partner in the US had donated 58 manual sprayers to be distributed in farmer communities. Subsequently, the cooperative has been informing farmers about the product and organized some trainings on its use.

All my interviewees had heard about copper sulfate, although the majority had not yet experimented with it in their plots. Farmers' views and perceptions about the product varied. Some were determined to try it out if their coffee would not show signs of recovering. Others said they could not afford the product or were not convinced of its efficiency. The reservations were based on rumors they had heard of other farmers' experiences according to which copper sulfate "did not help" or "the disease had not disappeared" upon its application. The following quotes illustrate thoughts about the use of copper sulfate:

> Last year I did not apply anything and neither did she [sister of the interviewee]. But, we now know roya hit our plants, so we are thinking [--], trying to see how to control it. There aren't difficulties anymore, as we now have a manual sprinkler in all communities. (Male, Ch'ixiltón, Chenalhó, 19)

> They said that when roya appeared, there is… I don't know, something for the prevention, a plant or I don't know. But they used it in other communities and said it didn't work. It's organic, maybe because of the rain it didn't work. (Male, Ch'ixiltón, Chenalhó, 15)

As an alternative to copper sulfate, one farmer stated he had been experimenting with an organic, home-made fungicide in his plot. He had prepared it by mixing chili and garlic, which is a known remedy against plant diseases in his community. Although he was convinced that the fungicide would create positive effects, he also admitted that his family did not have resources to apply the mixture often enough for it to be effective.

Reflections on the control methods

My data suggests that the rather limited knowledge farmers expressed about coffee rust (see Chapter 5) was also reflected in their plans to manage the disease. The control mechanisms farmers were applying or planning to apply, i.e. cultural practices and copper sulfate, are among those often recommended by experts on coffee rust (see Chapter 4.4). However, most farmers did not know how these could be combined in an

integrated manner in order to reach best possible results. Furthermore, there were still many farmers who said they had no idea what they could do to control the disease. This was either because they lacked sufficient information or because they thought that the disease was disappearing already. As one interviewee reported:

> No, I haven't yet [started to apply any control methods]. I don't know if that thing still affects the coffee, my brother knows. It has been cured more or less already, but let's see if it's true. (Male, Ch'ixiltón, Chenalhó, 20)

My findings indicate that more information and exchange of information on control methods may be required in order to avoid any unintended consequences. For instance, the decision to replace partly the "original" varieties with *Gárnica* raises an important consideration. It is very possible that this variety has shown some resistance to the disease or has suffered less damages than other varieties. Yet, as mentioned in the previous chapter, at the time of writing the thesis I had not found references in coffee rust literature of *Gárnica* being a resistant variety[72]. Secondly, even if *Gárnica* has shown resistance against coffee rust during initial stages of the outbreak, there are no guarantees that the disease will not attack it in the future: as seen in Chapter 4.4, the fungus might over time develop mechanisms which allow it to attack previously resistant varieties. This points to the strong possibility that this strategy might not be sustainable in a medium or long term.

The application of copper sulfate raises another important point. Copper sulfate is a fungicide that needs to be applied properly; otherwise it may be ineffective and cause simply a loss of investment for the farmer. For instance, the timing is crucial in its application: the fungicide is a preventive product that needs to be sprayed on the leaves before the infection occurs. It also needs to be applied several times, and preferable directed upward so that it covers the lower surfaces of the leaves where the infection occurs (Arneson 2000; Jacques Avelino, personal communication, May 28, 2015). During the time of my visit, it seemed most farmers were still lacking information about

[72] Avelino (personal communication, May 28, 2015) confirms that *Gárnica* is susceptible to coffee rust, which made him suspect that farmers actually might have been talking about another variety, *Oro Azteca*. *Oro Azteca* is a rust resistant variety developed in Mexico which has been criticized in the markets for its lower quality. In an email conversation with one staff member (June 9, 2015), he confirmed that it was *Gárnica* that farmers were talking about. He also told me they had sent samples of *Gárnica* beans to their buyer in the United States, and the reception had been very positive.

this control method and/or were suspicious about it. For this reason, it is paramount that farmers receive more training especially on its correct application.

My findings point to the importance of Maya Vinic cooperative in combating coffee rust. Through their networks and other sources, the staff members were collecting information about different disease control methods, which they passed on to farmers in meetings, trainings and visits to communities. However, several staff members recognized that their knowledge on the range of control methods was still scant and there were not enough resources to investigate more thoroughly on the matter. One staff member asserted that the methods they were promoting were somewhat palliative in nature, and the cooperative was still lacking a comprehensive disease management plan. This is perhaps not so surprising considering that coffee rust is a complex disease which escapes simple solutions: As seen in Chapter 4.4, the required control methods depend on a range of factors, such as the character of the soils, the varieties of coffee grown, and the amount of rainfall. Even the experts in coffee rust do not necessarily agree on the best possible approaches.

Regardless of these limitations, I claim Maya Vinic farmers are better equipped for dealing with coffee rust than producers lacking this type of network. The cooperative has a key role in mobilizing information, resources and knowledge on risk management as well as on alternative livelihood strategies, which might otherwise be unavailable for smallholders in remote locations (see also Bohle 2007, 23; Eakin et al. 2012, 483). In other words, membership in Maya Vinic creates social capital which is an important asset in coping with immediate and long term impacts of coffee rust (see below section 5).

In the light of growing literature on coffee rust, it seems vital the cooperative continues exploring different disease management alternatives, as the range of methods is wide and new information emerges constantly. Furthermore, Arneson (2000) states that coffee rust should “be managed as a continuous epidemic on a perennial crop”. This points to the urgency of finding solutions which are effective and sustainable not only at the initial stage of the epidemic but also in the long term.

6.2 Coffee as a principal livelihood strategy

As seen in Chapter 5, farmers were worried about crop damages and financial losses coffee rust was causing and would cause in the future. However, no one appeared to believe their future as coffee producers would be permanently compromised. Instead, all of them were determined to continue working on coffee and safeguard its role as a core livelihood activity also in the future.

This finding is in line with prior studies conducted in coffee lands in the context of experienced or potential livelihood crises. Several empirical studies show that coffee farmers are prone to continue growing coffee even when their livelihoods are threatened by a crisis, such as a major decline in global coffee prices and/or natural hazards (Jaffee 2007, 73; Ponette-González 2007; Tucker et al. 2010; Jha et. al 2011, 171; Eakin et al. 2012; Hausermann 2014). These studies further indicate that farmers have often complemented this strategy with attempts to diversify their livelihood portfolios (see Chapters 6.3 and 6.4).

Farmers' aspirations to hold on to coffee production can be assessed from different perspectives. Firstly, coffee rust was still a fairly recent phenomenon by the time of my visit, and the farmers I interviewed were uncertain if the disease would remain in the region. Even if they were aware that there would likely be tough years ahead, most of the interviewees thought the disease would disappear or settle eventually. Moreover, as a difference to other type of livelihood shocks, such as hurricanes, coffee rust had not destroyed farmers' assets completely or at one stroke. This left open the possibility that coffee would recover in the future (see Blaikie et al. 1994, 69).

In this context, the first reaction for most farmers was to undertake different management methods in order to control coffee rust, prevent future damages, and promote plant recovery, as seen in section 1 of this chapter. These impact-minimizing methods served as mechanisms to cope with the immediate impacts of the crisis and hence ensure short-term livelihood security of the household (see also Ellis 2000a, 45; Blaikie et al. 1994, 65). On the other hand, by trying to secure harvest and cash flows in the future, for example by planting new coffee trees, these attempts also aimed at long-term sustainability (see Tucker et al. 2010).

Secondly, farmers were well aware of the risks related to coffee production, such as price fluctuations and the prospect of crop loss. The also knew that the scarcity of available farm land would make it difficult to increase production volumes in the future. Nonetheless, most farmers reported they would keep on growing coffee because, regardless of the difficulties, coffee represents the most solid source of cash income for their households (see Chapter 5 and section 3). As one staff members said, coffee remains the most viable cash crop in the region, as at present there are no better income-generating alternatives available (see also Robles Berlanga 2011, 20).

Many farmers also emphasized they had been involved in coffee production since a very young age, and growing coffee was what they knew best. Engaging in alternative livelihood activities would require new skills and knowledge as well as money. My data suggests that these types of asset are not easily accessible for many of the interviewees (see section 5). The following quote is from an interview with a young producer. He believed coffee rust had disappeared for the time being, but was also conscious it might return. Despite of the uncertainty, he was determined to continue growing coffee, because he saw it as the only realistic livelihood option:

> **JA:** How do you see your future as a coffee producer in case coffee rust continues?
> **Interviewee**: I will continue like this, working. I don't care if the disease comes, I will continue working on coffee. It's the only thing we have, there isn't anything else. Only God knows if the disease returns. If not, then we made it.
> (Male, Tzajalchen, Chenalhó, 16)

Thirdly, coffee is a perennial crop which takes between three to five years to start producing cherries. Farmers have invested a great deal of time as well as money in the coffee production, i.e. in maintaining their plots vital and improving the quality of their production. Thus, replacing coffee with other livelihood alternatives was clearly not an appealing strategy for the farmers, as it would require new investments that could not be reversed rapidly[73] (see also Jaffee 2007, 141–2; Tucker et al. 2010, 28). The following quotes illustrate this aspect.

[73] Tucker et al. (2010, 28) also point out that as a perennial plant, coffee does not allow for interannual adjustments through crop-switching or altering varieties, for instance. Thus, this makes coffee production challenging in terms of risk management.

> I don’t want to give up, because we’re making an effort. We’re required to improve our work constantly, so we’re certainly doing a good job. (Female, Ch’ixiltón, Chenalhó, 19)
>
> Coffee is a business, you can’t just leave it, forget about it. If we’re going to say that coffee rust emerged and we shouldn’t plant coffee anymore… no. We have to increase the capacity, train a lot of farmers so that they can defend themselves against the disease. (Male, Tzajalhukum, Chenalhó, 24)

Finally, the last point relates to the notion of meaningfulness when assessing people’s motives to adopt certain livelihood strategies over others. Bebbington (1999, 2022) notes that person’s assets are not simply means through which one makes a living; they also give meaning to the person’s world. Even if assets are in many ways determined by structural factors, they are “also to some extent both reactions and components of the meaning the person has tried to create through their livelihood strategies”. Bebbington (ibid., 2039) further explains that rural people do not evaluate their livelihood alternatives solely based on income criteria; there are other criteria which may be equally important and meaningful, such as different cultural and social beliefs and practices (see also Hauserman 2014, 382).

During my field work I learned that coffee, like maize, holds deep cultural meanings for the farmers. Even if coffee production for commercial purposes does not have a very long history in the region, it has become an integral part of coffee-growing communities’ way of life and farmers’ identity. My informants often identified themselves as indigenous coffee-growers, and seemed to be unable to imagine a future without working on coffee. Similar findings have been reported from other coffee-growing communities in Mexico and Central America (Bacon 2005, 504; Jaffee 2007, 73; Ponette-González 2007).

In conclusion, farmers' determination to continue growing coffee despite of difficult times is partly driven by an economic rationale, i.e. willingness to secure a long-term investment. On the other hand, it is also determined by a limited array of viable livelihood alternatives in the region, or access to these. Lastly, farmers’ decisions are motivated by other than economic factors: cultural and social factors are also important drivers in farmers' livelihoods construction.

6.3 Diversifying production: honey and macadamia

Although coffee represented the principal livelihood activity for the farmers I interviewed, they were also engaged in other livelihood activities, as discussed in Chapters 4.3 and 5.2. Farmers explained that other income-generating and subsistence activities complement coffee-induced income and thus contribute to households' livelihood security. With the outbreak of coffee rust, several interviewees mentioned that diversification might be the best way to cope with the crisis and secure household wellbeing (see also Ellis 2000a).

Also Maya Vinic staff members highlighted the importance of diversification. They were conscious of the risks that dependency on coffee entails, especially during unexpected crisis such as the coffee rust epidemic. Therefore, already since before the outbreak of the epidemic, Maya Vinic staff has been promoting diversification among the farmers. They have been encouraging farmers to take up beekeeping, as honey is another important export product for the cooperative. Furthermore, with the help of a trading partner in the US, Maya Vinic farmers have been experimenting with macadamia tree since 2012. Currently, approximately 60 % of the farmers have planted a small number of macadamia trees in their lands. In the following extract, a staff member describes the importance of diversification:

> It's much better to have several products. [--] Coffee, honey, macadamia, these three help to survive. If you lose coffee, perhaps you produce some honey, it's an advantage. This is the view of the cooperative. It's not going to happen tomorrow or day after tomorrow, but in a future. There are already producers who have their two products, coffee and honey, so they have an advantage. [--] Then there are producers who only have coffee. (Male, Ch'ixiltón, Chenalhó, 5)

My data shows that many farmers had considered taking up beekeeping prior to coffee rust epidemic. However, Maya Vinic staff members told me that after the outbreak of coffee rust more coffee producers have shown interest in beekeeping, pointing to the possibility of honey production presenting one adaptation strategy as a response to coffee rust. The cooperative welcomed this development as there is more demand for their honey than they have been able to deliver. Apart from the fixed markets and cooperative's assistance in taking up the production, there are other reasons why beekeeping makes a fairly accessible livelihood alternative for farmers. Those farmers

with experience on beekeeping explained that starting the production on a small-scale does not require large investments. It is also time- and labor-efficient: looking after beehives is less laborious than taking care of coffee, and as a difference to coffee, honey can be harvested rather soon after initiating the production.

However, there are also obstacles and risks related to beekeeping. As explained by Maya Vinic staff members, the biggest impediment for engaging in honey production is the lack of land. Beekeeping requires a certain quantity of land, and as seen previously, there are a number of Maya Vinic farmers who do not meet this requirement. Also, many farmers told me they did not want to take up beekeeping as they were afraid of the bees. These two points were elaborated by a staff member as follows:

> **JA**: Why is it that more producers have not taken up honey production?
> **Interviewee**: First of all, there isn't enough land. You need a bit of land, around two hectares to put the bee hives in the middle. Sometimes the bees wonder off to bother the neighbors or cattle. So, there's a fear that the neighbors will complain. [--] Another thing is that bees sting, and that's why people are afraid, they don't want to [produce honey]. But, you get used to it. If you don't have land, that's more complicated. (Male, Chixiltón, Chenalhó, 23)

Moreover, similarly to coffee and many other agricultural products, beekeeping is dependent on optimal climatic conditions. Farmers stated that the success of the harvest varies a great deal between harvest cycles. Those farmers with many years of experience in beekeeping asserted that the unpredictability has increased over the past years, which they associated with major changes in climate (see Chapter 5). Some of them were also concerned that coffee rust would cause a decrease in the harvest in the forthcoming cycle as the coffee trees were flowering less and thus, would not provide sufficient nectar for the bees. The quotes below illustrate these concerns:

> [Honey production] can also have problems. This year we had a good harvest, but previous years we've been having lots of problems, the production has been very low. I don't know, it might be that the production decreases again next year because the coffee is flowering less, it may affect the harvest. (Male, Tzajalchen, Chenalhó, 17)

> [--] The climate is changing, that's why there isn't a fixed period anymore for collecting honey, not like before. [--] Because of the changes in climate there won't be harvest anymore, there won't be honey anymore. Sometimes it's raining a lot during the flowering period, and that's why the flowers are ruined. When the weather clears up again, there aren't flowers left and the bees don't find nectar, pollen. That's why the production is decreasing, because of the climate. (Male, Tzajalchen, Chenalhó, 8)

Macadamia is another product Maya Vinic cooperative was promoting among its farmers. According to the staff members, there are many factors which might make this cash crop a viable alternative for cooperative's members: Macadamia can be intercropped with coffee trees, as its optimal growing conditions are similar to those of coffee. Its nut is appreciated for its high nutritional value and multiplicity of use, making it a valuable export crop. In Mexico, where macadamia has been cultivated for more than 40 years, it is considered as a cash crop with great export potential. In Chiapas, especially the Ocosingo region has been specializing in its production, but due to favorable geographic and climatic conditions macadamia can be cultivated in other parts of the state as well (ASERCA 2000, 3-7).

At the time of my field work, all of my interviewees had planted some macadamia trees or were planning to do so in the near future. The cooperative had a nursery for macadamia saplings next to its warehouse and was selling them in farmers' reunions. For Maya Vinic farmers, macadamia represented a formerly unknown crop, and none of them had previous experience of the production process. Moreover, as it takes between six to seven years for macadamia to start producing fruit, none of the Maya Vinic farmers had harvested any macadamia yet. Due to these factors – as well as cooperative's lack of prior experience in commercializing the product – farmers were not fully convinced of its potential as a supplementary crop and were hesitant to make any major investments in macadamia[74]. As Tucker et al. (2010, 30) explain in their study on coffee farmers' responses to climatic and non-climatic stressors, “the investment risk and market uncertainties associated with alternative cash crops are likely important factors in farmers’ decisions”.

My findings show that coffee rust had not yet triggered an incentive for farmers to intensify macadamia production. Only a few farmers considered it a strategy which might help in livelihood adaptation if coffee rust was to remain. As one of them explained:

[74] Maya Vinic staff members estimated that once first producers start harvesting macadamia nuts, more producers are likely to take up production.

> **Interviewee:** I will plant new coffee plants, but if the disease attacks them again next year, or if it rains or gets cold, and there's no harvest [--] I'll find another way, I'll find a way to plant something else. We're already experimenting with a few plants, I have a few plants of those, what are they called?
> **JA:** Macadamia?
> **Interviewee:** Macadamia, we have two plants [--] and we'll buy some more. We'll also continue growing coffee [--] What if the disease remains for the next one, two or three years, but then after that disappears? (Male, Ch'ixiltón, Chenalhó, 11)

6.4 Other livelihood strategies

Intensification of subsistence production and other on-farm alternatives

As seen so far in this chapter, farmers were likely to resort to agriculture-based activities as a short- or long-term livelihood strategy in order to overcome the livelihood crisis. These on-farm activities, such as beekeeping and macadamia production, were seen as potential alternatives for diversifying the production and hence compensating for temporary or permanent losses triggered by coffee rust. Other than these two agricultural products, two farmers said they would be interested in growing pumpkins or tomatoes, but due to lack of money or know-how they had not been able to take up the production yet.

My data shows that, apart from the range of alternative income-generating activities farmers were planning to adopt, intensification of subsistence production was seen as an important strategy in coping with the impacts of coffee rust epidemic. As discussed in Chapter 5.2, my interviewees considered subsistence production as an essential part of their livelihood portfolios, and with the outbreak of coffee rust its significance was likely to increase. Prior studies conducted in coffee-growing regions have also noted the importance of subsistence production as a central risk management strategy (Eakin 2005, 1935; Jaffee 2007, 141; see also Bacon 2005, 506; Jha et al. 2011, 171). For instance, Eakin et al. (2012, 484) show that following Hurricane Stan the importance of subsistence farming, especially maize, increased among many households.

Maya Vinic staff members, in particular, highlighted the relevance of subsistence production during the crisis. Many of them expressed concern for those farmers who relied solely on coffee and had abandoned or neglected food production for household

consumption. They asserted that farmers should put more effort in food production, as it is an essential component of households' livelihood security and wellbeing. These thoughts were formulated by one staff member as follows:

> What we see in some communities is that they work solely on coffee, coffee, coffee. They don't have a clue anymore how to plant maize, beans, banana. [--] We're thinking to take up again [production of food stuff] so that the producers will react, so that they'll realize that they can either consume or sell these items. (Male, Tzajalhukum, Chenalhó, 24)

Migration

Migration has been identified as an important coping/adaptation strategy among coffee producers in times of a livelihood crisis (Bacon 2005, 502; Eakin 2005; Ponette-González 2007; Jaffee 2007, 73; Saldaña-Zorrilla 2008; Eakin et al. 2009; Tucker et al. 2010). Also my previous experiences from other coffee-growing regions in Chiapas let me assume that migration might be an attractive livelihood alternative to cope with coffee rust. Surprisingly, my informants did not consider it as an intriguing option: none of them mentioned short- or long-term migration among preferred coping strategies for tackling with the impacts of coffee rust.

In regions with Maya Vinic farmers, migration has been typically less intensive than in other parts of Chiapas (Martínez Velasco 2013, 68). However, many of my interviewees reported that migration brings an important contribution to their households' annual income (see Chapter 5.2). They explained that when the household is short of financial resources one or a few of the family members have to migrate to other parts of Mexico to look for employment. They considered this as an economic necessity, not a preferred option.

Based on their first-hand experiences, farmers gave several explanations for their unwillingness to migrate. Firstly, they found it difficult to save money in cities as the expenses were high and sometimes the employment opportunities turned out to be sporadic. They also told me that the quality of life was lower in the destinations than in their communities where basic needs were covered (see also Bebbington 1999, 2033).

The work they found, for example, in construction site was often risky, and many had suffered accidents. Furthermore, as indigenous people, they often faced discrimination.

Lastly, many farmers reported holding an unpaid post ('cargo') either at a local parish or an association which, as they told me, prevented them from leaving their communities. As Jaffee (2007, 62) explains, in many rural areas in Mexico, the *cargo* system is important for the cohesion of the community, and many *cargos* are highly valued. Thus, those farmers holding this type of *cargos* appeared to appreciate social relations or status above the possible monetary value migration would bring. This result supports previous findings in livelihood literature indicating that a diversity of factors affect farmers' livelihood decisions, including economic, social and cultural elements (see Chapter 1.3).

The extracts below illustrate some of the points presented above. In the first one, a young producer talks about the reasons why he is reluctant to migrate again. In brief, he does not see the benefits of migrating to cities for work appealing enough to leave his community where he considers the quality of life to be higher. In the second extract, the interviewee discusses his position at the parish, which prevents him from migrating. He mentions that he will rather continue looking for day labor within the same community[75].

> I'm not thinking of leaving anymore, I'm thinking of staying here. In the end, it's all the same. [--] It's not only about money, here you have maize and beans. If you don't have money, you can still eat here. In the city you work like ten hours and if you don't work, they won't pay you. You have to work every day, every day. If there's no money, there's no food. Here we produce. (Male, Tzajalchen, Chenalhó, 20).

> [--] I was designated as a catechist, I can't leave anymore. Sometimes I work for other people, they pay me. But that's within the same community. (Male, Ch'ixiltón, Chenalhó, 14)

[75] Also a few other farmers reported day labor being one possible strategy to cope with impacts caused by coffee rust.

6.5 Discussion on Livelihood Strategies

In this chapter I have analyzed farmers' livelihood strategies in response to the livelihood crisis provoked by the outbreak of coffee rust. As seen in sections 1 and 2, farmers are determined to find ways to conserve coffee as their central livelihood activity and source of income. They also discussed other, complementary livelihood alternatives which I have presented in sections 3 and 4.

To conclude the present chapter and summarize my findings, I raise some considerations of farmers' strategies by assessing these within the livelihood framework. As seen in Chapter 3, different forms of capitals (or assets) and access to these are central elements in determining which livelihood options are available for farmer households (Blaikie et al. 1994, 51; Ellis 2000a, 9). In the following, I focus on specific elements of assets/capitals which emerged from the data analysis and have relevance for farmers' livelihood strategies in the context of coffee rust epidemic. It is worth mentioning that the following points do not necessary apply to all the farmer households I interacted with; they aim at revealing some trends which future research may take as starting points

Natural capital

In rural areas, land is a key asset in livelihood construction. Many scholars have noted the importance of landholdings and access to land in pursuing different livelihood strategies in times of experienced or anticipated crisis (Eakin 2005, 1934; Ponette-González 2007, 299; Tucker et al. 2010, 30; Eakin et al. 2012, 484). Also in my data, the question of land came up repeatedly. First of all, many farmers told me that in their communities there is very little available land for farmers to expand their property[76]. Secondly, many farmers said they did not have sufficient savings for purchasing more land, as seen above.

[76] Land tenure in Mexico is a complex issue whose roots go back to the Mexican Revolution and the subsequent, long process of land distribution. One of the results of this process is the prevalence of "minifundios", i.e. small landholdings, in rural areas. Population growth is one factor maintaining the system of minifundios in rural Mexico (see more on the history of land tenure Saldaña-Zorrilla 2008, 585; see also Ponette-González 2007, 291).

Limited landholdings or access to new land constrains farmers' sets of livelihood alternatives. For instance, it puts barriers for taking up beekeeping or planting new crops, and also complicates intensification of coffee or subsistence production. As the total amount of land is unlikely to increase, changes in land use often imply trade-offs between different livelihood activities. For instance, increasing subsistence crop production may be done at the expense of land under coffee cultivation, which can cause a further decrease in cash inflows for households in the long run. On the other hand, planting more coffee despite of coffee rust may be a risky option as well, since in the case of future failed harvest(s) households' food security may be compromised (see also Eakin et al. 2012, 484).

Financial capital

Evidence suggests that scarcity of financial capital – or income poverty – is another important factor constraining farmers' livelihood options. As seen previously, farmer households typically have enough money for day-to-day basic needs, but are rarely able to save up from their modest income. Furthermore, in Chiapas, there is no functional system of rural microcredits in place (Robles Berlanga 2011, 28-29). These factors limit farmers' opportunities for taking up livelihood activities that require major investments. Scarce financial resources also translate into reduced purchasing power within the communities[77]. My interviews indicate that the decline in farmer households' income in 2014 due to coffee rust and the possibility of a failed harvest in the following year(s) is likely to force households' to cut down on all expenditure, including investments in future productive assets and possibly also in coffee.

Human capital

Several researchers have identified education and skills as central elements of human capital that play a critical role in defining farmers' livelihood strategy options (Bebbington 1999, 2028, 2032; Ellis 2000a, 97; Eakin 2005, 1934; Bohle 2007, 23).

[77] Even under "normal" conditions, people do not have much money to consume goods or services other people in the communities are selling. As one interviewee put it, "there is no money here".

Farmers in the communities I visited have plenty of knowledge and practical experience of coffee farming as well as agricultural systems in which their plots are embedded (see also Donovan and Poole 2014, 6). This, I believe, is an important asset in trying to find workable solutions for controlling coffee rust, as well as in maintaining the quality of coffee high and uniform during the crisis. Furthermore, these agronomic skills may facilitate adaptation of new on-farm livelihood activities in order to cope with negative impacts of coffee rust and strengthen households' livelihood portfolios in the long term. In the process of livelihood diversification, large households are also an advantage from the perspective of human capital: they have a significant role in providing workforce for carrying out different livelihood activities.

However, there are also important constraints to farmer households' capacity to gain new skills and knowledge for expanding their livelihood portfolios. Farmers' households often face a limited access to education/trainings which may help to build up new skills and consequently open up new livelihood opportunities (see also Robles Berlanga 2011). Furthermore, information on different livelihood alternatives is typically difficult to access in remote rural areas (see also Eakin and Wehbe 2009, 373).

Assessing these limitations in a larger socio-economic context, it is evident there are severe structural factors affecting farmers' opportunities. As discussed in Chapter 2.1, Chiapas is among the poorest and most marginalized states in Mexico. It is lagging behind other states in public investment in human development, such as education and health which translates into high levels of illiteracy, for instance (CONAPO 2011; SEMARNAT 2012). Furthermore, poor infrastructure in Chiapas puts additional barriers to accessing information or education especially in remote rural areas where most Maya Vinic farmers live.

Social capital

Finally, my findings strongly point to the importance of social capital in coping with coffee rust. Throughout my data, Maya Vinic cooperative emerged as a key source of social capital; among other significant sources were family, local parish, and different associations (e.g. las Abejas, see Chapter 2.1). In the following, I assess specifically the

role of the cooperative in dealing with the impacts of coffee rust, although my data suggests the other sources may be equally important in coping with the crisis. For instance, close social relations on the community level seem to be important factors in creating mutual assistance and yielding creative solutions for coping with hardships. However, I wish not over-emphasize the importance of this type of social capital[78]. As Nygren and Myatt-Hirvonen (2007, 850) point out "social relationships both enable and constrain the livelihood opportunities of the poor households". Further research will be needed to explore the role of social capital in livelihood building.

Several studies have noted the importance of farmers' cooperatives for small-scale coffee producers' livelihoods and wellbeing (e.g. Jaffee 2007; Tucker et al. 2010; Frank et al. 2011, Donovan and Poole 2014). These studies show that cooperatives serve as a forum and source of information for member farmers, provide technical assistance on a wide range of matters, and facilitate farmers' access to markets. They may also have an important part in rebuilding assets as well as facilitating adaptive changes after a crisis. (Tucker et al. 2010, 30; Frank et al. 2011, 73; Donovan and Poole 2014, 11; see Chapter 6.1.)

In the context of coffee rust, Maya Vinic cooperative's role proved to be critical in raising awareness about the disease and assisting farmers in applying a range of control methods. Although by the time of my visit it was still uncertain if these measures would be effective or not, I believe it was important that farmers received information about coffee rust and control alternatives in order to be able to deal with the implications of the epidemic. Furthermore, Maya Vinic staff promoted long-term livelihood sustainability and food security by encouraging farmers to diversify their livelihoods and hold on to subsistence farming, and continue diversifying their production.

As described by Poole et al. (2007, 326), farmers' access to markets is conditioned by a variety of assets, such as ownership of transport services, money to assemble and sell products, and skills to run a business and create commercial linkages. Maya Vinic has the required equipment ('physical capital') for processing coffee and honey, and the cooperative has already established market linkages for selling these products

[78] A further study could assess more broadly the role of social capital in coping with coffee rust.

domestically and abroad. Currently, they are searching for possibilities to commercialize macadamia in the future[79]. The existence of necessary facilities as well as commercial links paves the way for farmers' diversification efforts.

In conclusion, membership in Maya Vinic cooperative is an important source of social capital for smallholders which puts them in an advantageous position compared to non-organized farmers. The assistance, services and support the cooperative offers help to compensate for constraints in other forms of capital[80], and serve as a buffer against livelihoods shocks, such as coffee rust (see also Tucker et al. 2010, 30). Lastly, all the farmers I interacted with identified themselves strongly as "Maya Vinic members" ('socios de Maya Vinic'). They were committed to the work and development of the cooperative, and saw it as an important means of improving their conditions.

7. Conclusions

Since 2012-13, coffee rust epidemic has been threatening coffee farmers' livelihood throughout Central America and Mexico, including Chiapas where I conducted my field study in April-May 2014. The aim of the present research was to gain knowledge of smallholders' perceptions about coffee rust and their responses to the disease. To reach this aim I focused on hearing out what my interviewees, indigenous small-scale coffee of Maya Vinic cooperative had to say. Although the sample in my study was perhaps not extensive enough to draw generalizations – providing this would be useful in the first place – I believe these interviews allowed me to get timely, locally-specific and experiential information about farmers perceptions and responses at the height of the crises.

In the analysis, I applied my modified version of Frank Ellis' (2000a) Framework for Livelihood Analysis (presented in Chapter 3). Building on a long line of livelihood

[79] When it comes to other products, farmers seem to have difficulties in finding markets which is a result of many factors. For instance, there is overproduction of many products, such as crafts, since many families are producing very similar items (see also Eakin 2005, 1932; Saldaña-Zorrilla 2008, 588)
[80] For instance, the cooperative organizes trainings on different aspects of coffee farming as well as honey and macadamia production

literature, this model served as an analytical and theoretical tool in identifying some of the multi-scalar factors affecting farmers' livelihood decisions. In the following, I summarize the key empirical and theoretical findings of the present research. These are also illustrated in the Figure 3.

During the time of my field work, all the farmers I interviewed had been affected by coffee rust to varying degrees. I found that all of them knew what had hit their coffee plots, and could generally give detailed accounts of the symptoms of the disease (see Chapter 5). Most interviewees named the abnormal rainfalls that had occurred in 2013-14 as the main cause for the outbreak; only a few farmers made a link between coffee rust and their own management practices. All in all, I observed there was still much confusion regarding coffee rust, and wide differences marked farmers' level of knowledge about the disease.

This study has demonstrated that farmers' key source of information was the staff of Maya Vinic cooperative who was passing information about coffee rust and control alternatives through the meetings with community delegates, as well as trainings and visits to the farmer communities. However, some of the staff members admitted that the cooperative could use more knowledge about the disease and the adequate control methods in order to fight coffee rust more effectively. Regardless of these limitations, I argue that the cooperative's role in disseminating the available information about coffee rust was vital, as otherwise this type of information would have been difficult to access for farmers living in remote rural areas (see also Frank et al 2011, 68). I will come back to this point later on.

My results show that coffee rust epidemic presented a major livelihood shock for the farmers; they named it as the "greatest difficulty" they were facing as coffee producers in 2014. This is hardly surprising considering the direct and indirect impacts the epidemic was having – and would have in the future – for their livelihoods. The disease was directly causing damage to farmer households' central livelihood asset, i.e. coffee trees, and consequently leading to crop losses. Coffee being the most important source of income for most farmers, a diminished yield caused a significant reduction to many households' annual income.

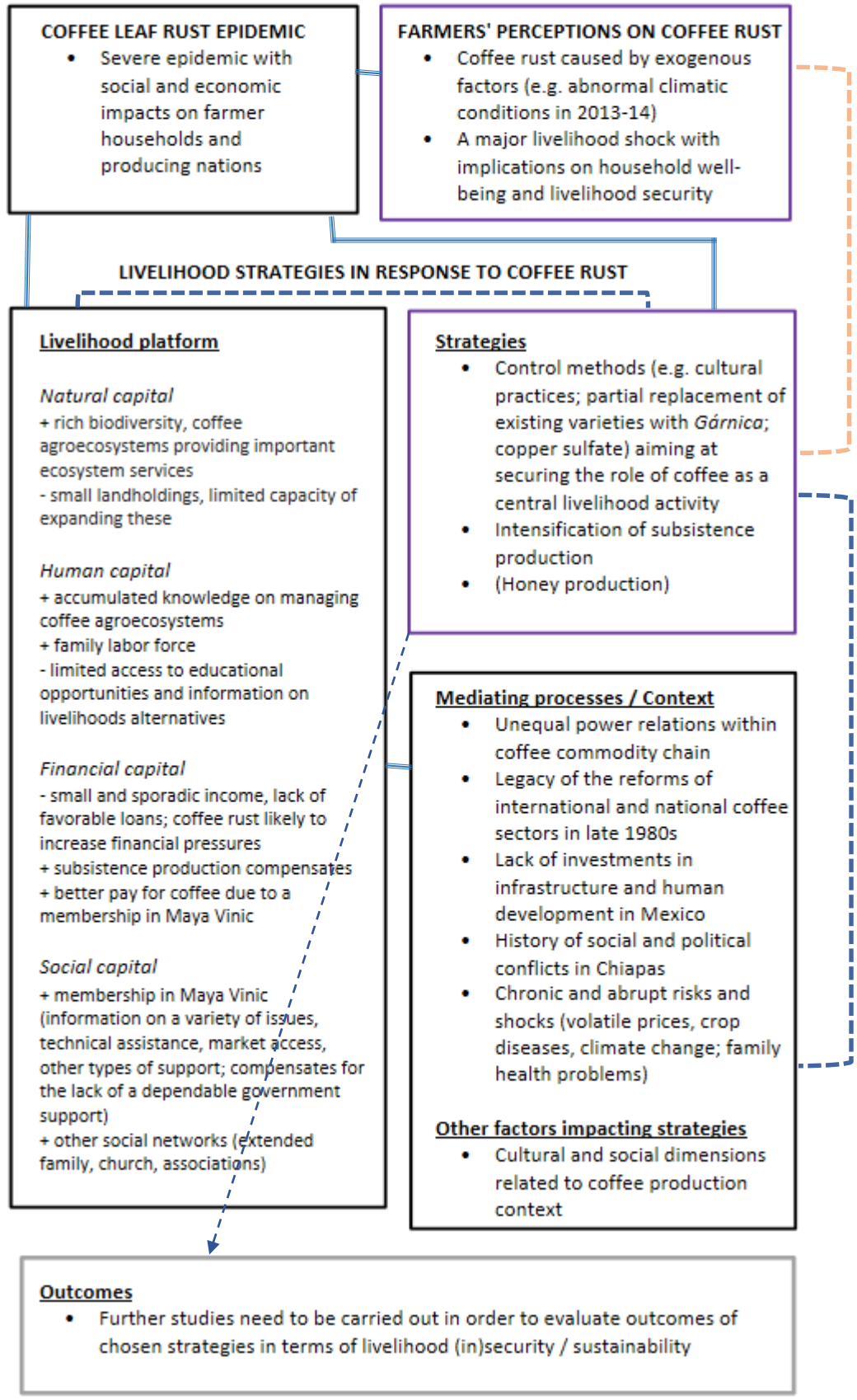


Figure 3 Relationships between farmers' perceptions on coffee rust, livelihood strategies, and endogenous and exogenous factors affecting these (see Chapters 3.1 and 3.2).

My results indicate that these changes in households' financial capital compelled farmers to cut back on consumption goods and basic food expenditure, which was likely to have implications on farmer households' welfare in terms of health and food security, for instance. Furthermore, coffee rust would likely have longer-term impacts on farmer households' livelihood security. Evidence suggests that an income drop may translate into a reduced capacity to invest in productive assets which are important in livelihood (re)construction (see Chapter 5.3).

I found that most of my interviewees had adopted one or several strategies in order to cope with coffee rust and its livelihood impacts. As an immediate coping strategy, most farmers had resorted to different control methods which aimed at preventing the spread of the disease and recovering plant vigor. Among the most popular methods were different cultural practices, such as pruning as well as transplanting new coffee trees. In many cases, the latter included replacing previously cultivated coffee varieties with *Gárnica*, a variety generally believed to be resistant to coffee rust. Furthermore, the cooperative was promoting the use of copper sulfate, but at the time of my field visit only a few farmers had experimented on it while many others seemed to be relatively skeptical about its use. These reservations stemmed from rumors farmers had heard about the presumed inefficiency of the product and/or from the lack of financial capital to buy it.

As discussed in Chapter 6.1, the range of methods applied were, to a large extent, consistent with the recommendations of coffee rust experts. However, taken into account the complex dynamics behind the disease, the application of some of these methods also raises some important considerations. Especially, the replacement of existing varieties with *Gárnica* might be counterproductive in the long run as – contrary to farmers' as well as staff members' believes – this variety has not proved to be resistant to coffee rust (see Chapter 6.1). However, there are other varieties available which have shown to be resistant and have a good cup quality. As for copper sulfate, some experts believe this (or other more environmentally-friendly) may be highly effective in controlling the disease, suggesting that this method could have an important role in preventing the spread of coffee rust. Due to these considerations, it seems prudent that the cooperative continues searching information on different control

alternatives and train farmers on their use in order to provide even more effective technical assistance to the farmers.

This study shows that, apart from the control methods, farmers were applying or planning to apply other coping/adaptation strategies in order to cope with the impacts of coffee rust. I discovered that one important coping strategy was maintaining or intensification of subsistence farming, which seems to be a common response in times of livelihoods crisis (e.g. Eakin 2005, 1935; Jaffee 2007, 141; see Chapter 6.4). All my interviewees had been growing subsistence crops, in particular maize and beans, already prior to coffee rust but the importance of these seemed to be on rise after the outbreak of the epidemic. As households' coffee-induced income was likely to suffer a decline not only in 2014 but also in the following year(s), subsistence farming was seen as a survival mechanisms and a means to secure a certain level of food security. As explained by several informants, those farmers lacking this type of type of buffering mechanisms were likely to feel more strongly the impacts of the crisis. For this reason, the cooperative was encouraging its members to take up or intensify subsistence activities.

Secondly, already before the epidemic the cooperative staff had been promoting honey production which they considered to be a viable option for farmers to diversify their production and reduce dependency on coffee. Many of those interviewees who were not yet engaged in beekeeping told me that they were considering the possibility of taking up this livelihood activity. These plans may have been in process already prior to coffee rust, but my findings point to the possibility of the epidemic serving as an impulse to take concrete actions in the near future. Apart from beekeeping, the cooperative was promoting macadamia production among its members. The "macadamia project" was still at its early stage, and so far there were no experiences of harvest or commercialization efforts. Although most farmers had planted some macadamia trees in their plots, in the absence of prior (successful) experiences they were still hesitant to invest more financial or human resources in this crop. Evidence from this study suggests that coffee rust was not likely to trigger an incentive to intensify macadamia production. In other words, the risks associated with this activity appeared to weigh more than the possibility of macadamia presenting a viable adaptation strategy.

Another important finding of this study is that all my informants were determined to continue with coffee production, despite of the heightened risk of crop losses in the forthcoming production cycles. Although they were likely to make some adjustments to their livelihood portfolios due to coffee rust, none of them appeared to question the role of coffee farming as a key livelihood activity also in the future. These results are in line with previous studies on smallholders' responses to livelihood crisis which indicate that farmers are inclined to continue producing coffee – and make only minor adjustments to their livelihood portfolios – even if the crop temporarily loses its economic viability.

My data indicates that there are many reasons for my interviewees' determination to continue with coffee production: First of all, most of them were convinced that coffee rust would not remain a chronic disturbance in the region, and that prior levels of productivity could be recovered. Secondly, farmer households had invested plenty of time and money in coffee production, and were thus eager to guard their investment. Thirdly, although coffee is generally a high-risk and low-return activity, in the absence of viable alternatives it remains economically the best livelihood option for farmers in many parts of rural Chiapas. Lastly, farmers' willingness to continue growing coffee goes beyond an economic rationale. As formulated by Tucker et al. (2010, 31), "coffee is not simply a cash crop for many smallholders, but also a cultural activity an aspect of local identity" (see also Ponette-González 2007, 298). My data shows that coffee holds deep social and cultural meanings for my interviewees, and forms an important part of their identity as indigenous farmers. This finding may also help to explain why farmers were not keen on resorting to emigration as a coping strategy.

As evidenced in a growing body of theoretical and empirical livelihoods literature, farmers' decisions are not born and shaped in a void. Instead, different types of livelihood assets – namely natural, physical, social, financial, and human capitals (Ellis 2000a) – and access to these play a critical role in defining people's livelihood options. In this study, I have identified a series of livelihoods assets/capital categories which appear to have relevance in terms of the strategies farmers were applying or planning to apply.

My results indicate that some of these assets (or rather lack of them) constrain farmers' coping/adaptation efforts (see also Tucker et al. 2010, 30). Firstly, the question of land

('natural capital') proved to be significant: I found that small landholdings and/or constrained access to new land put barriers for engaging in beekeeping or planting new crops, and also limits opportunities of intensifying coffee or subsistence production. Another constraint relates to financial capital. Farmer households typically earn a modest income of coffee sale and other livelihood activities. As a large share of this income is used for covering basic needs, little or no money is left to invest in productive assets. A decline in income caused by coffee rust was likely to compel farmer households to cut back on all expenditure, including investments in new livelihood activities. Thirdly, farmers in rural areas often face a limited access to different sources of information as well as education/trainings. These factors (seen as dimensions of human capital) are likely to constrain farmer households' capacity to adjust their livelihood portfolios in times of a livelihood crisis.

On the other hand, certain types of assets/capitals may facilitate households' coping/adaptation efforts in the context of coffee rust. Throughout my data, social capital arose as a key capital category in this regard. I found that Maya Vinic cooperative showed to be a particularly important source of social capital for the farmers. As demonstrated in this study, the cooperative – or more specifically its staff members who are member farmers themselves and directly accountable to other members (see Chapter 2.1) – played an important role in disseminating information about coffee rust and different control methods among the cooperative members. It is likely that this kind of information would have not otherwise been available to farmers whose access to different sources of information if often limited, as seen earlier. Furthermore, the cooperative staff was promoting strategies which they believed would help to sustain or increase farmer households' well-being. Although this work had been largely started prior to coffee rust, I believe its importance for farmer households' livelihood sustainability will rise in significance in the times following the shock. The significance of social capital, which extended beyond Maya Vinic (see Chapter 6.5), suggests that the notion of social capital might deserve more attention in different livelihood approaches (see Bebbington 1999).

As discussed in Chapters 1.3 and 3, an asset analysis helps to gain important information about the resources that households own or control, and how they can utilize these in pursuing different livelihood strategies (e.g. Ellis 2000a, 31). However,

the analysis needs to take one step further. As livelihoods-oriented literature repeatedly illustrates, farmers' livelihood decisions are embedded in specific economic, social, political and cultural contexts which shape these decisions. Putting it differently, there are a number of contextual and complex structures and processes that mediate the translation of assets into livelihood strategies (see Chapter 3). Although this study did not specifically focus on so-called mediating factors, I sought to take this dimension into consideration.

In particular in Chapter 4, I discussed the wider context in which small-scale coffee producers make a living, and identified a range of elements affecting farmer households' livelihood construction[81]. These include a range of local, national and global level factors, such as unequal power relations within coffee commodity chain, and lack of investments in infrastructure and human development in Mexico (for the Mexican context, see Saldaña-Zorrilla 2008, 592). Adding to these, farmer households are typically vulnerable to a number of chronic and abrupt risks and shocks, such as volatile prices, family health problems, and extreme climatic events. Regarding the latter, climate change is likely to increase these and other pressures, and pose challenges to smallholders' livelihoods in the future. Already during my stay in Chiapas, many farmers told me that the climatic conditions were not following "normal patterns" anymore, and the weather had turned more unpredictable.

Returning to a topic discussed earlier, my findings suggest that cultural and social aspects may be equally, or perhaps in some cases more, important than assets in evaluating farmers' responses and reactions in times of a livelihood crisis. As illustrated by the example of farmers' motives to continue growing coffee regardless of risks, cultural factors can help to explain, for instance, why "risk perception and experience with particular hazards alone remain insufficient to motivate adaptation" (Frank et al. 2011, 75).

Although this dimension needs to be evaluated more carefully in future studies, I concur with those authors (e.g. Ponette-González 2007, 300) who believe considering cultural and social factors is crucial for gaining a more nuanced understanding of livelihood

[81] Many of these factors are among those that limit smallholders' capabilities to "exercise social agency and escape political-economic marginality" (Nygren & Myatt-Hirvonen 2009, 851).

decision-making processes. I argue that assessing people's perceptions is one essential method for getting insights on these factors which may easily be omitted if focusing purely on assets and structures. People's perceptions are also a key for evaluating livelihoods in terms of meaningfulness, as proposed by Bebbington (1999).

The findings of this study add to a growing body of literature on small-scale coffee farmers' livelihood construction in times of major livelihood crisis. They also contribute to existing knowledge on coffee rust by providing evidence of the livelihood impacts of the disease as well as farmers' coping and adaptation strategies. This type of approaches have been largely missing in coffee rust literature. However, more research need to be conducted on these topics – urgently.

During the time of writing this thesis it was painfully evident that coffee rust continued sweeping across coffee lands in Central America and Mexico. It is important that further studies – preferably applying a transdisciplinary and participatory approach, and carrying clear policy implications – are carried out on different dimensions of coffee rust. It is equally important that different actors, including farmers, governmental, nongovernmental and corporate actors as well as academics, cooperate and try to find practical solutions for helping farmer households to combat coffee rust more effectively. These efforts should also aim at supporting farmers in sustaining and strengthening their livelihoods[82].

As discussed on several occasions in this study, climate change is affecting and will affect coffee producing areas in a myriad of ways, for instance, by creating favorable climatic conditions for pests and diseases such as coffee rust (e.g. Ghini et al. 2015). Therefore, following Avelino's and Rivas's (2013, 35–6) line of thinking, I believe efforts that aim at building more knowledge on coffee rust and finding practical livelihood-saving solutions ought to be keyed to the work on climate change adaptation. This could create creative synergies and yield innovative solutions which may help

[82] I am grateful to my friend Priti Darooka, founder and executive director of PWESCR (The Programme on Women's Economic, Social and Cultural Rights), for making me understand many years back the connection between livelihoods, dignity and human rights. People can and should be assisted in their livelihood-building efforts, but this support should not be based on mere 'hand-outs'. It should aim at strengthening people's agency and capabilities of choosing the kind of livelihoods they find meaningful.

farmers' make adjustments that reduce vulnerability and do not compromise economic, ecological or cultural sustainability.

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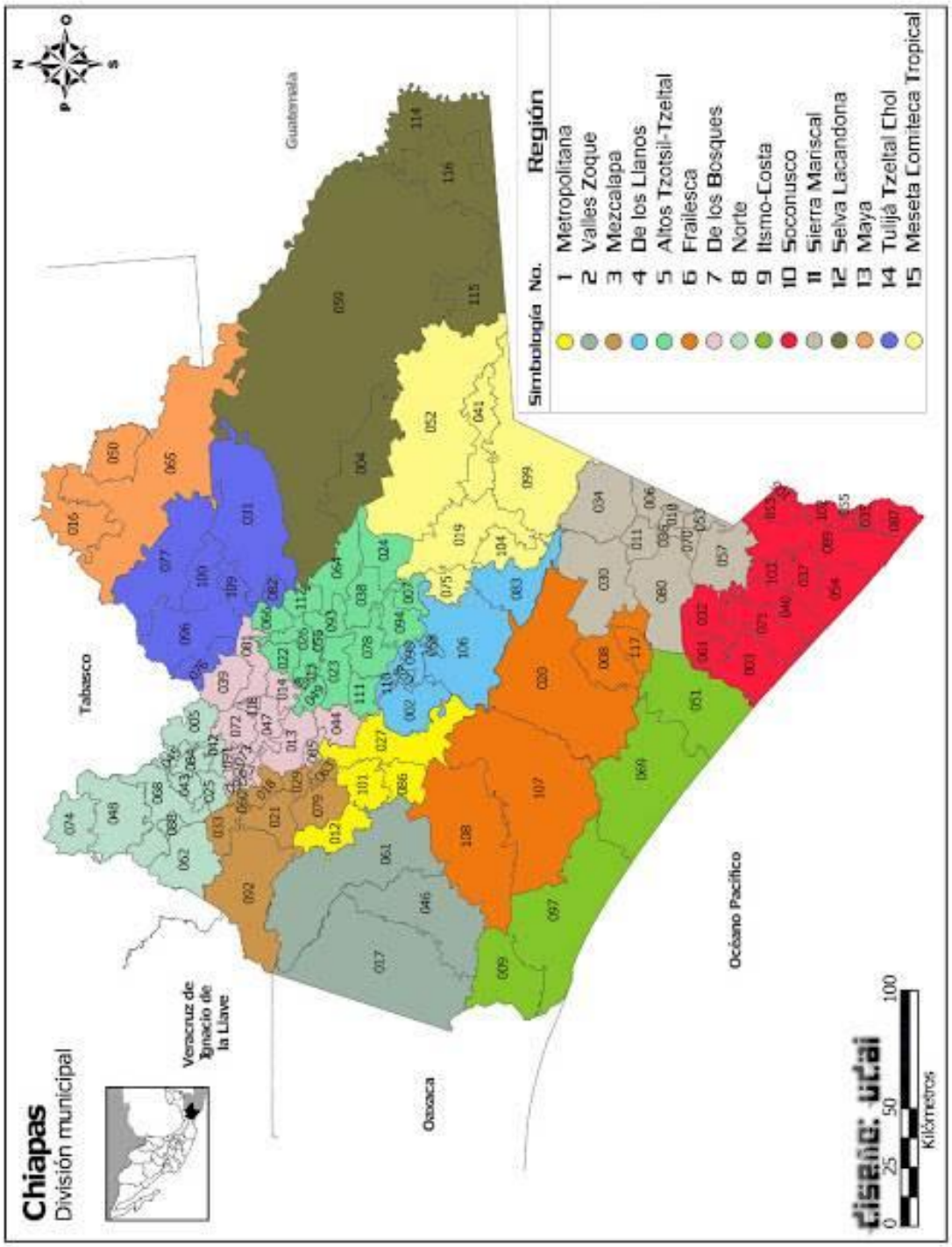
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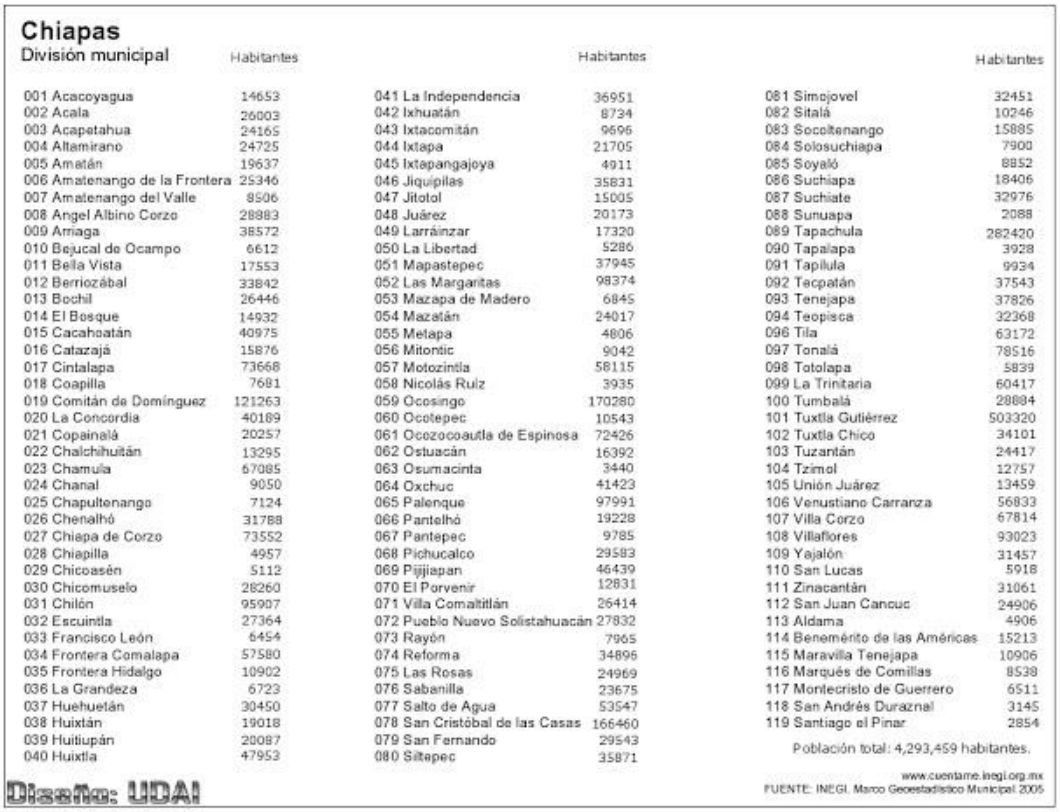
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APPENDICES

Appendix A. Map of Chiapas and locations of the field visits





Chiapas
División municipal

	Habitantes		Habitantes		Habitantes
001 Acacoyagua	14653	041 La Independencia	36951	081 Simojovel	32451
002 Acala	26003	042 Ixhuatán	8734	082 Sitalá	10246
003 Acapetahua	24165	043 Ixtacomitán	9696	083 Socoltenango	15885
004 Altamirano	24725	044 Ixtapa	21705	084 Solosuchiapa	7900
005 Amatán	19637	045 Ixtapangajoya	4911	085 Soyaló	8852
006 Amatenango de la Frontera	25346	046 Jiquipilas	35831	086 Suchiapa	18406
007 Amatenango del Valle	8506	047 Jitotol	15005	087 Suchiate	32976
008 Angel Albino Corzo	28883	048 Juárez	20173	088 Sunuapa	2088
009 Arriaga	38572	049 Larráinzar	17320	089 Tapachula	282420
010 Bejucal de Ocampo	6612	050 La Libertad	5286	090 Tapalapa	3928
011 Bella Vista	17553	051 Mapastepec	37945	091 Tapilula	9934
012 Berriozábal	33842	052 Las Margaritas	98374	092 Tecpatán	37543
013 Bochil	26446	053 Mazapa de Madero	6845	093 Tenejapa	37826
014 El Bosque	14932	054 Mazatán	24017	094 Teopisca	32368
015 Cacahoatán	40975	055 Metapa	4806	096 Tila	63172
016 Catazajá	15876	056 Mitontic	9042	097 Tonalá	78516
017 Cintalapa	73668	057 Motozintla	58115	098 Totolapa	5839
018 Coapilla	7681	058 Nicolás Ruiz	3935	099 La Trinitaria	60417
019 Comitán de Domínguez	121263	059 Ocosingo	170280	100 Tumbalá	28884
020 La Concordia	40189	060 Ocotepec	10543	101 Tuxtla Gutiérrez	503320
021 Copainalá	20257	061 Ocozocoautla de Espinosa	72426	102 Tuxtla Chico	34101
022 Chalchihuitán	13295	062 Ostuacán	16392	103 Tuzantán	24417
023 Chamula	67085	063 Osumacinta	3440	104 Tzimol	12757
024 Chanal	9050	064 Oxchuc	41423	105 Unión Juárez	13459
025 Chapultenango	7124	065 Palenque	97991	106 Venustiano Carranza	56833
026 Chenalhó	31788	066 Pantelhó	19228	107 Villa Corzo	67814
027 Chiapa de Corzo	73552	067 Pantepec	9785	108 Villaflores	93023
028 Chiapilla	4957	068 Pichucalco	29583	109 Yajalón	31457
029 Chicoasén	5112	069 Pijijiapan	46439	110 San Lucas	5918
030 Chicomuselo	28260	070 El Porvenir	12831	111 Zinacantán	31061
031 Chilón	95907	071 Villa Comaltitlán	26414	112 San Juan Cancuc	24906
032 Escuintla	27364	072 Pueblo Nuevo Solistahuacán	27832	113 Aldama	4906
033 Francisco León	6454	073 Rayón	7965	114 Benemérito de las Américas	15213
034 Frontera Comalapa	57580	074 Reforma	34895	115 Maravilla Tenejapa	10906
035 Frontera Hidalgo	10902	075 Las Rosas	24969	116 Marqués de Comillas	8538
036 La Grandeza	6723	076 Sabanilla	23675	117 Montecristo de Guerrero	6511
037 Huehuetán	30450	077 Salto de Agua	53547	118 San Andrés Duraznal	3145
038 Huixtán	19018	078 San Cristóbal de las Casas	166460	119 Santiago el Pinar	2854
039 Huitiupán	20087	079 San Fernando	29543		
040 Huixtla	47953	080 Siltepec	35871		

Población total: 4,293,459 habitantes.

Diseño: UDAI

www.cuentame.inegi.org.mx
FUENTE: INEGI. Marco Geoestadístico Municipal 2005

Source: http://ultimarisa.blogspot.fi/2011/01/principios-del-2011-el-c.html

Locations of my field visits:

- Polhó, Chenalhó (no. 026 on the map)
- Chivaltic Nuevo, Salto de Agua (two visits) (no. 077 on the map)
- Acteal, Chenalhó (several visits) (no. 026 on the map)
- Nueva Yibel joj, Chenalhó (no. 026 on the map)
- Paraje Beumpale, Chenalhó (no. 026 on the map)
- Ch'ixiltón, Chenalhó (no. 026 on the map)
- Tzajalchén, Chenalhó (no. 026 on the map)

- San Cristóbal de las Casas (the location of Maya Vinic office, no. 078 on the map)

Appendix B. List of interviewees

	Gender	Age[84]	Location	Status[85]	Date of the interview
1	Male	20-29	Chivaltic Nuevo, Salto de Agua	Son of a member	March 25, 2014
2	Female	20-29	Chivaltic Nuevo, Salto de Agua	Wife of a member's son	March 25, 2014
3	Male	50-65	Cuauhtémoc, Ocosingo	Community delegate, Member of the cooperative	April 4, 2014
4	Male	50-65	Chivaltic Nuevo, Salto de Agua	Community delegate, Member of the cooperative	April 4, 2014
5	Male	30-49	Chixiltón, Chenalhó	Staff member, member	April 8, 2014
6	Male	30-49	Canteal, Chalchihuitán	Staff member, member	April 8, 2014
7	Male	30-49	Tzajalchén, Chenalhó	Staff member, member	April 8, 2014
8	Male	50-65	Tzajalchén, Chenalhó	Staff member, member	April 8, 2014
9	Male	30-49	San Cristóbal de las Casas	Staff member	April 21, 2014
10	Female	50-65	Ch'ixiltón, Chenalhó	Member	April 30, 2014
11	Male	50-65	Ch'ixiltón, Chenalhó	Community delegate, member	April 30, 2014
12	Male	20-29	Ch'ixiltón, Chenalhó	Member	May 1, 2014
13	Female	20-29	Ch'ixiltón, Chenalhó	Wife of a member	May 1, 2014
14	Male	30-49	Ch'ixiltón, Chenalhó	Member	May 1, 2014
15	Male	30-49	Ch'ixiltón, Chenalhó	Member	May 1, 2014
16	Male	20-29	Tzajalchén, Chenalhó	Son of a member	May 9, 2014

[84] In my thesis, I have not focused on age as a determining factor in farmers' perceptions and responeses. However, I have grouped my interviewees in three age groups in order to indicate if they are young farmers (20-29), established farmers (30-49), or senior farmers (50-65).

85 'Member' refers to a membership in the cooperative. One or several persons in a household can be members of Maya Vinic.

17	Male	50-65	Tzajalchén, Chenalhó	Community delegate, member	May 10, 2014
18	Male	50-65	Tzajalchén, Chenalhó	Member	May 10, 2014
19	Female	50-65	Tzajalchén, Chenalhó	Wife of a member	May 10, 2014
20	Female	30-49	Ch'ixiltón, Chenalhó	Member	May 14, 2014
21	Male	30-49	Ch'ixiltón, Chenalhó	Member	May 14, 2014
22	Male	30-49	Xoyep, Chenalhó	Staff member, member	May 16, 2014
23	Male	50-65	Ch'ixiltón, Chenalhó	Staff member, member	May 19, 2014
24	Male	30-49	Tzajalhukum, Chenalhó	Staff member, member	November 25, 2014 (via Skype)

Appendix C. Interview guide

1. General

- Name and age?
- Are you a member of Maya Vinic, or a family member?
- How long have you been a member?
- How long have you been growing coffee?
- Are/were your parents and/or grandparents coffee producers?
- What is the size of your household?
- What is the size of your coffee plot?
- Which varieties of coffee do you grow on your plot(s)?

2a. Difficulties / risks

- What do you so perceive to be the greatest risk/difficulty as a coffee producer in 2014? (*If the answer was other than 'coffee rust', additional questions followed*.)

2b. Coffee rust

- Has coffee rust affected your coffee trees?
- If so, in which quantity?
- When did the first symptoms started to appear?
- What kind of symptoms have you observed in your plot?
- Have you observed any other anomalies in you plot?
- In your opinion, what are the main causes behind the outbreak of coffee rust?
- What factors do you believe are contributing to the spread of the disease?
- What control methods have you applied / are planning to apply to manage the disease?
- What experiences have you had of the control efforts?
- In what ways, if any, is coffee rust affecting your household?
- In what ways, if any, is coffee rust affecting your livelihoods?
- Do you believe coffee rust will affect your future as a coffee producer?
- (*Additional questions on coffee rust, based on interviewees' responses*.)

3. Other livelihood activities

- Are you producing anything else apart from coffee?
- Do you sell your (agricultural) products, or are they for family consumption?
- If you sell (agricultural) products, where do you sell them?
- Do you or your family members have any other sources of income?
- Could you describe how important these other sources of income are for the household?
- Due to coffee rust epidemic, have you considered taking up other livelihood activities?
- How do you perceive the future of small-scale coffee producers?

4. Maya Vinic

- Why did you join Maya Vinic cooperative?
- What benefits does a membership in a cooperative bring?
- Has Maya Vinic assisted you in managing coffee rust?

Appendix D. Total production of coffee exporting countries (2009-2014)[86]

(000 bags)

Crop year	2009	2010	2011	2012	2013	2014
WORLD TOTAL	**123 042**	**133 651**	**136 583**	**147 562**	**146 745**	**141 850**
Member countries of ICO	**116 453**	**126 300**	**128 090**	**140 091**	**139 671**	**135 943**
Angola	13	35	29	33	35	35
Bolivia	142	130	143	115	128	120
Brazil	39 470	48 095	43 484	50 826	49 152	45 342
Burundi	112	353	204	406	163	270
Cameroon	902	503	574	366	413	475
Central African Republic	93	95	87	56	30	22
Colombia	8 098	8 523	7 652	9 927	12 124	12 500
Costa Rica	1 304	1 392	1 462	1 571	1 444	1 508
Côte d'Ivoire	1 795	982	1 966	2 072	1 973	2 175
Cuba	92	108	100	88	107	100
Ecuador	813	854	825	828	666	650
El Salvador	1 065	1 814	1 152	1 235	537	680
Ethiopia	6 931	7 500	6 798	6 233	6 527	6 625
Gabon	1	1	0	0	0	0
Ghana	37	92	94	82	45	40
Guatemala	3 835	3 950	3 840	3 743	3 159	3 500
Honduras	3 603	4 331	5 903	4 537	4 568	5 400
India	4 806	4 728	4 921	4 977	5 075	5 517
Indonesia	11 380	9 129	7 288	13 048	11 667	9 000
Kenya	630	641	757	875	838	850
Liberia	13	10	10	10	6	10
Madagascar	457	530	602	537	645	530
Malawi	17	17	26	23	27	25
Mexico	4 109	4 001	4 563	4 327	3 916	3 900
Nicaragua	1 871	1 634	2 193	1 890	2 017	2 000
Panama	138	114	106	116	110	95
Papua New Guinea	1 038	870	1 414	717	828	850
Paraguay	20	20	21	22	20	20
Philippines	730	189	180	177	186	200
Rwanda	259	323	251	259	254	280
Sierra Leone	91	33	78	61	32	50
Tanzania	675	846	544	1 109	809	1 030
Thailand	795	828	831	608	638	494
Timor-Leste	47	60	50	58	79	50
Togo	202	160	162	78	141	100

[86] Highlighted top ten producing countries in 2014.

Uganda	2 860	3 223	3 075	3 878	3 602	3 800
Vietnam	17 825	20 000	26 500	25 000	27 500	27 500
Yemen	135	161	185	190	191	185
Zambia	28	13	11	5	11	3
Zimbabwe	21	10	9	7	8	12
Non-member countries	**6 589**	**7 351**	**8 493**	**7 471**	**7 075**	**5 907**
Congo, Dem. Rep. of	346	305	357	334	347	335
Dominican Republic	352	378	491	488	425	400
Guinea	499	386	385	233	158	150
Haiti	351	350	349	350	345	350
Jamaica	25	21	24	24	20	20
Lao, People's Dem. Rep. of	434	544	512	542	544	500
Peru	3 286	4 069	5 373	4 453	4 338	3 400
Venezuela	1 214	1 202	902	952	805	660
Others	82	96	100	94	93	92

Source: ICO 2014: Exporting countries: total production 2009-2014 (http://www.ico.org/trade_statistics.asp)