

**RECONNECTING THE CITY AND THE COUNTRYSIDE WITH FOOD AND
AGRICULTURE IN THE ERA OF GLOBALIZATION AND NEOLIBERALISM:
NOPAL, MEXICO CITY, AND MILPA ALTA**

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Abstract

My dissertation explores how geographically proximate sites of food production (largely semi-rural) and food consumption (largely urban), connect, and what makes the connections persist, disappear, and/or re-emerge. It specifically examines the food linkages between Mexico City and a nearby agricultural region, Milpa Alta, through a commodity supply chain analysis of nopal, a native food, from the 1990s to the present. My study makes the following key contributions: Theoretically, I propose an integration of the metabolic rift theory and agroecology that facilitates analysis of complex rural-urban relationships framed in neoliberal capitalism and in a context of intense interaction of peasants with globalized city's dynamics. Methodologically, I suggest a refinement in the commodity chain methodology so as to include analysis of space and place from the use-value perspective. This approach facilitates analysis of on-farm practices that build upon an ecological indigenous and peasant farming legacy to produce a food that carries strong cultural and historical meaning locally but that was barely known and commercialized outside Mexico until recently. Empirically, my results reveal that because of exposure to the neoliberal and globalized mega-city, nopal producers increasingly rely upon the human health benefits, and ecological and cultural values embedded in nopal, to both reconstitute their relationship with the local market and create global market connections. This empirical analysis expands on knowledge of the emergence of native foods in the world market as a result of global consumption trends based on health and ecological values and how that may compromise or foster the reproduction of the wealth of local agroecosystems of native foods. This research is at the intersection of the study of the city and the country and expands debates in scholarship at the intersection of agroecology, peasant studies, and food regimes.

*Para el amor de mi vida, Manuel Romero,
por acompañarme en este vuelo.
[To the love of my live, Manuel Romero, for accompanying me in this journey]*

*A mis padres, Ana Cervantes y Francisco Hernandez, dedico este vuelo.
[I dedicate this journey to my parents, Ana Cervantes and Francisco Hernandez]*

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Chapter 1: Introduction

1.1 Food, a Common Rural-Urban Problem

The year 2008 was marked by the latest world food crisis. A year later, 2009, the number of people living in urban areas exceeded the number of those living in rural areas (UN, 2007).¹ The food crisis certainly would be felt in cities, as it was in Mexico City. Between 2007 and 2008 hundreds of people marched on Mexico City streets protesting the soaring price of tortillas, a basic food of Mexican's daily diets. Tortilla prices increased between 42 and 67% and the international price of corn increased 75.5% from the average in 2006 to January 2007, but as a Mexican expert on the country's agricultural issues put it, "it was not a period of scarcity... but the price of maize was directly affected by the international market, and prices had been creeping up since the third quarter of 2006. Once consumers bore the brunt of the price increase, the debate on food policy gained momentum. Simultaneously, throughout 2007, the debate on the impact of total liberalization of maize imports under NAFTA, which was to come into effect in January 2008, was renewed with vigour" (Appendini, 2008).

The protests in those years concerning food prices reminded me of another protest in 2003, also in Mexico City, that was led by campesinos organizations coming from the rural areas of the country. They came to the city, the place of federal political power, demanding the government renegotiate the terms of the North American Free Trade Agreement (NAFTA) ten years after it had come into effect. National campesinos organizations, such as UNORCA (acronym in Spanish for National Union of Regional Autonomous Campesino Organisations), were at the front of the mobilizations, since they had opposed the NAFTA agreement and the neoliberal economic project established in Mexico. But by 2003, the campesino producers stated that they were in deep crisis (UNORCA national representative, 2012 personal communication). The Mexican campesino movement articulated in UNORCA² is allied with the international Via Campesina and shared a common vision for a food sovereignty movement. UNORCA vindicates campesino

¹ According to the FAO, by the year 2020, the developing countries of Africa, Asia and Latin America will be home to some 75% of all urban dwellers.

² UNORCA was created in 1985 in opposition to the campesinos organisations that were controlled by the Mexican State. They were at the forefront of rural social movement and were important actors in the creation of La Via Campesina in 1996.

and small to medium farming, not only for the sake of farmers, but for the people, as expressed by Olegario Carrillo, national representative of UNORCA (2012 personal communication):

“The peasant agriculture is an important part of the solution for our social and environmental issues, not only in Mexico, but in the world. We are of the idea of using technologies and techniques that do not destroy the environment. We are concerned about the environment and the effects of climate change proximity farming; we are concerned about nature and the people’s health.”

Not so long after the world food crisis of 2008, the UN delivered the report on the right to food (De Shutter, 2010) that stresses the need to scale-up agroecology and the importance of small scale farming as a strategy to accomplish the right to food in the context of ecological, food and energy crises. Both the UN report and La Via Campesina call attention to the obvious opportunity to link agroecology and small scale farming. Seemingly, after decades of the *green revolution* that promoted large-scale agricultural models, the importance of small-scale farming re-enters the scene.

The two mobilizations in Mexico City I just referred to reflect the fact that today the city and the countryside are linked by a common problem that transcends the rural-urban divide, and that is food. This problem seems to have escalated since Mexico adopted a neoliberal economic model in the late 1980s and deepened with the NAFTA agreement signed in 1993.

Within this context, my research examines the rural-urban linkage in the specific location of Mexico City and a nearby agricultural region of Milpa Alta, framed in the period of neoliberalism, from 1990s to today. Part of the reason for framing the research project in this time period is that neoliberal agri-food regimes have impacted structures and agricultural policies in both the countryside and the food market in the urban areas.

The proximity of the site of production and consumption was selected purposefully, as I argue that such geographic proximity should facilitate cultural, ecological and market connections. Should the study reveal that such connections are minimal, it would still shed light on the conditions impeding these relations. The result of my research suggests a double dynamic in which these linkages are both disrupted and remade. In the following chapters, I will describe how these dynamics operate.

1.2 A Context for the Agri-Food Rural-Urban Relationship in Mexico

Today, 78% of the Mexican population is settled in urban centres³ (UN, 2007) and problems of food security and hunger are becoming more apparent in cities. Since the 1980s Mexico is considered urban (CONEVAL, n.d).⁴ However, the urban growth of recent years has not been accompanied by real improvements in food security in urban areas (CONEVAL, n.d). The expansion of cities and the disruption of the domestic food supply during the last three decades (1990s to the present) converged with trade liberalization of the agri-food market of Mexico.

National policies shifted to a model that favoured large-scale producers and production of vegetables, while significantly reducing support to producers of staple foods (maize, beans, rice) that were campesino-type, small to medium-scale producers (Rubio, 2011; Appendini, 2008). Under neoliberalism, the national agricultural strategy was re-oriented to neo-export agriculture at the expense of small producers, who normally supply domestic needs (Rubio, 2008; Carlsen, 2011; Calva, 2003).

Although Mexico is ranked among the top ten food producers of the world, its dependency on imported staple foods grows: currently 33% of corn, 72% of rice, 50% of wheat and 95% of soy are imported (Carlsen, 2011). Furthermore, the most productive and capitalized agricultural sectors of the country, integrated into the global economy, seem to be in a less profitable position because of loss of competitiveness (Sandoval Cabrera, 2013). Meanwhile, former small and medium farmers, of whom peasants are a large component, swell the migratory flows to urban centres. Over approximately a decade, four million farmers abandoned the agricultural sector of Mexico (Rubio, 2008)⁵. Moreover, the Mexican domestic agricultural sector has lost its role as a provider of domestic food (arguably cheap food) for the nation's populations and industry (Calva, 2003; Appendini, 2008; Rubio, 2008).

The phenomena just described led me to query how, in the context of global agri-food

³ The UN and the national institution, CONEVAL (*Consejo Nacional de Evaluación de la Política de Desarrollo Social*) have slightly different numbers. The CONEVAL Report “*Evolución y determinantes de la pobreza de las principales ciudades de México, 1990-2010*” concludes that 72% of Mexico should be considered urban.

⁴ CONEVAL (*Consejo Nacional de Evaluación de la Política de Desarrollo Social*) publishes a report titled “*Evolución y determinantes de la pobreza de las principales ciudades de México, 1990-2010*” but there is no publication date. The report can be accessed at http://www.coneval.org.mx/Informes/Pobreza/Pobreza%20urbana/Evolucion_determinantes_de_la_pobreza_urbana.pdf

⁵ Although there are no accurate data indicating how many of them became workers for new landlords in their own villages or migrated to the cities, we can assume that a significant number became migrants, either going to national cities or to the United States.

relations, are geographically proximate sites of food production (arguably rural) and food consumption (urban) connected? What makes the connections persist, disappear and/or re-emerge?

1.3. Arriving at the Central Research Question

With this background and considering the site of Mexico City and the nearby agricultural area of Milpa Alta, I arrived at my central research questions: How do producers of Milpa Alta adjust their agroecosystem management and relationship with local and global markets in response to a neoliberal setting and exposure to Mexico City, a globalized mega-city? Moreover, as a sub-question, I ask: is the adoption/enhancement of agroecological farming methods maintaining producers' relationship with the land and the market?

The site of research and the central question provided me with a window into the intersection of small-scale and ecological farming in Mexico and urban food issues.

1.4. Landing in Mexico City and Milpa Alta: The Site of Research

Mexico City, DF,⁶ is the largest urban centre of Mexico with more than 8,851,080 people (INEGI, 2011a)⁷. It is a place full of stark contrasts, where characteristics of affluent cultural, educational life and political power co-exist with “rural-like” landscapes and slums.

The largest countryside migration to Mexico City happened from 1950 to 1970, as an aftermath of industrial development and modernization programs promoted by the national government at that time (Losada, Cortes, et al., 1998). Parallel to this process was the preference for industry over agriculture within the DF, since it was thought that “agriculture could not belong to a modern landscape” (Losada, Cortes, et al., 1998). Thus, a clear division between rural and urban started to take shape in Mexico City.

Agriculture at the foot of the city had persisted since pre-colonial times. Back then, farming activity was practised at the core of the great city of the Aztec civilization.⁸ Despite social and economic pressures against farming through different historical periods, seven (Milpa Alta,

⁶ It may seem confused that DF and Mexico City are used interchangeably. For Mexicans and non-Mexicans alike this is confusing because not all DF is a city as the name has changed many times. Indeed as recent as 2016, the name changed from DF to Mexico City. I explain the history of the geographical area in Chapter 2.

⁷ This is without considering the metropolitan area of the city.

⁸ The Great Tenochtitlan was the name of the city of the Aztec empire when the Spaniards arrived in Mexico. It was where Mexico City's downtown is now. Traits of that ancient farming practice still survive, for example, the technique called chinampas.

Tlahuac, Xochimilco, Tlalpan, Magdalena Contreras, Cuajimalpa and Alvaro Obregon)⁹ of the 16 districts of Mexico City are considered agricultural (INEGI, 2007). Today, 20% of DF's land is dedicated to farming and Milpa Alta is the most important agricultural area (SAGARPA, 2009).

Milpa Alta: The agricultural site

In the context of the growth of Mexico City, Milpa Alta appears as an exceptional case of resistance against the pressures of urban sprawl, conventional modernization and industrialization projects, which subordinate the rural world to the urban in the name of development. Though local officials describe it as the “rural area” of DF, Milpa Alta contests those fixed definitions.¹⁰ As such, it challenges dualistic ways of thinking that force a choice between one or another category. In this research, I use the “rural” and “urban” only as points of departure, but my final destination is the in-betweens, the linkages. Milpa Alta falls in both a rural-like and urban-like space and place.¹¹ Though some scholars attempt to describe it as an interphase, semi-rural or semi-urban, or rurban, those categories remain trapped in dualism. Linear transitions from rural to urban do not represent the experience of most of the urbanization processes in the global south. The difficulty of defining Milpa Alta actually mirrors the non-linear trajectories from rural to urban in the case under examination. As such, the study may help further an understanding regarding why and how small scale farming and farmers can continue despite the growth of a big city nearby, and encourage inquiry into how the food market structures and food culture in big cities allow or prevent the nearest local farmers from deepening the market, environmental and cultural connections.

The farmers are mostly small holders. The largest plot per producer rarely reaches 10 hectares. The majority work on plots between 1.5 and 5 hectares (Bonilla Rodriguez, 2009). The land ownership regime in Milpa Alta is ejidal, communal and private (INEGI, 2007). The ejidal type of ownership, which was set down by the agrarian reform of the 1930s, maintains a certain *campesino* identity in Milpa Alta (Bonilla Rodriguez, 2009).

The existence and historical co-existence of these small-scale farmers bearing indigenous

⁹ At the beginning of the 1970s, a presidential order reclassified the city's administrative and political regions into “urban” and “agricultural” and only these seven districts are formally allowed to farm (Lozada, Martinez et al., 1998).

¹⁰ In interviews with local officers presented in chapter 2, it is seen that depending on the approach of the office or secretary, they frame the area as rural or conservation land. Apparently, there is no consensus across offices of different levels and official documents in defining the areas as rural or urban.

¹¹ See more about this in Chapter 2.

and peasant legacies and the large Mexico City offered me an avenue to explore and test ideas of small-scale farming in the modern world. It contests notions of the peasant communities “untouched” by modernity. Indeed, because Milpa Alta producers are not so far from the modern world, *they* actually touch the city, the modern and global, while maintaining the agricultural orientation. This recognition encouraged me to challenge common associations of peasant/backwardness, peasant/untouched peoples, peasants/traditional/not evolved farming practices. In this regard, Van der Ploeg’s (2008, 2010a, 2010b) work¹² and scholars from the field of agroecology (Altieri, 1989; 1995; 2002; Toledo and Altieri, 2011; Gliessman, 2010; Gliessman, 2002; Hecht, 1995)¹³ were a good point of departure to develop a different view.¹⁴ Subsequently, exploring these questions motivated me to engage throughout my research the subject of whether the producers of Milpa Alta today can be considered ‘peasants’. If they are, what type of peasant? This topic is explored in the thesis employing an interdisciplinary approach.

1.5 Nopal: The Link

Nopal (*Opuntia ficus-indica*) is a type of cactus originally from the American continent (Kiesling, 2013). Nopal has been fundamental in the development of the peoples and culture of Mexico. According to some records, the Aztecs called it *nopalli* (ASERCA, 2001), but Lopez de Gomara (1554) tells that its oldest and original name in *Nahuatl* (the Aztec language) is *Tenuchtitlan*. Lopez de Gomara (1554: n.d) explains the two parts constituting the *Nahuatl* word: “*tetl* that means stone and *nuchtli* that means fruit”. Hence, the name evokes an image of a fruit of stone and recalls the name of the Aztec city, *Tenochtitlan*. There is no better way to describe nopal than with its *Nahuatl* name because, indeed, the cortex of nopal plants is very hard and from its leaves grows a fruit called tuna. From ancient times to today, both the leaves (*pencas*¹⁵) and the fruit tuna, have been fundamental in the diet of Mexican peoples. Nopal can be found in

¹² These were the main and inspiring works by Van der Ploeg when I was reviewing the literature in early phases of the doctoral program.

¹³ There many other important contributors in the field of agroecology, but these were the seminal works that set up important foundations in the field. I have followed with special attention the work of Miguel Altieri, a prominent author.

¹⁴ In Chapter 3, I link the new peasantries argument of Van der Ploeg and the work of scholars in the field of agroecology that provide evidence of the evolutionary character of the farming practices of peasants in the global south.

¹⁵ *Penca* is a type of leave, characteristic for its thickness.

different regions of the world because the Spanish spread it across the American continent and Europe (Kiesling, 2013).

That nopal became the centre of this research was a fascinating accident of my research journey. The examination of the site drove me to select this food because it was the most important crop, in terms of cultivated area, volume and commercialization for Milpa Alta's people (see Chapter 2). At the same time, it is widely known and consumed in Mexico City and the entire country. When I initiated this research project I thought that the fact that nopal is not a crop of global commercial importance would be a limitation, so I initially framed it as a *local* crop.

At the end of the day, the "local" character became a valuable doorway into the cultural dimensions of this food. For instance, the cultural connotations associated with nopal both facilitate and obstruct the economic connection with the city. That fact struck me because the cultural connotation is almost 'common sense' in Mexico. It is implicit in Mexican popular culture given nopal's prevalence in daily consumption, but is barely documented. So, this research is an effort to make it explicit. Throughout the interviews with producers, policy makers and chefs alike, the cultural and economic dimensions of nopal appear inextricable. My findings concerning the cultural-economic features of nopal are not presented exclusively in one chapter, but unfold throughout the thesis.

1.6 Choosing the Explanatory Frameworks for the Rural-Urban Relationship

A fundamental pillar of my theoretical framework is to examine the rural-urban relationship via the theory of metabolic rift. This theory is complemented by two other key approaches: that of the 'food regime' and of agroecology. This integrative analysis of the three approaches helped me address debates concerning the rural-urban relationship within the history of the development of global capitalism. Agroecology, specifically, allowed me to analyze farming practices and the intersections between ecological farming, small-scale farmers and peasant farming practices. Below, I briefly introduce these three key different frameworks.

Metabolic rift

The metabolic rift theory is attractive as a concept to explain the links between contemporary crises of soil fertility and environmental degradation and the politics of increasingly long-

distance global agricultural trade (Schneider and McMichael, 2010). The idea of city-countryside disruption can be found in the theory of metabolic rift rooted in Marx's analysis of the agricultural crisis of the late 19th century, which was reconstructed by John B. Foster (1999). This theory helps us to understand the historical causes of the apparent rural-urban antagonism within Capitalism (Foster 1998, 1999; Moore 2000, 2008, 2011; Clark and York, 2008; Friedmann, 2000; Schneider and McMichael, 2010). The key to understanding such antagonism is the separation of social production from its natural biological base, concretely manifested in both the distance of production from consumption and marked division of labour between town and country (Moore, 2000; Friedmann, 2000; Foster and Magdoff, 1998).

The history of metabolic rift: World market and implications for local ecologies

In Marx's conception, the mechanism of the metabolic rift is the movement of soil nutrients --in the form of grains or other fruits of the land-- to towns, where they end up in urban sewage and in the environment as human organic waste (or "humanure"), which should, but does not, go back to re-fertilize the land (Foster and Magdoff, 1998; Foster, 1999; Schneider and McMichael, 2010). For Marx, labour is a process by which humans mediate, regulate and control the material exchange between themselves and nature (Marx, 1981). Labour then catalyzes the society-nature-metabolism, and it is agriculture as a human labour activity which neatly reveals how labour links nature and society. Briefly said, this means that when people are removed from the land, the "humanure" goes away too, thus breaking the human-nature-metabolism. Marx focused only on soil as matter, ignoring the wider ecological functions of soil and overlooking the fact that soil is indeed a living organism, and as such its health and fertility do not merely depend on the chemical mechanism of nutrient availability, but on a complex soil-food web and metabolic reactions between living and non-living components (Schneider and McMichael, 2010). But this understanding of soil functioning was not available in Marx's time and is the reason his interpretations appear limited from today's vantage point.¹⁶

¹⁶ After examining the current state of the art in agronomy, Schneider and McMichael (2010:468) find four important differences in the ways in which soil scientists and agroecologists understand soil dynamics today, from how they were understood in Marx's time: 1) The ability of a soil to produce crops is not based solely on a measure of soil nutrients, but on a set of interrelated factors and processes that together constitute "soil health". 2) Certain characteristics of any soil can be changed through the choice and timing of agricultural practices, while others, at least in geological time, cannot. 3) Soil is understood as a living ecosystem nested within larger agroecosystems. 4) Understanding soil and soil fertility as processes means that looking at either one at a certain point in time

Schneider and McMichael (2010) noted that even in the seminal works of this theory (like that of Foster, Moore, Clark and York), an update on the true functioning of soil is not found. Here, the practice of farming seems secondary while abstract value relations are over-theorized. By noting this, Schneider and McMichael add a new meaning to the separation of humans from the land, which they call *knowledge rift* and *epistemological rift*. The former arises when people migrate from the countryside to the city and lose their farming skills and knowledge, thereby disrupting knowledge of agroecosystem management that works in harmony with natural cycles. Regarding the *epistemological rift*, the authors emphasize that it is through the practice of labour itself that humans know and experience nature. Therefore, if agriculture is considered a practice of labour, then farming activity expresses a co-transformation of nature and society. This means that ecological processes transformed through farming practice change social relations and vice-versa.

The controversy as to whether the rift happened in tandem with industrial capitalism or before emerges in the literature. This is the periodization problem. For Friedmann (2000) and Duncan (1996), the case of high farming during the late 18th century in England demonstrated the co-existence of an ecologically sophisticated and resilient capitalist agriculture, co-existent with industry.¹⁷ This seems to prove that industrial development could not have been the origin of the first metabolic rift, but rather, the development of global trade.¹⁸ In Chapter 3, I trace the genealogy, history and current debates concerning the theory of metabolic rift.

Considering this theory, I argue that Mexico's dialectic relation between city and countryside, from the 20th century to the present, can be specified as two historical processes that widened the metabolic rift. The first (1940s to 1970s) was geared to the national development program, extended to agriculture and marked by efforts to spread the green revolution --though it was never completed. In this period, we can place the division of labour between city and countryside within the borders of the nation. It created agrarian class division and the rural outmigration was mainly to national cities. During these decades the most important urban centres, apart from Mexico City, emerged; they include Guadalajara, Monterrey and Puebla.

necessitates an examination of the processes that converged to create the soil conditions observed at that moment (Schneider and McMichael, 2010: 468).

¹⁷ Friedmann draws from the historical evidence provided by Duncan (1996) on the practice of high farming in England and its capitalist nature.

¹⁸ Duncan's (1996) distinction of industrial, modern and capitalist agriculture provides key elements for re-framing our understanding of how agriculture interplays with different phases of capitalist societies.

The second period, between the 1980s and the present, starts with the implementation of the neoliberal model and the fostering of a new de-localizing strategy of agricultural development based on a neo-specialization in export-oriented vegetable production, whose markets happen to be in the core countries. The theory of metabolic rift helps locate Mexico's neo-export-oriented agricultural model as part of a global attempt by capital to further the accumulation of capital from the peripheries. This latest strategy inserts Mexico in the reorganizing of world ecology under the neoliberal framework.

The shift to the neo-export agriculture platform ended up favouring the already capitalized agricultural sectors (Sandoval, 2013) and enhancing the agrarian class differentiation in Mexico (Rubio, 2008). It also propelled the second great wave of rural outmigration of the 20th century in Mexico, but this time beyond national borders. The squeezing of macro and regional economies because of the neoliberal frames made the big urban centres, including Mexico City, incapable of offering prosperity to the newcomers. Indeed, Mexico City can be said to export people to other countries, and today it is the seventh region (out of 33 states) receiving the largest remittances sent by family members working outside the country (Gaceta Oficial del DF, 2010).

The focus on Mexico City and the Milpa Alta agricultural site falls within the agenda of "ways to heal the rift". In the same field are Wittman (2009) and Clausen (2007); the former employs this theory to explore the formation of agrarian citizenship based on the global food sovereignty movement as a means to heal the rift, whereas Clausen (2007) uses it to interpret the reconnection of city and countryside by developing urban agroecological agriculture in Cuba.

Overall, this research grounded in Mexico attempts to fill the gaps in understanding the contemporary and concrete expression of the metabolic rift in developing countries (periphery for Moore, 2000), that are totally immersed in global trade and subjected to neoliberal economic frameworks. Neoliberalism is seen as a phase of capitalist development that widens the rift, while at the same time intensifying the process of wealth commodification of agroecosystems, as well as increasing resistance to it.

Food regime analysis

Food regime analysis (Fridemann and McMichael, 1989) and the revised versions of this framework (McMichael 2005; 2009a, 2009b; Friedmann, 2005, 2009; Araghi, 2003, Van der

Ploeg, 2010a; Burch and Lawrence, 2009) are used to understand the history of global agri-food system relations at key points of contemporary capitalist accumulation.

The food regimes approach is a political economy perspective that enables one to historicize and politicize understanding of the strategic role of agro-food relationships in the world economy (McMichael, 2009a). Inter-state power relations, agrarian and food social movements, individuals, corporations and science applied to farming systems constitute the constellation of social relations that can be studied through this framework (Friedmann, 2009). Although the early version of food regime analysis (Friedmann and McMichael, 1989) strongly rested on regulation theory and world-systems theory --of which Goodman and Watts (1994)¹⁹ made a sharp critique-- more recent contributions go beyond episodic structure or sets of rules, and, for instance, take on the politics of food (Friedmann, 2005) and the commoditization debate (Araghi, F., 2003, Van der Ploeg, 2010a). Also, McMichael (2009) has more recently examined world historical value relations and food regimes of capital.

The authors of the food regime framework, Friedmann and McMichael (1989), offer two different avenues to interpret the influence of neoliberalism in reshaping food production and consumption relations. Friedmann (2005) focuses on the shift in politico-normative terms generated by the WTO in the 1990s and 2000s, which show a turn to quality-based regulatory schemes (e.g. healthy, fresh, organic food). For Friedmann (2005) the convergence of environmental politics and retail-led organization of food suggests that the third regime has “corporate-environmental” characteristics. Meanwhile, McMichael (2005) stresses attention to new forms of rural dispossession facilitated by the neoliberal regime (e.g. access to new lands and peoples, and of the natural wealth of the agroecosystem). Therefore, he employs the food regime framework as a vector of the social reproduction of capital on a world scale, and as a lens focusing on the social fact of dispossession. These two avenues of re-examination of food regimes in neoliberal times are not exclusive but complementary.

Agroecology

One of my key arguments stresses that the metabolic rift between agriculture and the city could be repaired through the adoption and/or enhancement of agroecological approaches in urban

¹⁹ The critique by Goodman and Watts (1994) focused on the weakness of the regulation theory, not on the world-theory system.

farming, since agroecology is a science that builds upon agronomy, knowledge of traditional farming systems, rural sociology and environmentalism (Altieri, 1989, 1995, 2002; Hecht, 1995; Uphoff, 2002; Gliessman, 2002). Agroecology extends beyond the design of technological packages and a set of practices. Rather, it encompasses both the understanding and designing of ecological principles to counteract the global economic forces --of concern to agriculture-- that disrupt ecosystems, culture and people (Sevilla-Guzman, 2006, 2007; Altieri, 2009).

One key aspect is that applications of agroecological science simultaneously transform the way farmers relate to agroecosystems and the social relations involved within and beyond the farming system (e.g. organization of markets, production-consumption relations, farming knowledge systems) (De Schutter, 2010). Interestingly, works treating small-scale, peasant-like farming systems abound in the field of agroecology. This leads to linking agroecology with peasant-like farming systems that imply control of the production process, autonomy from the state (against state co-optation) and from the market (against commodity market lock-in). However, questions about the peasant-like farming system existing near a city seem not to be fully addressed, except for those works about urban agriculture in Cuba (Funez-Monzote, 2010; Clausen, 2007). Therefore, I expect my research to contribute to this particular subject.

There is indeed a conversation between the authors for each of these frameworks, and in this study all these theoretical frameworks are linked together in inextricable ways.

1.7 Going Through the Linkages: Commodity Chain as the Method

The focus on “linkages” is methodologically necessary in my research in order to understand the character of the metabolic relationship between Mexico City and Milpa Alta. I see nopal as the connector of the linkages because nopal is what the majority of people who work as agriculturists grow in Milpa Alta and it is significantly commercialized in Mexico City. As such, it connects peoples of Milpa Alta with the land and with urban markets.

With these considerations in mind, I selected the commodity chain methodology and applied it to nopal (see discussion below). Commodity chain analysis traces an item through the process of production, commercialization, distribution and commercialization. This methodology enables me to manage my research questions via a concrete case study of a particular food. I also employ it as a heuristic tool for drawing conclusions on the social, economic, environmental, and cultural aspects fostering and disrupting the agri-food linkages between the city and Milpa Alta.

In addition to enabling a focus on linkages, the commodity chain methodology shares common intellectual ground with the theory of metabolic rift. For instance, commodity chain emerged as a method of inquiry within the world-system school of thought (Wallerstein and Hopkins, 1977). Like the metabolic rift, it centres on the division of labour. While metabolic rift theory identifies the division of labour between town and country, the world-system framework refers to a core-periphery division of labour. Chapter 4 on methodology and methods expands on the consistency between the chosen method and the theoretical framework I use.

A fundamental topic within metabolic rift theory that is suggestive for a commodity chain analysis is the interpretation of the rift as a result of an ongoing process of unequal ecological exchange between town and country, and core and periphery (see this debate in Chapters 3 and 4, the theoretical correspondences). This unequal ecological exchange is deeply intertwined with unequal trade exchange.

The fact that the commodity chain includes production, trade and consumption allows me to address the ecological processes involved in the production of nopal as a foodstuff, and also the terms of trade in which it is involved. As a result, this heuristic method enabled me to explore with regard to nopal, to what extent there is unequal ecological exchange linked to the terms of trade. Following my discussion and analysis of the different segments of the chains, presented in Chapters 5 and 6, in the concluding chapter, I offer some insights into unequal ecological exchange and economic trade as they pertain to the case study.

1.8 A Note on the Thesis Organization

Chapter 2 is an analysis of the site of research where I delve deeper into the tension in defining Milpa Alta as a rural place. There I address the agricultural history of its people as farmers, and the space as an agriculturally-oriented area from the colonial period to the present. I consider how nopal became both a key food crop and an important food consumed in the city.

In Chapter 3, I present my theoretical foundations. This chapter is organized in two parts: in the first one I traced the genealogy and main debates and in the second part I develop an integrated approach of metabolic rift theory and agroecology. My argument is that the theory of the metabolic rift lacks a systematic approach to operationalize the analysis of the town-country unequal wealth exchange and capital's attempt to separate or disrupt the organic relationship of humans and nature. In addition, I found that the theory requires an approach that enables

contrasts between labour practices that foster metabolic distortions against those that fix them or maintain normal metabolism. Moreover, by integrating agroecology and metabolic rift in a single approach, I attempt to overcome dualistic views of nature and humans because agroecology understands the farmer (the labourer) and the land (commonly seen as the element of nature) as part of the same unit, the agroecosystem. As such, the farmer and the land are both nature, a central point suggested by recent work in world-ecology (Moore, 2011).

Chapter 4 deals with methodology and methods. In the first part I discuss the methodology of the commodity chain, identify its intellectual terrain and demonstrate its consistency with my theoretical framework concerning the metabolic rift. Subsequently, I propose a refinement in the commodity chain approach so as to include analysis of space from the use-value perspective. In the second part, I explain how I employ commodity chain analysis as a qualitative method. Central here is that I constructed a model of the chain from the perspective of nopal producers (see full explication in Chapter 4). Based on their experiences and the data they provided me, I selected the relevant actors and topics in all the segments of the chain.

Chapters 5 and 6 provide discussion and interpretation of the data collected, based on the segments of the chain, which were input-production, commercialization and consumption. However, the presentation is not mechanically done by segments. Rather, the presentation and discussion of data was based on selected topics, which relate in an inextricable way to my theoretical framework.

In Chapter 5, I develop a spectrum of ecological farming in nopal production in Milpa Alta, based on the analysis of the data from the input and production segments of the chain. I deal with the social relations at the farm level that generate a certain way of farming, for instance what inputs they use, how they arrange labour and practices and the ecological level in which they are situated.

In Chapter 6, I analyze the trade and consumption relations from farm to city and beyond. The ecological spectrum I develop in Chapter 5 is the foundation to evaluate to what extent the market relations divert to different paths, based on the ecological character of farming and the final product, as well as the intertwined relationship between cultural and economic dimensions of nopal.

In Chapter 7, I present an integrated conclusion of the case examined, based on the results and interpretations provided in Chapters 5 and 6. Here I confront two topics that can only be

addressed once the full conclusions of these chapters are presented. These concerns how we might characterize the nopal grower of Milpa Alta as a producer, and the unequal rural-urban ecological exchange relations expressed in marketing (and consumption of) nopal as food.

Chapter 2:

Defining the Urban-Rural Contours and Boundaries

2.1 Introduction: Location

Milpa Alta is the second largest and most important agricultural political delegation²⁰ of Mexico City, Federal District (DF in Spanish). It is located in the southeast of the Federal District and covers an area of 28,375 hectares (INEGI, n.d), which encompasses 20% of the DF (SAGARPA, 2009) (See Figure 2-1). Milpa Alta adjoins three other political jurisdictions of the DF where agriculture has been practised historically. On the north side, Milpa Alta connects with Xochimilco, at the northwest with Tlapan, and with Tlahuac on the northeast. These jurisdictions differ from Milpa Alta in that the urban landscape has penetrated at a more rapid pace. On the east side are the neighbouring municipalities of the State of Mexico, and in the south is Tlanepantla, a municipality of the state of Morelos that also has significant agricultural activity and whose main crop is nopal. Milpa Alta is constituted of 12 towns or peoples, and the quality of land and intensity of agriculture varies among them.

While Milpa Alta manifestx hybrid characteristics of rural-urban, it is formally linked physically, culturally and economically to Mexico City. While the Federal District (DF) government classifies it as rural, federal institutions designate it urban. It seems contradictory to have a rural area within a city. Scholars studying this area describe it either as a “rural area of Mexico City” “sub-urban”, or “fringe of the city” (Torres and Rodriguez, 2010; Torres et al., 2010; Losada et al, 2011). However, the rural traits are quite strong, even merging practices related to peasantry and the indigenous legacy. This double cultural character of Milpa Alta actually offers proof of ongoing deeper tensions and antagonisms in the interaction between agroecosystems, ecologies, people and rural-urban cultures along the rural-urban boundaries. I provide details on the site-specific history of the place and space of Milpa Alta, its agricultural history and agrarian structure, as well as the cultural and commercial relevance locally of the most important cultivated crop in the region, nopal. Then, I discuss definitions of the urban and

²⁰ The DF territory is divided into sixteen political delegations. A “political delegation” functions in a similar way to a municipality, but it is not exactly a municipality. Later in this document an elaboration is provided.

rural in relation to DF or Mexico City and the frequent contradictions in official documents, government offices and statistics offices in defining the region and its urban counterpart.

Figure 2-1. Federal District (DF in Spanish) and Milpa Alta



2.2 The rural limits of Milpa Alta. The name Milpa Alta reminds us of the ancient agricultural practice based on the milpa system, an indigenous crop system combining corn, beans and squash. Alta means “high”, referring to its predominantly hilly terrain. The agricultural orientation of the area has been there for centuries in this location, which gives it a rural character. The agricultural orientation, combined with the history and culture of the people inhabiting Milpa Alta, are some elements that lend rural characteristics.

History of the peoples of Milpa Alta prior to the 20th century: The legacy of indigenous farming and identity

Indigenous roots are an important characteristic that transcend time, not as an “untouched” indigenous population, but rather, fully immersed in relevant political, social, cultural and economic historical processes. The lively interaction and co-existence of these people with the centre of political power (Mexico City) from pre-Hispanic times onward has not been enough to vanquish the culture that emanates from their indigenous legacy.

However, for the people of Milpa Alta, their indigenous ties are better expressed in the term *Original Peoples*. The concept is recent and was coined by the people of Milpa Alta to distinguish themselves from migrant indigenous populations that have been arriving in Milpa Alta and Mexico City. Under the name *Original Peoples*, “they assume themselves as the legitimate inheritors of the ancient inhabitants and therefore hold the unquestionable right to their territory” (Portal and Alvarez, 2011: 10). For Portal and Alvarez (2011), the principal difference between migrant indigenous peoples and original peoples has to do with the recent claim for a juridical recognition of their territory and natural resources, and that they recognize their indigenous past but do not consider themselves indigenous.

Yanez Enriquez (2007) points out that the term *Original Peoples* replaced the term *Indigenous Peoples* in an attempt to create social cohesion and authentic identity different from the urban identity (Yanes, Enrique, 2007). Portal and Alvarez (2011) found that the scholarly work and studies produced in relation to the original peoples of DF categorized them based on cultural criteria that, while valid in some ways, had essentialist implications. Portal and Alvarez (2011:11) emphasize that, “even the peoples of pre-Hispanic origin went through strong transformations during the Colonial period and established institutional and symbolic structures different to what could be considered ‘original’. In other words, they have gone through hybridization processes and syncretism seen in the integration of mestizo elements and practices, then transforming their classic indigenous character”.

The indigenous background had an influence in reproducing the social ownership regime of the land throughout the time. The indigenous legacy is also apparent in some farming practices (Yanez, 2006; Gomezcesar, 2010; Torres, 1991). For Gomezcesar (2010), the agricultural practices of Milpa Alta’s peoples merge elements of ancient and new techniques, reflecting the social mosaic that is “indigenous in essence, but mestizo in form”. For instance, in nopal plots some producers prepare compost in the way their ancestors made it, and use simple machinery. But, tractors are also employed (mostly rented and very limited) to clear plots and plant new nopal plants. As for maize, some producers practise native seeds selection, thus reproducing traditional seed-saving (Serratos, 2010). I briefly describe the continuity of this legacy since the pre-Hispanic times to Independence, presenting a synthesis of the work of Pablo Torres (1991). The synthesis emphasizes aspects of agricultural practice, labour, land ownership and ecosystems.

*People and agriculture in pre-Hispanic times.*²¹ One of the ancient farming practices of Milpa Alta is the milpa system²² introduced under the Aztec empire. According to historical records, the culture of the milpa started in the year 1409 in Milpa Alta. Other important infrastructure and practices to improve the farming system occurred between 1484-1528 when the Aztec ruler Huitzilauhtli fostered a system of moving stones (*piedras movedizas*) to prevent erosion over the cultivated lands and build infrastructure to channel the water from the natural springs. During that time the maguey or agave plant was introduced in the Milpa Alta lands. Maguey is a plant that Aztecs used for medicinal, culinary and drinking purposes. Centuries later, the maguey would become an important commercial crop in the region.

According to Kay (2000: 124) “at the time of the Spanish conquest, Latin America was dominated by two major empires, the Aztec and Inca. Within these empires, three types of land existed: land whose produce was destined for religious ceremonies; land which belonged to the state; and community land”. Milpa Alta belonged to the Aztec empire and as such the land ownership had some of the characteristics Kay mentions. Torres (1991) reports that land ownership in Milpa Alta was collective and corresponded to two types of social organizations, one being the *calpulli*, which were social groups formed by relatives and members of the same location. They were laypeople obliged to pay tribute to the central political power. The extension of land varied among *calpullis* and the quality of the land was varied. For the *calpullis*, the land was their means of subsistence and allowed them membership in the community. The 12 towns of Milpa Alta may correspond to different *calpullis*. The other land ownership type was held by another social organization, constituted by warrior chiefs, officials and religious authorities, or the authorities that receive the tributes. Common laypeople worked these pieces of land for them.

The majority of the work force of Milpa Alta was occupied with agriculture and in particular in the collective work to cultivate the milpa. As usual, when there were no mechanized systems employed, labour was the main input in their farming system. The collective work was devoted to the preparation of the soil and seeding, hard labour requiring the support of many.

²¹ Except for Kay's (2000) work, this section is based on historical records presented in Torres (1991). Based on Torres (1991) I did a synthesis of agricultural practice, labour, land ownership and ecosystem.

²² Milpa is a system that combines corn, beans and squash known as “the three sisters”

The ecological system of Milpa Alta during the pre-Hispanic times was constituted by numerous mountains and forest and extensive vegetative cover and abundant fauna. The milpa was cultivated in the plains (between mountains). The plots were divided by stone fences.

*People and agriculture in Colonial times.*²³ In contrast to other regions of Mexico that changed their productive orientation once the Spaniards took over the territory and peoples, Milpa Alta continued its agricultural activity. For the Spanish Crown, the region was useful to supply the urban centre of the colonial power with food and a work force for construction activities, services and other needs of the city.

However, the farming practice of Milpa Alta underwent changes resulting from adaptations of Spanish farming inputs, techniques and animals. For instance, for the first time, Milpa Alta's people employed fresh manure. The plow and hoe were introduced and substituted instruments the Aztecs used, such as the *coa* (a sharp shovel with a flat, narrow blade) and a stone ax.²⁴ The Spanish introduced new animal species such as sheep, horses, cows, and pigs. During these times new crops were also introduced, which are still cultivated in Milpa Alta today, like oats, green beans, vegetables, and fruit trees. Despite all these new species, the pre-Hispanic milpa and maguey were maintained, as well as the harvest of forest products. Seemingly, the Spanish Crown found it useful to keep the region of Milpa Alta in its original condition and in the year 1709 the definitive process of delivering titles of communal land property was concluded. From then on, the previous communal land ownership remained through the colonial period. According to Kay (2000), communal land was a third type of agricultural enterprise in many countries of Latin America. Kay (2000: 125) recounts that "while plantations and *haciendas* were owned by private individuals (the landlords) or by institutions (such as the church), indigenous communities had communal property rights over the land, part of which was cultivated by individual households and part communally". Hence, the communal land system, though marginal, continued in the colonies.

²³ This section is based on historical records presented in Torres Lima (1991). I draw on his work only and did a synthesis of aspects of agricultural practice and land ownership and ecosystem.

²⁴ At first sight there is no superiority in the Spanish instruments (hoe and plow) over the *coa* and Stone ax, but the replacements had to do with the need to substitute one culture for another one.

*People and agriculture post-Independence times.*²⁵ The independence of Mexico from Spain was formally signed in 1821. In the 1820s, the majority of Latin American countries achieved political independence. Kay (2000: 125) reports that in Latin America “agriculture became more widely integrated into the world market. The century from 1830 to 1930 can be considered the golden age of the *hacienda*: a period of oligarchichal domination in which the landed elite, in alliance with the merchant class, controlled the levers of economic and political power”.

The *hacienda* production type required long expanses of fertile land, preferably on plains. In the areas around Mexico City, there were set haciendas but Milpa Alta continued milpas and continued the production of pulque (the alcoholic drink derived from the maguey plant) (Torres, 1991). Productive activities such as the harvest of forest products, textiles fabrication, and artisanal baking remained as well.

Because the farming activity was not seen as a regional priority for the political and economic powers of Mexico City, the peoples of Milpa Alta sold their labour in the *haciendas* in nearby regions, in Morelos and the northern areas of Mexico City that were plain lands. There, they were seasonal migrant workers and sometimes became permanent workers.

The overall resulting effect of *haciendas* on Milpa Alta was indirect. On the one hand, the lands were abandoned because the labour force was working on the *haciendas*. On the other hand, because of the hilly terrain of the region, those who continued farming preserved traditional crops and farming practices.

The communal land regime of land ownership has remained, at least partially, despite laws of settlement and vacant lots, and even the forests were protected from the commercial extraction of their products prior to the revolution of the 20th century.

The 20th century and the campesino legacy: revolution, agrarian reform and effects of urbanization over Milpa Alta²⁶

The major impact of the national revolution over Milpa Alta’s people was the integration of part of their land in the new *ejidal* land regime during the post-revolution agrarian reform in the

²⁵ Except for the citation of Kay’s (2000) work, the rest of this section draws only on the historical records presented in Torres Lima (1991). I did a synthesis of aspects of agricultural practices and land ownership and ecosystem for the period in question.

²⁶ This section draws on several works, not only Torres Lima (1991).

1930s-1940s. That result allowed the continuity of common property land regime, and produced a campesino social organization and productive rationality.

Milpa Alta's people actively participated in the National Revolution War from its very beginning in 1910. They joined the Zapatist movement, which claimed the right to the land. The role of Milpa Alta was strategic given the proximity to the centre of political power. An important contribution had to do with the provision of food to the revolutionary army.

During the revolution, Milpa Alta lost some of its population (some just left while others were killed). Once the conflict came to an end around 1920, the priorities were to reorganize food production for self-consumption (Torres, 1991). The people of Milpa Alta put agriculture again at the centre of their economy, but in these times agricultural production was primarily oriented to sustaining the community, not the nearby urban, regional market or external markets. By the early post-revolutionary times, the milpa farming system was important, as it was the foundation of food self-consumption of the population.

The loss and exodus of the population impacted the agrarian structure, land tenure, particularly.²⁷ However, the community showed its resilience by working the land, ultimately integrating under the *ejido* land tenure, a social land ownership category that stemmed from the agrarian reform.²⁸ Thus, communal and *ejido* became two types of social land ownership existing in Milpa Alta. The origins of the communal type dates from pre-Hispanic times while the *ejido* was introduced after the revolution of the 20th century. Even today, there is communal land in Milpa Alta. The National Agricultural Census (2007) reports that 2,899 hectares (32% of the land of Milpa Alta) is under the communal land regime.

During the agrarian reform, the Mexican State expropriated land from the *hacendados* (the landlords of large land holdings before the revolution) and a process of redistribution took place in a variety of forms—private, public and social land ownership regimes (Orozco, 2010).²⁹ The evolution of the *ejido* regime is socio-historically and politically complex and beyond the scope

²⁷ Arguably, the structure of the communal land ownership was impacted because of the loss of members of the community, who were killed or left Milpa Alta and never came back.

²⁸ During the agrarian reform, the Mexican State expropriated the land from the *Hacendados* (the landlords of large land holdings before the revolution). The redistribution of the land was claimed by the revolutionary movement. The *ejido* is a form of social property in which the ones holding the title to the land can use it but not sell it. The *ejidatarios* can pass the land down to their children or to other members of the community but can't sell it to private agents or those outside the community.

²⁹ The legal characteristics, social organisation, juridical persons and rights related with the *ejido* were mainly established in Article 27 of the Mexican Constitution. In Orozco (2010), the reader can find the exact Constitutional articles and subsections about the *ejido* in Mexico.

of this research, so I will limit myself to explaining the characteristics of this land regime and the significant changes.

The ultimate objective of the *ejido* land ownership regime is to prevent the commoditization—preventing entrance to the market—of the land and its concentration in a few hands. The ones with the right to the *ejido* land are called *ejidatarios*. The conditions to become *ejidatario* restrict access to the land to the members of the local community and Mexicans. To become *ejidatario* the person has to be Mexican; be the age of majority or any age if he/she has family under his/her responsibility; live in the community where the *ejido* is located, except when it comes to an inheritor; or fulfill the requirements that each *ejido* establishes (Trujillo, 2010). Until recent reforms, a series of legal conditions prohibited the renting or selling of the *ejido* land, but the *ejidatario* has the ability to define to whom to pass on his/her rights, though this action is also severely restricted, as the law guarantees the reproduction and preservation of the territory as common or social property.³⁰ In addition, many *ejidos* remain organized around assemblies. The assembly was the place of decision making about the use of the land pertaining to an *ejido*. According to the National Agricultural Census (2007), in Milpa Alta 1,296 hectares are ejidal (14.7%).³¹

Recent constitutional amendments to the laws regarding the ejidal and communal land have compromised the historical social land property regime of Milpa Alta. The most important changes came into effect in 1993 during Carlos Salinas' administration (1988-1994). The modifications allowed *ejidatarios* to legally pass on their land rights to private agents and for *ejidatarios* to manage the land as private land without needing to consult the *ejido* assembly (Lopez-Barcenas, 2012). That change set the stage for the land to evolve into private property. It was during the Salinas administration that the structure of the economy of Mexico was significantly modified to operate within a neoliberal economic regime: the major move in that direction was the signing of the North American Free Trade Agreement (NAFTA) with the USA and Canada (Calva, 2003).

³⁰ Trujillo (2010) details the restrictions to passing on the usufruct right of the *ejido* land as follows: the people who can hold the land must have lived in the community for at least six months prior to the date of requesting the usufruct of the land. Only those who have worked it can usufruct the land; people who do not hold a private land extension larger or equal to the size of the land requested for usufruct; must have been born Mexican; should not hold a capital investment of \$2,500 pesos or larger in the industry or commerce or an agricultural capital larger than \$5000, etc.

³¹ Apparently, there is more land under communal land regime than *ejido* today in Milpa Alta. Perhaps *ejidos* have been sold more rapidly than land under communal regime. The National Agrarian Census (2007) reports that around 50% of the land in Milpa Alta is "private property".

During the period from early 20th century to date, there have also been significant changes in the crops cultivated in the region. By the closing decades of the 19th century, maguey or agave, another native crop, was central to an important economic boom in the region of Milpa Alta. From maguey, pulque is made, a beverage as unique to Mexico as tequila. However, the pulque industry declined after the Mexican Revolution, arguably due to the high international tariffs established for pulque and because of the outmigration of the campesinos escaping from political persecution in post-revolutionary years (Gomezcesar, 2010). Indeed, the 1920s to 1940s was a transitional period for the agriculture in Milpa Alta, at a time when important social changes occurred, such as the Land Reform, less labour being available (because of migration to the city, political persecution, etc), and the sudden urban expansion of Mexico City. As a result, the peoples of Milpa Alta had to search for a crop compatible with the social changes and natural conditions. In the middle of this transition, nopal was introduced as a commercial crop, and soon after its production became the economic foundation of Milpa Alta and the symbol of prosperity for its inhabitants.³² The terrain gained by nopal crops represented a relative loss for maize.³³

Nopal reactivated the local economy in the post-revolutionary times while articulating the region within the distribution and commercial networks of a growing nearby city. Different from other regions of the country, Milpa Alta was somehow neglected by the State from the 1940s onwards. The Mexican State, centralized in Mexico City, was busy delivering policies for the countryside with special focus on the most productive lands cultivating staple foods on a large scale (Torres, 1991). The fulfillment of national food self-consumption goals through productivist approaches to agriculture was the objective of the post-revolutionary State, which coincided with the worldwide green revolution. Hence, there was little interest in attending to the needs of the campesinos of Milpa Alta and its hilly lands (Torres, 1991). What is interesting about Milpa Alta is that it does continue cultivating maize as a “staple-food”³⁴ but it is not primarily for market purposes, while simultaneously managing a highly commercial nopal crop whose cultivation stems from cultural and historical site-specific processes.

³² Bonilla (2009) recounts two versions of the introduction of nopal in Milpa Alta for commercial purposes. The first version states that it was first cultivated extensively by the mid 1940s by a local peasant, who was from one of the twelve towns of Milpa Alta. A second version suggests that its commercial production happened soon after a group of agronomists explained the productive benefits of nopal, in the first regional fair of Milpa Alta in 1938. They pointed out the low water needs of the plant and the long-lasting nature of production—about 15 years—made its commercialization attractive for the people of Milpa Alta.

³³ Though maize has never disappeared from the lands of Milpa Alta, its presence fluctuated (Bonilla, 2009).

³⁴ Staple food means food for basic needs. In this regard maize is a basic food.

The Milpa Alta community continued operating under the communal regime, though this has not remained intact. Though the ownership of the land includes the members of the region, with the legal restrictions on selling it, the landholders are unlikely outsiders. Torres (1991: 37) stresses that “the rare transactions of land happens among campesinos of the region or migrant campesinos (*jornaleros*) that have lived in Milpa Alta for at least ten years.” He points out that the transformation of the agricultural land to urban-type use in Milpa Alta has to do with the internal growth of local families, who use the land to build their own family houses. In addition, Torres (1991) argues that the social movement in defense of the land has been in place and when threats over their right to hold the land appear, the local people organize and defend it. Interestingly, my fieldwork interviewees confirmed what Torres reported.³⁵

The overall profile of the region makes it an interesting hybrid and syncretic history and story reflecting complex and intertwined social, political, ecological processes.

The 21st century: Land ownership today and agricultural orientation

Land use and land ownership. At the present time, the land of Milpa Alta is used mainly for agriculture. The structure is as follows: 33% of total surface area for agriculture, 10% for urban infrastructure, 49% forest and 8% pasture (INEGI, n.d)³⁶ (See Figure 2-2). Today, Milpa Alta territory is protected as “Conservation Lands” by the DF government. According to the DF Environmental Laws, conservation land is defined as “all those zones whose ecological characteristics provide environmental services needed for maintaining the quality of life for Mexico City inhabitants” (Secretary of the Environment, 2012: 10).³⁷

The largest forests reserve of the DF are found in Milpa Alta. Centuries ago, this land lay at the shore of the lacustrine system of the basin of Mexico³⁸. The soil is of volcanic rock, a characteristic that functions as a filter for restoring the groundwater that partly satisfies the needs of urban water consumption.³⁹

³⁵ In the next chapters will emerge the relationships producers have with migrant campesinos or contract workers.

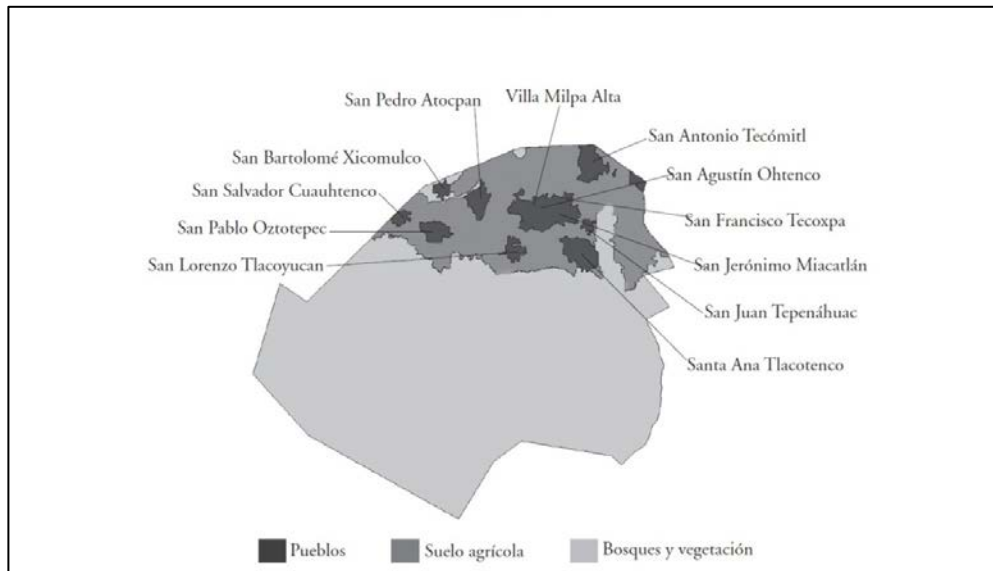
³⁶ Prontuario de información geográfica delegacional de los Estados Unidos Mexicanos, Milpa Alta, Distrito Federal (2009).

³⁷ In the section “biophysical characteristics” I provide further details about the implications of being a conservation land area.

³⁸ Human activity has been the main cause of drying lacunes. In colonial times, Spaniards dried out the main water system and built upon it. The lack of maintenance and construction on the water bodies continued through the centuries. Only the lake of Xochimilco-Chalco and a portion of Texcoco Lake remain, but they seem to be just a relic.

³⁹ These groundwater bodies are reminiscent of the lacustrine system of the basin of Mexico.

Figure 2-2. Map of Milpa Alta Divided by Use of Soil and Location of the Twelve Peoples



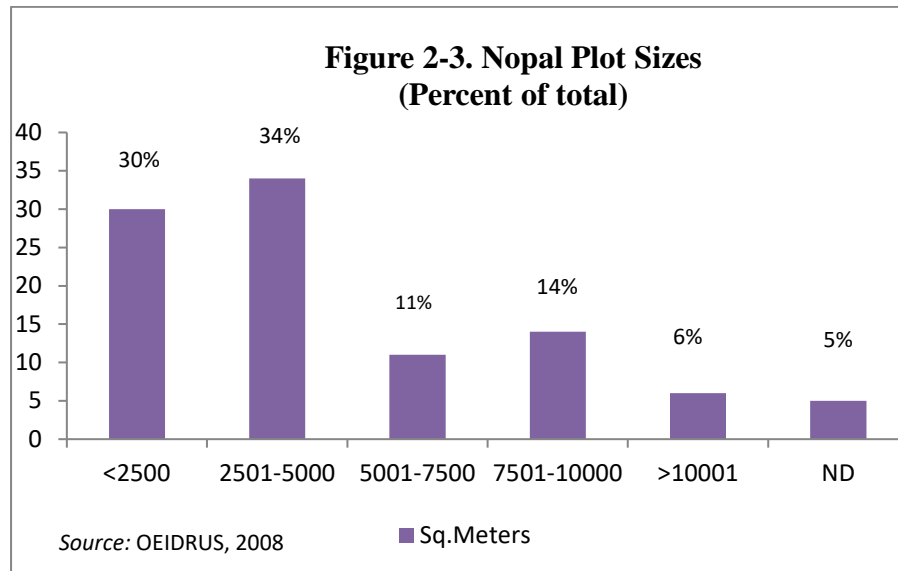
Source: Bonilla (2009)⁴⁰

Common property under the communal and ejidal regimen is still significant in this delegation. The National Agricultural Census of 2007 recorded that 47% of the total agricultural units of production continued to be common property, the rest being private (INEGI, 2007). This does not include the land employed for non-agricultural purposes, such as housing, backyard orchards and livestock; if included, 95% of the total land of Milpa Alta would be common property (Political Delegational Office of Milpa Alta, 2011).

Arguably, the ejido land ownership maintains a certain *campesino* identity in Milpa Alta (Bonilla, 2009; Gomezcesar, 2010) because it resulted from the peasants' engagement during the Mexican Revolution. When I spoke with some nopal producers, they recalled their predecessors' participation in the armed movement, after which they "gained the land with the agrarian reform," as they often said to me. They reported that the parcelling out of the land happens when the children of a family inherit the land and they use it for building their own homes, at the cost of agriculture. This might explain why the majority of the plot sizes range between 1.5 and 5

⁴⁰ Bonilla's elaboration based on data provided by CORENA (Natural Resources Regional Council of DF). This map may not represent exactly INEGI's division of land per use.

hectares (Bonilla, 2009), and many are less than 1 hectare. If considering only land cultivated with nopal, the majority of the plots are between 2.5 and 5 hectares (OEIDRUS, 2008).



Because of the social land regime, commercial use of soil is restricted, which prevents the building of malls, bank headquarters, hotels, transnational commercial stores and restaurants (e.g. Wal-Mart, McDonalds, Burger King and other national franchises), whose owners are not from the community. Therefore, the landscape contrasts starkly with the urbanization observed just a few kilometres away.

It is worth mentioning the undefined situation of land ownership today, at least when dealing with nopal producers. In recent surveys of nopal producers (OEIDRUS, 2009), almost 25% of respondents do not know to which property regime their land pertains, while 50.6% of the producers claimed to be private owners, and only 24.8% mentioned social property (communal or ejidal).

In addition, during earlier decades some social land (*communal* and *ejidal*) was expropriated by the government, justifying the need for “protected” natural areas. This represented a violent dispossession. Thus, the people’s response was an “illegal peasant invasion” or “takeover”, as the government called it, resulting in less green space, enlargement of the slums and land speculation (Torres, Avila-Gimenez and Contreras, 2011). Because the government has

the ultimate authority and legal power to evict these irregular settlements, once the irregular settlements occur, the land can be sold by the government for private commercial purposes, on the basis of the argument that it is already urban land.⁴¹

Laws and regulations for agricultural activity and land use in Milpa Alta. The activity on the land of Milpa Alta is subject to federal and local laws and regulatory programs (see tables 2-1 and 2-2 for a description of the regulations). Thus, all the programs delivered by the municipality of Milpa Alta must comply with this legal framework. From the content and purpose of the laws and regulations, their strong environmental orientation is apparent. This is because for administrative purposes the DF government divides its territory into only two types of land use, “urban” and “conservation land” (Environmental Law, Gaceta official del DF, 2000).

Table 2-1. Legislations and Programs Regulating Farming Activity in Milpa Alta

Laws/Regulations	Purpose
<ul style="list-style-type: none"> General Law of Ecological Equilibrium and Protection of the environment (LGEEPA) 	<p>It establishes the rules for the distribution of competencies among the three different levels of government that deal with preservation and restoration of ecological equilibrium and the protection of the environment.</p>
<ul style="list-style-type: none"> General Law for the Sustainable Development of Forests (<i>Ley General para el Desarrollo Forestal Sustentable</i>) 	<p>It regulates the activities related to conservation, protection, restoration, production, management, cultivation, management, and use of soil and forest ecosystems.</p> <p>According to this law, the DF government must foster the direct participation of owners and holders of the forest resources in the protection, conservation, restoration, vigilance, management use, cultivation, transformation, and commercialization of these resources.</p>
<ul style="list-style-type: none"> General Law for Wildlife 	<p>It regulates aspects related to conservation and sustainable use of wildlife and its habitat.</p>
<ul style="list-style-type: none"> Agrarian Law 	<p>It contains legal provisions about the promotion of integrated and equitable development of the rural sector, as well as promoting the care and conservation of natural resources and their rational use to preserve ecological equilibrium.</p>

Source: My translations from Gaceta Oficial del DF (2000).

⁴¹ This indeed might explain the loss of Conservation Land that the DF government acknowledges.

According to the Environmental Law, “conservation land is the territory classified by the Programs of Urban Development as the areas outside of the population limits”, while the urban land “constitutes the zones that the Programs of Urban Development classifies as urban because it has infrastructure, development and services” (Environmental Law, Gaceta oficial del DF, 2000). Based on that territorial classification, Milpa Alta is within conservation land and as a result the farming activity is framed within the Environmental Law of DF and the regulating program to determine how agriculture is managed is the General Program of Ecological Ordering for DF (Gaceta oficial del DF, 2000) (see Table 2-2). This Program of Ecological Ordering “regulates the use of soil in the rural areas of DF, as well as regulates and promotes productive activities according to the structure and function of ecosystems and the needs of the current and future population” (DF Government, 2000).

Table 2-2. DF and Municipal Laws and Programs Regulating Farming Activity in Milpa Alta, DF

Law, regulations and programs/Source	Purpose
<ul style="list-style-type: none"> Environmental Law of DF (Gaceta oficial del DF, 2000) 	<p>It defines the principles for formulating, conducting, and evaluating the environmental policy of DF. It provides the instruments and procedures for its application and also contains the guidelines and principles about conservation, restoration, and sustainable use of local natural resources.</p> <p>It concedes a fundamental role to biodiversity conservation and the continuity and integrity of the ecosystems of the conservation land. It considers biodiversity a fundamental principle for the policy of sustainable development of DF (Article 18).</p>
<ul style="list-style-type: none"> Program of Ecological Order (Government of DF, 2000) 	<p>The purpose of the Program of Ecological Order is to determine the use of the soil in the rural areas of the DF, as well as to regulate and promote productive activities according to the structure and function of ecosystems and the needs of current and future population.</p>
<ul style="list-style-type: none"> Program for Sustainable Rural Development of Milpa Alta. (Gaceta oficial del DF, 2008) 	<p>It promotes sustainable management of natural resources to ensure the conservation of biodiversity and the continuity of a sustainable agriculture in its territorial area and with it guarantee the production of environmental goods and services that the region provides to the inhabitants of Mexico City.</p> <p>It provides subsidies using criteria of proportionality and equity to rural members and producers of <i>Ejid</i>os, communities, production societies, legal</p>

	usufructuaries of the conservation land for the implementation of projects to restore agrosystems, agroforestry, hydrological systems, ecological waste management, agricultural and livestock production, as well as efficient capture and use of water for domestic use and productive activities. Domestic wastewater, protection and surveillance of natural resources, containment works and mitigation of environmental impact in human settlements, ecotourism, environmental education, infrastructure, and rural equipment and integrated management of micro-watersheds.
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Source: My translation from Gaceta Oficial del DF (2000, 2008)

Another important law regulating the agricultural activity of Milpa Alta is the Federal Agrarian Law, which highlights “the promotion of integrated and equitable development for the rural sector, through fostering the care and conservation of natural resources for the benefit of the nation and for the sustained preservation of the ecological equilibrium” (Gaceta oficial del DF 2000).

In sum, the land use and agricultural activity of Milpa Alta is strongly regulated by environmental laws given that the territory is legally classified under an environmental designation (conservation land), rather than as a “rural area.” However, the legal documents, programs, and norms refer constantly to the agricultural areas as “rural sector,” “rural areas,” and some of the goals even use the term “rural development” (see Tables 2-1 and 2-2). This is clearly observed in the programs to support agriculture in Milpa Alta. For instance, at the municipal level, the institutional support to agriculture is framed in the Program for Sustainable and Rural Development of Milpa Alta (Gaceta oficial del DF, 2008) (see Table 2-3), thought the goals and lines of actions of such programs intend to promote agriculture under the terms of “protection,” “conservation,” and “restoration” of natural resources.

Therefore, agricultural activity in Milpa Alta is environmentally regulated but with a strong rural spirit, reflected in the actual institutional programs and support to agriculture and producers in the region.

Table 2-3. Program for Sustainable Rural Development of Milpa Alta

Goals	Objectives	Actions
To incorporate landowners; ejidos, communities, production societies, rural producers, and legal usufructuaries in conservation and sustainable production, in order to continue the protection, and restoration of, and / or increase environmental services.	<p>1.To conserve, protect and restore natural resources within the territorial scope of Milpa Alta and jointly with members of the community and thereby ensure the production of environmental goods and services that provide the inhabitants of Mexico City, through the provision of economic support for the implementation of investment projects for the Conservation and sustainable management of natural resources.</p> <p>2. To guarantee, in the short, medium, and long term, the allocation of financial resources to rural producers, <i>ejidos</i>, communities, production companies and legal usufructuaries of the conservation soil of the Milpa Alta Municipality, for the implementation of investment projects for the conservation and sustainable management of natural resources.</p>	<p>Agroecology. -Ecological management of pests and diseases -Organic fertilization -Soil improvement Agroforestry -Establishment of timber and non-timber forest plantations -Establishment of fruit plantations -Establishment of medicinal plants. Containment and mitigation of environmental impact in Human Settlements. Others Eco-technical works; Environmental education; Rural infrastructure and equipment; Integrated management of micro-watersheds; Ecological management of organic waste from agricultural and livestock production; Collection and efficient use of water for domestic use and sustainable productive activities; Domestic wastewater management; Protection and surveillance of natural resources.</p>

Source: My translation from Gaceta Oficial del DF (2008)

Main crops. The main source of income in Milpa Alta is from agrarian activity. As much as 85% of the population depends on agriculture for their livelihood. There are three relevant crops, nopal, maize and oats, but only the first is fully commercialized and profitable. Roughly 10,000 people work in nopal production (Political Delegational Office of Milpa Alta, 2010). Even in the areas of greater urbanization, one can see nopal plants in between the houses and at the edges of paved streets.

Table 2-4. Main Crops in Milpa Alta. Cultivated Area and Volume of Production 1992-2010

Year	Nopal		Grain Corn		Forage Oats		Total Milpa Alta
	Cultivated Area (Ha)	Production (Tons)	Cultivated Area (Ha)	Production (Tons)	Cultivated Area (Ha)	Production (Tons)	Cultivated Area (Ha).
1992	4024.5	n.d	2700.0	n.d	1284.0	n.d	8662.0
2002	4159.3	280269.5	2910.2	4035.6	1586.0	25750.0	9356.0
2010	4327.0	294145.9	2732.8	4801.4	1668.0	37532.5	9420.0

% Var 1992-2002	3.3	n.d	7.8	nd	23.5	nd	8.0
% Var 2002-2010	4.0	5.0	-6.1	19.0	5.2	45.8	0.7

Source: Adapted from Annual Statistics OEIDRUS, DF, 2002-1992; Bonilla, 2009.

Nopal: Bearer of cultural identity and commercial ties

In my first stop on the way to Villa Milpa Alta (the headquarters of the delegation) at a food stand, the food vendor facing the fields said to me “this is no longer Milpa Alta, but Nopal Alta”. Driving around the slopes of the Teutli volcano, the main landmark of Milpa Alta, crops from pre-hispanic heritage, like nopal, amaranth and corn from milpas come into view, although nopal fields are far more numerous across the nearby mountains and valleys. The terraces observed around and over the mountains attest to the adaptations made by the ancient peoples of Milpa Alta to deal with hard volcanic, thin soils. Nopal is a native cactus plant, whose leaves are edible. The leaves of nopal have been consumed since 900 B.C and production developed in the south and centre of Mexico (Whitmore and Turner, 1992; Imaz, 1982). In Milpa Alta, nopal plants have long been part of the landscape and the local diet but not until the 1940s was it produced commercially.

A connection between the land, crops, diets and culture is quite apparent in the agricultural history of Milpa Alta. The native crops cultivated are meaningful not only in terms of the history of this locality, but for all of Mexico. Corn and nopal are found in the legends, myths and stories of pre-Hispanic Mexico, which were re-discovered once colonial times ended. For instance, it was believed that the Aztecs had the divine mandate to settle in the place where they first saw an eagle over a nopal plant, devouring a snake. That is in fact the symbol at the centre of the Mexican flag. The Aztecs met that divine image where the core of Mexico City is located. As for corn, since time immemorial it is imbued with the belief that Mesoamerican descendants are naturally maize’s children. This derives from the pre-Hispanic legend of Quetzalcoatl⁴², one of the most fundamental characters of Mesoamerican cultures. Mexico is recognized as the centre of origin and domestication of maize, and native varieties have been saved by the agricultural

⁴² Quetzalcoatl is depicted as snake with eagle’s feathers. The symbol at the center of the Mexican flag is an allusion to Quetzalcoatl, as it is an eagle standing over a nopal plant and devouring a snake.

producers of Milpa Alta over time (Serratos, et al, 2014). Indeed, like maize, nopal is a crop central to Mexican identity.

Nopal producers of Milpa Alta claim to be guardians of Mexico's national identity. This became apparent in the controversy over "Chinese nopal" that has concerned local producers since 2005. The issue involves a possible theft of nopal's genetic information by Asian businessmen who had visited Milpa Alta, and the rumour that massive importation of Chinese nopal to Mexico was about to happen (Lutz and Padilla, 2012). Despite the questionable veracity of this news, the possible "threat" to the Mexican crop mobilized and unified nopal producers in defense of the plant, and they demanded a *certificate of origin*. In conversations with producers, the issue was mentioned several times as threats to "the future of farming and our culture". As one producer said: "We have taught our children to love the land, because with the (*market*) competency and all, now the Chinese will dump nopal in our country. They (*the Chinese*) wanted to certify the nopal... and therefore, it was not going to be ours any more, even though this plant is in our national flag".

The historical stewardship role these farmers play is overlooked in the literature and in policy making. Policy makers are preoccupied with maintaining these farming areas for the environmental benefits they provide to the city, but for that to happen, farming must be profitable to the farmers. Perhaps an opportunity to promote these producers arises with the apparent re-discovery of nopal's health benefits, something that urban dwellers may appreciate.

The commercial boom of nopal. The commercial boom of nopal production happened between the 1960s and 1990s. From the late 1970s, nopal was already called "green gold" by local people (Gomezcesar, 2010). While the boom experienced in other agricultural areas of Mexico that grew staple foods, like beans and corn, started to vanish in the late 1970s, nopal producers began to enjoy good economic times. What explains this contrast? The answer seems to be that the national development project established in the 1940s, based on *development from within* and a large system of subsidies for agriculture, fell apart at the beginning of the 1980s. With the economic structural adjustment of that decade and the large national external accumulated debt, national agricultural development plans entered a deep crisis, with serious consequences for the social fabric of the countryside. Corn and bean producers relied heavily on subsidy programs and barely withstood the free market model that replaced the state assistance one.

What made the story of nopal production different in Milpa Alta is that the crop does not require large monetary investments; machinery requirements are minimal and labour is not as intensive as it is for staple crops. The land and environmental conditions are suitable for the plant; the conditions range from good to excellent for nopal (Gomezcesar, 2010). Due to these characteristics, Milpa Alta producers refer to nopal as a generous, “noble” crop. In addition, the good economic times of nopal production did not require a system of subsidies. Another important fact contributing to the success of the “green gold” was the population boom in Mexico City, which guaranteed increasing demand for nopal. Therefore, one can say that urban growth was bliss for Milpa Alta in those early years.

Recent levels of Production and Prices. Even though nopal is not a basic grain, it is today among the first one hundred more popular crops in Mexico. It is in position 71 of the first 100 foods most produced. Its consumption is also important nationally (Velasco, 2014). Today, it is the fifth most consumed vegetable across Mexico, after tomato, pepper, onion and potato (Sistema-producto del nopal, 2007).

The production of nopal and the land used for cultivation has grown nationwide in the last decade (See Figure 2-4 and Table 2-5). While Milpa Alta is among the major producers across Mexico, its cultivated area and volume of production have remained quite stable over time because the agricultural land cannot expand due to the limits required by conservation regulation.

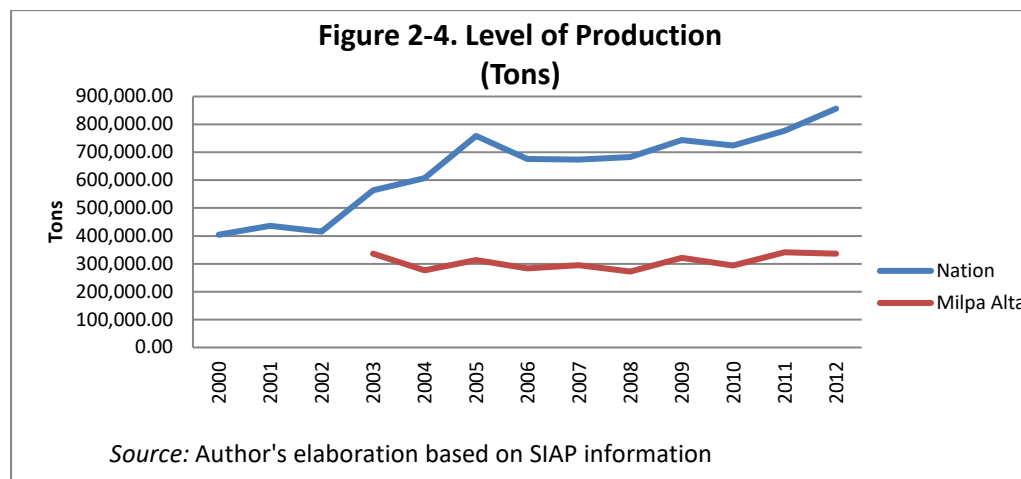


Table 2-5. Comparative Levels of Production for Mexico and Milpa Alta

Year	Volume of Production (Tons)		Harvested area (Ha)		Productivity (Ton/ha)	
	Nation	Milpa Alta	Nation	Milpa Alta	Nation	Milpa Alta
2000	404,459.79		8,568.15		47.2	
2001	436,221.59		8,967.15		48.6	
2002	415,957.15		9,319.24		44.6	
2003	563,443.18	336,255.42	9,579.34	4,176.00	58.8	80.5
2004	607,674.04	276,194.00	10,008.77	4,326.00	60.7	63.8
2005	759,071.96	313,857.10	10,612.93	4,326.00	71.5	72.6
2006	676,180.66	283,493.50	11,074.06	4,327.00	61.1	65.5
2007	673,559.03	294,757.80	11,401.31	4,327.00	59.1	68.1
2008	683,125.70	272,367.80	11,848.91	4,327.00	57.7	62.9
2009	744,250.41	321,742.30	11,746.50	4,327.00	63.4	74.4
2010	723,815.42	294,145.90	12,201.11	4,327.00	59.3	68.0
2011	777,413.00	341,365.50	12,179.51	4,327.00	63.8	78.9
2012	856,542.61	336,648.5	12,104	4,327	70.8	77.8
Average	640,131.89	307,082.78	10,739.31	4,311.7	59.0	71.3

Source: Author's elaboration based on official data from SIAP, used by Velasco Valdez (2014)

Despite this situation, nopal production in Milpa Alta alone is equivalent to the production volume of the entire state of Morelos. The official statistics report that Morelos and DF (Mexico City) are the two largest producers of nopal in Mexico, but in Milpa Alta cultivated area for nopal is larger than in the entire state of Morelos, though Morelos has better productivity rates than Milpa Alta. For the year 2012, Morelos had a productivity rate of 109 tons per hectare, while Milpa Alta had 77.8 (see Table 2-6).

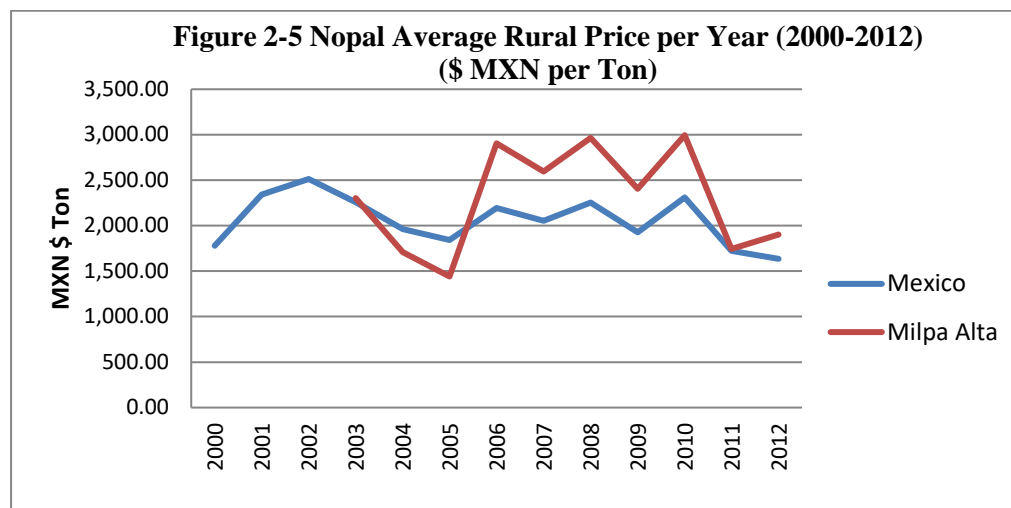
Table 2-6. Most Important States in Mexico for Nopal Production (Year 2012)

States	Cultivated land area (ha)	Harvested land area (Ha)	Production (Tons)	Productivity (Ton/ha)
Baja California	581.5	455.8	17,156.8	37.6
DF	4,331.0	4,331.0	336,882.5	77.8
Jalisco	490.2	454.0	22,363.3	49.3
Mexico	833.5	822.5	81,344.7	98.9
Morelos	3,256.0	3,256.0	341,642.0	104.9

San Luis P	431.5	429.5	1,980.5	4.6
Tamaulipas	640.5	625.5	7,149.8	11.4
Total	12,453.7	12,105.0	856,542.6	70.76

Source: Author's elaboration based on SIAP official data used by Velasco (2014)

The difficult issue with nopal is its price, particularly the price paid to the producer. My interviewees often refer to it as a “low price”, which the official statistics confirm. The average price of a ton of nopal Milpa Alta from 2000-2012 was \$2,296 MX pesos (CAN \$176.33).⁴³ If converted to the price per kg, it is certainly low: 2.3 MX pesos on average for the same period of time. I must highlight that the commercial unit for volume of nopal is not kg, but “100 leaves.” 100 leaves normally weight more than 1 kg and with it producers secure the selling of larger volumes of produce (from personal communication with manager of local retailing centre, and producers, 2012). Interestingly, when comparing the average price paid at the national level and in Milpa Alta, the latter one is over the national average (see Figure 2-5 contrasting national/Milpa Alta prices).



Source: Author's elaboration based on SIAP official data used by Velasco (2014)

However, when looking at the overall growth rate, the price, both nationally and in Milpa Alta, has not significantly increased, but remains somewhat stagnant. The average growth rate at

⁴³ Conversion to Canadian dollars based on the average currency exchange rate of 2012: 1 CAN=13.02 MX pesos. See http://cad.fxexchangerate.com/mxn-2012_11_30-exchange-rates-history.html

the national level, from 2000 to 2012, is 0.4%, while the rate for Milpa Alta is 4.1% (see Table 2-7).

Table 2-7. Prices of Nopal and Growth Rate of Prices per Year (2000-2012)

Year	National		Milpa Alta	
	MXN\$ per Ton	Growth rate (%)	MXN\$ per Ton	Growth rate (%)
2000	1,780.5		n.d	
2001	2,343.8	31.6	n.d	
2002	2,513.4	7.2	n.d	
2003	2,259.0	-10.1	2,302.2	
2004	1,961.9	-13.2	1,708.5	-25.8
2005	1,842.0	-6.1	1,441.2	-15.6
2006	2,193.7	19.1	2,903.6	101.5
2007	2,053.0	-6.4	2,596.5	-10.6
2008	2,255.1	9.8	2,964.4	14.2
2009	1,925.3	-14.6	2,407.1	-18.8
2010	2,308.9	19.9	2,995.2	24.4
2011	1,724.4	-25.3	1,743.2	-41.8
2012	1,635.4	-5.2	1,901.2	9.1
Average	2,061.2	0.6	2,296.3	4.1

Source: Author's elaboration based on SIAP-SAGARPA (2012) cited by Velasco Valdez (2014)

Based on the current production and price figures, the overall highlights are: firstly, production increases, which may indicate that more economic agents believe this crop may increase in value in the future; secondly, the price is low and variability is not significant. This may have been different in the decades of the nopal boom, or green gold times, but data for the decades of 1940s to 1970s are not available. Thirdly, for the Mexican population, the consumption of nopal is not just something of the past, but remains important today, which is a sign that it is embedded in the culinary tradition of contemporary Mexicans' diets. As such, it continues to be a carrier of cultural identity. But why is the price low? Given its centrality to Mexico's food culture how has the price remained limited? These questions are addressed in subsequent chapters.

2.3 Seeking Milpa Alta Within Rural-Type Categories

According to the National Institute of Statistics, Information, and Geography (INEGI), Milpa Alta falls in the category of rural or urban depending on the methodology applied in the surveys. For instance, when delimiting the Metropolitan Area, Milpa Alta is part of an urban category. However, in the National Agricultural Census and geographical documents to classify rural or urban municipalities, Milpa Alta is categorized as a rural area. In the regulatory body concerning the territory of Milpa Alta, there is no law defining the territory as rural, and instead it is categorized as a territory of Conservation Land with a non-urban character (see section on regulations of land use, etc). Furthermore, the regulations and programs (environmental laws, program of ecological management and agrarian law) acknowledge the area as rural. This results in confusion of terms and produces a lack of consensus among the objectives of programs delivered to the peoples and the region of Milpa Alta by different offices (see Table 2-8, relevant offices delivering programs related to agriculture in Milpa Alta).

Table 2-8. Relevant offices at the three levels of government delivering programs to support agriculture in Milpa Alta

Federal Programs	DF	Municipal
Secretariat of Agriculture Livestock, Rural Development and Food (SAGARPA)	Secretariat of Rural Development and Equity for the Communities (SEDEREC)	Department of Rural and Economic Development (In Spanish: Direccion de desarrollo rural y economico)
	Secretariat of the Environment (SMA) Commission of Regional Natural Resources	Sub-department of Agricultural Development (In Spanish: Sub-direccion de desarrollo agricola)

Source: Author's elaboration based on a review of programs of the three levels of government

It turns out that depending on the approach of the government office, the region is treated as part of the urban center or rural area of DF. For instance, the federal office, Secretary of Agriculture, Livestock and Rural Development (SAGARPA), and DF government office, Secretary of Rural Development and Equity for Communities (SEDEREC) have a strong pro-rural approach.⁴⁴ Meanwhile, the DF Secretary of Environment treats the agricultural activity as useful to enhance the environmental services that are fundamental to sustain the city (personal communication with Esteban Marquez, Director of Corena, March 2012). Though officials of

⁴⁴ In SAGARPA (2009), the reader can find the list of programs delivered in Milpa Alta by the three levels of government and the strong pro-rural approach they have.

SAGARPA and SEDEREC acknowledge the fundamental environmental dimension because the area belongs to the Conservation Land, their priority is, at least formally, more oriented to the “people’s well-being” e.g., economic development and commercial issues. The environmental offices acknowledge the “rural” character of the peoples and the activities in the region; however, the delivery of their programs is highly based on environmental conservation principles (personal communication with director of CORENA, March 2012). This produces a lack of coordination in the programs and sometimes contradictory objectives, a reality that was acknowledged by all the officials I interviewed. I will now discuss where and how the term “rural” is found when describing Milpa Alta.

The rural DF today in official discourses

In 1929, Milpa Alta was officially incorporated into the DF, and since then it has been part of one of the great urban transformations of the 20th century. The DF government classifies this delegation as 100% rural, due to its lack of industrial infrastructure, the important role of agriculture in the economy and strong ties to religious beliefs (Gaceta Oficial DF, 2010; Secretariat of the Environment, 2012).

In the Atlas for Land Conservation (SMA, 2012), the Secretariat of the Environment acknowledges its rural character⁴⁵ and states that “the integrity and reproduction of these peoples’ culture is critical to sustain the city.” They use the language of *Original Peoples*, their territory and resources, in the discourse of sustainability. But if the people lack access to the means to develop under conditions of equity and justice, despite demands by the surrounding urban centre, implementing practices of conservation and the sustainable use of resources will not be achievable. In reality, the megalopolis dynamic is a permanent threat to sustaining the culture of the Milpa Alta communities. Additionally, the language used by environmental institutions emphasizes the need for “preserving these peoples’ culture for sustaining the city” (SMA, 2012).

Furthermore, the DF administration of 2006 to 2012 created the Secretariat for Rural Development and Equity for Communities⁴⁶ to deliver public policy focusing on improving the conditions of indigenous and ethnic communities settled in the DF. At least formally, the

⁴⁵ In the Atlas, there are many references to Milpa Alta and the agricultural areas of DF are “rural zones”, “rural peoples”, “rural towns”. Therefore, in some sense, the Secretary of the Environment acknowledges that the agricultural zone of DF is both “conservation land” and “rural” area.

⁴⁶ http://www.sederec.df.gob.mx/sederec_

Secretariat intends to generate policy that recognizes and respects the multiethnic and multicultural character of Mexico City's population. Part of the Secretariat's mandate deals with peasants, migrants and indigenous peoples. In an interview with the Director of the Secretariat, Maria Rosa Marquez, she defines rural areas as follows:

"It [the area] must have a significant territory under the Land Conservation program, significant agricultural activity and the culture of daily life must be reflected in the agricultural practice. The *original peoples*, unfortunately, there are many of them in the rural zones, who have customs and uses, traditions—even *nahuatl*⁴⁷ language, which has become an official language in DF. That they preserve those characteristics is what gave them the category of rural. And the big challenge is to have a good understanding and acknowledgement of the large contribution of the rural zones to the life and viability of a great city like Mexico City. The viability of the city could not be understood without having a rural zone" (Maria Rosa Marquez, Director of SEDEREC, interview, March, 2012).

From this viewpoint, Milpa Alta is considered absolutely rural and efforts to support it are justified because of its contribution to the city. Yet the General Population Census developed by the Federal Statistics Office, INEGI, has categorized Milpa Alta as urban since the year 2000. Such categorization is based on population size (up to 2,500 inhabitants is a rural area, and above 2,500 is an urban area), which does not capture qualitative characteristics of the place.

The contradictions found in official discourses and official documents across different levels of government may create conflict over policy-making oriented to Milpa Alta. The problematic definitions may reaffirm that the co-existence of the rural and urban in today's world has yet to transcend a binary division between the two. Even sectoral livelihoods classified as agricultural and non-agricultural to distinguish rural from urban are controversial. Indeed, considerable recent research demonstrates an increasing number of urban households around the world are engaged in agriculture (Dubelling, Zeeuw and Veenhuizen, 2010; Foeken and Owuor, 2008) while rural households now rely less exclusively on agricultural income (Tacoli, 2004). Tacoli (1998, 2004) recognizes the problematic definitions of the so-called 'rural' and 'urban'.

⁴⁷ Nahuatl is an indigenous Aztec language..

2.4 Seeking Milpa Alta Within Urban-Type Categories: Mexico City, DF, Metropolitan Zone, Global City

As a result of historical, political and biophysical transformations, there are three “official” ways to define the urban in the case under study, Mexico City, DF and Mexico City Metropolitan Area (MCMA). Surprisingly, the most popular of them, “Mexico City”, is the most inaccurate and confusing definition.⁴⁸

Mexico City or DF?

Mexico City once was Tenochtitlan, the administrative city of the Aztec empire. After the Spaniards conquered the territories of Mexico, they established the centre of the colonial power exactly over Tenochtitlan. It was not until 1824, during the construction of the independent republic⁴⁹, that Mexico City became the Federal District (DF in Spanish). Its area was defined by a circle, with a six-mile radius, having the epicentre at the historical square (known as *zocalo*). Thereafter, it became the seat of political power in the Mexican Republic. Previously, Mexico City had been the capital of what is today the State of Mexico (Hurtado and Arellano, 2009), which now consists of much of the larger metropolitan area of the city outside the central core.

Mexico City remained the popular name, while DF was used for politico-administrative purposes. A few years before the end of 19th century, the city expanded to an area defined by a 12.4-mile radius around the *zocalo*. Urbanization had advanced at an incredible pace in the first three decades of the 20th century, as a consequence of large rural migration during the revolutionary movement, tripling the city’s population (Ezcurra, 1995). Growth pushed the urban frontiers to the edge of the towns surrounding DF and encouraged their annexation, becoming “political delegations”. The “political delegation” as a category is similar to a municipal district in that it has its own political representation and budget, but, in contrast to a municipality, it lacks full autonomy because DF is not a formal state.

Some of those towns had significant cultural traditions (e.g, Coyoacan, Xochimilco, Tlahuac, Milpa Alta) and their names, which represented their cultural identity, were retained.

⁴⁸ The name of this place has changed several times, from Mexico City to DF and as recent as this year 2016, it is named again Mexico City. According to the Diario oficial de la Federacion, now DF is officially recognized as Mexico City. (See DOF, http://www.dof.gob.mx/nota_detalle.php?codigo=5424565&fecha=05/02/2016

⁴⁹ Independence war concluded in 1821, after ten years of fighting.

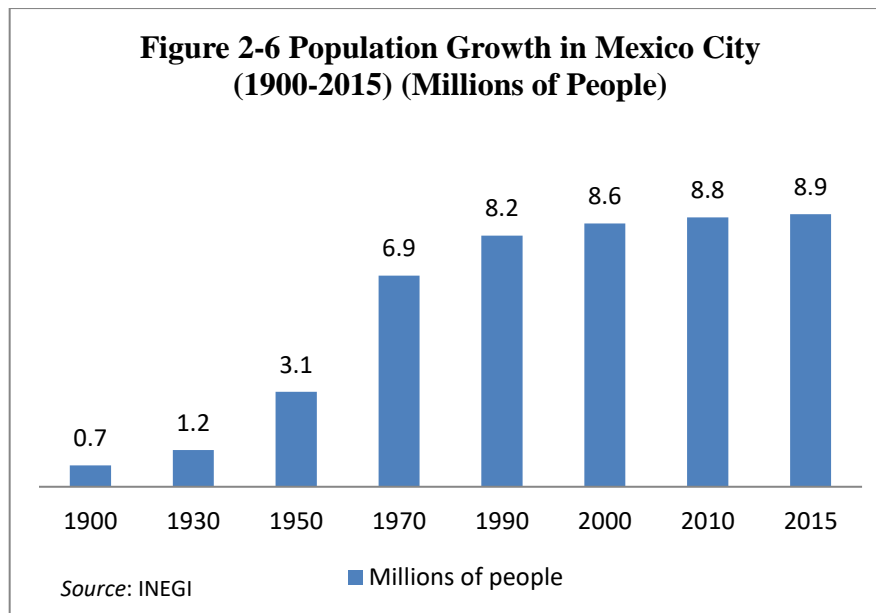
They rapidly started transforming into urban-like spaces as they merged physically with Mexico City, and then they became part of a single city, but administratively, these were political delegations annexed to Mexico City. The process of annexation continued and, by 1969, twelve political delegations and Mexico City constituted the DF, comprising altogether an area of 1,503 km², Mexico City having only 142.10 km² (Sanchez -Luna, 1996). But then, in 1970, the area of Mexico City was broken into four political delegations, leaving in limbo the formal frontiers that separated Mexico City from the rest of the DF. In theory, Mexico City disappeared and merged with the surrounding towns. The emerging question was whether the whole DF was a city or not. However, as in the past, people, inside and outside the country, continued to call all DF, Mexico City.

If this wasn't confusing enough, in 1994 DF and Mexico City became synonymous by law,⁵⁰ with implications for the places within the "rural" areas of the DF. This is the case for Milpa Alta, the specific site of this study (and other rural delegations like Tlahuac, Xochimilco and Tlalpan). The outcome is that DF has places with significant agricultural activity—physically and even culturally—different from an urban space, but belonging to an administration whose pressing priorities are of an urban character.

Urban growth of Mexico City, towards becoming a Metropolitan Area (MCMA).

After the revolution, Mexico City's population grew exponentially. The extraordinary growth occurred from 1930 to 1970 when the industrial development in the city was promoted and large waves of rural migrants arrived (see Figure 2-6).

⁵⁰ In 2016, once again the official name was modified. Now, DF is Mexico City again (Gaceta official DF, 2016). Under its new status it will acquire some of the same functions as Mexico's 31 regular states, with a constitution and congress holding legislative powers over public finance and security.

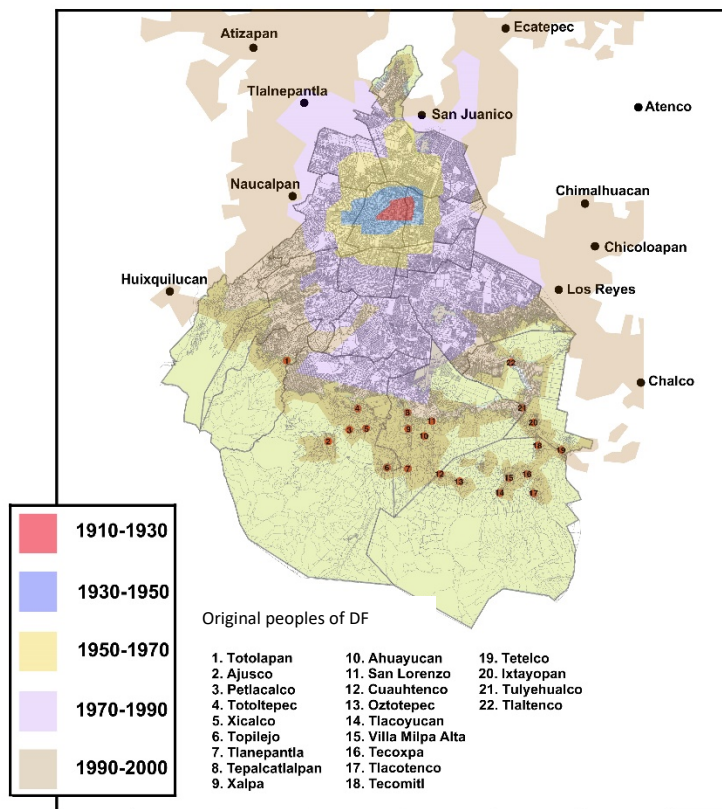


The figure above accounts for the population living in the geographical area of DF, however, Mexico City has become a Metropolitan Area (MCMA). The Metropolitan area reflects the urban sprawl that occurred as a result of the uncontrollable growth of Mexico City and today it has an area of 7,458 km². Milpa Alta is officially part of this metropolitan area.

Metropolitan areas of Mexico are delimited by taking into account the functional and physical relationship among a central city and other municipalities that together constitute “an integrated urban space” (INEGI, 2004).⁵¹ The limits are supposed to highlight the urban character of the place. Today, the MCMA includes 75 municipalities: the sixteen political delegations/municipalities of the DF and municipalities of two neighbouring states, State of Mexico and Hidalgo (see Figure 2-7). Milpa Alta falls within those urban limits, even though there are questions about the degree of its urban character. The contradiction is that the federal statistics office, INEGI, affirms that 95% of DF’s population is categorized as urban and the remaining 5% is rural. Based on that, it seems to be a small rural area within an “an integrated urban space” (INEGI, n.d).

⁵¹ http://www.inegi.gob.mx/est/contenidos/espanol/metodologias/otras/zonas_met.pdf

Figure 2-7. Urban Growth of DF (1910-2000)



Source: Serratos (2016)

The revised methodologies to define a metropolitan area have resulted in the inclusion of municipalities that might not meet conventional indicators of urbanism, but have ecological functions to sustain the urban environment. This methodological approach applies specifically to the MCMA. According to INEGI, the federal statistics office:

“For practical purposes, some (*methodological*) proposals have incorporated municipalities that do not necessarily comply with general criteria, but they are considered *for their strategic character in urban development planning* of metropolitan zones, in the medium and long terms, for instance these municipalities bear high environmental value that must be preserved” (INEGI, 2004: 16 my emphasis).

Putting rural-like places within an urban category seems to subordinate the countryside to urban needs, as if the nearby rural areas matter only as long as they provide something to the city, be it cheap food and fibre, or environmental benefits.⁵²

In official documents, the confusion remains as to whether Milpa Alta is rural or urban. In several documents of the DF government (e.g. Ecological management program for DF, Atlas for Conservation Land and Agricultural Development Law for DF) it is classified as fully rural. These difficulties defining the boundaries make this case relevant for investigating the tensions of the city-countryside relationship. The case of Milpa Alta is even more interesting because while other rural-like regions surrounding Mexico City have been entirely subsumed to urban sprawl and the urban lifestyle of Mexico City, Milpa Alta has not.

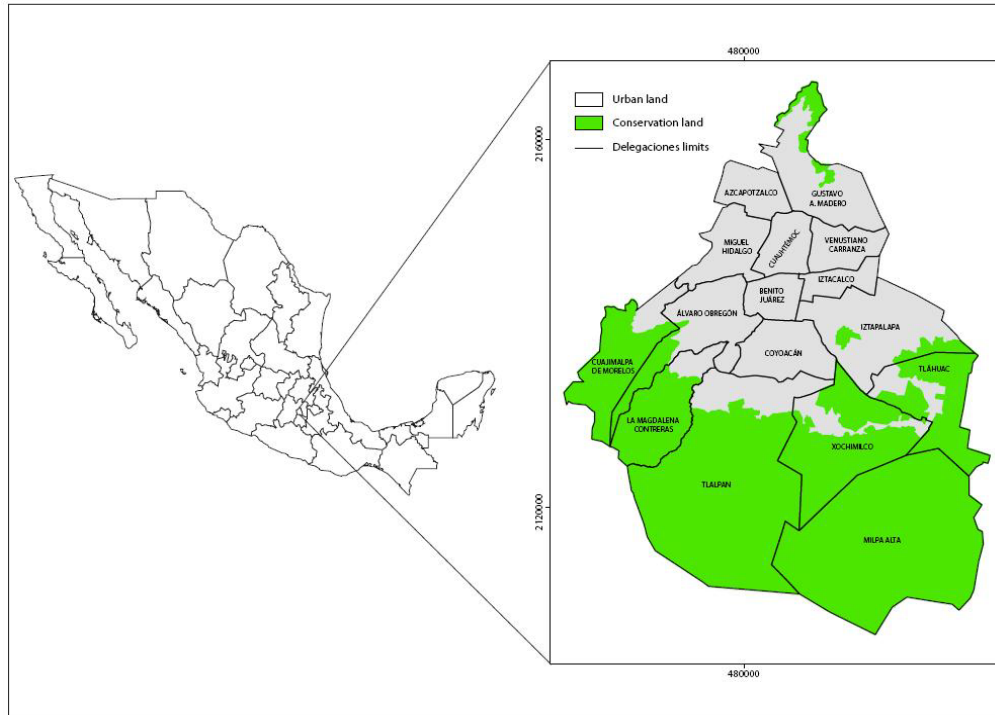
Biophysical boundaries: The basin of the Valley of Mexico and the Conservation Land Area.

Most areas of the MCMA pertain to the Basin of the Valley of Mexico. Aquifers, rivers and the remnants of the lacustrine system constitute the hydrological unit of the basin. It used to be a closed hydrological unit, but not any longer because many artificial openings have been created. The surface is about 7,500 km², but with the northeast basins that are joined to the basin of Mexico, it covers an area of 9,500 km² (Imaz, 1992). It encompasses the municipalities of the State of Mexico, Hidalgo, but not all areas of DF; for instance, some regions of Milpa Alta are within the frontiers of the basin (Gomezcesar, 2010). In biophysical terms, the basin is part of the volcanic axis, with an ellipsoidal form (INEGI, n.d) (see Figure 2-8).

⁵² Not so long ago, rural areas were merely seen as agricultural production zones with the mandate of generating large volumes of food and fibre for the urban population (Tacoli, 2004).

Agricultural activities are thought to be consistent with those objectives. However, after three decades of this program, the authorities acknowledge a constant loss of natural areas.

Figure 2-9. Map of Conservation Land Area



Source: From Saavedra, Ojeda and López-Barrera (2011).

Mexico City, a global city⁵⁴

Mexico City grew, along with its importance as a point of concentration of political and economic power. Nowadays, the relevance of the city itself goes beyond the nation. Parnreiter (2010) argues and uses empirical data to validate that Mexico City is a global city. He asserts that global cities are key nodes in cross-border production networks, particularly in producer services, and their character constitutes them as the instruments for the management and control of the dispersed world economy. This author considers Mexico City an emerging example of a global city “because the country’s economy has gone through a rapid course of globalization, and because there is sound evidence of ongoing global city formation” (Parnreiter, 2010: 37). The

⁵⁴ Here I refer to Mexico City as the urban area of DF.

global city term emerges from the intersection of the literatures of world cities and global commodity chains to situate the importance of cities within commodity chains across the world (Sassen, 2010; Brown et al., 2010).

Parnreiter (2010) finds that Mexico City is a node in the global market, but he provides a nuanced interpretation when finding that the demand for producer services provided (mainly) by Mexico City-based service firms varies significantly among economic sectors and sub-sectors. Though Parnreiter (2010) assessed data related to financial services, his research outlines that the importance of Mexico City to food retailers may be even greater, given the fact that many food commodity chains end up in the 1,104 supermarkets owned by Wal-Mart Mexico, a transnational food retailer that has deeply penetrated the country's food supply market.

Even though discussion about global cities is beyond the subject of this research, I raise it to highlight the striking fact that the "rural" Milpa Alta also co-exists with a global city, despite the contrasting evolution and relationship to the land in Milpa Alta. Despite that contrast, they are deeply interrelated and managed under the same local government. Moreover, the fact that Mexico City is a centre of command and control for transnational food retailers could be of significance for the local food commodity chains, such as nopal, that end up in that urban market.

Far from being an isolated and specific case, the relationship between Milpa Alta and the urban area of DF may reflect what is happening in many big cities across the South, where the process of urbanization and development has not followed a linear trajectory or has manifested a different one than in the North. The place in question in this study is thus a mosaic of characteristics defying any linear and fixed definition of what constitutes a rural or urban area.

2.5 Milpa Alta: Between Rural-Urban and Society-Nature Antagonisms

As presented in this chapter, the difficulties of defining Milpa Alta either as rural or urban are in legal documents, official statistics, and programs for agriculture in the region. One way to make sense of it is certainly inefficiencies in government organisation, which have been discussed in studies that examine policy and programs for the region (Yanez, 2006). However, beyond the analysis of policies, my insight is that the origin of the contradictions may lie in the still dominant view of the society-nature relationship in a hierarchical structure (society first, nature second, or nature first and society second) that generates an antagonism between humans and nature. This is

reproduced in the institutional organisation and policy design that separates programs that are “social-oriented” from those that are “environmental-oriented.”

Chapter 3:

Disruption of Rural-Urban Relationships: Towards an Integration of Metabolic Rift Theory and Agroecology for Envisioning Ways of Mending the Rural- Urban Linkage

3.1 Introduction

To undertake the research presented here, I draw from a combination of political economy approaches, notably metabolic rift, food regime analysis, and agroecology theories. I frame this research in the broader evolution of town-city relationships within a capitalist economy. The metabolic rift theory enables me to incorporate world market relations and their influence on local ecologies.

The temporal boundaries of my research are located within neoliberal capitalism. I draw from the food regime body of literature to better understand the transition of food and the agriculture market to a neoliberal regime. The onset of the neoliberal regime differs from region to region, and country to country. I situate the turn to a neoliberal economy between the late 1980s in Mexico and its agriculture. By 1986 Mexico entered the General Agreement on Tariffs and Trade and what is today called the WTO.⁵⁵ The state's regulator role and active participation in some fundamental sectors of the economy (e.g communications, transport industries, etc.) shifted to a role that is more supportive and protective of private companies' interests.

Interestingly, Mexico's urbanization trend that was notable from the 1950s was consolidated by 1980s when Mexico's economy opened to external markets. Henceforth, a drastic change of the rural-urban relationship converged with Mexico's more forcefully entering the arena of the global economy. Consequently, the role that the rural areas had in the national food and agricultural market changed, affecting food consumption habits of the Mexican population and the ecological role the countryside played.

In order to understand the current rural-urban relationships between Milpa Alta and the urban center of DF, I draw on agroecology. That body of literature lends me analytical tools to interpret the mechanics of the metabolic rift based on a grounded site of research. Agroecology

⁵⁵ The General Agreement on Tariffs and Trade officially became WTO in 1995.

enables me to build my analysis from the level of farm to market. I address how the farming practices of my research site are shaped and reshaped by complex market relationships (from local to global). In addition, because there is a history of farming based upon indigenous and campesino practices in this location, agroecology is particularly appropriate as a large body of agroecological research deals with small-scale farming systems in Latin America.⁵⁶

This chapter is organized in two parts. In Part I, I trace the genealogy of the metabolic rift theory, identify some fundamental intersections with other bodies of literature, examine critiques of this theory and the outcomes of empirical work that uses the metabolic rift framework. In Part II, I propose an approach that integrates metabolic rift theory and the approach of agroecology, and show possible complementarities between these two frameworks. Such an integrative approach is an endeavour to benefit both fields of study and ultimately may be useful for grounded research on contemporary cases of rural-urban relationships, where farmers develop the ecological legacy of their farming approaches.

Part I.

Disruption of Rural-Urban Relationships: World Market and Implications for Local Ecologies

3.2 Tracing the Genealogy and Explanatory Potential of Metabolic Rift Theory

The metabolic rift is an attractive concept to explain the links between contemporary crises of soil fertility and environmental degradation, and the politics of increasingly long-distance global agricultural trade (Schneider and McMichael, 2010). The idea of city-countryside disruption is situated in the theory of metabolic rift rooted in Marx's analysis of the agricultural crisis of the late 19th century, and was reconstructed by John B. Foster (1999). This theory helps in understanding the historical causes of the apparent rural-urban antagonism within capitalism (Foster, 1998, 1999; Moore 2000, 2011; Clark and York, 2008; Friedmann, 2000; Schneider and McMichael, 2010). The key to understanding such antagonism is the separation of social production from its natural biological base, concretely manifested in both the distance of

⁵⁶ The literature first treated those farmers and farming systems as "traditional" though the language has been changing over time. Today the literature increasingly refers to them as small-scale ecological farming/farmers

production from consumption and the marked division of labour between town and country (Moore, 2000; Friedmann, 2000; Foster, 1998).

An important aftermath of such disruption is an imbalanced trade of wealth initially manifested in the transferring of wealth from the countryside to towns. Adam Smith (1925), a writer from the 18th century who subscribed to political economy thinking, was quite optimistic about a symbiotic dialectic relationship between cities and countryside. He thought that the growth of cities would bring about the transference of the wealth of cities to the countryside because, “country supplies the town with the means of subsistence and the materials of manufacture. Then, “town repays this, by sending back a part of the manufactured produce to the inhabitants of the country” (Smith, 1925: 355). Put in this way, the symbiotic relation is a positive one, resulting in balanced wealth.

However, Smith (1925) underestimated that capitalist expansion, through global trade, generates uneven distribution of wealth. At a global scale, capitalism has a clear preference for urban economies because they facilitate capital accumulation (Arrighi, 1994).⁵⁷ Cities are structured to control and command the flow of goods and are fully implicated in the creation of core-periphery structures through commodity chains (Brown et al., 2010). In today’s world, some places, e.g., the countrysides of some southern countries, are dedicated entirely to producing the food and means of subsistence of distant northern urban areas, without being fairly compensated. As a result, this unbalanced transfer of wealth, the relationship has broken down into core and periphery, with the periphery producing mostly for the core States (Moore, 2000).

The explanatory potential of the metabolic rift to understanding processes of imbalanced transfer of wealth⁵⁸ rests in the conversation with unequal economic exchange (UEE) theory (Hornborg, 2009, 1998; Jorgenson, 2006; Jorgenson and Clark, 2009; Foster, 2014; Burkett, 2006). The history of global capitalism is also the history of unequal economic exchange. Therefore, the concept of wealth in this debate is fundamental, as it brings back to the fore the fact that wealth is material, physical, and not fully represented in the system of prices (Hornborg, 1998).

⁵⁷ Arrighi (1994) focuses on cities as the key territorial spaces enabling the emergence of global capitalism. As an example of that, he proposes that Seville and Lyons had important roles as central market places for foreign business organizations.

⁵⁸ The fundamental idea of wealth as physical wealth was gradually blurred in further developments of classical (then neoclassical) economics. Neoclassical economics use prices for representing the material wealth of things produced in the economy.

The theory of unequal economic exchange that emerged within the political economy tradition can be traced back to Karl Marx's work and has been a subject of theories of imperialism, dependency and world systems (Frank, 1967, 1978; Wallerstein; 1974-1989). According to Foster and Holleman (2014), the articulation of the unequal economic exchange theory can be traced back to the work of Austrian Marxist Otto Bauer in his volume *The question of nationalities and social democracy* (1924). A crucial aspect of unequal economic exchange theory is the unequal transfer of labour through global trade, and between countries of unequal levels of productivity. The working argument of this theory is that the imbalanced transfer of labour from periphery to core countries is due to the differential in labour productivity of their industries. Thus, low productivity countries (i.e., developing countries) give more labour for less and tend to rely on labour intensive industries, such as raw material extraction, in order to compete in the global market. Trading under asymmetrical productivities forces low-productivity (peripheral) countries to increase the volume of raw material production and enter into an endless treadmill of over-exploitation of their natural resource base. Conversely, core countries (high productivity) enter into a consumption trend of goods (inputs for production or final products) that come from peripheral countries, thus increasing forms of environmental degradation within the latter ones (Jorgenson, 2006).

This is where political economists who consider environmental issues within the context of capitalism relate unequal economic exchange theory with the idea of unequal ecological exchange (Hornborg, 2009; Jorgenson and Dick, 2009; Jorgenson, 2006). From such research it is possible to conclude that reliance on extractive resource industries implies that the goods traded embed more nature. As a result, developing countries not only give more labour for less, but also more ecological content for less.

Within capitalism, the trade relationship between town and countryside is perhaps the primary expression at the local scale of unequal transfer of physical wealth and labour from one geographical area to another. Since capitalism began in Europe in the 1500s, the unequal division appeared in the rural-urban disruption, intensified in Europe with industrialization, and outpaced the local boundaries through international trade.⁵⁹ However, the terms of international trade are

⁵⁹ The convergence of the bodies of literature on unequal economic and ecological exchange and metabolic theory strengthened the argument that it was global trade, not industrialization, that caused the first metabolic rift. When Foster (1999) elaborates on the metabolic theory, he asserts that, based on Marx's writings, the first metabolic rift emerges with the rise of the industrial form of capitalism and its consequent capitalist agriculture. But Moore (2000,

characterized for processes of dispossession, colonialism and imperial relations imposed by Europe on other regions of the world, and this is where the history of unequal exchange comes into play. Those interlinked historical processes produced the so-called First and Third Worlds, or developed and underdeveloped countries (Clark and Foster, 2009; Clark and York, 2005). All of those nomenclatures have served to describe an uneven global development phenomenon. An overarching concept that describes that capitalism depends upon further ecological exploitation and unequal economic exchange is known as ecological imperialism (Clark and Foster, 2009; Clark and York, 2005).

Imperialism describes the control of Third World resources by imperial countries through military means (Clark and Foster, 2009). Adding “ecological” to the concept acknowledges that implicit in this relationship of control is not just a massive unpaid transfer of wealth to the First World, but also an immense ecological damage in Third World countries’ resource base and ecosystems (Clark and Foster, 2009). Today, imperialist forms may be disguised in the hierarchical organization of the global economy between dependents and dominants, where the unequal extraction of resources is inflicted not only through military means but unified economic, political and legal frameworks (Wallerstein, 1974).

In short, the parallel development of, and then dialogue among, the literature of unequal economic exchange and metabolic rift strengthens the argument that in global capitalism there is an imbalanced transfer of material-physical (ecological) wealth from one region to another (Hornborg, 2009; Jorgerson and Clark, 2009; Clark and York 2005; Foster 2009). Nonetheless, after more than a decade of productive debate, the lack of means to operationalize and illustrate the process of unequal ecological exchange remained. This is where Foster and Holleman’s (2014) work offer particular contributions. For these authors, such endeavor necessarily requires a comprehensive synthesis of the theory of unequal exchange of physical material, consistent with Marx’s theory of value. This idea has its origin in a critical review of Howard Odum’s

2011) and Friedmann (2000) question this idea. For Moore, the rift is specific to capitalism as a whole, not just to its industrial form. For Friedmann (2000) and Duncan (1996), the case of high farming during the late 18th century in England demonstrated the co-existence of an ecologically sophisticated and resilient capitalist agriculture with industry. Friedmann draws from the historical evidence provided by Duncan (1996) on the practice of high farming in England, a practice that was embedded in capitalist relationships. Duncan’s (1996) distinction between industrial, modern and capitalist agricultures provides key elements for re-framing our understanding of how agriculture interacts with different phases of capitalist societies. This seems to prove that industrial development could not have been the origin of the first metabolic rift, but, rather, global trade development.

work.⁶⁰ Though not a Marxist, Odum engaged extensively with Marxian political economy. Howard Odum was an ecologist, not an economist, but he viewed “free trade” as a major cause of ecosystems erosion at the global scale because the value of nature was not captured in the conventional measuring of the economy: prices.

Then, the “closest connection between Odum’s ecological critique and Marxian political economy is reflected in the overlapping critiques of mainstream (today neoclassical) economics with its subjective theory of value” (Foster and Holleman, 2014: 214). Like Marx, Odum suggests that prices do not reflect the real wealth. While Marx suggests that the surplus is extracted from labour and nature, his elaboration focuses mainly on labour. It is in this regard that “for Odum, Marx’s theory was an attempt to explain wealth/value creation under capitalism in terms of energy transformations via abstract labor” (Foster and Holleman, 2014: 214). In contrast, Odum’s contribution concentrates on the part of surplus extracted from nature.

This is what allows Foster and Holleman (2014) to state that Odum’s work is consistent with, and complements, Marx’s theory of value. This is not to say that Marx did not recognize the existence of both types of surplus. In *Capital* Vol. 1, Marx (1887) states that wealth is produced by human work and nature. In fact, his labor/value theory based on categories of use value and exchange value provides a strong foundation to further the understanding of the process of extraction of surplus value from nature within a capitalist economy.⁶¹ Use values represent the physical form of the goods while the exchange value represents the monetary (expressed in prices) of such content. Marx considers that exchange values mask the surplus labor that is not compensated to the worker and that this the source enabling accumulation in the capitalist system.

For their part, Odum and Scienceman (2005) engage with those categories, focusing on the problem of the “real wealth”, which they understood as the work done by nature to produce both human energy (labor) and energy that helps nature create its fruits (e.g. plants, minerals, etc). These authors see a theoretical space to explore the material content of goods in the use value category of Marx. However, to distinguish from the Marx’s labor value, Odum and Scienceman (2005) use the term “emergy” values (“m” of material and “ergy” of energy), a category to reflect

⁶⁰ Foster and Holleman (2014) provide an exhaustive critical review of Howard Odum’s work produced in a two-decade period, and find intersections with the Marxian theory of value. I provide a tight synthesis of Foster’s key findings and complement it with my own readings of some parts of Odum’s work.

⁶¹ “Ecological economics” strongly rests on the revision of these categories (see Burkett, 2006).

the physical content of goods. Critical of this approach, Foster and Holleman (2014) warn of the possible energy/physical reductionism of the economy that may derive from this type of measuring.⁶² However, it was through this emergy category that Odum and colleagues could conduct empirical work to further their insights on “nature as a donor” to the economy (Odum, 1996).

Aware of the theory of unequal economic exchange, Odum conducted exercises to account for the emergy values, instead of prices, embodied in trade between nations. He concluded that “free trade made developed countries rich, with high standards of living, leaving less developed countries devastated” (Odum cited in Foster and Holleman, 2014). The devastation is firstly because the terms of free trade are not equitable, and secondly because less developed countries rely more on the work of the “free” environment, for which no money is paid. What is interesting is that Odum and colleagues (Odum and Arding, 1991; Odum and Sciencemen, 2005, Odum, 2007) suggest unequal economic exchange, but the other way around: they go on to review the terms of physical material exchange through empirical work and then arrive at the conclusion that the cause is unequal economic exchange.

Still more crucial to the metabolic theory is the fact that Odum’s work reminds us of the relevance of the town-country division in today’s world because his empirical exercises let us see that rural countries (less developed) transfer much more real wealth to urban countries (developed).⁶³ Then, labor division between rural and urban is extrapolated at a global scale. This is how Odum’s work strengthens the insight that the rift is enhanced through unequal transfer of “real wealth”, which rests on unequal terms of trade.

Although the literature on unequal exchange economic theory and its ecological counterpart focuses on core-periphery trading relationships, recent grounded research on metabolic rift (Sanderson and Frey, 2014) attempts to transcend the core-periphery debate and address the rift at the level of local-global relationships.⁶⁴ Using the case of export-oriented agriculture of western

⁶² Very often, the Achilles heel of economic approaches that put a value (price) on nature is the dilemma between physical reductionism or price reductionism. This is apparent in the new fields of ecological economics, environmental economics and bio-economics (Georgescu-Roegen, 1971; Daly Herman, 1996, 1999; Constanza, 1980).

⁶³ The theory and resulting methodology elaborated by Odum became a whole research agenda on “Emergy Systems”, which is widely used in the work produced by the Center for Environmental Policy of the University of Florida. This research center has developed simulation models to measure real wealth trade for several countries. See <http://www.cep.ees.ufl.edu/emergy/index.shtml>

⁶⁴ This is frontier research, which produces a twist to the theory. Most authors following metabolic rift theory remain in core-periphery relationships.

Kansas in the United States, Sanderson and Frey (2014) reveal that in local rural-urban relationships and asymmetrical political and economic power relationships between regions within core countries also result in unequal ecological exchange. In addition, this case tells us that rural regions that are economically successful in global markets through trading their agriculture products create their own “devil” nearby: in their own cities.

In Kansas, the success of farmers in the global marketplace enhances the economic and political power of local urban areas (Kansas City). The largest weakness of this region is its dependence on non-renewable (fossil) water sources for agriculture, which ultimately affects farmers. In Kansas, the success of farmers in the global marketplace enhances the economic and political power of local urban areas (Kansas City). Although the profits from agriculture have made it possible to increase the purchasing power in both rural and urban populations, a big portion of it remains in urban areas. Higher farm productivity levels increase urbanization because less labor is needed in the fields. Meanwhile, greater purchasing power allows urban populations to demand more goods from the local countryside and from overseas. In order to maintain their urban lifestyles, the political decision-making center—which is in the city—supports the continuity of agriculture while exerting pressure on farmers to increase productivity. Dependence on non-renewable water (fossil water) to perform agriculture in Kansas forces farmers to invest in productivity, which gradually decreases farmers’ profits and leaves them in a lower economic position compared to the Kansas urban populace.

The fact that core-peripheral food trade has been increasingly controlled by transnational retailers in the last three decades leads one to think that a significant amount goes to feed urban populations because transnational supermarkets are mainly located in cities (Michelson, Reardon and Perez, 2011; Brown et al., 2010; Parnreiter, 2010; Echanove and Reardon, 2006). Put this way, high productive agricultural sectors based on core countries also underwrite processes of rural-urban asymmetries, since peripheral countrysides outcompete, forcing farmers to migrate to cities. In addition, the emerging urban population in peripheral countries tends to include meat in their diets, which may need to be imported, or if livestock is raised locally, wheat and corn needed to feed livestock may be imported⁶⁵.

⁶⁵ A large portion of the corn produced in the United States is for feedstock that goes to national and external markets. Mexico imports corn feedstock from the United States.

The key point is that capitalism shows a preference for urban economies. Hence, no matter the country, urban economies wield more political and economic power over areas (normally rural) of the world oriented to primary economic activities. In this way, the Kansas case reveals processes that deepen the metabolic rift at the intersection of local-global relationships. However, more research is needed to test if cities in peripheral countries are empowered when their nearby countryside is successful in the global market, as in the Kansas case.

Debates on De-Localization and Re-Localization of Food Production and Consumption: Food and Agriculture at the Intersection of Markets and Ecologies

Global agricultural trade gives rise to concrete and in some cases an artificial distance between rural and urban spaces. Thanks to developments in information and transportation technologies, it is possible to send goods from one to another corner of the planet in a short timeframe. Therefore, large populations residing in cities are no longer dependent on food grown in nearby rural areas to feed themselves. Hence, the role of the local countryside as provider of basic material for the survival of humans inhabiting the closest cities has significantly diminished.

In recent decades, environmental food movements concerned with food quality have called attention to the ecological, social and cultural implications of reliance on distant food (Pretty, 2008; 1998). This has created an agenda and social movements organized around themes of re-localization, territorialization and an urgent re-connection of food production and consumption (Friedmann, 2016; McMichael, 2016).⁶⁶ For many local food advocates, the cause of ecological damage is the extreme reliance on world trade or “distant food”. Certainly, international trade deepens the town-country division. However, international trade itself may not be the problem, but rather the very nature of trade under capitalism.

The function of trade in capitalist economies is not mainly the fulfilling of human needs. Instead, trade is a mechanism enabling capitalist accumulation and a side effect is to satisfy the needs of those who can afford the goods at the market price. So, how different is trade under localized markets (production and consumption) to the de-localized ones if we know both are framed in a capitalist economy? Perhaps, the history of the unfolding of de-localized markets can shed light on the issue.

⁶⁶ Interestingly, the most influential environmental and food movements are based in urban settings. Other movements also concerned about the environment but that emerged in rural zones have been recognized as environmentalist just recently. They are typically related to agrarian, peasant, campesino movements.

To explore this matter, I discuss and complement metabolic rift theory with the body of literature on food regimes. These frameworks let us understand that the history of world trade is the history of capitalism's expansion -- and the metabolic rift between town and country is an aftermath of it. Based on Wallerstein's work *The modern world-system I*, Moore (2000) and Friedmann (2000) offer insights to understand how de-localization started.⁶⁷

The first de-localization of food happened with the town-country division, which for Moore (2000) arose much earlier than industrial capitalism. For Moore (2000), the very origin of this division is found in the western European global expansion from 1350-1580. Linking concepts of Wallerstein's world-system approach and the classical theory of metabolic rift, Moore (2000) asserts that in each phase of capitalist expansion there is not only a restructuring of labour division, but also a restructuring of ecologies. Hence, capitalism is a world-ecology system. Meanwhile, Friedmann (2000) takes on the agenda directly, concerned with how the practice of agriculture is modified by the capitalist crisis of "foodgetting" and territory. As a result, in Moore one finds a macro-level explanation of how capitalist expansion generates local disruption, while in Friedmann's work the interaction between grounded processes that actually transform and disrupt environments and immersion in global trade are more deeply explained.

Moore (2000) points out that the pillaging of resources in the invaded countries contributed to the destabilization of their ecologies and the re-organization of local ecologies. For instance, during the 16th century, Europe brought large amounts of food from the colonies, and consequently the local European countryside turned into more pastured fields. However, the extraction of resources from far away required the simplification of systems of agriculture in the dominated places in order to speed up the market circulation of the vast quantities of cash crops. Monocultures are since then the most typical and simplified agricultural systems. Plantations -- a form of monoculture -- became the agricultural model of the first European colonies during the 16th century whether it be for sugar in the Caribbean or wheat in North America. Through monoculture, a system of deep and rapid exploitation of nature was inaugurated. However, exploitation of nature required exploited workers. Plantations required massive labour, which explains the development of slavery. Then, as Moore (2000: 146) asserts, "fresh land, however, is worthless without fresh labor". Hence, Moore (2000) suggests that at the very foundation of

⁶⁷ Wallerstein's work is devoted to the history of the European expansion in the 16th century and how it gave rise to a world-economy and a capitalist agriculture. It is also important to note that part of the food regime's agenda is based on the critique of industrial food systems and transnational food corporations controlling global food chains.

capitalist expansion are phases of agro-ecological transformations that result from the quest for fresh land and labour.⁶⁸

Since the 16th century, capitalism has been able to sustain itself by finding “untouched environments”⁶⁹ that have reserves of natural wealth. During five centuries of capitalism, the otherwise “untouched” spaces have been taken over, disrupted and wasted in each phase of outer expansion.

Despite the laudable attempt to address disruption at the local scale, Moore (2000) remains in macro explanations and vaguely addresses the feedback between the practice of agriculture and world trade. Friedmann (2000) fills out that gap as her work informs us that de-localization of agriculture is not only an economic story but also a cultural one. Situated also in the history of colonialism, from the 16th century onward, and drawing from interpretations of ecological imperialism by Crosby (1986), Friedmann (2000) explains how the transplanting of species and people in new lands enhances market penetration in agricultural production.

New settlers --a kind of species-- bring cultural diets and farming practices which, once they interplay with species invasions and global trade, amplify the vicious circle of dependence on export-oriented agricultural models (in other words, long-distance trade). Species invasion is a crucial first moment of local ecological disruption. In the second phase, new settlers demand imported agricultural inputs as they manage the land with the techniques they used in European

⁶⁸ Moore (2000) proposes five systemic cycles of agro-ecological transformation as follows: 1) 1350–1580: Transition from feudalism to capitalism. The first massive European invasion across the globe initiated not only an epidemic disease of apocalyptic proportions but also a Columbian exchange of flora and fauna. 2) 1590s–1750s: A new period of agro-ecological restructuring began at the end of the 16th century. The world economy expanded; it is a period marked by consolidation. Probably the most important agro-ecological development in this era is the maturation of the plantation complex, with its extension to the West Indies and the southern colonies in British North America. 3) 1760s–1870s: A new wave of capitalist agrarian transformation swept over the core, and the world-economy again expanded dramatically, producing major transformations of agrarian life in the new peripheries. 4) 1870s–1940s: The late 19th century to the Second World War witnessed the industrialization of agriculture to an unprecedented extent. Geographical expansion converges with the rise of British hegemony. Once again, the scale and scope of agrarian unrest increased dramatically, leading to social revolutions in Mexico and Russia and increasingly powerful anticolonial movements in the new peripheries, especially in Africa and Asia. 5) 1950s to the present: With the opportunities for geographical expansion foreclosed, capital shifted from an expansionist strategy to an intensification strategy. This has been the era of the so-called green revolution. In these times, powerful peasant movements and a series of epochal peasant wars occur in China, Cuba, Algeria, Vietnam, among other countries. This green revolution has been the latest (and possibly the last) phase of primitive accumulation on a world scale; it has been all the more intense because there are no more frontiers. The strategy now lies in commodifying remaining non-commodified natural wealth. The division of labour is manifested in the creation of new agricultural-oriented platforms, which is a reformulated way of de-localizing agriculture.

⁶⁹ This is Rosa Luxemburg’s idea that capitalism depends on the existence of the “untouched environment”, because those spaces have fresh or unused wealth that saves the capitalist economy from crisis that resulted from the depletion of a previous resource base (Luxemburg, 2003).

ecosystems. For instance, in the case of European settlers, bread is what they used to eat and they knew how to grow wheat. Therefore, when they transplanted wheat to America, settlers maintained their culinary culture and traditional diets in the new land, but undermined the indigenous ones by displacing them from the land.⁷⁰

Because the “new world” (the Americas) had not been overexploited, the land was highly productive for a long time. Friedmann (2000: 492) gives evidence of this in the history of the U.S Great Plains, whose nutrients were eroded, after being exploited under farming practices developed according to European agroecosystems conditions:

“The grasslands of North America, called the Great Plains, are a distinct ecosystem not amenable to methods and implements used to colonize regions east of the Mississippi River, which were more similar to the cleared forest lands of northern Europe. Later called the breadbasket and cowranch of the earth, the unbroken prairies were called the Great American Desert until the Civil War... The native grasses held moisture and soil in place. Both were crucial under the conditions of low rainfall punctuated by violent downpours unknown in Europe or Eastern North America. After the prairie was broken by the new steel plows, soil could not hold moisture and was washed away by rainstorms.”

Cultivating crops under conditions that are alien to the local people and ecosystems enhances disconnection of food consumption from production and ends up eroding the land and the local culinary culture. The market logic --especially the logic of the world trade market-- helps deepen this trend. As a result, gradual shifts in people’s diets based on imported foods occur as shown in Latin America, Asia and Africa at different points in history (Friedmann, 1993; 2000). Furthermore, the crops cultivated locally are also substituted and oriented to export to northern markets. In Latin America, the substitution of maize for wheat and meat-based diets (predominantly imported) has changed the culinary culture, particularly in Mexico (Appendini, 2014). Still more interesting is that this shift in consumption patterns is more apparent in urban

⁷⁰ With this I do not mean that local crops were completely wiped out. Indeed, Friedmann (2000) gives account of how in the very origin of species invasion, there is a process of mixing indigenous species and management techniques. However, once the market penetrates, there is a selective rationale regarding what to grow based on market targets.

areas of Mexico. This reveals the socio-cultural dimension linked with global trade that enhances disruption of local agroecosystems.

In summary, the history and analysis provided by Moore (2000) and Friedmann (2000) lead us to conclude that the system of long-distance food and agriculture came about as a result of the external search for, and procuring of, new resource-rich lands. World trade was needed to secure transactions in profitable markets, in Europe, far from the source of the resources. The continuous outer geographical expansion re-configured local-global ecologies and changed farming practices and food cultures worldwide.

Food regimes at the intersection of local, global food markets and “alternatives”

The particular characteristics of farming practices are influenced by the world market agricultural relationships and the regulatory order that rules the world in different historical periods. In contemporary capitalism, that order is constituted by the actions of powerful actors, such as states, corporations, social movements, consumers and scientists (Friedmann, 2009). This is what defines food regimes (McMichael and Friedmann; 1989; Friedmann, 1993, 2000, 2005, 2009). Today, we face increasing concentration in the food market, which stems from the constant ongoing industrialization of agriculture, the world market as an ordering principle, and the restructuring of food processing industries (Van der Ploeg, 2010a).

These processes bring about a new, worldwide, food regime that is deeply affecting farming practice, the ecosystems on which farming is grounded, and the quality and distribution of food (McMichael, 2016). The ruling actors today are food corporations borne out of the deep economic restructuring after the 1970s, a phenomenon that also produced a drastic change of the role of the state in the economy.⁷¹ Key players that emerged in the 1940 to 1970s, such as the IMF and World Bank, gained a prevalent role from the 1980s onwards, which, together with reduced state intervention, signaled the beginning of the neoliberal globalization project (McMichael, 2005; Friedmann, 2005). Increasingly specialized agriculture across the world and deep reorganization of global agri-food chains with food corporations leading from start to finish became a central characteristic.

⁷¹ After decades of neoliberalism, we have seen that the State did not disappear, but only changed its role within the economy. Then, instead of a “withdrawal”, I suggest that the State reconstituted its type of economic intervention. For instance, through policy design and changes in laws, the State facilitates the exploitation of natural wealth by corporations.

Although Friedmann and McMichael elaborated the food regime framework in a seminal article of 1989, Friedmann only identifies “signs” that a new food regime is emerging, which she characterizes as an environmental-corporate food regime whereas McMichael (2016) considers that there is indeed a third food regime in place, one that corresponds to the neoliberal project.⁷²

“In contradistinction to previous food regimes constructed by hegemonic British and US States, the food regime under neoliberalism institutionalizes a hegemonic relation whereby States serve capital. This, to me, is the distinctive organizing principle by which corporate rights have been elevated over the sovereign rights of states and their citizens—the World Trade Organization (WTO) rules (among other, ongoing, trade agreements) made this clear. In this sense, this, then, is a ‘corporate’ food regime... And, just as previous food regime dynamics revolved around central tensions—temperate (national) vs. tropical (imperial) tensions (1870s–1914), or national vs. transnational (1950s–1973) – so the dynamic in the contemporary food regime involves a key tension between abstract globalism (fractionated industrial ‘food from nowhere’) and concrete localism (ecologically farmed food and nested markets: ‘food from somewhere’)” (McMichael, 2016: 649).

For her part, Friedmann (2005) states that the signs of the environmental corporate food regime are apparent in the new politico-normative terms that appeared in the 1990s and 2000s, generated by the WTO. These emerging normatives showed a turn to a quality-based and environmental regulatory scheme including a number of food-related elements that fall under the broad category of the environment; for example quality, safety, biological and cultural diversity, intellectual property, animal welfare, environmental pollution, energy use, and gender and racial inequalities (Friedmann, 2005). For Friedmann (2005), these are indicative of a transition from the second to a third regime.

The different interpretations regarding “the third food regime” (signs of transitions vs establishment of a new third regime) of the original authors of this framework, has not stopped

⁷² Although McMichael (2016) had indistinctively used the terms “neoliberal” and “corporate” to name this third food regime, in his most recent paper of 2016 he leans towards the term “corporate”.

the proliferation of scholarly work that uses this analysis.⁷³ The power of this theoretical lens goes beyond the periodization of regimes and lies in its ability to serve “as a key historical and theoretical pivot that moves debates in rural sociology from a rather narrow, structural and orthodox political economy of agriculture to a more contingent, historically contextual understanding of many configuration (geographical and historical) of agri-food capitalisms” (Campbell and Dixon, 2009: 262)⁷⁴.

Recent formulations of food regimes address a number of issues that could be signs of transitions to or outcomes of a consolidated food regime (Otero and Pechlaner, 2013; Otero 2012; Holt-Gimenez and Shattuck, 2011; Burch and Lawrence, 2009). Campbell and Dixon (2009) note that new formulations bring up questions concerning value and ecological relations, cultural politics, nutritional knowledge and dimensions, and the transformation of corporate and institutional power relationships in an era of neoliberal globalization and financialization. In this line of reformulations, Otero and Pechlaner (2013) propose, in contrast to McMichael’s *corporate* food regime, a *neoliberal* food regime, arguing that states continue to be central in “imposing” a neo-regulation constituted by the series of international agreements and national legislation that promotes the neoliberal agenda. Though McMichael (2016) recognizes a new role of the state (serving capital) in the corporate regime, Otero and Peshlaner (2013) intervene to overcome the abstract characterization of capital (or market) presented by McMichael. So, in principle authors of both sides concur that the state has a new regulation principle, but in naming it *neoliberal*, Otero and Pechlaner (2013: 279) intend to determine the specific mechanisms by which food regimes operate: “abstract characterizations such as McMichael’s obscure how ‘empire, state and market’ change their contents in different historical periods and do not allow us to determine the specific mechanisms by which food regimes operate—or how they can be changed.”

I concur with Friedmann’s (2005) argument on the environmental character that the third food regime will have, but also agree with McMichael’s (2016) idea of a consolidated neoliberal/corporate regime. This research will attempt to expand these conversations based on the analysis of the evidence gathered in the field. Both analyses help understand how and why the

⁷³ The resurgence of interest in the food regime analysis is apparent particularly from the late 2000s onwards, which was manifested in a symposium of the AFHVS in 2007 and an entire issue of the Journal of Agriculture and Human Values in 2009 (Issue 26). Campbell and Dixon (2009) reflect on this resurgence.

⁷⁴ Bernstein (2016) has indicated that today it is almost impossible to think about the agrarian question without engaging with the food regime analysis.

influence of neoliberalism in re-shaping food production and consumption has penetrated the realm of environmental, ecological and health values claimed by environmental and social food justice movements. Initiatives based on re-localization, meaning re-linkage of food producers and consumers became the popular solution to counteract the negative environmental and social implications of global and de-localized food systems (DeLind, 2011; Allen, 2010; Allen, FitzSimmons et al., 2003).

However, critical reviews on the practice and politics of food systems re-localization in North America bring to the fore serious limitations regarding successful opposition to mainstream values; some scholars even point out that the “go local” project sometimes operates as a mainstream tool (Guthman, 2011; DeLind, 2011; Allen et al., 2003, Hinrichs, 2003). For instance, the support to local agriculture in regions where local farmers are large farmers using industrial practices may do little to contest inequality and anti-ecological practices (Hinrichs, 2003). Instead, it can turn into a defensive localism with serious racial inequalities, as Hinrichs (2003) shows in her analysis of the politics of local food in Iowa in the United States. In contrast, some long-distance food could be ecologically produced, such as those foods certified organic and travelling from the South to the North, but the social justice merits of that “alternative” long-distance food production are also in question (Brett, 2010; Wise and Calo, 2005).

There are examples in the organic coffee sector,⁷⁵ mainly based in southern countries, that show how small-scale producers’ immersion in the organic international market does not deliver the promise of improvements to livelihood, given costly access to certifications for organic and fair trade markets (Wise and Calo, 2005; Gomez-Tovar et al., 2005). There is also evidence of small-scale farmers facing asymmetrical power relations in the organic world market negotiations, despite being the largest number of participants in this sector (Gomez-Tovar et al., 2005)⁷⁶. Additionally, after some decades, corporations have joined the organic food scene and since then intervene at different points of the organic food chain.

As a result, fair trade, organic, healthy and local food systems initiatives are being contested because of the encroachment of corporations (Holt-Gimenez and Shattuck, 2011;

⁷⁵ The experience of organic coffee production is absolutely relevant to illustrate the benefits and setbacks of world organic market relations because it was one of the most popular and first organic crops that were to be extensively traded internationally. Coffee has been heavily part of Certified Organic, Fair Trade, Bird Friendly and other certifications that appeal to consumers (Wise and Calo, 2005), and because those alternative markets mainly involve small-scale producers using traditional agro-ecological management and residing in the South, it neatly shows the reproduction of power relationships in the environmental and social-friendly markets.

⁷⁶ According to IFOAM (2015), small-scale producers are still the largest number in the organic sector world-wide.

Guthman, 2004; Allen, 2000,). This explains how the values and practices that first appeared to contest are co-opted by conventional approaches that focus on the choices made by ecologically and socially-minded consumers.⁷⁷ When the mechanics to access this type of food depend on the individual's economic capacity and agency, then they appeal to neoliberal principles (Fairbairn, 2010), which converges with the values of top-down, retail-led food chain corporations.⁷⁸ With this I do not undermine the positive educational (Turner, 2011; Saldivar-Tanaka and Krasny 2004; Kurtz 2001) and community empowering (Travaline and Hunold 2010; Levkoe, 2011; Baker 2004) outcomes arising from some local food systems projects. Rather, I insist, echoing Allen (2010) and Guthman (2011) on the need for further discussion on the social justice agenda of those projects, which has been slowly blurred.

In addition, the normative shift of de-regulated economies to neoliberal principles opened new avenues for corporations to execute various forms of rural dispossession, by means of land grabbing, appropriation of genetic seeds, biomass and other natural stock (McMichael, 2005, 2007, 2009). Another less apparent and subtle way to appropriate natural wealth has been through appropriation of people's knowledge of ecological farming management.

Together, the trends towards ecologically oriented markets and de-regulated economies have been shaping the "corporate-environment" character of the food regime (Friedmann, 2005). Under this type of regime, one finds different combinations of elements of local and global markets with various degrees of positive and negative environmental and social characteristics. How can we possibly explain the co-existence of a variety of approaches that includes local- and global-scale initiatives, environmentally-friendly or industrial-based, small-scale and large-scale? Based on the reviewed literature, I argue that this phenomenon is a reflection of the restructuring moment of the world economy, which opens space for experimentation.

The experiments may propose reformist and radical changes; all of them competing against to each other to become the mainstream. Moreover, the restructuring phase is a reflection of the previous model of capitalist accumulation in crisis. In order to survive, the capitalist economy

⁷⁷ The popular slogan "vote/decide with your fork" reflects how the politics of some food movements have been individualized.

⁷⁸ My argument is that the retail-led food chain organization and the later consumer-driven food chain are a response to the change of values that came from bottom-up, grassroots movements, organic and local food movements in the North mainly. The emergence of markets that apparently meet those values, are not necessarily opposing neoliberal values. The popular slogan "decide with your fork", is used both for food marketing and for some food movements. The slogan appeals to the individual's choice and purchase capacity, and according to Fairbairn, that's a neoliberal principle.

needs to start a quest for new, fresh resources, which typically results in a new accumulation model. I would suggest that in the present, the capitalist economy transits into an inner and outer expansion simultaneously.

Outer expansion

I understand outer expansion as the search for new resources from the core to the peripheries of the world; meanwhile inner expansion goes deep into the core. Expansion is based on the search for the “untouched space”. However, after centuries of outer expansion (since the 16th century), the availability of untouched areas on earth are very limited, an issue touted in world reports, from the *The Limits to Growth* by the Club of Rome (1972) to recent IPCC (2014) reports.

Some of the remaining ‘untouched’ spaces are biosphere and ecological reserved areas that are vital for maintaining fundamental earth biophysical cycles, and whose access has been regulated with ecological norms. Therefore, outer expansion faces regulatory and geographical limits. Nonetheless, this does not prevent economic forces from trying to exploit these remaining lands. However, any intentions to penetrate these areas must ensure that their productive penetration pretends to keep ecological balances (e.g. farming with organic management). In addition, I would suggest that because there are fewer and fewer untouched spaces, the outer expansion now operates through the takeover of “abstract untouched spaces” such as indigenous farming knowledge.

This type of knowledge was largely neglected during centuries of industrial agriculture and persisted, resisted, and coexisted at the margins of capitalist circuits of markets. In other words, the knowledge remained as an untouched space. Indeed, farming methods used by some large-scale organic northern-based farms (Altieri, 2002) that converted from industrial-based to a “mild” version of organic management show some elements of so-called traditional or indigenous farming methods. Altogether, we witness a time where large corporations lobby to de-regulate productive use of biosphere reserve areas, arguing that native populations would know how to work the land and receive income from trading ecological production (Chung-Tiam Fook, 2013).

Thus, through this type of outer expansion, it is possible to profit from marketing food produced with cheap local labor that embeds the so-called “local” or “indigenous” ecological farming knowledge that people pass from one generation to another and that accumulates through centuries, and at no cost to private companies. The development of the organic farming industry

in southern countries may be the most emblematic example of this trend. In some southern countries, the organic wave started by fostering traditional ecological farming (Gonzalez-Jacome, 2009; Romero-Lima, 2009). In its initial phases the objective was also to empower small-scale farmers⁷⁹ by directing them through fair trade commercial chains, which were targeting the increasing market of northern urban consumers demanding healthy (e.g., pesticide-free) and socially-produced foods. However, after decades of the organic market boom there has been a corporate encroachment at different points of the organic food chain. In the meantime, organic certification agencies may be operating as the market-based mechanism for concentrating the local and traditional ecological knowledge because certifiers record step-by-step what producers do on the ground and have the power to suggest what to change, as market access depends on that certification. Interestingly, the most influential agencies are North-based countries (Gomez-Tovar, Gomez-Cruz and Schwentesius, 1999). One can argue that this was an expected result because the market target is northern countries; thus, concentration of indigenous knowledge may be seen as a side effect, to say the least.

Inner expansion

As for the inner expansion, I suggest that the “going local” projects of food and agriculture, particularly popular in northern countries, is a strategy to build up a model of accumulation, re-valuing the already “touched space”. It is important to note that current movements that support re-localization initiatives have grown exponentially in northern cities, much more than in southern cities. In the literature and evidence available, one rarely finds projects of local food production led by rural movements.⁸⁰ What we see is urban local food movements dealing with strategies to feed themselves with the produce of the nearby countryside or produce grown within cities (urban farming). Then, I would say that the food re-localization project is mainly an urban phenomenon in the north, which is consistent with the idea that capitalism is mostly a city-based model (Moore, 2000).

⁷⁹ In early phases, environmentally-friendly international trade appeared to be an alternative to acknowledge, empower and improve small-scale farmers’ livelihoods across the world. That may be the reason why small-scale and/or indigenous producers were main actors when the organic market emerged (Nigh, R. 1997). Meanwhile, certifiers offered a mechanism to guarantee that attributes valued by consumers were met. Interestingly, the major organic food exporters’ countries are developing countries (IFOAM, 2015).

⁸⁰ The localization projects in southern countries are far less popular. Perhaps the local food movement is being framed under the “food sovereignty movement”.

From the environmental perspective, connecting urban populations with foods produced nearby or within the city, results in saving energy and educating people about the functioning of agroecosystems and the environmental impact of bringing food to the table.⁸¹ Because environmentalism informs, in part the urban food movement, ecological-minded food production, like organic, is strongly supported. From the market standpoint, nowadays an energy-saving business model is key, given the skyrocketing transportation costs in an economy still based on oil resources that are now increasingly scarce. In addition, the largest consumer markets are in urban zones (the urban population is far larger than the rural one in northern countries), which raises market interest in short commercial chains whose end point is the urban consumer.

In this regard, urban farming appears to bear attributes that help cope with the triple global crises of energy, economy and food. Along a similar line of thinking, McClintock (2010, 2013) points out that the interest in urban farming projects in North America re-emerges in times of crisis, such as in the United States during the 1930s (the Great Depression) and the 1970s (the oil crisis). At these times, it seems that the deeper the crisis, the larger the development of urban farming. Nowadays, urban farming projects are not just community-based; corporations show interest and also invest capital in this sector (Kuznets, 2012). Capital investment is apparent in the development of costly urban projects in the United States, such as the largest vertical urban farm (The Independent, 2015) and investment in research on the potential of floating farms offshore to feed cities (FastCompany, 2015). If capitalist urban farming takes this path, the energy-saving ability of city farm projects may be dubious. In that case, the story of short-distant food projects contesting the ecological destabilization inflicted by the de-localized, global food systems may become no more than a fiction.

Certainly, it is too soon to predict that all the local and global food systems experiments will take the direction of concentration of corporatization. Rather, it strongly shows the current tension between abstract globalism and concrete localism within the actual food regime, which McMichael (2016) has identified. My analysis is in the spirit of informing critically the transformational power of “re-localization” and “environmentalist” food and agriculture projects. Since social movements play a role in reformulating structures of food regimes, then any analysis

⁸¹ The popular one-hundred miles food project illustrates the importance of saving transportation energy in North American local food movements.

on the ground promoting peoples' actions based on proactive optimism are as important as arguments elaborated with intellectual pessimism. The end is unpredictable.

3.3 Reframing the Society-Nature Problem within Capitalism: Metabolic Rifts or Metabolic Distortions?

The proliferation of projects and alternatives to generate a more sustainable relationship with nature signals a time of environmental crisis, presumably caused by the way humans intervene in ecosystems. To what extent can metabolic rift theory be useful to both address the problem and potential solutions? A revision of its bias and internal problems may be necessary in order to evaluate its potential. For that, I engage in a comparison of the theory's critiques so far.

One of the sharpest of these critiques points out that it falls prey to a Cartesian binary, seemingly because it puts social causes (related to capitalism) in one box and environmental consequences in another, and it assumes society *acts upon* nature. Then, arguably it perpetuates views of society and nature as separated realms, deeply attached to modern science, a view that this theory tries to overcome (Moore, 2011; Schneider and McMichael, 2010). Jason Moore (2011: 3) puts the critique as follows:

“The problem is not with the attention to ‘social’ drivers or to ‘environmental’ consequences, or with causal statements as such. Rather, a difficulty emerges with the elevation of these ‘singular abstractions’ to the status of actor and acted-upon, foot and footprint, as the conventional metaphor would have it. In this metaphor, we see a symbolic enclosure (and alienation) at work, which effects an idealized separation of producer and produced, manifest in a purified social repertoire of agents and a purified bundle of environmental effects. It is an eminently Cartesian way of seeing, one that accounts for capital’s depredations upon the ‘environment’ in the same way that capital surveys, accounts, and quantifies nature’s utility for accumulation.”

In response to that critique, Foster (2013) puts forward two key arguments drawn from Marx's work, one related to the “universal metabolism of life” that explains his understanding of human life as part of a wider natural realm; and the second argument recalls that abstraction as a

necessary phase of the process of the dialectical method developed by Marx. Regarding the first argument Foster (2013: n.d) points out that:

“To account for the wider natural realm within which human society had emerged, and within which it necessarily existed, Marx employed the concept of the “universal metabolism of nature.” Production mediated between human existence and this ‘universal metabolism’. At the same time, human society and production remained internal to and dependent on this larger earthly metabolism, which preceded the appearance of human life itself. Marx explained this as constituting ‘the universal condition for the metabolic interaction between nature and man, and as such a natural condition of human life... Human beings transform nature through their production, but they do not do so just as they please; rather they do so under conditions inherited from the past (of both natural and social history), remaining dependent on the underlying dynamics of life and material existence.”

Foster’s defense notes that the conditions inherited come out of natural and social history, which leaves us with the impression that history is the sum of successive human impacts on the environment; in other words, social causes producing environmental consequences. Furthermore, Foster remains attached to Marx’s conception that there is a wider natural realm that exists independent of humans, a very Darwinian perspective that was innovative in Marx’s times. However, updated perspectives of life as a living organism refute that the environment exists independent of all the organisms that form it. Lewontin and Levins (1997: 96) put it this way:

“There is no organism without an environment, but there is an environment without an organism. There is a physical world outside of organisms and that world undergoes certain transformations that are autonomous. Volcanoes erupt, the earth processes on its axis of rotation. But the physical world is not an environment, only the circumstances from which environments can be made. The reader might try describing the environment of an organism that he or she has never seen. There is a non-countable infinity of ways in which the bits and pieces of the world might conceivably be put together to make environments, but only a small number of those actually have existed, one for each organism.”

Moore's (2011) critique in part draws on Lewontin and Levins' (1997) intervention on "Organisms and Environments", a work published in *Capitalism Nature Society*. This article inspires Moore to call for approaches that overcome views of capitalism *acting upon nature* (social causes of environmental crisis). Instead Moore (2011) suggests that capitalism develops *through nature*. Although a very compelling critique, how can we possibly understand our organic relationship with the environment without taking our human experience, which we call social, as a point of departure? The concept of metabolism, which is at the core of the metabolic rift theory recalls that humans are organisms exchanging energy and materials with other organisms living in the environment. However, scholars using the theory keep repeating the basic notion of metabolism as an exchange between humans and nature.

Perhaps there is a need to use a more coherent version of the concept, one that states that metabolism is an operation within a single organism and between organisms that form the environment. The concept used by Magdoff (2011) informs us that the metabolic process has internal and external components. For Magdoff (2011: n.d), internally, "an organism builds up new organic chemicals and breaks down others, recovers energy from some compounds and uses energy to do work." Externally, "an organism exchanges materials with the environment and other organisms, obtaining energy-rich molecules and individual elements necessary to make all the stuff of life, including oxygen, carbon dioxide, nutrients (such as nitrogen, phosphorus, potassium, and calcium), and water. Without access to these resources outside itself, an organism would run out of energy and die" (Magdoff, 2011: n.d).

Using this concept, the metabolic rift theory does not prevent us from seeing capitalist society developing *through* nature. If society is an organism of the environment, then it reproduces through its internal and external metabolic operations. For the political economy approach of metabolic rift theory, the external operations are executed through human labour. If we follow Moore (2011), we would categorize labour as a socio-ecological experience; then our problem is how to inquire into such a dual (social and ecological) type of experience. The dialectic-materialist method is a path, and it requires in the first place, an effort to scrutinize the parts.

Arguing the correct use of the dialectical-materialist method is how Foster (2013) justifies the supposed division that Moore (2011) points out. Foster (2013: n.d) remarks that the reason that critics "characterize the metabolic rift theory as a form of Cartesian dualism is due to a

failure to perceive that within a materialist dialectical perspective it is impossible to analyze the world in a meaningful way except through the use of abstraction... which temporarily isolates, for purposes of analysis, one “moment” (or mediation) within a totality... The object of such an exercise in abstraction is merely to comprehend the larger concrete totality through the scrutiny of those specific mediations that can be rationally said to constitute it within a developing historical context.”

Hence, if metabolic rift theory follows the dialectic-materialist method, abstraction, to inquire into the parts of our *organic relation with the environment* (taking this as the totality) is simply a necessary methodological step. Aware of that, Moore (2011) does not throw away the whole theory, but encourages us to “use and transcend it” in order to arrive at a synthesis, the next phase of the dialectic-materialist method, with the ultimate goal of thinking capitalism differently. Moore (2011: 8) writes: “There is no denying that the dialectical method has been central to the metabolic rift.... But the central question posed by our shared commitment to a dialectical method and historically-grounded theory is this: How do we think capitalism differently as a result of metabolic rift investigations?” This is a very interesting question, but we should ask first if there are enough investigations to think capitalism differently. Have we learned all the lessons from the metabolic rift investigations?

There is no question of the perils of abstraction. We know that modern science did not manage to avoid that pitfall, and maintained a fragmentation model, in the process, separating the subject (the viewer, the observer) from the object (the observed). The fragmented view is useful for reproducing capital.⁸² Seeing nature as external to society became the required premise to develop the type of science and technology that controls and subdues nature.⁸³ Again, does the metabolic rift perspective reproduce that bias? For Schneider and McMichael (2010: 479) it may do so, because analysing “the subordination of labour and the natural world to capital, and in

⁸² The supposed human-nature separation is a functional fiction for the capitalist system. It enables the perpetuation of surplus accumulation. Polanyi, in his work *The great transformation* (1944) had already pointed out other concrete fictions operating within the capitalist economy, when he argues that land and labor are two fictitious commodities.

⁸³ Interestingly, in the western modern science realm there have been efforts to construct theories that challenge the fragmentation bias. However, methodologies related to modern science tradition are still used even when making an effort to give up of its premises. It seems that we are still in the transition phase from one way of thinking and analyzing the world to another one. Perhaps modern science is in a metamorphosis, and like animals in the metamorphosis phase, they use the cells of previous states to constitute their new shape. The caterpillar does not become a butterfly without using the cells that constituted the caterpillar.

‘seeing like capital’, we simultaneously render invisible labour practices/cultures engaged in reproducing or restoring natural cycles and processes ecologically.”

Unlike these authors, my position is that there is nothing wrong in “seeing like capital” as long as we explicitly acknowledge that we do so for the purpose of analysis. Thanks to that “way of seeing”, metabolic rift research made us aware that labouring for the purpose of producing exchange values drives toward an accelerated pace of extracting resources from nature. In other words, as Marx (cited in Foster, 2013: n.d) put it, “the creative potential (of real productivity to the fulfillment of human needs) was so distorted that labour power was seen as being ‘useful’ (from a capitalist exchange value perspective) only insofar as it generated surplus value for the capitalist.”

Taking this into account, metabolic operations are distorted. In addition, using the “seeing like capital” lens temporarily, we are able to interpret that the inner capital logic is a perennial “attempt” to divide what is indivisible, humans and nature that is, by distorting their metabolism. Thanks to this methodology, the theory arrives at the milestone conclusion that there is no capitalist development without socio-ecological contradictions because it is organically constituted of them. More importantly, as Moore (2011) recognizes, this theory let us locate those contradictions in time and space: time, moments of agricultural revolutions; space (geographically), in the permanent tension between town and country. Capital sees nature and society separated (disrupted or rifted) and we know it because the abstraction phase of the method of metabolic rift theory let us see it that way. However, once that moment of abstraction is transcended we realize that *it is not how* they (humans and nature) are indeed related.

The fact is that metabolic processes do not materially disrupt or stop as a result of capitalist operations. Regardless of capitalism, society and nature are organically connected.⁸⁴ The risk is that under the logic of capitalism the living environment (humans included) is at stake. From this viewpoint, rather than focusing on the concept of rift (or rifts), I consider more productive to refer to *metabolic distortions within capitalism*, because through its development, capitalism exhausts the breath of organisms that form the environment, leaving a trail of metabolic distortions in its wake. Understood as a metabolic distortion, I assert that there is no full

⁸⁴ For Toledo and Gonzales de Molina (2013), there have been different humans and nature metabolic relationships through human history. Therefore, capitalism is only one of many possible types of socio-metabolic regimes.

interruption of biological cycles, but their functioning changes in a way that erodes the environment (environment as the organic unit of human and non-human nature).

Taking this into consideration, industrial agriculture does not wipe out fully the connection between humans and land, but creates a type of relationship that is mediated by artificial functions of certain cycles (e.g. nitrogen cycle functions with the help of synthetic inputs) and mediated by geographical distance (e.g. global markets) that together slow or simply alter the metabolic process between human nature and non-human nature. Then, a *metabolic distortion* is a type of metabolism characterized by the sum of interruptions of some (not all) biological cycles, waste accumulation and a series of other manifestations of environmental degradation.

Recapitulating, the productive results of the critique are: it warns us away from a fragmentation bias and urges us to further the theory in order to arrive at a synthesis, in which the abstraction of society and environment as separated entities is no longer needed for analytical objectives. Without undermining Moore's (2011) effort to construct a synthesis with a unified world-ecology theory, I propose that the recent empirical work that uses a metabolic rift framework provides a good insight to construct the synthesis. My premise is that we need more understanding of how the metabolic distortions are inflicted. In the next section I examine empirical work based on the metabolic rift approach. This effort is in the spirit of demonstrating whether or not the metabolic rift has not gone far enough. What does the empirical work tell us about it? I inquire into the empirical research through the lenses of two critiques, one that questions if metabolic rift theory obscures labour/cultures engaged in reproducing and restoring processes ecologically; the second that asks whether the theory can only see purified social causes and purified bundles of environmental effects. Despite my position on focusing on metabolic distortions, I stick to the *rifts* terminology to enable a conversation with the literature.

Evaluating empirical work based on metabolic rift theory

The production of grounded metabolic rift research started in the mid-2000s with research on how capitalist operations affect some key biological cycles (Clausen and Clark, 2005; Clark and York, 2005; McMichael, 2008). Interestingly, these first grounded research efforts were conducted by scholars who were well-immersed in the elaboration of the theory.

Methodologically, it heavily relies on the abstraction of social causes of ecological problems, which in part substantiates the Cartesian binary critique. However, this corresponds to

an early, immature phase of empirical work. I support this idea because around the 2010s, the empirical research appears abundant with advanced approaches where analysis sometimes departs from abstraction of nature and society but always ends in a socio-ecological unity (Clausen, 2007; McLaughlin and Clow: 2007; Wittman, 2009; McMichael, 2008; Gunderson, 2011; Longo, 2012; Sbicca, 2014; Sanderson and Frey, 2014).

An important characteristic of this advanced research phase is an agenda about ways to heal, mend, or repair the rift, which I interpret as like paving the way to the synthesis because it shows a deliberate intention to seek out and explain practices (labor and cultural ones) that unite what the capital wants to separate. Clausen (2007), McLaughlin and Clow (2007) and Wittman (2009) pioneered work from the perspective of ways of healing and mending the metabolic rift.

Additionally, the “mending the rift” approach reflects that the power of the dialectic-materialist method lies in understanding a phenomenon and its counterpart; its logic and counter-logic. As a result, the empirical research puts labour and cultural practices that sustain a stable metabolism in contrast with other practices based in capitalist principles that generate metabolic distortions. In doing so, this research sheds light on the inherent political tensions in the process of substitution of one set of practices for another, which confirms that different social views of nature and society are always competing against each other. This is clearly seen in Wittman (2009), who innovatively links the social rural movements in Latin America for food sovereignty, addressing not only the social dimension but intertwined climate issues affecting the health of the land. Then, advocates of this social movement claim their right to be stewards of their environments, which Wittman (2009) interprets as a practice of a new agrarian citizenship. Such a practice firmly contests metabolic distortions.

Longo (2012) inquiries into disruptions of socio-ecological relationships in the practice of tuna fishing in Sicily and, while focusing on understanding the industrial practices that deepen metabolic rifts, the author finds simultaneously practices of previous generations who used to fish according to rhythms of nature (fish reproduction). Longo (2012) explains how, in the process of substituting traditional fisheries with industrial practices the fabric sustaining local fishing communities (social and ecological fabrics) were eroded, as well as the reproduction of the marine life itself.

In a similar vein, Gunderson (2011) explains the disruptions caused by the capitalist organization of the livestock industry (using data in the United States) and suggests that the

tendency to disrupt biological cycles can be counteracted by applying a more rational way of relating with animals, whereby humans and animals *share the house*, nature that is. Such a proposal firmly leans toward the idea that there is no human ownership of nature. Gunderson (2011) discusses ideas and practices of animal rights, as well as vegetarianism, within the development of socialist thought. Hence, contrary to what Schneider and McMichael (2010) were afraid of, metabolic rift analysis does not obscure, but enlightens labour/cultures that engage in reproducing or restoring natural cycles and processes ecologically.

In addition, the empirical work elucidates the intricate connections of institutions, economic policies and class struggles behind every set of labour/culture practices. In this line of research, Sbicca (2014) studies the influence of neoliberalism in the socio-economic metabolism of food production and consumption in urban spaces in the United States, and the class struggle and biased state intervention that anti-hunger, food security social movements have faced. Similarly, Sanderson and Frey (2014) shows that the institutionalization of rural-urban power asymmetries leads to a treadmill effect of land nutrients and water extraction. As a result, we can see the ecology of institutional and market regimes, and the economy behind the state of ecosystems. The theory does go beyond purified social forces and purified environmental consequences. It unifies both.

A significant outcome of this grounded metabolic rift research is that, without exception, practices that enable human and non-human nature to work organically and free of metabolic distortions are both labour- and knowledge-intensive. Individuals require a good deal of knowledge about their symbiotic relationship with the wider environment. Meanwhile, in capitalist practices, individuals have a piecemeal knowledge of themselves as elements of nature and their connections with it. Because of this, McClintock's (2010) concept of individual rift, and Schneider and McMichael's (2010) concept of "knowledge rift" are fundamental to expand understanding of the co-production of society and nature while using the metabolic rift theory. The point of departure of the two concepts is the problem of labour in capitalism.

On the one hand, *individual rift* implies that the separation of individuals from the fruits of their labour makes them perceive themselves as external to nature (McClintock, 2010). On the other hand, the concept of *knowledge rift* relates to the town-country division of labour (e.g. knowledge specialization in agriculture and industry). Schneider and McMichael (2010) build up this concept considering that the town-country division implies forcing people off the land, and

when they leave the land they take with them their culture, historical heritage and knowledge of agroecosystems that were fundamental for the resilience of their agroecosystem. Then, this knowledge is eroded because they migrate to a place where they no longer practice agriculture.

Thus, the *knowledge rift* concept brings to the fore that separation equally affects ecosystems and humans (or human and non-human nature). For instance, without the people who know how to work the land using the biodiversity of agroecosystems, some wider ecological functions are altered and artificial inputs are put in place to keep the land producing (e.g. pesticides). Simultaneously, when people are removed from the land, they “forget” that human reproduction depends on the fruits of the land, resulting in a misperception of the self apart from nature. Here the two concepts of individual and knowledge rifts converge.

McClintock (2010) discusses the concept of ecological rift and proposes the concept of social rift. The ecological rift and the social rift are useful tools to conduct a better analysis in the abstraction phase of dialectic method. However, this is just a moment to be transcended. Ecological rifts are created when a system of production depletes more than it regenerates the resource base (McClintock, 2010). Meanwhile, at the center of the social rift concept is the commoditization of land and labour. When treated as a commodity, land becomes a private property and people (not owners) inhabiting that land are removed and forced to sell their labour in urban centers. Interestingly, McClintock (2010) came up with these concepts of social and individual rifts based on analysis of urban farming and its potential to mend the rifts.

In conclusion, the examination of empirical work of the metabolic rift allows us to see that the theory has been useful to analyse different areas of production (marine ecosystems, livestock, agriculture, fishery, etc.). However, most of the innovative concepts, such as individual, ecological, social and knowledge rifts, emerged out of investigations of agriculture and food related issues in rural or urban spaces, or in the interrelationship between these two geographical spaces mediated by food and agricultural relations. My research is situated at the rural-urban intersection. Therefore, the state of the art of the metabolic theory discussed here, particularly the synthesis of the advanced applied research, is my foundation and point of departure.

Part II.

Mending the Rift: Towards an Integration of Metabolic Rift Theory and Agroecology

Se creó así una brecha entre teoría y práctica que domina nuestra condición teórico-política de hoy: una teoría semiciega que corre paralela a una práctica seminvisible. Una teoría semiciega no sabe dirigir, y una práctica seminvisible no sabe valorizarse.

There is a gap between theory and practice dominating our theoretic and political condition nowadays: a semi-blind theory running in parallel to a semi-invisible practice. A semi-blind theory is incapable of guiding and a semi-invisible practice is incapable of valorizing itself (De Sousa Santos, 2009: 31, my translation).

The research on metabolic rift, including the critique and the empirical work, revolve around labour practices, and I see in them the transformative power to change, distort or maintain metabolic relationships. Labour practice seems to be an overarching and wider concept: a human activity that integrates human life with other forms of life. Hence, farming, fishing, livestock are all “labor practices”. Put this way, every type of labor practice results from the combination of socio-ecological conditions (cultural, biophysical, political, traditions, etc.). Such an interpretation of the concept is in part a resonance of Schneider and McMichael’s (2010) proposal. They propose placing labor practices at the center in our analysis between capitalism and nature in order to avoid simplistic understanding of ecological processes, or worse, getting those processes wrong.

The ultimate goal, as they propose, is to specify the ways in which human and non-human processes interact to mutually constitute nature. However, the theory lacks a systematic approach to operationalize analysis that confronts or contrasts labour practices that foster metabolic distortions against those that fix them or keep up with a normal metabolism. Schneider and McMichael (2010) provide some guidelines, for instance, on the role of different systems of ecological knowledge (e.g., local ecological knowledge), but the theory of metabolic rift needs to integrate a more systematic body of analytical tools for the analysis on how that knowledge forms.

What is necessary is an approach consistent with the theory’s interpretation of unequal rural-urban wealth exchange and capital’s attempt to separate or disrupt the organic relationship of humans and nature. In addition, this approach must be equipped with practical tools to analyze degrees of metabolic distortions and ways to heal the rift (or fix the distortions). Furthermore, we need an approach that in the analysis of labour practice explicitly challenges dualistic views of nature and humans. I see that the agroecology approach offers a possibility. Agroecology is a practice and self-reflexive science, present in academia and social movement realms. I propose

endowing metabolic rift theory with a transformative power, thus enabling alternatives to overcome unequal socio-ecological relations (e.g. rural-urban; nature-human society).

A point of inspiration for doing this intellectual effort is the idea of De Sousa Santos (2009: 31), a prominent Latin American thinker, that “a semi-blind theory is incapable of taking the lead, and a semi-invisible practice is incapable of valorizing itself.” Hence, the integrative approach I propose is for the theory to make the practice of the alternative visible and take the lead of actual transformations. Why agroecology? For two reasons: agroecology is a paradigm for agriculture that contrasts with the dominant industrial agricultural model (Gliessman, 2010; Gliessman, 2002; Altieri, 1989; 1995); and is also a set of practical tools to transform the way people manage the agroecosystem.

In the body of literature of agroecology one finds an arsenal of concepts, research methodologies (Mendez et al., 2013; Uphoff, 2002; Norgard and Sikor, 1995) and understanding of ecological knowledge production that stand in stark contrast to conventional modern science (Wezel et al., 2009; Altieri, 2002; Hecht, 1995). Some scholars (Vandermeer and Perfecto, 2014) have found ways to complement, and intersect with modern science, especially from the realms of ecological science and agroecology.

Next, I discuss the complementarity between the foundations of agroecology and metabolic rift theory, then explain why this integrative approach is of special relevance for the Latin American context. The complementarity that I intend to probe could benefit both fields of agroecology and metabolic rift theory.

In the first instance, I argue that the metabolic rift theory offers to the agroecology field a cohesive theoretical foundation that also enables engagement in the politics of the alternatives. I do this echoing Gonzales de Molina's (2013) call for constructing a solid framework to enable agroecology to engage in politics. This author suggests constructing a “political agroecology” body, but perhaps instead of building a framework from scratch, a strong political economy foundation can be borrowed from the metabolic rift theory. Sevilla De Guzman and Woodgate (2013) advance this line of research by tracing the interconnections of agroecology and agrarian social thought. In their map of the currents of thoughts linked to agroecology appears metabolic rift theory, but it is just mentioned, not developed. In addition, the integrative approach I propose intends to set conceptual boundaries that prevent mainstream co-optation of the agroecological

approach. Recently, concerns of co-optation of the “alternatives” based on agroecology has arisen among agroecologist authors and advocates (Levidow et al., 2014).

3.4 Challenging Nature-Society Separation: Agroecology’s View of Agroecosystem and Knowledge Production

The agroecology approach stresses attention in-situ ecological farming knowledge; farmer as a central piece of ecological resilience and views of agroecosystem as a socio-ecological production system. As such, it can complement and operationalize the conceptual body of the metabolic rift theory in two themes: 1) nature and society separation; and 2) rural-urban unequal ecological exchange.

One of the most prolific developments in the field of agroecology started in the 1980s, with investigations of traditional farming systems in parts of Latin America (Wezel et al., 2009; Vandermeer and Perfecto, 2014; Mendez et al., 2013; Toledo and Altieri, 2011). Wezel et al. (2009) observed different evolutions of the approach of agroecology in northern and southern contexts and noted that the inquiries of the most prolific authors (in terms of number of publications) study Latin American contexts. Because my research is located in Latin America, those lines of research are of special interest. What is common element to North and South research of agroecology is the critique of industrial agriculture as a cause of world-wide rural poverty, rural migration, health problems, hunger, malnutrition and destruction of the resilience capacity of ecosystems (land degradation, water pollution, loss of biodiversity in the countryside, etc.) (De Schutter, 2010; Pretty, 2008; Altieri, 1995).

Additionally, there is recognition that the aforementioned problems are more profound in the southern countryside (Altieri, 1989), which in part explains why agroecology in the South is strongly anti-poverty and peasant-farming oriented. Such an agenda resonates in projects that enhance an ecological way of farming among peasant communities and in rural social movements. Perhaps the major strength of agroecology in Latin America is that three different facets, as science, movement and practice, appear integrated, a characteristic that has been documented in Wezel et al. (2009), Toledo and Altieri (2011) and Gliessman (2014, 2013). For Levidow et al. (2014), the transformative role of agroecology depends on integrating those three facets.

The focus on traditional farming,⁸⁵ very present in agroecological research in Latin America, originally sought elements of ecological farming design, based on the fact that this farming style does not rely or only marginally rely on the use of synthetic inputs and other external inputs. Recycling of on-farm resources, polyculture, management of biodiversity (e.g., biological pest control), among other practices, are found in traditional farming systems (Wilken, 1987; Perfecto et al., 2005). These practices have in common that they are labour-intensive.

All these elements distinguish traditional farming as fundamentally different from the industrial agriculture paradigm that is the cause of social and ecological problems in the countryside. More importantly, agroecological research based on traditional farming clearly asserts that ecological management is deeply dependent on, and attached to, the social organization and reproduction of people who practice it. In other words, the social organization backs the resilience of the ecosystems' biophysical functions. Furthermore, at the core of this type of farming is complex and sophisticated farmer knowledge of the biophysical functions of their local environment, which leads authors to conclude that deep ecological farming knowledge is site-specific (Toledo, 1992; Sevilla De Guzman et al., 2013). Such findings challenge the principles of universalism of modern science, which indicate that the same approaches should work in different contexts.

In addition, resulting from observations of the symbiotic and reciprocal nature-human relationship, agroecology challenges atomistic views of agroecosystem found in the science of agronomy. Agronomy understands agroecosystems as a set of physical conditions to be manipulated by humans. Meanwhile, the effects of such management on the resilience of society are considered external variables, not objects of scientific tasks (Altieri and Toledo, 2011). Instead, agroecology views the agroecosystem as a socio-ecological system (Toledo and De Molina, 2007). Therefore, research of social institutions, values, culture and economic organization that support ecological balance is absolutely necessary.

With these considerations, an agroecosystem can be interpreted as the environmental unit where humans and nature co-produce each other. Put this way, all changes in the social structure (institutions, cultures, values, knowledge production system) can be reflected in the performing of biological functions of the land. In addition, the body of literature of agroecology, especially

⁸⁵ Traditional farming is associated with peasants. Who the traditional farmer or peasant is becomes an important theme, which I discuss later in this chapter.

that focused on small-scale traditional farming, provides evidence of various agricultural practices (labor, in the language of metabolic rift theory) that maintain the indivisible human-nature unit in ecological agriculture. For the metabolic rift theory, such evidence can give substance to the character of a labour practice that performs a human-nature metabolism free of distortions, and also a foundation to systematize analysis of the social organisation that accompanies that practice.

In advanced frameworks and research of agroecology, the ecological performance at the farm level is linked to the larger food system. This is the agroecology and food system perspective and provides evidence of how synergies beyond the farm level (distribution, commercialization and consumption) and forces emerging from farm space (local, regional, global) affect the way people manage the land. For Gliessman (2010), a great achievement of research of agroecology from the food system perspective is that from the farm level, one can question institutions, culture, people's customs (including consumption patterns), and market organizations that deepen land degradation. From the farm-food system perspective, the farm is a window to more complex social relationships.

In the volume edited by Gliessman and Rosemayer (2010), the development of agroecological practices is analysed from this integrated view. Those contributions pave the way to study metabolic distortions (and also potential ways to fix them) originated throughout the food system but that are materialized on the farm. More importantly, these studies let us see that farming practices and the food system in which they are embedded are place- and time-specific. Hence, in the unified socio-ecological perspective developed in the integrated study of agroecology and food systems, I envision possibilities to fill out the gap Schneider and McMichael (2010) identify in the metabolic rift theory. The gap is the lack of a perspective that more explicitly engages nature (nature understood through agriculture) as a historical process, and that simultaneously recognizes that agricultural practices are time- and place-specific. Schneider and McMichael (2010: 470) state:

“As analysts of the relations between capitalism and agriculture (or perhaps of the relationship between capitalism and nature understood through agriculture), we should think about how capitalism and agroecosystems encounter and reshape one another as dynamic processes, instead of as static or organised systems. This necessitates not only

an ecological understanding of agricultural systems, but also a focus on the agricultural practices of particular times and places.”

Agroecology recognizes time and site specificities and can inform about changes in the agroecosystem at different points in time. This could advance the potential of metabolic rift theory to relate changes in the agroecosystem from a historical perspective.

On the other hand, agroecology can inform the human-nature relationship because it can give an account of how and why ecological farming knowledge production requires a constant relationship between humans with the land. From metabolic rift theory we know that the separation of people from the land creates a knowledge rift in the ecological way of farming; but how the contemporary farmer⁸⁶ learns and accumulate ecological knowledge is the evidence the theory does not have and that agroecology can offer. A paramount difference to industrial farming knowledge remarked in agroecological research is that farming knowledge is not bundled in a technological package delivered by external scientists and inputs generated in distant laboratories. Instead, “agroecology is knowledge-intensive based on techniques that are not delivered top-down but developed on the basis of farmer’s knowledge and experimentation. For this reason agroecology emphasizes the capability of local communities to experiment, evaluate and scale-up innovations through farmer-to-farmer research and grassroots extension approaches” (Toledo and Altieri, 2011: 588).

This is not to undermine the value of external scientific support but to restate the need to reconfigure the relevance of other types of knowledge. As Levidow et al. (2014: 1) put it: “To play a transformative role, collaborative strategies need to go beyond the linear stereotype whereby scientists ‘transfer’ technology or farmers ‘apply’ scientific research results.” In addition, these authors note that “agroecology can either conform to the dominant regime (food regime, that is) or else transform it, depending on specific empowerment strategies” (Levidow et al., 2014: 1129).⁸⁷

⁸⁶ I refer to the “farmer” generically just momentarily. Farmer is for now an individual, not an enterprise or a corporation, and because I take into account the literature of agroecology that focused on traditional farming and small scale farming, then “farmer” should be understood for now interchangeably as a small-scale farmer, traditional or peasant.

⁸⁷ Levidow et al. (2014), develop the conforming vs transforming thesis as related to the European context, where they see more clearly the “conforming” trend. Also very interesting is that they take the agroecology-food sovereignty peasant movement that originated in Latin America, La Via Campesina, as an example that better reflects the transformative power of agroecology.

Taking the conforming rather than the transforming tension into account, I purposefully lean toward agroecological research that promotes horizontal knowledge formation, particularly the kind based on the actual observation of contemporary experiences of horizontal sharing and learning of farming knowledge. The most successful contemporary example is the farmer-to-farmer knowledge creation between Guatemalan and Mexican *campesinos* (Holt-Gimenez, 2008). For many agroecologists this model has empowering strategies and has been widely discussed (Martinez and Rosset, 2012; Mendez et al., 2013; Gliessman, 2002; Altieri, 2002, 1989).

Participatory methodologies developed among agroecologists are an important tool to enhance, scale out and scale up this type of farming knowledge (Rosset and Martinez, 2012; Mendez et al., 2013). This is where agroecology connects to social movements and especially with peasant social movements. Rosset and Martinez (2012: 5) see in the close connection with social movements a potential space to reproduce this type of farming knowledge system because “social movements incorporate large numbers of people, in this case, large numbers of peasant families, in self-organized processes that can dramatically increase the rate of innovation and the spread and adoption of innovations.”

In terms of the metabolic rift, what does this farming knowledge paradigm imply? First of all, in this model of ecological farming, it is fundamental that the individual observes the ecosystem behaviour and experiments within it. For that, the farmer(s) must stay on the land in order to learn the environmental aspects affecting the present and evolving land conditions. Farmers must develop a sophisticated understanding of the agroecosystem’s behaviour and be capable of making decisions, in an active, reflective and creative labouring on the land. Thus, it is knowledge-intensive,⁸⁸ but also labour-intensive because a larger number of people are needed to perform complex ecological management. However, we should conceive the labour intensity as different than conventional conceptions, which relate labour-intensity with low productivity, while high productivity implies fewer workers.

In addition, in the language of conventional economics and even in political economy, labour intensity is seen as a low-skilled, routine, mechanical type of labour performed by a large number of workers. Then, one pictures a mass workforce, a number of individuals assigned to

⁸⁸ Agroecologists very often say that agroecology is *knowledge-intensive*, but is industrial agriculture non-knowledge intensive? Agronomists creating inputs and hybrid seeds also have some kind of deep knowledge. For a more clear distinction we should say that agroecology is a deep ecological knowledge embedded in the farmer. The other one is modern scientific-based intensive knowledge. Then, one is scientific-off farm knowledge intensive (industrial agriculture), the other is on-farm farmer intensive knowledge.

accomplish mechanical tasks that do not require development of skills, creativity or reflection. Under agroecological management, all individuals working a piece of land, be they owners of the land or hired workers, must share the complex ecological knowledge of the ecosystem in order to keep a consistent management. Neither *knowledge-intensive* nor *labour-intensive* concepts capture the two components of the type of labour applied in agroecological management. Instead, we should speak of *peoples' knowledge-intensive labour* to grasp the notion of local farmers' knowledge and highlight the qualitative difference of labour-intensity.

Furthermore, the horizontal character of this ecological way of farming requires retaining people in the countryside because it is *people-intensive*. Put differently, this way of farming may prevent further rural-urban migration (a contra-tendency to town-country division or rift) and favour a territorial rural-urban re-balance. A territorial re-balance allows keeping in the countryside an important socio-ecological wealth (labour/people and land nutrients) used in the process of food production, rather than transferring it to the cities. This is another point of coincidence, or proof of consistency, between agroecology and metabolic rift theory. Because in today's world economic and social forces increasingly push farmers to leave the land, agroecology provides a practical means for rural social movements to reclaim the capacity to stay on the land. This is particularly true for peasant movements, as illustrated by the transnational, global movement, *La Via Campesina*.⁸⁹

Indeed, *La Via Campesina* is a world-wide organization that uses agroecology as a strategic practical tool and discursive content for peasants and other small-scale farmers to stay on the land while producing food sustainably. But who are the peasants in today's world? Why has ecological farming become so central to them? The literature of agroecology itself does not provide a complete answer to these questions; therefore an examination of recent peasant debates and updated agrarian questions is necessary. The intersectionalities of these debates illuminate alternative agricultural practices that offer means of rural-urban rebalance. The rural-urban rebalance may be a way to fix the metabolic distortions resulting from the town-country division of labour, which has been the natural tendency within the development of capitalism. In addition, the conversation with recent peasant debates is coherent with the line of agroecological development predominant in Latin America. Moreover, these debates have permeated and informed approaches to analyze northern contexts (Desmarais and Wittman, 2014; Levidow et

⁸⁹ Here again, agroecology connects to social movements.

al., 2014; Van der Ploeg, 2008), thus proving their relevance for dealing with world-wide ecological and social issues related to agriculture and the rural-urban relationship in the 21st century.

3.5 From Rural-Urban Unequal Ecological Exchange to Territorial Re-balance

Small-scale farming has largely been agroecology's object of study, arguably for its high ecological potential (Gonzales De Molina and Woodgate, 2013). Smallholders around the world demonstrate resilience in the face of economic pressures and even drastic climatic change conditions (Koochafkan and Altieri, 2008). For this reason, agroecologists have proposed agendas for enhancing (scaling up and scaling out) these types of farming practices to cope with the environmental conjunction of our time, as well as socio-economic and food crises (De Schutter, 2010). For agroecologists and rural sociologists involved in agroecology, small-scale farmers "are closer to a rural rationality and practices that make the sustainable management of agroecosystems possible" (De Molina and Woodgate, 2013: 56).

FAO's recent report on the State of World Agriculture (2014) indicates that 72% of the total farms in the world are small in size (of less than one hectare) and *family type farms*, are what we need to ensure global food security, to care for and protect the natural environment and to end poverty, undernourishment and malnutrition. This shows that small farmers represent a large part of the current rural population and a reassessment of the socio-ecological value of their way of farming is a key to counteracting extraction of people (e.g. rural outmigration because of loss of livelihoods) and ecosystem wealth from the countryside.

For a long time, the anti-small-scale farming bias has prevailed in agricultural policies that follow the modern and industrial paradigm, which ultimately results in an economic model with an urban bias (e.g. agriculture subjected to production of cheap food for urban consumers) (Thompson and Scoones, 2009). Intrinsic to this paradigm is a productivist narrative and an unequal rural-urban exchange manifested in the transfer of human labour and ecological wealth (e.g., in the extraction of biodiversity wealth, water, land nutrients) from the countryside to the cities. The productivist narrative excluded small-scale farmers and considered them a temporal circumstance; thus, policies have been oriented to support small holders participate in economic growth as a way to integrate them in the modern and industrial paradigm (Thompson and Scoones, 2009). Such an approach has been a factor fostering a rural-urban territorial unbalance.

But who are the so-called small scale farmers? The spectrum can include many varied categories as small-scale entrepreneur styles, family, traditional, and peasant farmers. Although size is conventionally referred to as their common characteristic, there is a need to scrutinize their social conditions. Frequently, family, traditional and peasant categories are used interchangeably. Indeed, in the literature of agroecology, traditional and peasant farmers are often treated equally. As for family farm, the still relevant classical work of Chayanov (1966) refers to the peasant and family farm economy as the same. However, in more conventional references, a family farm can also be an entrepreneurial-enterprise, capitalist in nature, as long as it is operated by a family. Considering those characterizations, the spectrum of small-scale farming can actually be reduced to two truly distinct types of farmers: peasant and small entrepreneur farmers.⁹⁰ The peasant category has been the subject to formal studies, political discussions and social movements, and its importance is of special significance to my research.

Because a meaningful amount of agroecology literature explicitly leans toward peasant farming systems (Wezel et al., 2009; Altieri, 1989), an analysis of the peasant type of farmers deserves attention. For this endeavour, recent work on the peasant of the 21st century (McMichael, 2007; Van der Ploeg, 2008, 2010, 2011), which confronts old and classical approaches to peasants, is of special relevance. The virtue of this recent literature is that it departs from a critical review of classical peasant studies and goes beyond pure socio-economic and cultural approaches. Moreover, this literature contributes to an environmental perspective, which classical literature, mainly from sociology and anthropology, has not developed systematically (Van der Ploeg, 2008). In addition, the environmental perspective seems to gain attention even in updated versions of the agrarian question (Akram and Kay, 2010a, 2010b).

⁹⁰ A working definition of an agricultural entrepreneur is provided by Van der Ploeg (2008: 17): “It (agricultural entrepreneur) is assumed, a farm enterprise that is highly, if not completely, integrated within markets on both the input and output sides... the degree of commoditization is high.” Van der Ploeg actually proposes that entrepreneur and peasant modes of agricultural productions are the two relevant models. Is this a binary description? His argument rests on the fact that from 1950 on the agricultural modernization project reached worldwide and the States and their agricultural policies carried out a program of “peasants transitions to entrepreneur models”, guided by the tale of productivity and profitability. The transition was to transform the peasant’s purpose and even worldviews to farming and replaced them with a profit-driven activity, external-technology efficiency and high productivity. Thus, any deviation from the entrepreneurship model was thought of as “temporary imperfections”. For Van der Ploeg, such a view “translates into a denial of the typical way in which peasant agriculture unfolds—that is, a labour-driven intensification. And although “it (peasant way of farming) is a promising trajectory for tackling unemployment, food shortages and poverty; yet, it is absent on political agendas and in the international forums that discuss issues of agriculture and development” (Van der Ploeg, 2010: 19).

This new turn in peasant debates in part is influenced by agro-ecological research and current self-denominated peasant movements that use agroecology as a discursive and strategic tool to develop their way of farming (Wittman, 2009; McMichael, 2007, 2014). Altogether, it indicates that the ecological aspect of the peasant farming practice is what gives to peasants a renewed relevance in today's world. Even more important is the fact that peasants re-emerge on scene not as relic of the past and/or passive victims of capitalist development, but as a social class⁹¹ that has something to offer to a modern world in crisis (McMichael, 2014; Van der Ploeg, 2008).

In regard to the peasant category, Bernstein (2010: 3) provides a working definition:

“The term peasant usually signifies household farming organized for simple reproduction, notably to supply its own food (“subsistence”). Often added to this basic definition are presumed qualities such as the solidarity, reciprocity and egalitarianism of the village and commitment to the values of a way of life based on household, community, kin and locale”

In a recent debate about peasants and contemporary food sovereignty movements, Bernstein (2014) questions intellectuals in the food sovereignty arena who deeply engage with peasant food sovereignty movements. For him, their treatments of peasants largely miss the point that peasants are not all the same, which is clearly reflected in the fact that there is peasant class differentiation, an issue largely developed in the peasant studies tradition. For Bernstein (2014), the debate presumably ignores differentiation of the social conditions of the peasants. About this, McMichael (2014:7) responds sharply:

“As Bernstein has always argued, it is important to ask ‘are all peasants the same?’ (2014,13). Certainly they may look alike on paper (and I acknowledge some responsibility here). But it is not simply about categorical lumping. At ground zero, and in international discourse regarding the rights of up to 2 billion small producers, it is about the struggle for unity in diversity against a common foe (both material and discursive) —in this sense, as Edelman claims, ‘peasantness’ is a political rather than an analytical category (2009).

⁹¹ I don't argue with the fact that among peasants there is class differentiation issues (Bernstein, 2010). When I say “social class” it is especially in contrast to the capitalist social class.

Desmarais (2007) has comprehensively disclosed the class and political divisions within La Vía Campesina, but this does not negate the desire and need for unification to blunt the singular force and violence of commodification of land, labour, genetic resources and knowledges. This is why ‘peasantness’ is political” (McMichael, 2014: 7).

Instead of defining the peasant as a category, Van der Ploeg (2008) suggests a *peasant condition*. For Van der Ploeg (2008), the peasant as a concept should be seen as a fluid category, rather than a purely analytical one. The peasant condition he proposes then is related to a series of social processes. According to this author, the peasant’s social conditions are related to processes of permanent struggle for autonomy, creation and development of a resource base, control of the resource base and co-production of man and living nature. Here is how Van der Ploeg (2008: 23) defines the peasant condition:

“Central to the peasant condition is the struggle for autonomy that takes place in a context characterized by dependency relations, marginalization and deprivation. It aims at and materializes as the creation and development of a self-controlled and self-managed resource base, which in turn allows for those forms of co-production of man and living nature that interact with the market, allow for survival and for further prospects and feed back into and strengthen the resource base, improve the process of co-production, enlarge autonomy and, thus reduce dependency. Depending upon particularities of the prevailing socio-economic conjuncture, both survival and the development of one’s own resource base might strengthen through engagement in other non-agrarian activities. Finally, patterns of cooperation are present which regulate and strengthen these interrelations.”

By formulating the concept of the peasant condition, Van der Ploeg (2008) notes three important shortcomings in classical peasantry studies⁹², but I find one in particular fundamental for noting the ecological relevance of peasants today:

⁹² The three shortcomings in the peasant studies tradition according to Van der Ploeg are summarized as follows: first, separation of the world into two parts, the developed and the underdeveloped. Then, “peasants are seen as a hindrance to development (see Byres, 1991) and as an obstacle to industrialization as the way out of backwardness. Second: peasants’ ways of farming are largely neglected (this I cited fully in this text’s body). Third shortcoming: “peasant studies have generally been weak in acknowledging agency, which is an (unintended) consequence of their epistemological stance. Thus peasants figure as passive victims” (Van der Ploeg, 2008: 20-22).

“A second troubling aspect of the peasant studies tradition is that the peasant’s way of farming has largely been neglected: the emphasis has simply been on involvement in agriculture as one of the defining elements. That a peasant was involved in agriculture was taken for granted; but how peasants were involved, how they practiced agriculture and whether or not this was distinctive vis-a-vis other modes of practicing agriculture has been hardly touched, upon leaving aside exceptions such as the rich empirical studies realized by CIDA in Latin America during 1960s-1970s” (Van der Ploeg, 2008: 21).

In contrast, Bernstein’s (2010) definition is anchored in the peasant and agrarian change tradition.⁹³ Interestingly, when Bernstein lists the five broader themes in agrarian change and peasant studies, the environmental/ecological aspect is not there.⁹⁴ Once again, the relationship with the resource base is just indirectly related to the understanding of what peasants are. Thus, the problem with classical peasant studies, as Van der Ploeg (2008) points out, is not that they are wrong, but *incomplete*. Hence, from my interdisciplinary perspective, I question to what extent exploring *the peasant way of farming* would change the way we understand and analyze the

⁹³ In addition, emphasis on cultural aspects in definitions of peasants remain attached to bias of conventional political economy analysis, which conceive cultural aspects moulded and somehow determined by powerful economic relations (markets, labour division, technology) that are controlled by the outside capitalist economic forces. Consequently, peasants present and future are dictated to by the outside economic power. Put this way, they are the *passive victims of history*. For a long time, political economy materialism rested upon the idea that society is organized around both a base and superstructure. The base is constituted by economic relations (markets, prices, labour, capital, technology), while the superstructure is constituted of social, cultural and political relationships (power relations, institutions, means of ideology dissemination, like mass media). However, there has been a significant bias in this view: economic relations appear like the largest determinants of the socio-cultural and political relationships, then creating a view that rests on a major economic bias. This is how the economic narrative about the history and dynamics of society gained supremacy (this is an insight and a reflection I came up with after years of being educated in a political economy tradition, but it is not the problem or topic central to my research). The common division of society in terms of base and superstructure created a kind of deterministic view. Actually, Karl Kautsky, an important proponent of peasant studies, developed the framework of base and superstructure (see <https://www.marxists.org/archive/harman/1986/xx/base-super.html>). Although the base and superstructure perspective has received harsh critiques for its deterministic foundation, the fact that classical peasant studies were very permeated by that perspective gives us pause to question whether or not peasant studies have truly divorced from such determinism. After all, Bernstein (2010: 4) writes, that for him “peasant” and “peasantry” are restricted to... two historical circumstances: pre-capitalist societies, populated by mostly small-scale farmers and processes of transition to capitalism.” His position then situates the peasantry in linear and deterministic paths, where peasants are the arm length of powerful forces determined by history: they are left behind the development of capitalism (pre-capitalist) or subsumed by the development of capitalism (entering in agrarian transitions towards capitalism).

⁹⁴ The broader topics according to Bernstein (2010) are: 1. Class and gender differentiation in the countryside, 2. Divisions of access to land, division of labour and divisions of the fruits of labour, 3. Property and livelihoods, wealth and poverty. 4. Colonial legacies and the activities of states. 5. Paths of agrarian development and international markets (for technology and finance as well as agricultural commodities) and 6. Relations of power and inequality, their contestation and the violence often used to maintain them, from “domestic” (gendered) violence in Tanzania to organized class violence in Brazil.

organization of labour and the economy of the peasant household.⁹⁵ How would engagement with the ecological dimension of the peasant way of farming impact or change the way labour in peasant systems of production is analyzed? Although these are questions that deserve a full thesis treatment,⁹⁶ I suggest a line of investigation linking the approach to labour discussed in the metabolic rift theory and complemented with evidence from agroecology research. Here I only offer an exploration of such a line of argument, acknowledging that more research would be necessary.

As reviewed in previous sections, labour in metabolic rift theory is what relates humans and nature. Farmers relate with nature by working the land. If a *peasant way of farming* is a particular way farmers organize labour to relate with nature, or a particular involvement in agriculture, then the peasant way of farming is a type of human-nature metabolism. What are the particularities of this involvement with nature? How different is this from other ways of farming, especially from those related to the dominant industrial-agricultural paradigm, arguably anti-ecological?

This is where I see space for agroecology to complement this theoretical endeavour. Agroecology research in contemporary peasant farming systems proves that peasant farming practices are distinguished from the dominant industrial agriculture paradigm in the way they integrate into the agroecosystem, farming management and construction of ecological knowledge.

As a result, peasant farming models can be seen as prototypes of alternatives to socio-ecological imbalances present in the countryside, not only in southern but also in northern countries. Palerm (cited in Sevilla de Guzman and Woodgate, 2014) points out that farming peasant systems are prototypes of the agriculture of the future, because “they depend more on a technology based on the intelligent management of (natural) resources by means of human labour, utilizing minimal capital, land and fossil energy.” Actually, the core of my argument is not whether all the countryside should convert into peasant farming systems. Instead, as suggested by Van der Ploeg (2008, 2010), it is about understanding why this farming is becoming meaningful worldwide:

⁹⁵ Since treatments of peasants are deeply rooted in an economic narrative (through political economy), I think it necessary to interrogate that narrative and I do it from my environmental perspective.

⁹⁶ Also because I have an interdisciplinary perspective, my knowledge on peasant studies is broad, rather than deep (this being more natural to unidisciplinary frameworks). As a result, my knowledge of the peasant field of studies is limited, which is why I just allow myself to interrogate the vast field of peasant studies from the perspective of my background in environmental political economy and regarding some selected issues concerning this research.

“Farming worldwide is restructuring in to a peasant-like way of farming in response to the agrarian crisis of state-induced modernisation and accelerated by the financial crisis and the generalised economic depression “through a process of restructuring that is both multi-dimensional and multi-level farmers are reconstituting themselves into peasants (although important features of operating as peasants have never been completely absent), a process that is occurring as much in developed countries as in developing ones” (Van der Ploeg, 2010:1) .

In Francois Houtart (2014)⁹⁷, a scholar based in Ecuador, I find a more overarching socio-ecological distinctiveness of the peasant way of farming, which goes beyond differentiation from industrial agriculture. Houtart (2014: 11, my translation) writes:

“The ‘peasant farming’ term has been discussed. Some prefer to talk about family farming or small-scale farming. Although opinions may vary, what is essential is the contrast between an industrially organized agriculture and subjected to a capitalist logic and a production guided by autonomous peasants with a more holistic perspective of the farming activity (including respect for nature, organic food consumption, landscape stewardship). In other words, it is use value-oriented farming versus exchange value-based agricultural⁹⁸ activity.”

By linking the peasant way of farming with a use-value production system, Houtart’s (2014) notion gives a glimpse of the metabolic rift theory approach to labour. In the treatment of the metabolic rift theory in a previous section of this chapter, we know that a production system centered in exchange value creation, degrades nature and the worker, and it leads to the depletion of physical wealth from partial to full disruption of biological cycles. It is a production system that extracts physical wealth and human labour at a faster rate than it replenishes it. In contrast,

⁹⁷ Houtart (2014) was a main leader in the organization of a world conference about global peasant farming, from which resulted a book on current debates about peasant farming in Latin America. The volume title is *Agriculturas campesinas en America Latina. Propuestas y desafios* (2014).

⁹⁸ In Spanish “*agricultura*” is used indistinctively for farming and agriculture. I translated agriculture as farming when it refers to non-industrial ways of cultivating the land in the countryside, as I understand that in English “farming” is the term used to refer to the act of cultivating the land, managing livestock for a livelihood, but is not restricted to merely commercial endeavors.

the use-value rationality uses human work and nature in ways that enable the reproduction of an organic relationship between the worker and nature. It is a system of human-nature co-production. Put this way, when land and farmers' labour are not used primarily to produce commodities⁹⁹, then both can be restored and result in the re-establishing of farmers' energy and land's biological functions.

The non-commoditized logic of land and labour in the peasant farming activity is what allows them to not only convert ecosystems' wealth and human labour into a range of goods and services, but also reproduce them as resources.¹⁰⁰ Then, one can say that labour and land constitute the resource base that peasants can control (because they do not commoditize them), develop and grow. However, as noted in Van der Ploeg's (2008) peasant condition, it is not enough that the peasant has this resource base, but that s/he controls the processes, such as labour organization and farming knowledge, that enable reproduction independently from commodity circuits, so that they can *produce with their own resources*, instead of getting them from capitalist agricultural markets (inputs commodities and external assistance). Thus, the peasant production rationality brings back old problems to capital, what Lewontin (1998) calls the problem of industrial capital:

"The problem for industrial capital, then, has been to wrest control of the choices from the farmers, forcing them into a farming process that uses a package of inputs of maximum value to the producers of those inputs, and tailoring the nature of farm products to match the demands of a few major purchasers of farm outputs who have the power to determine the price paid. Whatever production risks remain are, of course, retained by the farmer" (Lewontin, 1998: n.d).

The fact that peasants can choose to produce with their own means opens the way to market autonomy and a degree of economic freedom. It is an autonomy that likely develops into a way of farming economically. The economic factor can explain why ecological/resilient farming is absolutely central to understand the continuity and/or re-emergence of peasants. Since mostly, if

⁹⁹ Bersnstein (2010) shows that some peasants become petty-commodity producers. However, Van der Ploeg tells us that they engage in commodity markets in ways that allows reproduce their resource base.

¹⁰⁰ That constitutes the co-production dynamic that Van Der Ploeg suggests in the definition of the peasant condition. Through time it manifests as an "evolving resource base". Understanding peasants' resource base in terms of evolution then means that the peasant way of farming is forced to innovate and develop ecosystems and labour management strategies to cope with changing conditions.

not entirely, operating outside commodity circuits, their economy and farming strategies are less impacted by global price fluctuations of agricultural inputs, for instance.

Through the contrast of use value and exchange value production rationality, then we arrive at the conclusion that what peasants do with and how they form their resource base, is what constitutes their distinctiveness with respect to ways of farming under a purely exchange value rationality. That could be one important instance to intervene in the debate. But, “are all the peasants doing the same?” Bernstein (2014) asks intellectuals and activists, who he feels “celebrate the peasant way”.¹⁰¹ For him, part of the problem is that vindictive peasants movements construct the peasant as the capitalist’s other, and “the wholly positive construction of the other incorporates an abstraction of ‘peasant economy’ (‘peasant mode of production) combined with what one may term ‘emblematic instances’ of the practices of the peasant ‘rank and file’ (Bernstein, 2014: 1041).

But then, one may ask, is there an only-peasant economy, a single peasant mode of production?¹⁰² In a footnote, Bernstein (2014) points out that Chayanov’s work is still the best work from which to learn about the peasant economy. Interestingly, Chayanov also constructs the peasant economy model in contrast to the entrepreneurship style units of production (is that also an elaboration in terms of the capitalist other?). Chayanov’s work is fundamental to understanding that one of the great distinctions of the peasant economy is the use of unpaid family labour. However, the problem again is that labour is seen from a purely economic perspective, for instance, the impact of unpaid labour on the household income. In addition, it is important to recall that Chayanov’s work is based on real life peasant units of production (farms) of the early 20th century in Russia, which by no means undermines his work, but remind us that it may be a site- and time-specific peasant economy.

If for any reason the generalization of the peasant economy is acceptable, would the mode of peasant production of the early 20th century be the same as that of the early 21st century? If this

¹⁰¹ This questioning is part of Bernstein’s skeptical comment on the peasant (2014) debate he engages in relation to peasant food sovereignty movements that I cited above in this section.

¹⁰² McMichael (2014) responds to Bernstein that the binary problem (capital vs capital’s other) is only a problem when analyzing peasants’ definitions through capital’s lens: “Such categorical binarism is not useful in understanding the movement’s significance. Food sovereignty counter-movement agency occurs within capital’s relations of subjection, but without accepting the terms of subjection (cf Beverley 2004). The movement is a dialectical or relational process – it’s not about which comes first; rather, it’s about which comes last! Food sovereignty is a movement within, against and (hopefully) beyond capital and its food regime, and so, as stated at the outset, the movement matures and evolves through struggle on a changing terrain (McMichael 2014b). It is only capital’s ‘other’ if objectified via a capital lens”. (2014b, p. 6)

is a valid question, then we could ask what remains equal and what is different in the functioning of the peasant economy of today. It is here where I see a complementarity among classical peasant studies, Van der Ploeg's approach to the peasant condition and resource base, and the agroecology approach. Such a complementarity could enable an analysis of how the whole household economy is affected by the evolution of the peasant's resource base, for instance identifying changes in crops and biodiversity management due to restricted unpaid family labour.¹⁰³ From this perspective, the problem of family labour will not be a purely economic problem, but a socio-ecological one. Also, it would allow assessments about ways that labour knowledge intensity required in the peasant ecological way of farming is economic or non-economic.

Hence, a different perspective opens up to analyze impacts of labour mobility from rural to urban settings or to other rural ones (nationally or transnationally) in the household economy. Rural-rural migration (or labour mobility), as well as rural-urban migration, within and between nations, is a critical phenomenon of our times and as McMichael (2014: 7) would put it, all these dynamics complicate what it means to be a peasant. For instance, "migrant labour circuits, and uneasy combinations of farming and farm-working, complicate what it means to be a peasant."

Although this labour mobility has normally been viewed as a path toward semi-proletarianization and pauperization of peasants (Akram and Kay, 2010b),¹⁰⁴ some research from the agroecological perspective provides more nuanced and complex results. In this regard, the work of Gonzalez-Jacome (2009) records the transnational peasant labour mobility from the Mexican countryside to North American farms and how, on returning, peasants change crops from self-consumption to marketable and more lucrative ones, with serious effects on agro-

¹⁰³ In addition, this different perspective on labor challenges other aspects of economic measures and standards, for example, productivity. Normally, peasant farming economy is deemed low productivity, because the typical measure does not include the resources- replenishing outcome of this way of farming. If production or reproduction of biodiversity is taken into account, the peasant way of farming would be more productive than a typical industrial-base farming. In this regard, the work by Pretty (2006) is fundamental, as it presents comparisons of crop yields and replenishing capacity of ecological farming (which happened to be small-scale!) against the industrial-base.

¹⁰⁴ Akram and Kay (2010) point out that this stratum was described by Lenin as no-peasant non-proletarian. These authors then add, of rural populations, "in order to survive they must be able to sell their increasingly commodified labour-power, which is productive of surplus value, and an inability to sell labour-power results in pauperisation. This then is why this stratum is separated from the productive agricultural subsectors: with insufficient means of production, they do not produce for exchange but rather sell their ability to work and, indeed, their potential to produce surplus value". Interestingly, these categorizations of the peasant are in relation to their "ability or not to engage in exchange value production system". In other words, the degrees of pauperization are related to their ability or not to produce commodities. Perhaps the analysis would be different if considering possibilities in which engaging in outside labour is for the purpose of enhancing/continuing a use-value production system.

biodiversity.. For example, peasants coming back from temporal work in strawberry farms in Central California substitute self-consumption crops for commercial strawberries. Along a similar line, but with different results, Öztürk et al. (2014) in their work on *Smallholder Autonomy and Rural-Urban Kinship Communalism in Turkey* give an account of how peasant mobility from their own farm work to urban employment favours the continuity of an ecological way of farming. As a result, the land contains and reflects labour mobility, which confirms again the co-production dynamic of peasants and their resource base. In addition, labour mobility back and forth from the farm also offers an area for studying the extent to which the terms of unequal rural-urban exchange of wealth (nature and labour) are deepened or reversed with such mobility.

All in all, the value of Bernstein's sceptical comment on the peasant way is that it encourages us to see the peasant way of farming from an economic viewpoint. However, the peasant economy should be constructed differently when integrating the perspective of labour as a practice that transforms the resource base (the worker/farmer and biological cycles).¹⁰⁵ In addition, the critique warns us about the non-existent universal peasant and allows us to see that there are peasants with different social conditions. Thus, we should be also cautious when framing the peasant economy as a single model and applicable for all type of peasants. Likewise, caution in generalizing the *peasant way of farming* is necessary. With that said, there is no way for reification of the peasant, but neither for a reification of historical determinisms of the future of the peasant.

In sum, the peasant way of farming can be viewed as a form of agricultural production that departs from use-value production rationality but that can but not necessarily move towards different commodified relations.¹⁰⁶ Commoditization, however, does not necessarily end up in farming under exchange-value production rationality, for instance entering labour markets. Van der Ploeg (2010: 8) explains such a possibility:

“Strictly speaking it could be argued that relying on engagement in labour markets to reproduce the farm could be viewed as the very antithesis of non-commoditised renewal. I think such reasoning is incorrect: while savings obtained through pluriactivity (including

¹⁰⁵ This is not to say that Bernstein is not aware of this definition of labour, but the point is that the political economy of peasant studies tradition does not go far enough with this perspective.

¹⁰⁶ For instance, when some family members sell (commodify) their labour, or when some peasants start becoming petty commodity producers and then commercialize all or some of their produce.

trans-border migration) may have a commodity history, they nonetheless enter the farm unit as non-commodities. Their use is no longer dictated by the logic of the market but by local repertoires and needs.”

As a result, the peasant way of farming, similar to the concept of peasant, should be seen as a fluid category; this means a fluid system, and not static mode of production, but subject to change according to different social conditions.

Perhaps, by exploring further peasants’ farming practices, one can find contemporary examples of an organic human-nature metabolism. Documenting those practices would reveal the social and political tensions required to defend such a human-nature relationship. On the other hand, the realization that peasants innovate and develop ecological management strategies may help us understand the innovation forces underneath a use-value production rationality. However, this does not mean that there is no need of any type of developmental policies for peasant farming and farmers.¹⁰⁷ In fact, this perspective contradicts historical deterministic views that see peasants as a historical circumstance, either a pre-capitalist society or a form of social organization in transition towards capitalism, to which Bernstein (2010) and other well-established scholars in classical peasant studies would adhere. Such a view portrays peasants either as a relic of the past (pre-capitalist) or as expected to conform into capitalist markets in the future, through conversion into exchange-value production rationality.

A serious scrutiny of the peasant way of farming should lead us to more useful policy interventions, for instance, policies that deal with issues of household labour availability, as well as access and development of skills based on local ecological knowledge. These new perspectives would offer alternatives to the 580 million small farmers that FAO categorizes as family farms and whose social conditions are very similar to what Van der Ploeg (2008) describes as a peasant condition.¹⁰⁸ Hence, there is space to infer that a very significant number of farmers in today’s

¹⁰⁷ Therefore, we should not just make a reification of the peasant ecological way of farming. It could be harmful for peasants themselves because it could send the message that any policy or support is not needed.

¹⁰⁸ Comparing FAO’s definition of family farming and the peasant condition as defined by Van der Ploeg, one finds that most of the family farmers included in FAO’s report have a peasant condition. I find resonance with three aspects of the peasant conditions: ownership of a resource base, dependence upon reproduction of the resource base and pattern of cooperation. Although FAO acknowledges that there is no universal agreement on what a family farm/farmer is, the working definition this organization uses, coincides with key aspects of the peasant condition of Van der Ploeg. In the first place, *ownership of the resource base*, household labour and partial or full ownership of the land are crucial aspects in FAO’s definition of the family farm: “definitions of a family farm require that the farm be partially or entirely owned, operated and/or managed by an individual and her/his relatives... Several definitions

world have a peasant condition and central to them is a way of farming with ecological potential and closer to the use-value rationality. With these people staying on the land, the terms of economic and ecological rural-urban exchange can challenge the urban bias of modern development projects (McMichael, 2007). However, we have to know more about how to harmonize the labour shortage and the intensive labour requirements of ecological farming. Furthering this line of the debate could provide a stronger foundation to assess the future of ecological farming.

of family farm also require that the family supplies most of the labour on the farm.” Secondly, *dependence upon reproduction and evolution of the resource base*: FAO highlights that family farmers, particularly in the south, strongly rely upon agro-ecological conditions and family labour availability, which resonates with dependence of a resilience resource base: “the size of family farms, their production patterns and their use of inputs, land and labour depend on agro-ecological conditions, relative prices of inputs and outputs, the size of the family, and the functioning of the labour market” (FAO, 2014). Thirdly is *patterns of cooperation*. FAO stresses the importance of flexible ways of family labour incorporation when employment opportunities outside the farm are restricted.

Chapter 4:

Methodology and Methods

Part I.

Disentangling the Chains: Towards a Use-Value Perspective of the Commodity Chain

4.1 From Site of Research to Research Questions

Drawing upon my theoretical framework of metabolic rift, I frame the rural-urban relationship discussion within the history of the development of global capitalism. Using the concept of *metabolic distortion* that emerged from Chapter 3, I represent the site of research as the material and geographical form of a country-town *metabolic distortion*. In the theoretical examination, I distinguished *metabolic rift* from *metabolic distortion*, where the former is a methodological category representing a completed or finalized process of social division of labour between country-town, which results in an unbalanced transfer of wealth (physical and human) from countryside to cities. The latter, *metabolic distortion*, emerged from the recognition that the country-town division of labour within contemporary capitalism is an ongoing process, not finalized. From this standpoint, the rift is in the making; country-town maintains a metabolic relationship but one of a distorted nature. Because Milpa Alta has a double rural-urban character, it does not conform to a purely rural-urban (or country-town) category. Nonetheless, because it is an interphase, it tells the story of tensions in the city-town metabolism at play and in two directions; one, towards concretizing or shaping rifts; another, towards preventing and/or healing disruptions. The case of Milpa Alta reflects the tensions of those contradictory processes more profoundly because it is exposed to a fully globalized mega-city and has resisted being subsumed into urbanisation for centuries.¹⁰⁹

According to the literature, the deepening of metabolic country-town distortions relates to unequal country-town transference of physical and human wealth, a phenomenon deeply related to the development of world markets. One of those unequal transferences can be seen in the massive production of cheap food to feed urban populations. The development of global markets within capitalism has enabled the transference of wealth in the form of food commodities from the distant countryside to cities, which weakens the food linkage between cities and the local countryside. Nowadays, Mexico City's food market is fully immersed in world markets. This is

¹⁰⁹ Though the intense urbanisation process of Mexico City happened in the 20th century.

apparent in the predominance of transnational supermarkets across the city, through which the urban population is exposed to internationally imported foods and food brought from other states of Mexico. Nonetheless, a food item, nopal (an edible cactus), still connects Milpa Alta and Mexico City. Therefore, this site of research, and specifically the story of nopal, can tell us about the processes of linking and de-linking these two spaces. Because not all the linkages are broken, there is opportunity to inquire into that which sustains, shapes and reshapes the existing food linkages. My proposition is that the interlocking of human (history, economy, social organization, culture) and non-human aspects (land quality, water availability, agroecosystem) have a role in reproducing this space. Then, in order to reveal the linkages, I focus on the commodity chain methodology.

4.2 Selecting a Methodology

For conducting my inquiry in a coherent methodological way, I first selected the commodity chain methodology and applied it to nopal (see discussion below). The basic notion of the commodity chain is the tracing of an item through the process of production, commercialization, distribution and consumption. I expect this methodology to allow identification of linkages among actors related to and influencing Milpa Alta production of nopal; and across spaces (from rural to urban spaces, from local to global markets). I am particularly interested in interpreting links and de-links as sources of mending or enhancing distorted metabolic relationships between the town and country. For that, I need a type of commodity chain analysis to understand the material and abstract spaces where the distortions originate. For instance, part of the material space is the agroecosystem where nopal grows, while an abstract space refers to market relationships, culture and social meanings embedded in nopal. Nopal's production, commercialization and consumption intertwine with peoples' culture, markets and ecosystems; therefore, a nopal commodity chain can reveal both human and non-human dimensions involved in the country-town metabolic distortion. Next I will explain what a global commodity chain is, why it is consistent with my inquiry and my theoretical framework.

4.3 Historical and Theoretical Grounds of Commodity Chain Methodology

The commodity chain methodology was proposed by Hopkins and Wallerstein (1986) in response to the large research agenda, within the field of world-system theories, that intended to document

the patterns of the capitalist world-economy as a historical system marked by a world-scale division of labour and phases of contraction and expansion. For the authors, “a commodity chain is a network of labour and production processes whose end result is a finished commodity” (Hopkins and Wallerstein, 1986: 159). The “commodity” focus is justified by the fact that the distinctiveness of capitalism is a widespread commodification of processes -- not merely exchange processes, but production processes, distribution processes and investment processes -- that had previously been conducted other than via a market (Hopkins and Wallerstein, 1986). The term “chain” reflects the procedure of this methodology: a consumable item (commodity) is selected and traced back to the nodes of operations involved in producing the commodity¹¹⁰.

It is important to note that this methodology came into being in the middle of a debate on whether globalisation or internationalisation of production became the organizing principle after the industrial period of capitalism. Hopkins and Wallerstein (1986) actually used this methodology for the first time to argue that such phenomena appeared much earlier, in the 16th century, with world trade as the organizing principle. The authors wanted to validate that:

“the development of productive forces in Europe (what Adam Smith called “The Wealth of Nations”) was initiated primarily through the transformation of trade surpluses between distant points into a true division of labour with integrated production processes crosscutting political jurisdictions and that the state-level and local processes ensued therefrom. The boundaries of the division of labour are therefore properly defined by the effective geographical reach of the production and labour processes thereby integrated, not by town or national boundaries” (Hopkins and Wallerstein, 1986: 158).

To demonstrate this, they selected two fundamental commodities of the 16th century, ships and wheat flour. Then, this methodology provides the empirical grounds for researching the dynamics and drivers of a capitalist world-economy.

This first elaboration of the commodity chain is powerful because it demonstrates that place and locality are no longer barriers for capitalist accumulation; therefore, it provides a vast terrain to think about how an abstract economic geography actually rules the organization of localities.

¹¹⁰ The reader may consider this methodology linear thinking. I will discuss this characteristic and how innovations in the methodology overcome that limitation.

The commodity chain methodology starts from the material representation -- a commodity that is of complex economic and social processes -- and in tracing back the operations of producing it, the radiography of more of an “abstract economic geography” is revealed. Through this methodology, it is seen that the extraction of surplus articulates beyond the boundaries of place, normally set in terms of political demarcations (such as nation-States).

Wallerstein and Hopkins (1986) construct the chain considering two steps. The first step delineates the anatomy of the chain; the second step records four key properties of each operation or node, which are the following: 1) flows between nodes and operations; 2) dominant kind of relations of production within a node; 3) dominant organization of production including technology and the scale of the unit of production; 4) the geographical loci of the operation in question (Wallerstein and Hopkins, 1986: 162). The proposed methodology allows us see the following qualitative variations in the chain: 1) geographical distribution of the operations; 2) the forms of the labour force encompassed in the chain; 3) the technology and type of productions; and 4) the degree of dispersion/concentration of operations within each site of production. Transformations in the chain can be observed in different moments; then one can identify intervals of time during which a certain structure of production operations endures.

The centrality of labour can be seen in two ways: 1) in terms of labour power as input of the production; and 2) as a link in the chain which has to be reproduced and is therefore linked to other commodity chains.

Disentangling the chains: Commodity chains and related methodologies.

The use of the commodity chains or related metaphors, such as commodity circuits, networks, systems, and systems of provisions proliferated in the 1980s and 1990s (Leslie and Reimer, 1999; Bair, 2005; Challies, 2008). The presumed affinity of these various related methodologies makes the task of distinguishing benefits, bias and potentials difficult. However, critical and extensive reviews of the genealogy and relevant critiques of these methodologies help “disentangle the chains.” I use fundamental contributions by Bair (2005, 2009), Leslie and Reimer (1999) and Challies (2008) and a more recent contribution of Bair and Werner (2011) to help me in this endeavor. Because the reader can find a detailed analysis of the genealogy and discussions in those contributions (Bair, 2005, 2009; Bair and Werner, 2011; Leslie and Reimer, 1999; Challies, 2008), I only concentrate my effort in mapping the lineage and main points of critiques.

Since the original elaborations of the methodology, two lines can be distinguished. A first one embraces methodologies that claim to share the world-system theory terrain of the original commodity chain. Thus, the original commodity chain methodology, global commodity chain (GCC) and global value chain (GVC), appear here. A second line is formed with the methodologies that were constructed either in critique of the path methodologies in the first line has taken or in response to the needs of case-specific studies. Commodity circuits, global production networks, commodity networks, and systems of provision are in this second set. Although the review by Leslie and Reimer (1999) categorizes this second set as “alternative” methodologies, Challies (2008)¹¹¹ and Bair (2009)¹¹² see them as critiques that can potentially enrich the main lineage of methodologies (CC, GCC and/or GVC) or that have been already absorbed in them. Taking that into account, I stress attention to the main lineage and discuss critiques that point out problems of linearity, space and cultural issues as gaps in the main line of methodology. I include these critiques in a way that is consistent with my research inquiry.

Commodity chain, GCC and GVC are seemingly the closest siblings in this methodological family. Discussion of the differences between the three of them is the main focus of Bair (2005), summarized in Table 4-1:

Table 4-1. Contending Chain Frameworks

	Commodity chain	Global commodity chains	Global value chains
Theoretical Foundation	World-systems theory World-systems theory International business foundation Organizational sociology	World-systems theory Organizational Sociology literature	International business Global commodity chains

¹¹¹ Challies reviews “alternative” methodologies such as commodity networks and commodity circuits and contrasts them with the Global Value Chain. He concludes that the critiques of the former ones can actually be absorbed in the global commodity methodology.

¹¹² Bair (2009) considers the Global Production Network as the closest “alternative” methodology to the commodity chain tradition. She points out that GPN evolved in dialogue and as a critique to research done under the GCC banner, but for her “despite the different emphases of the GPN framework and the efforts of its proponents to distinguish their approach from the GCC framework, most research carried out under the banner of the former consists of detailed and empirically rich case studies, and thus does not differ greatly from analyses of global commodity chains in terms of methodological approach” (Bair 2009, p. 4).

	literature		
Object of Inquiry	World-Capitalist Economy	Inter-firm networks in global industries	Sectoral logics of global industries
Orienting concepts	International division of labour Core-periphery, semi-periphery Unequal Exchange Kondratieff cycles	Industry structure Governance (PDCC/(BDCC distinction) Organizational learning/Industrial upgrading	Value added chains Governance models (modular, relational, captive) Transaction costs Industrial upgrading and rents
Intellectual influences	Dependency theory Structuralist development economics	MNC literature Comparative development literature	International business/Industrial organization Trade economics Global/international production/networks systems s
Key Texts	Hopkins & Wallerstein (1977; 1986) Arrighi & Drangel (1986), Arrighi (1990) <i>Review</i> , 23(1), 2000	Gereffi & Korzeniewicz (1994) Appelbaum & Gereffi (1994) Gereffi (1999), Bair & Gereffi (2001)	Humphrey & Schmitz (2000) <i>IDS Bulletin</i> , 29(1), 2000 Sturgeon (2002), Gereffi <i>et al.</i> (2005)

Source: Bair (2005: 160)

The original view of commodity chains holds that globalization and global firms are not a novelty of contemporary capitalism.¹¹³ Nonetheless, GCC followed the assumption that upgrading the position of firms within the global chain would benefit the industry and generate development in the nation where the firm/industry is based. Gereffi, a prominent scholar in this field, justifies this agenda through the questions: “What potential is there for firms, industries, and societies from the developing world to ‘upgrade’ by actively changing the way they are linked to global value chains? How can economic actors gain access to the skills, competencies

¹¹³ As such, the contestable point is that contemporary global firms are not initiating the process of global economic integration, as there is support for the view that this process started in the 16th century.

and supporting services required to participate in global value chains?” (Gereffi, cited in Bair, 2005: 161)

Then it emerged that value was the fundamental aspect for upgrading the firms, which encouraged the narrowing of the focus toward tracing the value within the global commodity chains, which gave rise to the global value chain (GVC) analysis. For that reason, appeared as an innovation of the GCC. However, this variant seems to be a more distant sibling of the original commodity chain analysis. Its theoretical framework shows a stronger affinity with the international business literature than with world-systems theory (Bair, 2005).

In targeting processes of firm/industry upgrading through competitiveness (and value generation) in the global trade markets, the GVC approach is further from the holistic perspective of the world-systems treatments. As a result, the GVC analysis carries an apparent economic bias. Furthermore, it is presumably a bias easily assimilated in conventional economic views, which disregard the production of uneven development¹¹⁴ in the extraction of surpluses within capitalist economies. Hence, the diverging points among the original commodity chain—the GCC and GVC—can be summarized as follows:

- CC studies deal with macro analysis such as the global economy, while GCC and GVC look at meso (industry) and micro (firm) levels. Research on GVC abounds in studies of industries (e.g. garment, automobile, horticulture).
- GCC and GVC contend that contemporary international firms *are integrating* with the global economy, while for CC theorists they have *been* “an integral part . . . of the functioning of the capitalist world-economy since it came into existence in the long sixteenth century” (Wallerstein 2000, cited in Bair, 2005:156).
- CC is a holistic perspective because it not only analyzes economic relations but insists on social action and social change beyond the boundaries of capitalism. For Bair (2005), this

¹¹⁴ Bair (2005: 157) recalls that the “world-system tradition is actually against the myopia of the developmental illusion.” In Hornborg (2009), one finds this point about why discussions of uneven development are avoided clearly articulated: “For centuries, there has been a widespread intuition in both capitalist core nations and more peripheral areas that the economic and technological expansion of the former occurs at the expense of the latter... It is not difficult to understand this discursive resistance to moral qualms about development. In the core nations, politicians would be unwise to suggest that the average living standard in the country is unjustly high from a global perspective. In peripheral nations (the so-called ‘developing’ or ‘less developed’ nations), attempts by individual politicians to challenge global inequities and power structures have backfired in various ways, for instance through military interventions sponsored by the core, loss of economic benefits and support linked to established trade patterns, and the inability to offer a credible and attractive political program to the electorate (see Hettne, 1990). A fundamental problem is the inclination in both core and periphery to define ‘progress’ in terms of economic growth and technological advances (Norgaard, 1994)” (Bair, 2005: 245).

type of analysis is the sine-quantum of the world-system perspective and it is reflected in the commodity chain analysis: “the insistence on analyzing social action and social change within the holistic context of a European-centered world-economy which emerged during the ‘long sixteenth century’ is the sine qua non of the world-systems perspective” (Bair, 2005: 156). Meanwhile, GCC and GVC are markedly economic and see possibilities of changes within the boundaries of capitalist world trade.

- The GCC-GVC duo does not contest the very nature of surpluses extraction mechanism within capitalism; rather, they conform to the notion of national development with less attention to the production of uneven development within capitalism and the persistence of a hierarchical world-system order.

Confronting weaknesses of commodity chain analysis

With the above considerations in mind, I keep to the original commodity chain methodology for my research inquiry. The main problem to confront is the arguable abstraction of space of this methodology. Although the significant contribution of the original CC is that it “de-spatializes”¹¹⁵ operations of the capitalist economy, after investigation, the undermining of space and place became the weakness of this methodology. The critique points out that putting the space aside leads to ignoring the significance of cultural, historical and environmental connotations that influence the production of a commodity. In response, other methodologies attempt to overcome this “weakness”, such as systems of provisions, commodity circuits and global production networks.

However, these alternatives rely upon theoretical foundations different from world-system theory (Leslie and Reimer, 1999; Bair, 2009). Noteworthy is that these alternative methodologies critique the GCC and GVC variants, not the original methodology. Additionally, their call for place and space is followed by the need to grasp symbolic meanings, discourses, physical content, environments, knowledge and representations around the commodity (Challies, 2008; Leslie and Reimer, 1999). In addition, it is the analysis of food commodity chains that contributed substantially to revealing the importance of space and place, and pushed forward efforts to spatialize the chains (Leslie and Reimer, 1999).

¹¹⁵ De-spatializing in the sense that it is no longer bounded by physical geography based on political demarcations.

Food production brings to mind the material realities of production in several ways. In the first place, natural processes and environments are very apparent in the production of fresh foods. The quality and quantities of food produced are related to the functioning of the agroecosystem as a whole. Food reveals cultural components because peoples' diets develop not only in response to economic factors. Instead, food is deeply connected to the history and culture of the people who either eat and/or produce it. A number of scholarly works have opened the "Pandora's box" of food culture (Winter, 2003; 2004; Cook, 2006; Cook et al., 2011; De la Peña and Lawrence, 2011), revealing complex issues beyond tradition. Cultural identity is one of those issues, and with it social class, race and gender tensions that ultimately attribute values to food. Therefore, the belief that culture is embodied in food like an anecdotal and marginal factor can no longer be accepted. Food, be it whole, processed or cooked, conveys deep cultural connotations and that shape food commodity chains (De la Peña and Lawrence, 2011; Cook, 2006; Cook et al., 2011). Additionally, food chain analyses challenge the productivist bias of GCC and GVC, as it is at the consumption level of food where cultural elements come to the surface.

Challies (2008) states that these critiques can (potentially) be absorbed in the GCC or in the GVC version. However, Werner and Bair (2011) consider that scholars sympathetic with the overall thrust of the commodity chain ended up lacking a coherent way to absorb the critique. Some of their efforts diverted to "territorialized", "embedded" and "spatialized" approaches. Nonetheless, Werner and Bair (2011: 989) keep from those critical engagements "its generative if largely unrealized potential for interdisciplinary theorizing of the ongoing processes by which global networks of production, trade, and consumption are continually given expression in concrete historical and geographical relations."

In turn, they call for examinations of site-specific historical and geographical relations from the perspective of disarticulation and uneven geographies.¹¹⁶ The disarticulation perspective aims to overcome the "incorporation bias" of the extant literature of commodity chains manifested "in the tendency of researchers to pursue the newest production frontier of a particular commodity in order to analyze how a region becomes linked into a chain and how this incorporation impacts local actors" (Werner and Bair, 2011: 989). For Werner and Bair (2011: 989), the bias resulted in a tendency to overlook, if not ignore, the fact that "changing geographies of global production

¹¹⁶ Werner and Bair edited a special issue in *Environment Planning A* in 2011 revolving around the disarticulation and uneven geographies perspectives to commodity chain. The contributions to the issue draw on historical site specific characteristics of the places and peoples participating in global commodity chains.

reflect moments of inclusion and exclusion. The latter refer to those processes by which regions and actors become disconnected or expelled from commodity chains that may be incorporating new regions and actors elsewhere.” The inclusion and exclusion of places and actors within a chain is deeply related to their site-specific historical and geographical contexts.

In keeping with this argument, Werner and Bair edited a special issue on production of commodities through the lens of reproduction of uneven geographies¹¹⁷. The contributions explore various site-specific factors that explain moments of inclusion and exclusion of some places and peoples, ranging from cultural, historical and ecological factors that produce and reproduce a commodity chain, but simultaneously reproduce uneven geographies. From all the contributions to the special issue, two resonate with my research: Bair and Werner (2011) and Lieba Faier (2011). Bair and Werner’s (2011) paper reviews how the agricultural and *ejido* history of La Laguna, Mexico, influenced the way this region connected to the garment maquiladora global commodity chain. The history of social land ownership inherited from the post-revolution land reform times in Mexico enabled La Laguna producers to organize in cooperatives of cotton production and work simultaneously in an emerging garment maquiladora. Historical conditions facilitated the incorporation of this place into a global commodity chain. However, after some years of a seemingly successful incorporation, the position of the region within the chain declined. A possible explanation for the declining process is that the connection to commodity chains occurs within a larger global dynamic that operates under an uneven geography. However, this does not rule out the possibility of integrating the region into the global economy. Indeed, the new geography may provide the site-specific characteristics that enable inclusion in a different commodity chain. As a result, places and actors produce and reproduce commodity chains and vice versa. The back and forth feedback is what creates moments of inclusions and exclusions.

Lieba Faier (2011)’s study of the matsutake (a Japanese mushroom), which focuses on nature as an actor in reproducing this food commodity chain, reveals how the interaction of nonhuman (related to ecosystems) and human factors (cultural, processes of trade and distribution, etc.) influence the ecologies of the sites of this mushroom production across Japan. The quality and quantity of matsutake deeply relies upon the interaction of human and nonhuman factors. For instance, the spread of forest disease affecting the mushroom occurs in the

¹¹⁷ See *Environment and Planning A*, 2011, 43.

distribution and trade processes of lumber (human factors) and in natural ecological conditions (nonhuman factors). Weather and rain patterns also affect the quality of matsutake differently across Japan. Changes and uncertainties in ecologies of this food production ultimately determine which producers are capable of getting the best position within the chain. Additionally, those human and nonhuman factors have an influence on the price obtained from year to year.

Although the research linked to the articulation and disarticulation concepts deal with global commodity chains, the goal to recover the heuristic and holistic nature of the original methodology (commodity chain) is relevant to my research.

Refining the commodity chain: space from the use value perspective.

Overall, the critical message of contributions under the agenda set up by Werner and Bair (2011) is that capital dynamics alone do not shape commodity chains, and it is that acknowledgement that opens space for coherent interdisciplinary engagements. However, there is an aspect that remains unclear: How can we see the site-specific conditions incorporated in the commodity itself? Is it possible to do an analysis of space and place aspects but with reference to the finished commodity? A possibility arises by drawing on the use value perspective of Marx's theory of value, which has been revisited by proponents of the metabolic rift theory (Foster, 2014).

The analysis of commodity chains has typically seen in labour the source of surplus value and resulted in abstraction of the space from where that surplus value is extracted. Instead, the perspective of use value offers opportunities for reconciling abstract economic relations with the material space (or material realities) where surplus originates. The theory of value makes explicit that nature plays a role in creating the value of commodities. An important premise is that the creation of surplus value is firstly production of use values: a good comes into existence not only through the action of human labour, but also through the work done by nature.¹¹⁸ However, nature is not abstract, but contained in a space. Nature develops in the space in the form of land, water, air, seeds, bacteria; and ecosystems. All those aspects are, however, not only part of the context of production, but actually are physically present in the finished commodity. That explains the double character of use and value of a commodity. In addition, the use value concept

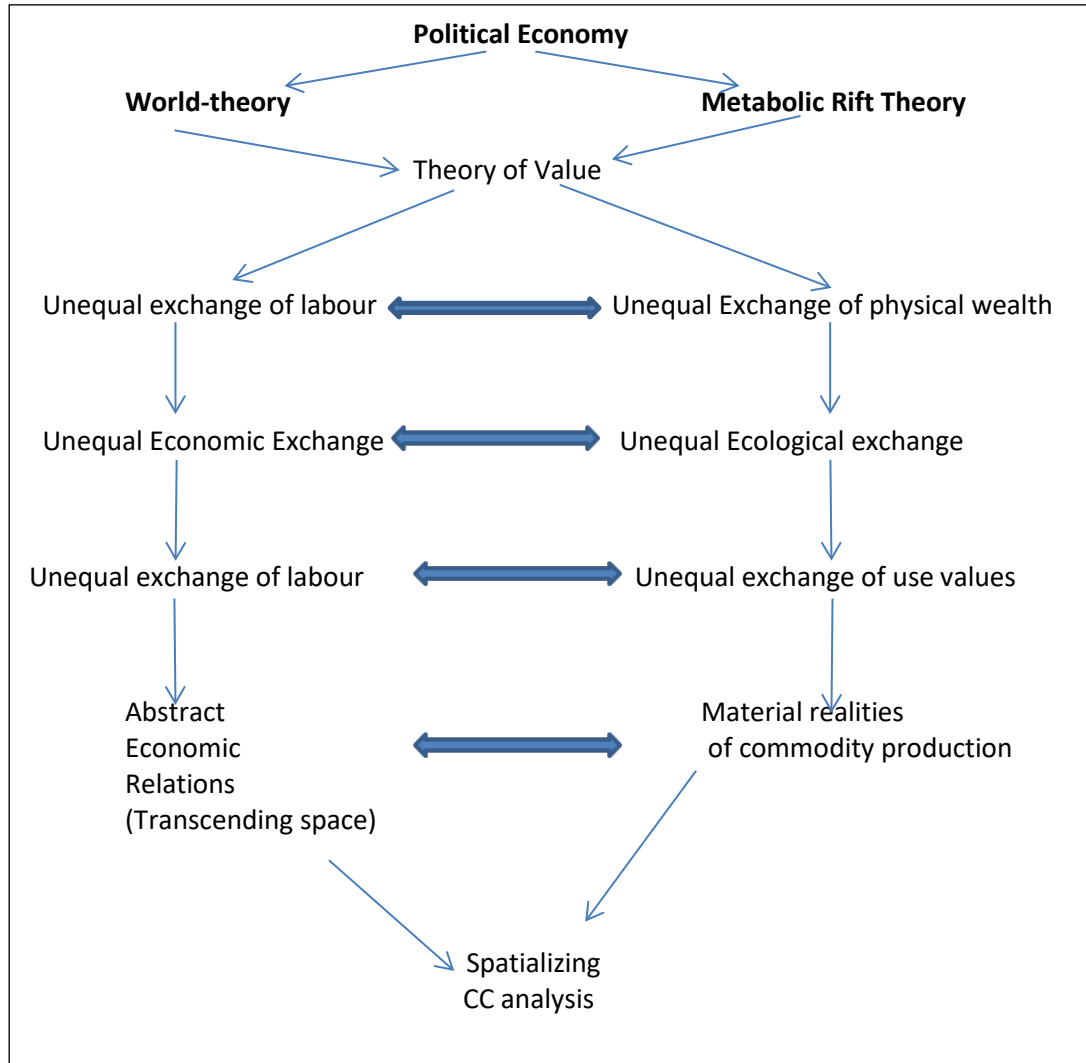
¹¹⁸ See literature review chapter for a more comprehensive discussion of analysis of use value. Here, I will only recapitulate key points.

enables perception of the symbolic, historical and cultural meanings of goods, otherwise abstracted in the exchange value form of the commodity.

The use value component of Marx's theory appears to be fundamental in explanations of the unequal ecological exchange (see Chapter 3). While unequal labour exchanges stresses the unequal exchange of values, unequal ecological exchange reflects an unequal exchange of use values (see Figure 4-1). Such correspondences maintain consistency with the theoretical foundation of the commodity chain analysis because the unequal terms of trade argued in world-system theory lies in the unbalanced exchange of labour.

With this intervention, the space re-emerges as both context of the commodity production and also as component of the finished commodity. A commodity carries natural factors like minerals, water, energy; this is particularly evident in fresh food commodities. From this standpoint, site-specific conditions are held in the commodity itself and travel with it throughout the chain. The addition I suggest to the commodity chain analysis complements the innovations proposed by Werner and Bair (2011). It builds upon the notion of site-specific characteristics of places and actors participating in commodity chains and producing and reproducing uneven geographies. Uneven geographies are enhanced by a double process of unbalanced terms of exchange: economic and ecological. It is the indirect relation with Marx's theory of value that metabolic rift and world-system theories possess that enables incorporation of the space within the commodity chain methodology.

Figure 4-1. World theory and Metabolic Rift Theories: Theoretical Correspondences and Complementarities



Proving consistency.

A proof of consistency of this approach to space within the commodity chain analysis rests in the theoretical commonalities of world-system (the theoretical foundation of commodity chain methodology) and metabolic rift theories. The commonalities are identified in terms of their main explanatory categories and common debates. To begin with, both metabolic rift and world-systems theories emerged within the political economy tradition that highlights the problem of labour. Labour is the central concern of both world-system theory and metabolic rift theory. From the world-system perspective, world trade underwrote the global division of labour and gave rise to the capitalist world economy. Such an economy operates under unequal terms of exchange of labour, which is ultimately reflected in the hierarchical world order. Concepts of “core” and

“periphery” expose this hierarchy.¹¹⁹ Core refers to regions benefiting the most from the capitalist world economy (northwestern Europe). Meanwhile, periphery encompasses areas of the world with weak central governments and therefore controlled by more powerful states (normally core states). Characteristically, peripheral countries export raw materials to the core. At various historical and site-specific moments, core countries appropriate/expropriate capital surplus generated by the periphery.¹²⁰ Latin America and Eastern Europe heavily represent the characteristics of peripheral regions (Wallerstein, 1974). The hierarchical and unequal relations in the world economy have resulted in uneven geographies and uneven world development.

On the other hand, for metabolic rift theory, the unequal exchange of labour goes hand in hand with the unbalanced transfer of physical wealth, which primarily occurred at the town-country level. Arguably, because of unequal global productivities, the peripheral countries (typically more rural) extract more raw materials and transfer them (under unequal trade relations) to core countries (typically more urban countries), which then end up in final goods consumed in urban areas of core countries. Thus, town-country can be another representation of core-periphery division: periphery associated with country; and core linked to town. In the world-system approach the division of labour explains the emergence of uneven geographies and uneven development within the capitalist world economy (Wallerstein, 1974), but in the metabolic rift arena, the unevenness is understood and built upon an “ecological” variant of the original theory of unequal economic exchange, as presented in the literature review.

The significance of world trade in the 16th century is part of fundamental debates in both world system and metabolic rift theories. In the world-system realm, the capitalist economy integrated into a world-economy through the development of world trade in the 16th century and has been the organizing principle of the world-economy ever since. This argument has been subject of debate, especially among the main theorists of world-theory (Arrighi, 1990, 1994; Arrighi and Drangel, 1986; Hopkins and Wallerstein, 1977, 1986) and proponents of the CC variants (GCC and GVC) (based on Table 4-1, these are Gereffi and Korzeniewicz, 1994; Appelbaum and Gereff, 1994; Gereffi, 1999) as previously discussed in this chapter. Within the metabolic rift a number of scholars hold that world trade in the 16th century marked the

¹¹⁹ The world-system approach developed by I. Wallerstein (1974) includes categories of “semi-periphery” and “external” as well. Semi-peripheral regions are those that are looking to get out from the peripheral zone and get a better position in the world economy. External regions are those areas that are not at all integrated in the modern capitalist economy. For the purpose of my research, core and periphery are explicative categories.

¹²⁰ For instance, appropriation could be by unequal trade relations and expropriation by wars and invasions.

beginning of the rift (Friedmann, 2000; Moore, 2000; 2011), as it enabled the separation of production from consumption (e.g. raw materials extracted in a region and used/consumed in a distant place). The counterpoint in the debate maintains that the rift emerged with the rise of industrial capitalism (Foster, 1999).

Problems and bias of main categories.

Some weaknesses and bias in the conceptualization of core and periphery have been acknowledged. Hornborg (1998: 128) raises the point that the weakness of the world-system perspective is that it “is unable to provide adequate definitions of key notions such as ‘core: periphery,’ ‘exploitation’ and ‘accumulation’ as long as they do not relate to factors specified independently of the premises of the model itself.” For instance, there is seemingly a tendency to ignore the fact that in core countries there are dynamics of both unequal labour and wealth exchange, and some industries of peripheral countries exploit and accumulate at the expense of other regions, as do core countries.

One important premise of the world-system model is that the unequal exchange of labour is due to the differential of productivities between the industrialized and non-industrialized countries, which leads the low productivity country to use more human labour in the production of goods, which are traded mostly to core countries. The question is: What if some of the industries of peripheral countries develop high productivity and become competitive in the world market? If so, should that be interpreted as an externality of the model? So far, even the presence of competitive industries based in peripheral countries has not changed the landscape of a hierarchical world economic order, which makes a revisiting of these concepts still valid and useful.

Another possible problem is regarding the concept of unequal exchange itself, specifically the ecological one. There have been questions about how much of the physical (ecological) wealth is definitively transferred from peripheral to core countries (Hornborg, 1998). The insight is that core countries manufacture the raw materials from peripheral countries, but since manufactured goods containing the original physical wealth may go back to peripheral countries (through trade or aid programs), it is unclear where that physical wealth resides (Hornborg, 1998). However, the work of ecologists Odum and Scienceman (2005) provides an argument for keeping the categories. Their concept of “emergy”, which is based on notions of

thermodynamics, was the fundamental category to capture “the real wealth” involved in the trade of goods.¹²¹ Odum and Scienceman (2005) later used the theory of value to make more sense of the physical content. They used this concept in several world trade matrices (Odum, 1991) and the usual conclusion was that there was a net transference of emergy values (or unequal ecological exchange) from core to periphery.¹²² When Odum and Scienceman (2005) reviewed Marx’s theory of value, the emergy values were to some extent represented in the form of use values. Thus, unequal exchange of emergy values can be expressed as unequal exchange of use values.¹²³

Overall, the fact that the hierarchical world economic order is an ongoing reality provides enough reason to argue that the core-periphery conceptualization is still useful. Uneven geographies have not been transcended in the capitalist world economy. In addition, the unequal ecological exchange perspective lends elements to strengthen the argument that unbalanced relations remain. Furthermore, core-periphery conceptualisation seems to be particularly useful when dealing with fresh foods that are traded for final consumption, as there is no controversy that all the physical wealth (or use values) embedded in these goods is totally transferred (no way back). In addition, because typically the bulk of fresh foods traded at world scale go from peripheral (or low productivity, non-industrialized countries) to core countries, it enhances both unequal economic and ecological exchanges.

The differentiation of regions into core and periphery is indeed a representation of uneven geographies. These categories enabled world-system theorists to assert that within a singular capitalist world economy, there is uneven development (Werner and Bair, 2011). For Werner and Bair (2011), commodity chains demonstrate that fact.

For my research, the core-periphery terminology remains useful because I deal with a food item that ends up as fresh food for final consumption in a local urban market (Mexico City) and although it is marginally traded at a world scale, when it is, it goes to core countries (Europe and United States). Hence, the place of nopal production and the place of its consumption are in a core-periphery relation at local and world levels. I validate this by using the association of core to

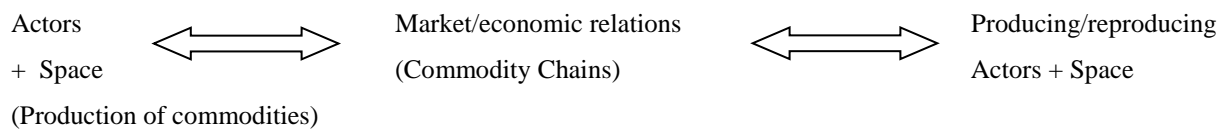
¹²¹ Part of this is examined in the Chapter 3.

¹²² Foster and Holleman (2014: 201) considers that “the success of this endeavor was necessarily limited, since the world of nature and of production in general is so complex and variegated as to raise fundamental problems of incommensurability facing anyone attempting to bring it within a single measure, such as energy accounting”. However, this type of effort is one of the most advanced of its kind.

¹²³ See Chapter 3.

town and periphery to country and argue that the town-country unequal exchange is a representation of uneven geographies. In addition, the innovations by Werner and Bair (2011) enable me to inquire into how the space of nopal production that I look at has been produced and reproduced (see Figure 4-2), articulated and disarticulated. As in the matsutake mushroom case studied by Faier (2011), nonhuman factors have heavily influenced the nopal chain. The site-specific ecosystems conditions in Milpa Alta were critical to converting it to nopal production. In addition, due to cultural aspects, nopal allowed this place to connect with the urban center. Moreover, the people of Milpa Alta have been deeply influenced by pre-Hispanic culture, in which nopal had an important place, and that historical heritage has remained.¹²⁴

Figure 4-2. Producing and Reproducing Actors and Place in the Commodity Chain Analysis



In order to operationalize the analysis of a commodity chain that acknowledges human and nonhuman factors associated with nopal production, I use an agroecological approach. Consistent with my literature review, agroecosystem is the integration of human and nonhuman nature. Furthermore, I draw on the integrated approach of agroecology and metabolic rift I developed in my theoretical framework because it merges the use and exchange value perspectives, which is consistent with the spatializing twist in the commodity chain I propose.

It is important to note that the main contrast with common applications of this methodology is that my commodity analysis targets small producers and a product with limited export. Typically, the methodology has been used to analyze commodities extensively traded at global scale (e.g., garments, manufactured goods, wheat, and flour). The purpose is to take advantage of the heuristic and holistic value of the analysis. Indeed, Challies (2008: 389) comments that, “commodity chain approaches do not have to be crudely linear, unidirectional, preoccupied with

¹²⁴ More details on this are in the chapter of Site and historical context of research. Here I only list the outstanding characteristics of the place.

production or restricted to a particular geographic scale.” Furthermore, globalization has spread so widely that even those commodities circulating mostly at the local level are interconnected or penetrated by other fully globalized processes.

As far as my research is concerned, since nopal enters a fully globalized city (Mexico City)¹²⁵, the insight is that it should encounter globalized actors (brokers, transnational supermarkets) and world trends (diets, healthy, organic food trends). Thus, far from being a limitation, it can become a contribution to mobilizing the commodity chain approach to include smallholders’ livelihoods, as they relate to the interactions of their local-global markets. In addition, the analysis I suggest could provide a robust understanding of networks and interrelations taking shape at the local level, which later on could become the platform for a strongly globalized product. Put this way, the analysis serves to build possible scenarios.

Part II. Methods

4.4 Qualitative Methods Approach

I employ a qualitative methods approach, which includes a compilation of historical statistical and documentary data, data from semi-structured interviews, and observations in order to inform the commodity chain of nopal. My research design builds upon concurrent procedures. Creswell (2003: 16) explains that in this type of research design, “the researcher converges quantitative and qualitative data in order to provide a comprehensive analysis of the research problem... the investigator collects both forms of data at the same time during the study and then integrates the information in the interpretation of the overall results.” I therefore use the commodity chain method as a heuristic and holistic analytical tool to reveal complex socio-economic and environmental phenomena that my research inquiry refers to.

My tools for collecting qualitative data are voice recording, field notes, a research journal and videotaping. As for quantitative data, my sources are statistical information office websites, statistical yearbooks and related sources.

The collection of data was based on the main boxes/links of a commodity chain: inputs, production, distribution, commercialization and consumption. My main source of data to learn

¹²⁵ Simply, the food market of Mexico City is dominated by transnational supermarkets (Parnreiter, 2010; Mendoza, 2010).

about the commodity chain was interviews with producers. Through preliminary research (before going to the field) I learned that nopal producers in Milpa Alta are in a very weak position in terms of commercialization and access to inputs. On the one hand, most of the nopal ends up in Mexico City's market through indirect commercialization; middlemen now have the largest advantage and producers are forced to sell the produce locally. On the other hand, the region of Milpa Alta is part of the conservation area established by the DF government, which has urban priorities.¹²⁶ As such, producers' agroecosystem choices may be influenced by DF's government decisions. This is not *per se* negative or positive, but it gave me the insight that producers have a weak position when negotiating farming options. It is itself a tension between top-down and bottom-up priorities. Thus, I assumed that the weakest point of the chain is in production. Following Friedland (2001: 84), I focused on the weakest point of the chain as the "weakest link in the chain will stop commodity production." Since I see in the nopal commodity the significance of the space and rural-urban linkages, I am interested in knowing the forces that could potentially lead to the stoppage of this commodity production. Additionally, such an approach to the chain (from the weakest link's point of view) may help inform commodity chain analysis that deals with smallholders' livelihoods. In fact, Challies (2008) calls attention to evolving the analysis in this direction.

Despite my purposeful reliance on producers' views of the chain, I use other sources that enable a more complete and better understanding of the chain. In Table 4-2, I summarize the matching of information sources with each of the boxes/linkages.

¹²⁶ Documentary sources that I accessed during fieldwork confirmed this insight. For instance, the internal documents Plan Rector of the organization Nopal Product-system (Plan Rector, 2007; 2011) reveal that the weakest players of the chain are the producers because they conduct several activities at the same time, which is both inefficient and time consuming, thus resulting in disincentives to keep producing, given the declining economic benefits. Therefore, this is a reason to enhance qualitatively the issues producers identify as the most challenging.

Table 4-2. Sources of Data to Construct the Nopal Commodity Chain

Inputs	Production	Distribution	Commercialization	Consumption
Interviews with Producers	Interviews with Producers	Interviews with Producers	Interviews with Producers	Active participant observation in supermarkets/health food stores and barter market in Mexico City
Interviews with Officials	Interviews with Officials		Interviews with local retail center	
Documentary Sources	Documentary Sources		Documentary Sources	Interviews with chefs of restaurants in Mexico City
	On-site participant observations		Active participant observation in supermarkets/health food stores and barter market in Mexico City	Documentary sources
	Interviews with farmers associations' representatives		-Interviews with farmers associations' representatives	Interviews with farmers associations' representatives

I must acknowledge that pursuing an analysis of the complete nopal commodity chain was ambitious. Therefore, two important limitations of my approach should be mentioned. I collected data only about the producer's farming practices on their nopal plots, but did not attempt to analyze the work done by the many other living organisms in the ecosystem. Those other living organisms produce and co-produce with humans, the ecosystem of Milpa Alta and such analysis would offer a more complete view of the human and extra-human nature interaction in the ecosystem. On the consumption side, the analysis is limited to my own active participant observations in supermarkets, barter markets and complemented with a few interviews with chefs. Therefore, the analysis of the nopal consumption story is largely impressionistic.

4.5 Data Collection

In this section I briefly describe the methods of data collection employed and the rationale in choosing them, including the reasons for selecting my participants and sites, along with dates that I collected the data. Overall, the process of data collection became a "follow the commodity" approach, but keeping up with the nopal producers' perspective. This means that I did

preliminary analysis of producers' interviews and, based on that, made decisions about where to go and who to interview.

Semi-structured interviews.

Semi-structured interviewing was a principal data collection method used in this research. I did semi-structured interviews with nopal producers, officials of three levels of government (municipal, DF and federal), key informants, leaders of local and national producers' organizations and chefs of restaurants located in Mexico City.

According to Cohen (2006), among the characteristics that define a semi-structured interview are:

- The interviewer and respondents engage in a formal interview;
- The interviewer develops and uses an "interview guide". This is a list of questions and topics that need to be covered during the conversation, usually in a particular order;
- The interviewer follows the guide, but is able to follow topical trajectories in the conversation that may stray from the guide when he or she feels this is appropriate;

Of these characteristics, the most relevant to my research was the interview guide, which is typically a topical framework that enables consistent comparisons of data gathered in other interviews or through other methods (Cohen, 2006; Gill et al., 2008). A more specific advantage of developing a topical framework is that the relationship between the topics initially identified and issues/insights noted by the participant become the basis for more specific questions which do not need to be prepared in advance (FAO, 1990).

The semi-structured interview is mostly used when the researcher wants "to obtain specific quantitative and qualitative information from a sample of population; obtain general information relevant to specific issues and gain a range of insights on specific issues" (FAO, 1990: n.d). But it is also useful when the researcher has only one chance to meet the interviewee (Cohen, 2006).

In order to benefit as much as possible, I did preliminary research on the topics to be explored and carefully selected the participants. In addition, the one-to-one conversation, with its semi open-ended nature, allowed me to identify unknown issues.

Interviews with nopal producers.

Through a purposeful sampling process I sought out farmers that commercialize in local markets and others commercializing in global markets; farmers that employ agro-ecological approaches,

and farmers that do not use them at all. Using purposeful sampling, an informant leads me to the elements I want to investigate (Flick, 2007). This strategy is used when the study intends to include the experiences of those who make relevant the case study (Flick, 2007). The intention was to make possible correlations between producers' interactions with local/global markets and use or non-use of agro-ecological farming approaches. As a point of departure, I considered the use or non-use of agrochemicals as the basis of involvement in agro-ecological practices. I acknowledged that there will be cases that combine more than one characteristic, for instance, use of agrochemicals and commercializing in local/global markets; or not using agrochemicals and commercializing in local/global markets, but I wanted the data to reveal those connections.

Table 4-3. Interviews with Nopal Producers Conducted from January to March 2012

Nopal producers	Number	Location within Milpa Alta	Type of production
Uses agrochemicals	3	San Lorenzo & Villa Milpa Alta	Fresh nopal
Does not use agrochemicals	3	San Lorenzo & Villa Milpa Alta	Fresh & processed nopal
Commercializes in local and/or regional markets	4	San Lorenzo & Villa Milpa Alta	Fresh & processed nopal
Commercializes in external markets	3	San Lorenzo & Villa Milpa Alta	Fresh nopal
Total	11		

The themes addressed in these interviews focused on the process of (see Appendix A):

- 1) Access to inputs: I inquired about how the access to inputs affects the rationale of production, use of agrochemicals or organic inputs. I consider labour as an input and following the rationale of commodity chain I inquired about the type of labour, origins and costs.
- 2) Organization of on-farm resources (production). I inquired about: how producers use the plots' space (e.g polyculture, monoculture); ecosystem changes and producers' management responses (e.g pest control; changes in weather conditions); organization of labour, especially how labour needs change according to changes in ecosystem and producer responses.

- 3) Commercialization: producers' barriers to accessing Mexico City's market. In addition, I wanted to collect views and experiences of producers who have engaged in foreign markets.
- 4) Consumption: I inquired about producer perceptions and values associated with nopal consumption. In this part, I intended to capture nopal's cultural values as part of their own diets and how they perceive the value for others of eating nopal.

Cross-cutting issues: Through the components of the commodity chain, I also inquired about the influence of government programs, farmers' organizations and centers of research in their decisions about inputs selection, farm production and commercialization. Appendix A presents the actual interview guide that I used with producers.

Interviews with government officials.

Preliminary research revealed that government programs play an important role in nopal producers' decisions in Milpa Alta. For that reason, I targeted officials of government institutions (municipal, provincial and federal) that have programs for the region. The approaches that these offices take to Milpa Alta and nopal producers vary. By reading the offices' respective websites and learning about the orientation of the financial support and programs delivered to producers of the region, I could roughly categorize offices according to a range of approaches, from productivist, environmental, sustainable, developmental, cultural or combinations of these. The interviews were structured around the argument that programs influence links of the nopal chain.

Table 4-4. Interviews with Officials of Three Levels of Government Conducted from Jan to March, 2012

Level of government	Office	Position of interviewee	Approach to Milpa Alta/nopal producers
Municipal (Milpa Alta)	Subdirector de Des. Agropecuario, pertenece a la dirección general de	Subdirector	Productivist
	Desarrollo Rural Sustentable y Economico	General Director	Productivist and Environmental
Provincial (Government of DF)	Secretary of Rural Development and Communities Equity (SEDEREC, acronym in Spanish)	General Director	Cultural/Productivist/Environmental/Developmental

	Council of Natural Resources (CORENA, Spanish acronym)	General Director	Environmental/Sustainability
	Secretary of the Environment	Director of barter program that links DF producers with urban population	Environmental and Cultural
Federal (Government of Mexico)	Secretary of Agriculture, Livestock, Rural Development, Fisheries and Food	Director of the office for DF	Productivist

Interviews with leaders of organizations.

Farmers' organizations have been fundamental to protecting the agricultural area of DF and face challenges due to labour scarcity, agroecosystem management, commercialization and urban pressures. I interviewed leaders of organizations that deal with overarching agricultural issues at national, regional and local levels. This was because I wanted to frame nopal producers' approaches, issues and concerns within broader regional and national contexts. Some of these organizations are key to national social peasant movements. Some of them are closely linked to public policy programs affecting nopal producers in DF. Some deal strictly with nopal producers of Milpa Alta, while others deal with producers from other areas of DF and still others deal with farmers at the national level.

Table 4-5. Interviews with Leaders of Producer Organizations

Organization	Scope/ influence of the organization	Position of the interviewee	Date of interview
<i>Centro de Acopio del nopal</i> (local retailing center)	Milpa Alta nopal producers	Manager	February 8, 2012
Product-System of Nopal DF	Milpa Alta nopal producers	Producers' representative	January 25, 2012
Leader of organic cooperative Terra Nova	All agricultural zones of DF	General representative	October 21, 2012
UNORCA National	National	General Representative	February 3, 2012
UNORCA DF	National/DF	General Representative	February 3, 2012

Interviews with other key informants.

“Key informant” refers to a person who can provide detailed information and opinions on a particular subject based on their knowledge of this particular issue. Key informants from a community under study are “privileged witnesses, or people who, because of their position, activities or responsibilities, have a good understanding of the problem to be explored. These witnesses are not necessarily members of the population targeted by the study, but they all have a major interest in that population” (Laforest, 2009: n.d). Their privileged capacity could be in terms of witnessing the community from an administrative position and having privileged access to information or stakeholders, or having an extended expertise in the field that resulted from extended witnessing of the community or studying the field. Overall, key informant interviews render a more extensive background of information on which the researcher can follow up during the research. I conducted semi-structured interviews with the following key informants:

- Ex-director of the Council of Natural Resources of DF government. I targeted this ex-official hoping to get a more long-term picture of the environmental offices’ approach to Milpa Alta. I had access to this informant through a colleague from an academic list of “scholars of Mexican rural development” that connects scholars working on rural Mexican topics across the Americas.
- Two experts (researchers) in the field of organic and agroecological farming in Mexico. One is at the University of Chapingo, another one is at the Iberoamericana University. The former is a leader in Mexican agricultural studies. The work of the scholars interviewed has informed my knowledge on the evolution of agroecology and organic farming in Mexico. Their work is well known in international publications in both Spanish and English. In the interviews, I learned about trends and current actors which helped me refine the direction of my project.

Interviews with chefs.

From the methodology section, it emerged that the consumption level appeared to be important in understanding the nature of a commodity chain. As a result, interviews with chefs focused on analysis from the consumption and cultural ends of the nopal chain. Trends and changes in food consumption culture within a cosmopolitan city such as DF are also fostered by restaurants. The

restaurant landscape of Mexico City is formed by a variety of eateries, which range from street food, small eateries (fondas), transnational franchises and a new trend of restaurant/bistros specializing in local, traditional, fresh food. Access to narratives of well-established eateries like traditional, street food and franchise restaurants was done through documentary sources.

I then focussed on interviews with chefs of restaurants that are in the range of new food trends for the following reasons. First, this type of data is less widespread currently; and secondly, within food movements there is the idea that this type of eatery may challenge neoliberal and anti-environmental, global agri-food relations from the consumption end. The “slow food” movement and “100 mile diets” in North America and Europe are examples of these celebrated movements intended to transform food consumption culture and in which chefs are not only menu-builders but key actors transforming agri-food relations (Fonte, 2006). However, this idea has also been contested and deemed superficial and easy to copy in the neoliberal game (Alkon and Agyeman, 2011).

Taking that into consideration, I conducted in-depth interviews of two chefs with the purpose of shaping a larger notion of recent trends of food consumption within Mexico City and assess that ambivalent idea. The selection of these two chefs was purposeful, as I wanted one chef running a restaurant that holds to the principles of local, traditional and organic food (see Table 4-6). I also inquired into the linkages and connections this type of restaurant has with markets (e.g to get local, fresh food), notions on social food movements, consumption education and his own perspective on barriers and opportunities for engaging local nopal with these trends.

The second chef I wanted to be in charge of a restaurant of a new wave of traditional high-end Mexican food, so selected the chef of Azul Historico, a restaurant that has received national awards for revaluing Mexican cuisine heritage. This restaurant builds up their menu based on research on the history of Mexican cuisine. Because nopal is part of the ancient and very popular Mexican diet and cuisine, and it is produced close to the urban center where the chosen restaurants are located, I inquired about the extent to which nopal is an important food in that type of restaurant. Once I decided on the type of restaurant then my personal connections (mainly throughout my partner who is a chef) identified those chefs in Mexico.

These interviews were done once the research was well advanced (in December 2015 and January 2016) and as a result of the need to gather more data about the cultural dimension of

nopal consumption within Mexico City.¹²⁷ The rationale is consistent with the “follow the chain” approach as it chases nopal within Mexico City, while keeping producers’ perspectives of the nopal chain. In this case, I follow producers’ idea that in order to keep the market value of nopal within the urban market, it must meet the needs of consumers whose values about food are more on the side of healthy, local and ecological. Once again, the decision to do these interviews shows the iterative nature of this research process.

Table 4-6. Interviews with Chefs of Mexico City

Restaurant’s name	Restaurant’s approach	Chef’s name	Date of interview
Azul Historico	Local, fresh and traditional cuisine	Rigel Sotelo	December 22, 2015
Jauja	Traditional Mexican cuisine	Maria Jose Serrano Sada	January 4, 2016

Documentary sources.

Documentary sources include published and unpublished, and public and non-public documents, such as official surveys, official reports, newspapers, internal and unpublished documents of organizations and institutions.

I had access to official surveys, internal documents of government offices and/or organizations, which are unpublished or had a limited circulation. The following were key to this research:

- *Planes rectores del Sistema de Producto del Nopal DF* (Development plans for the Product-System of Nopal DF): These are documents generated by the producers of the organization Product-System of nopal DF. It shows plans to develop the nopal commodity chain, confront challenges and offer alternatives. I collected the plans for the years 2007, 2010, 2011.
- *Estudio de Mercado del nopal DF* (Marketing study for nopal DF) The organization Product-System of Nopal, DF subcontracted marketing specialists to conduct a market study for nopal producers of DF and identify areas of market opportunities. This was done

¹²⁷ Because at the time of doing these interviews I had no funding to stay longer in Mexico City I did only two interviews.

in 2006. It is not published, nor publicly available. During my visits to the office of the Product-System of Nopal DF, I was given this information by the producers' representative.

- *Recetario del nopal* (Nopal recipes): This book was published in 2009. The organization Product-System of Nopal DF subcontracted a chef to do this collection. I obtained the book through the organization of Product-System of Nopal DF.
- *Geoestadística del nopal 2009* (Geostatistics of nopal): This database (cd) was generated and published by three institutions: the State Office for Rural Development of DF (OEIDRUS, DF), Secretary of Rural Development and Equity for the Communities of DF (SEDEREC, DF) and Secretary of Agriculture, Livestock, Rural Development, Fishing and Food (Federal office SAGARPA). The statistics are not available online but were circulated through CDs, so the circulation is limited. The CD includes information on nopal producers and units of production in the regions of nopal production within DF, where Milpa Alta is by far the most significant. The information was gathered through direct surveys of producers and direct visits to the units of production during 2007 and 2008. The statistics were finally published in a CD in 2009. I obtained this document through the Product-System of Nopal DF.
- *Programa de Trabajo 2011 de la delegación Milpa Alta* (Working plan 2011, Milpa Alta municipality): This is an internal document of the office of Milpa Alta that outlines the programs, targets, goals and scopes oriented to nopal producers of Milpa Alta. It is a Word document and Power Point file type. The document was provided by officials.
- *Programa integral para productores de nopal, 2011 de la delegación Milpa Alta* (Integral program for nopal producers, Milpa Alta municipal office): This document outlines the objectives, the number of users people and the municipal office budget for this specific program oriented to nopal producers. It is in a Word document and Power Point file type. The document was provided by officials of the municipal office.
- *Programas de la SEDEREC* (Public Programs of SEDEREC): These are CDs that present all the programs run by the Secretary of Rural Development and Equity for the Communities of DF at the time of the fieldwork. Because of the format, distribution is limited. Some, not all information in this CD is available on the website of SEDEREC. The document was provided by officials of the Secretariat.

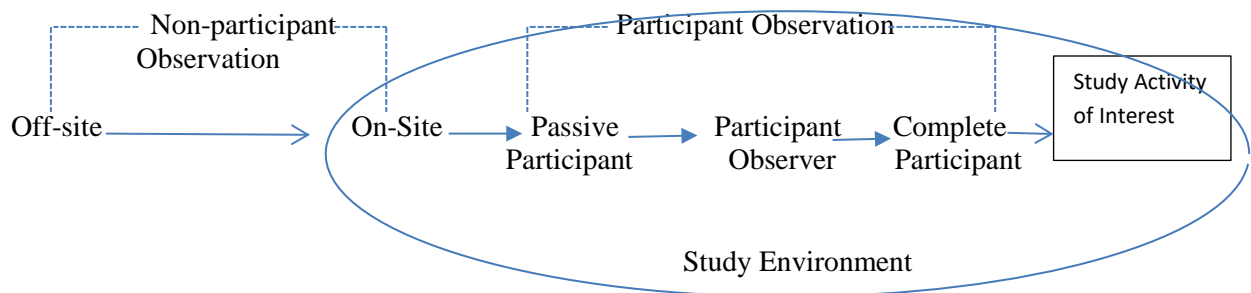
- *Informe de labores 2011 de la SEDEREC* (Report of the secretary's results, 2011. SEDEREC): This is a book where the office presents the results of the programs, goals accomplished, use of budget by the secretary for the year 2011. The document was provided by officials of the Secretariat.
- *Panorama agroalimentario y pesquero, 2011. Distrito Federal* (Agro-food and fishing state of the art for DF, 2011): This is a pamphlet generated by SAGARPA. It was published in 2011 and is of limited circulation. It is a study about the state of fishing and agro-food's state of the art in DF. Document were provided by officials of the Secretariat.
- *Fichas de empresas certificadas* (Untitled document): These are documents with updates about enterprises certified and in the process of getting certifications for Good Practices. Certifications are conducted by the SAGARPA office in DF (PPT file). The document was provided by officials of the office.
- *Propuesta de seguridad alimentaria de UNORCA* (Word Doc and PPT presentation files): The document is a proposal to cope with national agro-food national challenges. It was elaborated by the organization UNORCA in 2011 and presented at its national assembly organization. It sets strategies and plans for the agro-food sector. UNORCA also presents these plans in press conferences.
- *Informe de labores UNORCA, 2009* (UNORCA's work report, 2009): In this document UNORCA's general representative presents the work done during the year, goals accomplished and plans going forward. It is handed in to the national assembly of the organization.
- Internal document of SMA (Secretary of the Environment DF) and *Cooperativa Tierra Nueva*. Project of Barter Market "*Mercado de trueque, que es?*" provided by the director of the Tierra Nueva, Erik Izquierdo.

Participant observations and on-site observations.

In qualitative research, observations are an important method of data collection. In some qualitative research, such as ethnographies, observations may become the principal method (Roller and Lavrakas, 2015), while in others, its function is more to help triangulate information collected through other methods such as interviews (Maxwell, 2005). The latter describes better

the rationale for including these observations in my research. The type of observations varies in terms of qualitative research; therefore it is important to specify the observation type selected. Roller and Lavrakas (2015) show very clearly the range of observations from the perspective of the observer's involvement in the physical setting and in the activities of the setting (see Figure 4-3).

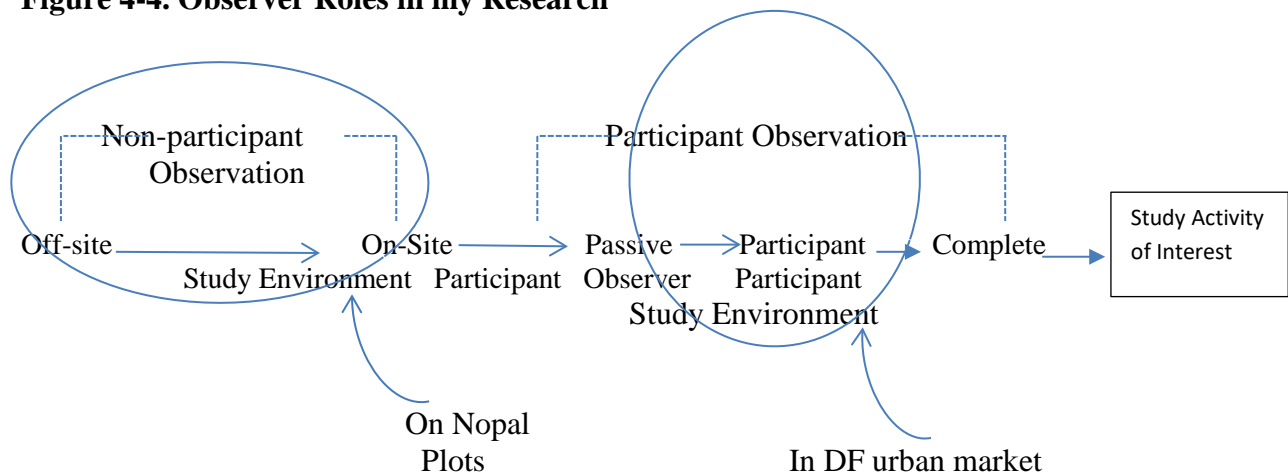
Figure 4-3. Observer Roles



Source: Roller and Lavrakas (2015)

The observation methods I applied in my research are non-participant-on-site observation and participant observer within the site of study (See Figure 4-4). The first one was on the units of production of nopal producers and the second was in urban market places where nopal from Milpa Alta is traded in Mexico City.

Figure 4-4. Observer Roles in my Research



From Figure 4-4, my observations subscribe to the on-site non-participant and on-site participant-observer type. With the goal of triangulating data, I did on-site observations of the producers interviewed at the nopal plots. It was an overt on-site observation, which Roller and Lavrakas (2015) identify as a “non-participant” on-site observation because I did not engage in the activities of the farm, but only moved physically to the setting where nopal is actually grown. The producer and other workers at the farm knew of my presence. This overt on-site non-participant observation allowed me to observe farming practices and ask questions that complement or validate what the producer said in the interview. For instance, observations allowed me to observe compost, pest problems, and diversification of crops. Since my farming expertise is limited, I videorecorded (with producers’ permission) the visit, in order to do a more detailed analysis of the physical setting later on. I visited plots of each of the producers interviewed, for a total 11 visits between January to March 15, 2015.

Table 4-7. Non-Participant Observations, from January to March 15, 2012

Non-Participant Observations	Location	Number
On-Farm visits	Villa Milpa Alta, Milpa Alta	8
On-Farm visits	San Lorenzo, Milpa Alta	3
Total		11

A more active participant observation was done in three different types of markets/stores where Milpa Alta nopal is found within the urban area of DF: transnational supermarkets (Wal-Mart), organic food stores and barter markets. I visited these places as a consumer. The decision to do this observational fieldwork resulted from a preliminary analysis of interviews with producers where I learned producers identify these market sites as ones where they need to place their produce in order to keep within the DF urban market. The decision to act as a consumer was based on the producers’ description of the emerging importance of these markets from their perspectives.

They mentioned the new markets, where people like to buy food in urban DF; they stressed that urban populations now demand healthy, fresh and organic foods. Going to the supermarkets as a buyer, was kind of a “follow the chain” form of data collection in line with the objective of constructing the commodity chain analysis from the producer’s perspective. From a preliminary analysis of the interviews with producers, it became clear that they see in these three type of markets barriers and opportunities to connect with their nearest urban consumers. Once again, this shows that my collection of data was an iterative process.

This collection of data happened in a second phase in October 2012. Within each of the market places I acted as a buyer and asked casual questions of other buyers or stores managers about where the nopal comes from. I acted as buyer/consumer because I wanted to experience for myself how and why an urban consumer obtains nopal from Milpa Alta in these three different locations. I used a journal to take notes, e.g notes of prices, type of nopal products available, pictures of the products I bought, etc. The experience allowed me to compare prices, ask other shoppers their reasons for buying nopal in that specific store and how they knew about nopal. This way, I collected data that helped me see if producers’ views on nopal consumption in the urban area made sense (it is a type of data triangulation) and it also enabled me to engage in the culture (e.g. consumers’ values) of nopal consumption within the urban setting.

For transnational supermarkets, I selected three Wal-Mart supermarkets; for health-organic food stores, I selected a store called Green Corner store, and I participated in one of the barter markets (this market is on only once a month). All of them were mentioned by the producers. Additionally, I found these food marketss even more relevant to my research because Wal-Mart is the predominant supermarket chain in DF and since it is transnational it best represents the globalization aspect of the food market within the city (Biles, 2008). Meanwhile, the organic food store Green Corner was one of the pioneers in the organic food stores sector, selling organic certified foods within Mexico City DF; therefore, it represents new trends in the city’s food culture (Rudiño, 2008; The Green Corner, 2005). As for the barter market, it has been the first public program linking the rural and urban through food grown in the agricultural areas of DF.

The three locations selected for Wal-Mart supermarkets are in urban neighbourhoods of different ranges of economic income. One is in a high-income area and the other two are located where the income population ranges from middle to low¹²⁸ (see Table 4-8). Regarding the health-

¹²⁸ Since I lived in Mexico City, I know by experience the economic level of the neighborhoods.

organic food stores, there are four Green Corner stores across DF, and all of them are in high income neighbourhoods and for that reason I visited one location. I couldn't select the location of the barter market as the place is assigned by the secretary of the environment; however, it is worth noting that it is located in central DF and at the very popular Chapultepec Park where families from all different social classes come for recreation on the weekends.

Table 4-8. Active Participant Observation as Consumer

Active Participant Observation	Locations/type of consumers	Observation date
Transnational supermarket Walt-mart	Wal-mart Coyoacan/high income neighbourhood	Oct 16,2012
	Wal-mart Copilco/middle and low income neighbourhood	Oct 18, 2012
Organic food store Green Corner	Coyoacan/high income neighbourhood	Oct 17, 2012
Barter Market Chapultepec Park	Chapultepec/mixed incomes	Oct 7, 2012

4.6 Data Analysis Strategies, Validity and Reliability of Data

For the analysis of quantitative data gathered throughout the statistical series, I coded it as micro (local) or macro (national or global data) and by date. Then I create tables and graphs using Excel. For analysing my qualitative material, I proceeded in three phases: preparing data; strategies of analysis; and interpretation.

In preparing data, I followed the steps proposed by Creswell (2003) for preparing data for analysis and interpretation:

1. Transcribing interviews, typing fieldnotes, or sorting and arranging the data into different types depending on the sources of information;
2. Reading through all data to get a general sense of the information and to reflect on its overall meaning. At the time I read, I wrote comments and reflections at the margins;
3. Coding and categorizing by organizing the material into "chunks". It involves taking text data or pictures, segmenting sentences (or paragraphs) or images into categories and labeling. I labelled employing terms used by the participants.

Strategies of analysis included a sampling strategy and a comparative strategy. The rationale for sampling is to do subsets of key themes. The themes selected to sample the interviews with farmers were adjusted after conducting the first interview. Such a strategy of adjustment takes into account the need to maintain a level of flexibility in qualitative analysis mentioned by Flick (2007). I sampled according to the following themes for the farmers interviews: 1) market-orientation (national, local, global); 2) agro-ecological¹²⁹ on-farm management; and 3) labour (gender, age, origin). And for interviews with policy makers, I first categorized the approach of the government offices they belong to and analyzed accordingly: 1) orientation of public financial support to nopal producers (productivist vs. multifunctional, poverty, environmental conservation, cultural conservation, food security); and 2) policy approach (rural development, sustainable agriculture, urban agriculture, others emerging from the interviews).

In the comparative strategy, I followed the levels suggested by Flick (2007: 101)

- Within a case, I substitute the term *case* for *participant*. I look at what a particular participant of my sample interviews said about different issues, asking myself how consistent or contradictory statements are across categories.
- Between cases (between *participants*): I identify how different or similar the responses were of various interviewees at the level of one topic/category. At this level, I compared different narratives and meanings.

It is important for a coherent interpretation to identify a unit of analysis that enables analysis of different levels of data, from historical, statistical data to detailed oral data of participants of a process, such as my case study of the nopal commodity chain. Therefore, for my interpretation, my unit of analysis is “social relations between agriculture and the city” (social relations with nature, social relations of producers and consumers, market relations).

To aim for validity and reliability in my data, I adapted suggestions by Creswell (2003):

- *Triangulation of different sources of information*. This was possible because of the diverse methods and type of data gathered.

¹²⁹ Polyculture vs. monoculture, bio-inputs vs. agrochemicals, efficient use of water

- *Rich, thick description to convey findings.* My journey through the commodity chain and video tape recording facilitated describing with accuracy the setting where my research subjects were.
- *Peer debriefing* to review the entire project. This validity procedure involves locating a person who reviews and asks questions about the qualitative study. So, in this case, my main supervisor played this role.
- *Make clear my own bias* that I bring to the study. With this self-reflection I attempted to create an open and honest narrative that would resonate well with the readers.

In the following chapters 5 and 6, I will present and discuss the data collected per segments and in chapter 7, an overall discussion of the data is presented.

Chapter 5

Understanding the Material Mechanisms of the Metabolic Rift: Farming Practices and Production of New Social Relations Involved in Nopal Agriculture of Milpa Alta, DF

5.1 Introduction

In much of the theoretical work on metabolic rift,¹³⁰ treatments of abstract value relations are over-theorized while the practice of farming, which is part of the material mechanism involved in the metabolic rift, is taken for granted. In this chapter, I engage in the challenge of interpreting such material mechanisms in order to identify practical ways to mend the rift. My interpretation builds upon Schneider and McMichael (2010)'s critique, which points out that Marx's metabolic rift concept is disembodied from practice as the original form of "the concept is narrowly focused on (1) a single source of soil nutrients (humanure), the agroecological importance of which is empirically indefensible, and (2) on the capitalist aspects of agricultural systems, without adequately engaging ecological aspects" (Schneider and McMichael, 2010: 470). Therefore, these authors claim that the metabolic rift concept abstracts from actual practices of human labour and the local contexts within which those practices are embedded and call such a gap "the problem of practice" and I reframe it as the "problem of farming practice" (Schneider and McMichael, 2010). I understand farming practice as a particular form of farm work defined by the material conditions of agroecosystems and the social relations that shape and reshape them. To focus on farming practice is important because it mediates the human interaction with environmental conditions to influence and reproduce the conditions of soil.

I ground the analysis in fieldwork on nopal farming practices in Milpa Alta with the objective of identifying complex social relationships that emerge from on-farm decisions and that change the way producers engage in markets, farming knowledge and institutional programs. The insight is that those social relations help deepen or mend the metabolic rift. In order to conduct the analysis on interrelations between the on-farm level (focus on farming practice) and aspects beyond the farm, I borrow some analytical tools from the literature of agroecology (Gliessman, 2007; Rosset, Altieri, and Thrupp, 1998; Altieri, 2002, 1995, 1989) and on processes and

¹³⁰ See Chapter 3 for a broader debate on the metabolic rift theory.

principles of conversion to sustainable agriculture (Gliessman and Rosemayer; 2010; Gliessman and Muramoto, 2010; Clark and Summer, 2010; Porter, et al. 2010; Gonzalez-Jacome, 2010; Romero Lima, 2010; Gliessman, 2002; MacRae and Hill, 1995; MacRae, 1990, 1989). Through these lenses, I am able to situate the farming practice in a site-specific context, but that is embedded in a broader context of social relations. In addition, that body of literature enables me identify shifts in practices that enhance or mend the metabolic rift.

Based on the research fieldwork data, I categorized the actual on-farm practices and produce a spectrum of ‘somewhat ecological,’ ‘semi-ecological,’ and ‘advanced ecological management,’ as concerned with nopal production in Milpa Alta. This analysis identifies opportunities to find solutions across a variety of rifts, such as social, ecological (McClintock, 2010) and knowledge related rifts (Schneider and McMichael, 2010). Ecological rifts take place when it is impossible to close the loop between the source and resource sink. A food system that depletes rather than regenerates its resource base becomes dependent upon resource ‘subsidies’ from outside (McClintock, 2010), the origin of an ecological rift. Central to the social rift is the commodification of land and labour, which for McClintock (2010: 196) has to do with “the clearing or dispossession of subsistence farmers and herders from common land,” which then “has resulted in the proletarianization of rural population who flood into the urban centers in search of work.” Knowledge rift is the loss of knowledge of local agroecosystems caused by farmer migration to urban centers and involvement in urban-type occupations.

5.2 The ‘Ecologicalness’ of Nopal Farming Practices in Milpa Alta

The ecological spectrum of farming practices

Creating a spectrum helps situate farming realities of the region beyond binary categorisations of ecological and non-ecological agriculture based mainly on the use or non-use of agrochemicals. In regions where the intensity of agrochemical use is high, this differentiation seems important. However, in places where it is not, how good practices are mixed with the use of agrochemicals has meaning for defining the “ecologicalness” of the operation. Based on observations and interviews, I generated a typology of farm management (see Table 5-1). This typology resulted from three important characteristics of nopal production in Milpa Alta: 1) the use of agrochemicals does not prevent farmers from incorporating elements of ecological agriculture,

although it does block adoption of advanced ecological approaches; 2) monoculture (which is a non-ecological approach to farming) of a perennial crop predominates because of limited land to intercrop and lack of markets for the non-nopal crops; and 3) fully ecological farming practices with no elements of monoculture or use of synthetic chemicals exist but are limited. In creating this typology, I took into account aspects important to nopal farming and that help understand the determinants of this variety of management types and the rationale for farmers to move from one point on the spectrum to another. Next I present the typology of farming, based on the degree of adherence to ecological practices, profiles of producers based on the group they belong to within the typology of adherence to ecological practices, and finally the general technical characteristics of nopal management in Milpa Alta.

Table 5-1. Typology of Farming Management within a Spectrum of Ecological Practices

Types of Farming Management		Non-Ecological aspects		Aspects of Ecological farming					
		Agrochemicals	Monoculture (nopal production only)	Manure	Bio-inputs	Traditional sheet compost	New Composting Approaches (on-farm or off-farm made)	Livestock	Inter cropping (consistent/eventual)
Somewhat ecological	A	X	X	X		X			
	B	X	X	X		X		X	
Semi-ecological	C	X	X	X		X	Off-Farm		Eventual
	D		X	X	X	X			Eventual
	E		X				On-Farm		Eventual
Advanced ecological	F						On-Farm		Consistent
	G						On-farm and off-farm	X	Consistent

Source: Author's data.

** The letters A to G indicate the different arrangements/combinations of ecological and non-ecological aspects in the same category of farming management. This level of detailed disaggregation of data intends to show that ecological management is diverse and is not associated with a single model of practices. Eventual intercropping means that they may intercrop once a year or every two years or so. Consistent intercropping is throughout the year.

This typology situates nopal farming practices in the region in a range from semi-ecological to fully ecological. My typology divides ecological from non-ecological aspects of nopal farming.¹³¹ Monoculture and the use of agrochemicals appear to be the most common non-ecological characteristics. In terms of ecological aspects, I found:

- Use of non-chemical fertilizers such as manure, traditional compost (sheet compost made with leftover nopal that has not been sold), manure compost (made with manure, lime and nopal), tamarind chaff compost, and commercial bio-fertilizers.
- Integration of livestock to different degrees.
- Integration of seasonal crops (including fruit trees) to different degrees and intensities (e.g. some producers have a small piece of land with intercropping while others with larger plots use more than a half of their plot for intercropping).

Table 5-1 makes these variations explicit in order to raise awareness of opportunities to enhance ecological elements of farming practice that already exist. The typology is more of a heuristic approach, consistent with the qualitative methods I used in the collection of data.

Producers' profile based on their place within the spectrum of ecological practices

In reviewing the producers profile data, I found important commonalities across the spectrum and particular patterns when grouping their profile according to their position in the ecological farming spectrum. A first commonality across the ecological spectrum is that producers' ages are generally in the 45-60 range, (35 being the youngest and 60 being the oldest), which suggests that people in the peak of their productive years are involved in farming. Another general pattern is that in all cases, their parents used to cultivate nopal, a characteristic that reveals that farming is a living legacy in the region. A third commonality is that all reported to be private owners of their land, with no mention of a social regime property. When I inquired about methods of obtaining the land, a typical response was "I got it from my parents", with only one female producer reporting that the land was purchased after giving up her job (in the city) as a professional in telecommunications. Thus, land is passed from one generation to another and in that process likely the ownership passes from the social regime to the private realm. They may have different

¹³¹ This typology is consistent with characteristics of ecological and non-ecological agriculture established in the Environmental Norm for DF that establishes the conditions for ecological agriculture in the land conservation of Distrito Federal (*Norma ambiental NADF-002-RNAT-2002 para el Distrito Federal que establece las condiciones para la agricultura ecologica en el suelo de conservacion del Distrito Federal*).

interests for the use of land (not merely to farm, but for building their own home), as commented on in Chapter 2. All producers have always lived in Milpa Alta, regardless of whether they've been farming all their lives, have other occupations or have had careers other than farming. Diversifying occupations, involvement in professional careers and high education levels have not been enough for them to fully migrate to the city.

Hence, the footprint of previous generations dedicated to farming, whether the land is used for building their own family houses and/or for farming are site-specific historical conditions increasing the potential for people to work the land (whether continuing on or returning to the land).

Table 5-2. Profile Patterns Among Producers According to their Place in the Ecological Spectrum

Characteristic	Ecological spectrum		
	Somewhat ecological	Semi-Ecological	Advance Ecological
Age Range	35-45	36-57	36-60
Range of Educational Level	High school	High school-University	University
Time as nopal producer	Entire life (one exceptional case, 7 years)	Entire life (one exceptional case, 12 years)	Entire life (one exceptional case, 10 years)
Parents were nopal producers	Yes	Yes	Yes
Land ownership	Private	Private	Private
Range of plot size	3000 m2 - 3 Has	8000 m2 - 5 Has	1.4 Has - 5 Has
Have an occupation not related to farming, livestock, apiculture	Yes	No	No
Have performed other professional career	No	Most of them	Most of them

Source: Author's data

The difference among producers at different points of the ecological farming spectrum is in their educational level, current occupations and involvement in professional careers. Notably, the more ecological, the higher their education is. Another significant aspect is that the least ecological producers of the spectrum have other occupations, such as taxi drivers or working in commercial family businesses. In contrast, those in the range of semi- and advanced ecological,

all have had professional careers, but currently are only occupied in farming nopal. Some of them have combined in the past their professional careers with nopal farming or had fully engaged in their careers (no farming at all) and then came back to the land.

General characteristics of nopal management in Milpa Alta

Nopal production in Milpa Alta is characterized by low external input use and limited machinery. The Agricultural Census (2007) reports that there are 483 tractors in Milpa Alta, but only two in use. Producers use the machinery to replace nopal plants. My interviewees explained that, once a field is started, they only need to replace all the nopal plants every 10 to 15 years. The census reports that there are other types of machinery (only 403 units), including rotavators, but they are not necessary because the majority of the production units are less than three hectares (see Figure 5-1). Hired labour is probably the most significant input, but only where family labour is insufficient. According to my interviewees and key informants, normally the number of hired workers ranges between 2 and 4.

Although agrochemicals are still used, my interviewees, along with the National Agricultural Census generated by INEGI (2007) and “*Geoestadística del nopal*, (OEIDRUS, 2009), reveal that the quantities of agrochemicals applied are not significant. Of a total farmed area in Milpa Alta of 7,206 hectares (including land cultivated with crops other than nopal), only 1,372 (about 19%) are treated with agrochemicals, including fertilizers, and/or pesticides (National Agricultural Census, 2007) (see Table 5-3).

The survey “*Geoestadística del nopal*” (OEIDRUS, 2009) shows that only 7.3% of nopal producers in Milpa Alta use chemical fertilizers while the rest use manure or compost. As for pesticides, the distinction between chemical and non-chemical is unclear in this report. It only indicates that 7% of producers apply chemical herbicides; however, whether the rest use other non-chemical herbicides (e.g. organic or other types) is not explicitly stated.¹³² My interviewees indicate that they continue using agrochemicals to reduce labour, and because they trust in their effectiveness. Regarding insecticides and fungicides, the same survey states that 46% of producers employ ‘any type of pesticides’, which implies both chemical and non-chemical, but without listing them by type. What is missing in both official reports are data on the quantities of agrochemicals applied.

¹³² There aren’t many organic herbicides, so these are probably chemicals.

The division of data from the National Agricultural Census into ‘chemical’ or ‘organic’ inputs overlooks methods of pest management and fertilization that do not fit into those categories. This point emerges from my estimates on *land without chemical and organic inputs* (see Table 5-3) resulting in a surprising 57% of total farmed land in Milpa Alta. Similarly, only 2.5% of cultivated land has either chemical or organic pesticides applied, as if an incredible 97.5% of land had no pest problems at all and therefore no need of pest-control methods. This points out that alternative pest-control methods were not considered in the official surveys.

Table 5-3. Agricultural Land Receiving Chemical and Organic Inputs in Milpa Alta

Total Agricultural Land (TAL)	Chemicals (C)	Organic (O)	(C)+ (O)	Land without C & O
7,206 ha	1,372.0	1,705.9	3,077.9	4,128.1
% of TAL	19.0	23.7	42.7	57.3
Herbicides (ha)	347.2	58.5	405.6	6,800.4
% of TAL	4.8	0.8	5.6	94.4
Insecticides and fungicides (ha)	146.0	34.5	180.4	7025.6
% of TAL	2.0	0.5	2.5	97.5
Fertilizers (ha)	Chemicals (C)	Manure	(C)+ (M)	Land without C & M
	878.9	1,612.9	2,491.9	4,714.2
% of TAL	12.2	22.4	34.6	65.4

Source: Author based on data from the National Agricultural Census, 2007

The term ‘organic’ is relatively new in the language of Mexican small producers, and in interviews it became clear that they relate the term to organic certification. This fact problematizes concepts of ecological agriculture bounded as they are by the terminology of ‘organic’ inputs. Producers might name these practices differently. For instance, manure is widely used in Milpa Alta although producers do not call it organic fertilizer but simply fresh

manure or “natural fertilizer”. A field study by Torres (2008) confirms this insight, that 56% of the total nopal producers surveyed use ‘natural’ farming methods.¹³³

Other cultural pest management and fertilization techniques employed by producers were not likely captured in this survey. Fertilizers based on compost seem to be excluded altogether, as they are neither chemical nor pure manure. That could explain why as much as 65.4% of the total land (4,714 Has) is supposed to be free of ‘any type of fertilizer’. Possibly, a portion of the remaining 44.6% is managed with composts that are not pure manure, but contain other ingredients.

In the document Geostatistics of Nopal (OEIDRUS, 2009), only fertilization methods such as manure and compost (without specifying the type of compost) are mentioned. Therefore, chances are that traditional and new local technologies for fertilization, pest-control and weeding are not recognized by official institutions, and even respondents (producers) to the surveys may not match the concept of ‘organic’ with their own chemical-free management.

¹³³ The terms “agroecological” and “organic” were recently introduced in official surveys, so producers responding to surveys may be influenced by the concept or definitions provided by the people who apply the surveys. It may be that interviewers are incapable of explaining to the interviewee the difference between those terms without trying to get the interviewee’s response to fit the survey’s purpose.

Ecological farming and programs for producers

The three levels of government have programs that nopal producers can access. Different from the federal programs, the local programs (DF and municipal level of governments) have a clearer orientation toward ecological farming (at least in discourse). At the federal level, there are various programs but they do not specifically target ecological farming. The most important program at the national level for rural producers is PROCAMPO, but producers from Milpa Alta face barriers to accessing this program because many of them are under an irregular land property status (Torres and Burns, 2002).¹³⁴

Regarding the programs and subsidies at the local level (DF and municipal levels), sometimes producers have to demonstrate that their plots are ‘converting’ to agroecological practices or that they intend to enhance them, in order to obtain economic support. The norm with regard to environmental conditions of agriculture in DF (Gaceta DF, 2003) provides definitions that qualify producers as ‘ecological producers’ (Box 5-1) and processes to identify when producers are ‘in transition’.

Box 5-1. Official Definitions of Conventional and Ecological Agriculture: Environmental Norms that Establish the Conditions for Ecological Agriculture in the Conservation of Land in DF

Conventional agriculture: an agricultural production system whose inputs have a chemical, industrial, synthetic origin and/or come from genetically modified organisms.

Ecological agriculture: Forms of agriculture/livestock production developed according to the biological system, whose functions are carried out in a key space and based on soil conservation and fertility improvements, biodiversity protection and reduction of environmental impacts at the minimum. They are also socially responsible. They do not employ synthetic agrochemicals, pesticides, GMOs (Gaceta DF, 2003, p. 6).

Source: My translation from the official document “Environmental norms that established the conditions for ecological agriculture in the conservation of land in DF”

¹³⁴ The irregular status is particular to the “private property” of the land. The social regime under ejido or communal ownership is being dismantled since members of the ejido have sold land that they have the right to use. When they do this they sell the right to use the land to the person who buys it, but the ‘new owner’ has no titles of private property because in theory there is no private property under the ejido system. Although this is not illegal, the status of the ownership remains irregular. This irregularity becomes an obstacle to accessing resources from programs in which producers must demonstrate title or that they belong to a producers/rural organization. According to Merino (2009), this is the case of PROCAMPO because an eligibility criterion is to own the land or apply for the resources belonging to an organization. So, if producers are not part of an association and can’t demonstrate titles of property, then they cannot access PROCAMPO resources.

In order to access the programs of CORENA (from the Secretary of the Environment, DF), producers must prove they are ecological (interview with Director of CORENA, February 2012) whereas to access programs of SEDEREC the criteria is more related to the commitment of the producer to continue working the land (Interview with director of SEDEREC, March, 2012). Table 5-4 lists the different programs nopal producers can access and whose support is oriented to enhanced ecological farming. However, without proper tools to identify where producers are in the spectrum of ecological management, processes of transition may be difficult to achieve and complete. Therefore, the typology I offered (Table 5-1) could be used as a heuristic approach, which intends to fill the gaps in understanding levels of ecological management of the land in Milpa Alta that the official data does not reflect.

Table 5-4. Public Programs to Enhance Agroecological Methods among Nopal Producers

Program	Description	Impact*	Office in charge
Integral Program to Support Nopal Producers	Monetary subsidy. It subsidizes purchases of organic fertilizer (fresh manure or bio-inputs) or other goods; or services to adapt new technologies; or assistance to add economic value and support throughout the commodity chain. (Source: Official Flyer and internal document of the Municipal office of Milpa Alta)	Inputs / technical assistance/comercialization	MOofMA (DF) ¹
Program of Organic Fertilizers	Monetary subsidy. It subsidizes purchases of fresh manure or compost (Flyer and internal document of the Municipal office of Milpa Alta)	Inputs	MOofMA (DF)
Funding Program for conserving and restoring ecosystems	Economic support. Beneficiaries use the economic support for professional and technical assistance, equipment and to develop basic infrastructure in ecological investment projects to restore, rescue and protect ecosystems. (Source: CORENA website and personal communication with CORENAofficials http://www.sma.df.gob.mx/corena/index.php?option=com_content&view=article&id=76&Itemid=96)	Inputs/ Technical assistance	CORENA/ SMA (DF) ²
Rural and agricultural development for DF-Native Crops	Economic support. Producers should use it to buy only organic inputs and new equipment. (Source: SEDEREC Website personal communication with SEDEREC officials)	Inputs	SEDEREC (DF) ³

Program for small-scale sustainable agriculture to promote organic agriculture	<i>Economic and/or in-kind support.</i> Organic inputs to support conversion or transition to organic agriculture for certified producers in Good Practices or Organic Agriculture. Equipment for manual activities. Composting equipment and ingredients (e.g. worms, compost thermometers). Economic support for certification in Good Practices and Organic Agriculture. (Source: SEDEREC Website personal communication with SEDEREC officials)	Inputs/ production infrastructure/ commercialization (indirectly, through certifications)	SEDEREC (DF) SENASICA-SAGARPA ⁴
Commercial linkage and food culture program	<i>Economic support.</i> Producers can use it to participate in local fairs and markets. (Source: SEDEREC Website and personal communication with SEDEREC officials)	Commercialization	SEDEREC (DF)
Certification program	<i>Technical assistance for sanitary measures on farm, microbiological analysis, pesticide residues.</i> Users obtain certification in Good Practices/ Organic Production/ System of Risk Reduction. Users receive free training by agronomists qualified by the office in charge. (Source: personal communication with SAGARPA officials)	Technical Assistance/ production/ indirect impact on commercialization	SAGARPA (Federal) and SEDEREC

Source: Author's data.

¹Municipal office of Milpa Alta, DF; ² Commission of Natural Resources CORENA/Secretary of the Environment SMA, DF; ³ Secretary of Rural Development and Community Equity; ⁴ SENASICA (National Service of Vegetable Sanitation and Food Safety)/SAGARPA (Secretary of Agriculture and Livestock (Federal Government)). Note: I based the impact on the official description of the program and according to what producers reported to me during interviews.

It is important to note that the typology is mainly based on the key inputs (e.g agrochemicals, bio-inputs) and practices (e.g. integration of intercropping) that distinguishes one class of management from another and only considers nopal producers. This is a methodological decision based on the notion that many of the factors transforming social relations throughout the food system confront directly the farmer (Gliessman and Rosemayer, 2010). I assume that changes in inputs may have an influence on producers' decisions to incorporate more complex on-farm approaches such as intercropping, re-use of on-farm or local organic resources and waste, and natural pest management, which could close the ecological loop.

However, I acknowledge that efforts toward fully ecological on-farm management rely also upon aspects found beyond the farm, such as institutions, markets, farmers' values and attitudes (Gliessman and Rosemayer, 2010; Altieri, 2002; MacRae, et al., 1995; Hill and MacRae, 1990). Experiences of conversion to sustainable agriculture (Gliessman and Muramoto, 2010; Clark and Summer, 2010; Porter, et al., 2010) or enhancement of ecological approaches (Gonzalez-Jacome, 2010; Romero Lima, 2010) demonstrate how elements at various levels are intertwined. Hence, my focus on inputs and practices should be seen just as a methodological step or a point of

departure to untangle the complex relationships among these different aspects; it is particularly useful when dealing with a region where the transition to absolute ecological farming is not complete.¹³⁵

5.3 Farming Practices and Social Relations: An Analysis of On-Farm Management of Agricultural Inputs

In the following sections, I describe the social processes and social relations that make possible the relevant inputs and practices identified in the typology. Where the inputs come from, who provides them, how producers obtain them and how they learn to use them are key aspects of the social processes. Also, I will describe the producers' rationale for using them.

Agrochemicals and bio-inputs

Producers in Milpa Alta must legally comply with an ecological approach to agriculture (Ecological Norm to Agriculture, DF; 2003). However, agrochemicals have not been fully removed so it is therefore not completely ecological. Presumably, the quantities used are not very significant according to the official data presented above (see Table 5-3). The majority of producers complement agrochemicals with other cultural practices like sheet compost made with manure and nopal leftovers. When inquiring about the quantities of synthetics employed, producers claim that they use just "limited quantities" due to the climatic conditions of Milpa Alta and the small plot size per producer (on average between 1 to 2 hectares).¹³⁶ Their concerns relate to the quality of the synthetics and the associated health and environmental issues.¹³⁷ This analysis can help identify areas of policy intervention to support producers moving along the ecological part of the spectrum of practices.

Some of the products that producers are using or have used in the past few years (see Table 5-5) are red-listed or yellow-listed or even unauthorized in other countries (Perez Olvera et al., 2011). This list complements the data reported in the *Geoestadística del nopal* (OEIDRUS, 2009) regarding the most frequently used products (see Table 5-6). In Table 5-6, foley (methyl

¹³⁵ The most recent literature records experiences of farmers or regions that have completed the transition. Then, the challenge here is to understand the process of transition in the case of a region such as Milpa Alta, whose transition has not been accomplished.

¹³⁶ Producers argue that the pest threat comes from Morelos, a nearby state with warmer weather. Some producers have nopal plots there and when they transport the nopal harvested from Morelos to Milpa Alta, they bring the pest.

¹³⁷ Producers do not use a homogenous terminology for the quantities of agrochemicals. Some say "one application", "a bottle," or "1 litre". So, I was not able to synthesize the information.

parathion) appears as the pesticide most frequently used in Milpa Alta and it was also mentioned by the interviewees. Methyl parathion is classified by the World Health Organization¹³⁸ and the US Environmental Protection Agency (EPA) as “extremely hazardous” and “highly toxic”. Indeed, producers do not ignore the risk it presents, as noted by one of the producers interviewed: “methyl parathion has been used in Milpa Alta and we have named it ‘*panteonazo*’ because you would end up in the ‘*panteon*’ (cemetery in English), if you don’t take extreme precautions”. Yet, methyl parathion appears in the list of authorized pesticides in Mexico¹³⁹ (Federal Commission Against Sanitary Risks of the Secretary of Health of Mexico, 2008). Moreover, the substance is not even mentioned in the list of commodities whose import or export is subject to regulation by the same commission¹⁴⁰ (*Diario oficial de la Federacion*, 2013).

¹³⁸ See <http://whqlibdoc.who.int/hq/2002/a76526.pdf>

¹³⁹ See <http://www.salud.gob.mx/unidades/cofepris/cis/tramites/infpynv/RegPlag.pdf>

¹⁴⁰ “Agreement that establishes classifications and codification of commodities whose import and export is subject to regulation by the institutions that are members of the intersectorial commission to control the process and use of pesticides, fertilizers and toxic substances (in Spanish: *ACUERDO que establece la clasificación y codificación de mercancías cuya importación y exportación está sujeta a regulación por parte de las dependencias que integran la Comisión Intersecretarial para el Control del Proceso y Uso de Plaguicidas, Fertilizantes y Sustancias Tóxicas*”, (2013, April 12), *Diario Oficial de la Federación*. First section.

Table 5-5. Agrochemicals Employed by Nopal Producers Interviewed

Brand Name¹	Active Ingredient ²	Description³	Status⁴
Malatión	Malathion	Pesticide	Warning and restricted use Caution and restricted use: Only for sale to by commercial pest control operators. To be applied only by or under the direct supervision of commercial applicators responsible for insect control program.
Faena	Glyphosate	Herbicide for agricultural use	Warning Caution with restricted use
Agromil	Chlorpyrifus	Pesticide	Warning Caution with Restricted use in the USA (restricted by the Environmental Protection Agency)
Folidol	Methyl Parathion	Pesticide	Danger Prohibited
Amina 4-D	D, Dimethylamine Salt	Herbicide	Somewhat Dangerous. A few brands have warning: Caution with Restricted Use
Gesaprin	Atrazine		Warning Caution. With Restricted use Federally
Bravo Daconil	Chlorothalonil	Fungicide	Danger, warning and caution
Vanucron	Monocrotophos	Insecticide	Danger Not registered
Robosh	Not found		
Gordocop	Not found		

Source: Author's interviews with nopal producers

¹ Brand's name or active ingredient (in Spanish), as provided by producers in the interviews; ² In order to find the equivalent active ingredient in English, I first searched the active ingredient in Spanish and then the equivalent in English; ³ Description based on only brands with that active ingredient, which are only for agricultural purposes. EPA system; ⁴ Status is based on the Product, Ingredient, Manufacturer, System (PIMS), a system developed by Cornell University and the New York State Department of Environmental Conservation. I use status on the "signal word" that ranges from NONE, CAUTION, WARNING, DANGER. When the product is prohibited, it means the product is not currently registered and the sale, use and distribution are illegal. The PIMS also provides information on restrictions: "Restricted use pesticide" or "restricted pesticide" means any product whose labeling bears the statement "RESTRICTED USE PESTICIDE" is restricted in its purchase, distribution, sale, use, and possession in New York State or federally. Furthermore, restricted-use products may only be purchased and used by a certified applicator in New York State.

Table 5-6. Pesticides and Fertilizers Used with Greater Frequency among Nopal Producers

Pesticide	% of those who use pesticides*	Fertilizer	% of those who use fertilizers*
Foley	33.09	Triple 17	31
Folidol	26.85	Sulfato	26
Lime (Calcium)	6.65	Guano	4.3
Biological	1.83	Nitrofosca	2.8
Others	31.53	Supercompuesto	2.9
		Nitrofosca triple 10	1.1
		Others	31.9

Source: *Geoestadística del nopal*, 2009 OEIDRUS

*The percentage is out of the total nopal producers surveyed.

Concerns arise because some producers use such products when desperate, due to the persistence of some pests. An interviewee pointed out that when producers want to eradicate pests, “they trigger bombs on them” and “hit them with the strongest one (agrochemical)”. There is also the issue of mismanagement of pesticides, which causes severe toxicity in producers, said one interviewee.

So, why do they keep using synthetics? From the interviews, it consistently emerged that they do it because “it is affordable” and “results are reliable”. Seemingly, the affordability relates to the costs of labour. Among interviewees using agrochemicals and who trust in their results, there is the perception that saving labour makes better business sense. A producer using agrochemicals says that with his combination of agrochemical inputs and basic machinery (rotovator) is perfectly manageable for one person to work a plot of up to one hectare in size. As the producer says: “I would quit just to not contaminate the produce, but agrochemicals are ‘indispensable’. If you do not put on agrochemicals, the plot gets full of weeds and you waste production.” The fear of wasting production cannot be underestimated in this producer’s case because his unit of production is only 3,000 sq. meters (32,292 sq. feet) and nopal provides 62% of his household income. However, despite the small unit size, he uses herbicides in the rainy (or summer) season. Chemical fertilizers are applied once a year, either Triple 17 or ammonium sulphate, complemented with livestock and hen manure. The frequency of herbicide use is

consistent with his approach to efficient and well-organized production, based on saving labour and keeping the plot clean to not waste production. Keeping the terrain clean helps reduce the need for herbicides too.

The above story could resonate with 64% of nopal producers in Milpa Alta, whose units of production are in the 2501-5000 sq. meters range (34%), or less than 2501 sq. meters (30%) (OEIDRUS, 2009) as presented in Chapter 2, Figure 2-3. Thus, producers holding small plots must supplement their income with other activities. One interviewee combines the nopal business with a job as a taxi driver, but his main income is from nopal.

In addition to saving labour, agrochemicals represent only 5% of the global costs of a regular hectare of nopal production (SAGARPA 2007, as cited in Valencia, 2010). However, this figure underestimates the real problem, which is the continuous dependency on those inputs. As these have become fixed costs, producers do not realize that they might generate a larger profit by employing non-chemical inputs.

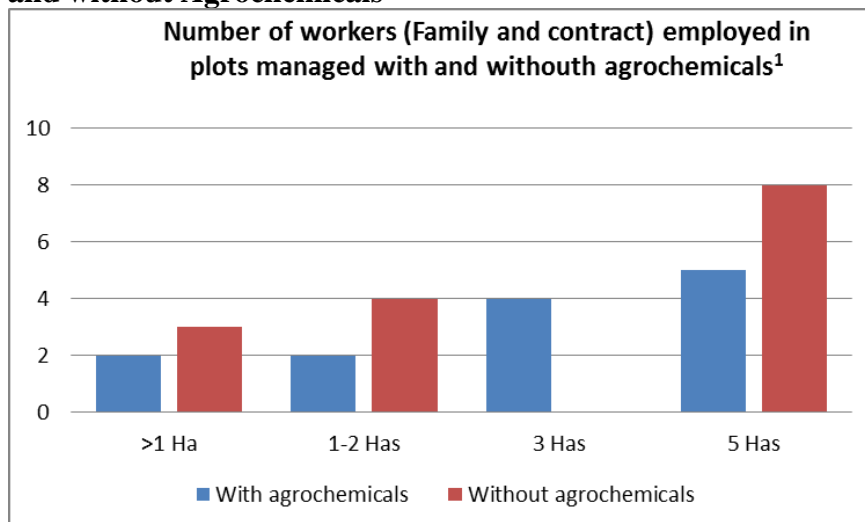
Despite the seeming “affordability” and “reliable results” some producers associate with nopal production, there are producers already employing strategies to ‘reduce’ their use. For instance, I found that producers rotate the land on which synthetics are applied (half of the plot free of agrochemicals each year). In addition to the values related to their education and occupations, health and environmental concerns motivate them to gradually remove the synthetics in this way. One interviewee, who is a retired junior school biology teacher, says: “My daughters don’t want to deal with agrochemicals any more... We don’t want to cause illness to people. She [the older daughter] is a chemical engineer and knows well that people can get ill from them [agrochemicals]. She has no children but she says ‘I am sorry for those who have because we are contaminating the water and everything; we must find ways to not contaminate.’” Education influences the decision to give up agrochemicals.

Understanding the agrochemicals-labour trade offs. Producers not using agrochemicals need more human labour for weeding, natural pest control and making compost. Based on data collected in the field and estimations based on internal documents of the producers’ organization Product-System of Nopal, the difference in labour employed in plots managed with and without agrochemicals ranges from one to three workers, depending on the size of the plot (see Figure 5-

1). This figure includes family members and contract workers. Table 5-7 shows separately the workers employed in each of those two categories.

This finding is consistent with the evidence found in the literature of organic and/or agroecology farming that indicates that labour needs are higher and a pressing economic factor in farms managed ecologically (Morison et al., 2005; Jaffe, 2008; FAO, 1998). Therefore, the potential and challenges associated with sustaining ecological farming should be linked to the site-specific conditions of labour of the case study in question, such as the structure of labour, availability, and costs (Morison et al., 2005).

Figure 5-1. Number of Workers (Family and Contract) Employed in Plots Managed with and without Agrochemicals



Source: Author's elaboration/estimate with field data and data from the document *Plan Rector del Nopal* (2010) of the organization Product-System for Nopal DF.

¹Number of workers based on an average per year.

Table 5-7. Number of Workers (Family and Contract) Needed in Plots Managed with and without Agrochemicals ¹

Plot size (Has)	Using agrochemicals			With no agrochemicals		
	Family	Contract	Total	Family	Contract	Total
>1	1	0-1	2	1	2	3
1-2 Hectares	n.d	1-2*	1-2	1	2-3	3-4
3 Hectares	1	2-3	3-4	n.d	n.d	n.d
5 Hectares	n.d	5*	5	3-4	3-4	6-8

Source: Author's data and estimates based on *Plan Rector del Nopal* (2010) by Product-System for Nopal DF.

¹Number of workers is an average per year. The variability depends on of the crop season. In high season additional labour is required, so for instance, a producer with less than 1 Ha requires 0 contract worker in low season and 1 during high season *Estimated based on document *Plan Rector del Nopal* (2010)

Labour in Milpa Alta is constituted mainly of family members and contract workers, who typically originate from “nearby areas” or “other states.” The agricultural census 2007 reports 5420 units of production with agricultural and forestry activity in Milpa Alta; 254 of these (without distinguishing units per crop) were contracted workers. In 116 of these units, contract workers come from “other states” while in 132 other units, workers come from an “area nearby Milpa Alta.”¹⁴¹ Torres (1991) shows that contract workers in Milpa Alta represent 32% of the total workforce employed in agriculture in all Milpa Alta (without distinguishing the type of crops). However, that study is more than twenty years old and it may need an update. Hence, issues of labour availability or shortage must be framed in relation to the forces affecting availability of family and contract labour in the region in certain timeframes (e.g., high season). Two key issues emerging from interviews and other documentary sources are: 1) family members engage in other economic activities and sometimes stop working the land (Torres, 2008; 2002); and 2) contract labour has to be attracted from outside Milpa Alta and then the salary must be attractive enough for the outside labour to come to the region.

Insufficiency of family labour is due to that families diversify income sources as a strategy to reduce risks associated with low prices of nopal. A producer engaged in a taxi business states that this “is a secondary activity to complement the income based on nopal business”, but he still sees nopal as a primary income. In some instances, I found cases where the income from a family member working in the city (out of agriculture) is actually used to cover farm costs. A producer

¹⁴¹ The census does not specify how close that area is, but the point to highlight is that the contract workers are not from Milpa Alta.

whose husband works in the city for a TV company as an engineer explains: “I have to use part of my husband’s salary to cover the costs of nopal farming, although later on I recover the money when there are better nopal sales.” In this way, the pluriactivity functions to support the farming activity. Interestingly, this producer used to have a job in the city while continuing to reside in Milpa Alta. She went back to the land looking for a better quality of life and agriculture became her source of income. For her, the land and farming knowledge is the legacy she wants to leave to her only daughter.

In another case, the producer “helps” a family member in a non-agricultural business, which takes a few working hours away from the plot, and for that reason he contracts workers to do the farming work. He says: “I work on the plot from 6 to 9 am and then leave the workers there because I help my father with his tortillas shop; then I come back to the plot around 2 pm.” Other producers refer to cultural issues related to the fact that Milpa Alta is close to the city, especially with regard to men: “Men don’t want to work the land anymore, they don’t want to get their hands dirty, and even prefer to work in the city for less pay”, tells a female producer. Hence, when family labour is insufficient the workforce is not available in Milpa Alta and has to be brought in from other regions.

The predominant issue pertaining to contract labour has to do with “high wages”. Producers must pay wages established in DF (*Plan Rector del Nopal*, 2010) because Milpa Alta belongs to DF. DF is in the group of areas of Mexico with higher salaries.¹⁴² While proximity to urban DF might poses an economic disadvantage for Milpa Alta, I found that the wages producers pay are actually a little higher than the wage paid in all DF. Interviewed producers consistently reported paying \$150 MXN pesos (\$11 CAN) a day for two workers (8 hours), which is \$70 MXN pesos (\$5.3 CAN) for each worker. Meanwhile, the official wage in DF for 2012 (the year I conducted my research fieldwork) was \$59.82 MXN pesos (\$4.6 CAN).¹⁴³ However, the high wage paid in Milpa Alta may be the reason that workers from other regions keep coming to work on Milpa Alta plots. When speaking of this issue, producers state that they do not face contract labour shortages, but their problem is to have cash to pay for it. Milpa Alta nopal producers are smallholders and everyday sales of nopal sustain the household economy. When considering

¹⁴² National Commission of Minimum Salaries assigns ranges of salaries in three geographical areas, A, B, C. Section A has the highest salaries and DF belongs to it.

¹⁴³ Salaries for DF were taken from the National Commission of Minimum Wages.
http://www.conasami.gob.mx/pdf/tabla_salarios_minimos/2012/01_01_2012.pdf

shifting to an agrochemical-free management, the additional labour would likely have to be contract labour from outside Milpa Alta.

Labour costs represent 13% of the global costs of nopal per hectare, whereas agrochemicals are less than 5% (see Table 5-8). Actually, fresh manure expenditure is higher than that of agrochemicals. Thus, if labour costs double or triple per hectare (see Table 5-7 of comparison of workers in plots managed with agrochemicals and without agrochemicals), then it is clear that there is a significant economic burden for ecological producers.¹⁴⁴

Table 5-8. Total Costs of Nopal Production per Hectare

Concept	Costs in \$MXN	% of the global costs
Labour	1200	13.3
Agrochemicals	435	4.8
Manure	720	8.0
Technical assistance	5000	55.2
Packing	1700	18.8
Total	\$9,055	100

Source: Author's data on the structure of nopal production costs from SAGARPA (2007), cited in Valencia (2010). (See Appendix B: Nopal production costs data, SAGARPA-SIAP)

Removing synthetics can benefit the agroecosystem, as well as producers' and workers' health but changes the production costs structure. This throws into question the economic incentive for nopal producers to either quit agrochemicals or continue working without agrochemicals. Among the programs to support ecological agriculture in the region, there is not a specific one addressing and subsidizing the costs of labour. Although officials from the three levels of government (Milpa Alta municipality, DF offices and Federal government) that I interviewed often point out the importance of ecological agriculture in the region "to prevent further urban growth" and "prevent further ecological unbalances", but they do not make an explicit connection with the fact that ecological agriculture is labour-intensive. Helping producers cover the additional labour costs when removing agrochemicals would be a much more effective

¹⁴⁴ The structure of costs according to SAGARPA does not make sense to me (55% of the total costs). My interviews consider rated labour as "highly important" and technical assistance only "important".

strategy to achieve the DF government's objective of conserving the ecological services while preventing further urban growth. Without a policy framework to address the labour issue, producers without agrochemicals have to engage in markets that can pay the cost of their management.

Substituting agrochemicals with bio-inputs

Bio-inputs are external off-farm, manufactured, commercial fertilizers or pesticides made with biological ingredients. Usually, farmers substitute synthetics for these bio-inputs without necessarily modifying the rest of the farming practices. In order to understand the potential benefits of using these products in Milpa Alta, I contrast a case of a producer who has successfully used these products for more than 14 years and another case that resulted in failure after six months of substitution. In both cases, the producers hold more than three hectares, thus are among the producers with the largest units of production in Milpa Alta (6% of total nopal producers, according to Figure 2-3).

Producers that moved to bio-inputs approached technicians with an interest in learning something new and make improvements to their farms. They wanted to “try something new” and “insist on making changes”. This may disprove the common belief that producers using agrochemicals don't have the will to change. Rather, they take risks, investing time in training and money to support higher costs.

In the two cases, relationships with agronomists and technical training were the window into trying bio-inputs but expectations to eradicate the pest in the short-term resulted in one of the producers giving up quickly. The producer who failed said, “I went to a workshop with the engineer who sells them (the bio-inputs). He said that the pests are controlled with other pests; that the pest had to drop... but I got full of cochineal... As the first product did not work, I came back to him and he gave me a different one, but nothing worked and it was very expensive.” This was the first and only workshop he had attended about chemical-free management.

In the successful case, the producer gradually learned alternative approaches from 1998 onwards with the support of external technicians. By the time she replaced agrochemicals, she knew how to better manage pests and never expected to eradicate them. In 2000, this producer and her family contracted newly graduated agronomists who were offering their services as technicians: “They were knocking on doors and nobody trusted them. We did. They told us what

to change. Although they were newly graduated from the university, they learned a lot with us but also brought us new knowledge”. This was more of a collaborative learning process, in which the technician not only focused on making changes on the farm but also connected the producer with other public governmental training programs and bio-input providers from the University of Chapingo, one of the most recognized universities in Mexico in agriculture. Since then, this producer engaged in public training programs offered by the Secretary of the Environment DF on non-agrochemical based farming. He also learned how to process nopal, after which they started a business processing nopal.

The costs of bio-inputs are higher than agrochemicals. Comparing the costs, the interviewee who failed says: “with \$200 MX pesos a year (\$18 CAD) I can apply agrochemicals over one hectare, while with the others (bio-inputs) I need to pay \$900 MX pesos (\$88 CAD).” Therefore, implementing complementary strategies that secure earnings and limit expenditure on technical advice is a key. He holds three hectares.

In the successful case, a strong concern for minimizing health issues related to agrochemicals kept them on track with bio-inputs despite the costs. The producer points out, “We realized that we can get sick with agrochemicals.” In this case, the producer had five hectares and looked for markets that rewarded the agrochemical-free quality of their nopal. Over time this producer has learned and introduced “hygienic measures” and “organic practices” to the plot, which she has learned from workshops and public training programs. However, it was the capacity to commercialize the nopal at a better price because of better quality that allowed them to continue farming without agrochemicals. The current public training programs that target nopal producers of DF are sponsored by DF offices, SEDEREC and CORENA, and by the Federal Secretary of Agriculture (SAGARPA) (see Table 5-4 on public programs).

In contrast, the producer who gave up bio-inputs, sold all his produce at the local retailing point (*centro de acopio*) only cultivates nopal in his plots, barely knows about certifications and is disappointed about the lack of price premiums for his non-chemical nopal production. In his words: “It’s not worth expending much more money if we will get the same price”. Nonetheless, because of declining nopal earnings he has started a livestock business, which now provides him with 20% of his total annual income. Despite the bad experience with bio-inputs, the interviewee asserts, “I would try again only if I am taught how to do it.” Producers like him represent fertile ground for change. When I inquired about public programs available to learn chemical-free

methods, he responded: “I barely know about public programs. I’ve heard about the program of subsidies for manure as recently as last year”. It appears that a limited number of people in the region have accessed public training programs. This coincides with Torres and Rodriguez’s finding (2008) that only 30% of producers in Milpa Alta have received training or even technical assistance from public institutions.

In addition, a bad experience may lead to a stronger belief in the effectiveness of agrochemicals and monoculture. A producer with such an experience went back to the agrochemical supplier and trusts in that approach again. When he finds a new pest that does not respond to the actual synthetic substance, he asks for advice from the local agrochemical providers. The established supply of these inputs in Milpa Alta creates a blind confidence in their effectiveness. Nonetheless, the producer acknowledges that even though the pests are controlled with agrochemicals, new ones (secondary pests) appear. Such a situation recalls Gomiero et al.’s (2008) point about the producers’ dependency upon agrochemicals to deal with the well-established spiral of new pest outbreaks associated with synthetic chemical use.

A reason that the bio-input substitution approach is recommended as a transitional phase toward deeper agroecological methods has to do with the reliance on external technical assistance (MacRae et al., 1990; Gliessman and Rosemayer, 2010) that is disseminated top-down as in farming approaches based on external synthetic inputs (Rosset and Altieri, 1997). According to my interviewees, both bio-inputs and the associated technical assistance are provided by the suppliers, who in all cases happened to be agronomists. The reliance on assistance came to the surface with the successful substitution case. Since 2000, when this producer introduced bio-inputs, she only trusts in the supplier’s advice because, in her view, the supplier “has scientific knowledge that one needs.” This belief can prevent farmers from having agency in the generation of farming knowledge relevant to their specific environmental and social conditions, and confidence in farmer-to-farmer exchanges that generate knowledge collectively (Holt-Gimenez, 2008; Altieri, 2002). More worrying is the fact that producers actually undermine the potential of these grassroots ways of reproducing farming knowledge. My interviewee appears to be in that place as she says “It is not the same to get advice from the technician than if you ask a friend who tells you what worked for them. No, we need someone to identify the problem and the pest.”

In order to close the ecological loop or mend the ecological rift, the goal would be to minimize external inputs and associated advice. Instead, learning integrative ecological

management of the farm to improve fertility and diversity is recommended. In the field, I found stories of farmers' experimentation that actually allowed them to remove agrochemicals without needing to pass through the input substitution phase. This was reflected in the story of a producer who by his own experimentation found a method to naturally control grana cochineal, one of the pests that hits Milpa Alta the hardest. He left a piece of land without any pest treatment and the rest treated with agrochemicals. He says: "I came back after a month and oh surprise! I found lots of ladybugs in the plot with no treatment and they had finished all the grana cochineal... so I collected the adult ladybugs and brought them to the plot that was infested with that pest. Then, after a month, the cochineal was controlled... So, I said to myself, the agrochemicals kill these beneficial beings first! Then I stopped using agrochemicals." This is pertinent knowledge gained through experimentation and provides a practical method to solve a site-specific problem using on-farm resources. Such experiences need to be collected, catalogued and disseminated in the region, not only because they emerge from the farmers and their needs but also because they are consistent with ecological agriculture.

Public financial and training support is fundamental to the substitution because usually the change comes with harvest and monetary losses as with the producer who failed. This is true for any process of conversion to sustainable agriculture where synthetics are removed (Gliessman and Rosemayer, 2010). Hence, a plan of conversion, including but not exclusive of input substitution approaches, must be accompanied with a financial plan that outlines strategies to keep liquidity when yield losses occur (MacRae et al., 1990). According to MacRae et al. (1990: n.d), after removing conventional methods of production, toxic residues remain in the soil and "decomposers of organic matter in soil and natural controls of pests may be affected in this way and this can translate into yield and income losses for up to six years." In addition, the conversion may be delayed if there is low quality technical advice. The interviewed producers who tried input-substitution, including but not limited to the successful and unsuccessful stories described above, had no public financial support or a plan for conversion. Hence, a successful substitution depends upon producers' capacity to find economic opportunities (e.g., finding a broker who pays premium price although the producer has no certifications) and willingness to invest time and money in learning about strategies to help the soil recover.

The need for external technical assistance can be expressed as a process of farming knowledge rift (Schneider and McMichael, 2010) in the region. For Schneider and McMichael

(2010), farming knowledge is lost when farmers move to town and take with them specific farming knowledge of local agroecosystems accumulated through experience. As a result, reliance on external agents' support (e.g., technicians and/or suppliers) to develop agroecosystems management strategies may increase (Foster, 1999; Schneider and McMichael, 2010). In the experience described previously, producers using either agrochemicals or bio-inputs rely on the suppliers' advice and the availability of 'new products' to cope with new pest outbreak. They also hold a limited understanding of the biological cycles of their ecosystems and may be unable to solve problems by themselves. This is true despite the fact that all of the interviewees substituting agrochemicals come from families who have worked the land for generations, which suggests that even without fully migrating to urban centers, local agricultural knowledge may be lost. For this reason, the case of Milpa Alta calls for further investigation into how farming knowledge is preserved or lost in the context of partial migration.

From previous studies (Torres and Rodriguez, 2008; Torres, and Burns, 2002; Torres, 1995), we know that there are two important trends regarding producers' occupations in Milpa Alta. On the one hand, there is a trend toward combining farming activity with urban occupations. On the other hand, there is also a process of giving up agriculture and becoming involved in non-farming occupations without necessarily leaving Milpa Alta. Instead, they commute every day when the jobs are in Mexico City (Torres and Rodriguez, 2008).

The phenomenon of mixing rural and urban jobs developed in the 1970s with urban growth and the industrialization process of Mexico City, and has persisted since then (Torres and Rodriguez, 2008). However, surveys reporting occupations of the Milpa Alta population at different points in time reflect that engagement in urban jobs fluctuates. For instance, a survey by Torres and Burns (2002) found that 68% of Milpa Alta producers had an urban job, while Torres-Lima and Rodriguez-Sanchez's (2008) survey indicates that less than a 17% of Milpa Alta producers have an urban job. Having part-time or full-time urban jobs is a strategy to deal with seasonal agricultural income, but it is difficult to conclude that this actually threatens the continuity and development of local farming knowledge because they can bring knowledge gained in their urban immersion (Torres-Lima and Rodriguez-Sanchez, 2008). Therefore, more influential in the process of the knowledge rift is the decline of the economically active population (EAP) of Milpa Alta occupied in agriculture. In 1995, 75% of the EAP worked the land (Torres and Burns, 2002) and in 2010, the number dropped to 29% (Political Delegational

Office of Milpa Alta, 2010). In the context of people keeping their residence in Milpa Alta, this could result in less traditional farming knowledge being available for new generations that work the land. Traditional farming knowledge is normally continued when one generation passes it on to the next one (Wilken, 1980; Altieri, 1989).

In addition, the loss of local farming knowledge may continue with agrochemicals still available and affordable. Current governmental actions, such as banning the use of agrochemicals, a law passed in 2011 (Gaceta Oficial DF, 2011), are not sufficient if the distribution and commercialization are not prohibited. The DF government prohibited agrochemicals use, but not its distribution and commercialization. Hence, harmful agrochemicals are authorized at the national level and the big manufacturers and distributors operate within and near Milpa Alta: a Bayer factory is located in Morelos and its headquarter is in Mexico City. Dupont, Bayer, Bass, Monsanto, Ingeniería Industrial Bravo, Agricultura Nacional and Syngenta Agro are the most common agrochemical brands used by nopal producers in Milpa Alta (*Plan Rector de Nopal*, 2004). Banning only use, which disfavours producers, is not an effective action. Additionally, it may prevent the allocation of public resources to help producers make transitions from agrochemicals to more ecological approaches because producers cannot state openly that they use agrochemicals if it is not permitted by law. Rather, a more fruitful policy approach should focus on enhancing and improving existing traditional ecological practices.

In the next section, I explore the potential of incorporating manure and nopal leftovers as a type of compost, which is a traditional method still predominant in the region. In addition, I will analyse whether the producers' farming knowledge and market expectations influence their decisions to move towards advanced ecological practices.

Another aspect of a broader knowledge rift is, perhaps, the limited number of professionals (in and outside Milpa Alta) with the skills to develop biological farm inputs and support farmers in transition to non-agrochemical management. Therefore, if a local or national sector does not develop quickly, likely in the near future bio-input brands manufactured overseas might start to be imported. Knowledge of how to use them will need to come from off-farm and far away as happened with agrochemical-based approaches. The current high cost of bio-inputs is in part a reflection of the limited local supply. It is necessary to increase educational programs to train people in these approaches and incentivize the local industry of bio-inputs. Such industry is in the early phases of development, in part because the laws about commercialization and distribution

of bio-inputs across the nation were passed as recently as 2006 (*Diario Oficial de la Federacion*, 2006)

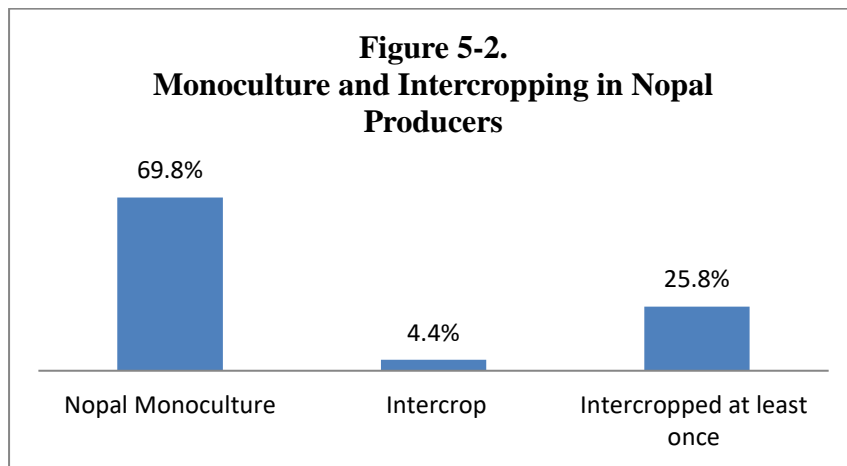
Monoculture

Monocultures are simplified agricultural systems that disrupt positive biological functions (e.g., energy, water cycles) of the agroecosystem as a whole, including natural control of pests and recycling of nutrients (Altieri, 2005). Between 1960 and 1970, the commercial links of Milpa Alta with the urban market of Mexico City fostered monocultures, as producers wanted to take advantage of the profits from one specific crop. The result was ecological disruptions (or ecological rift). The ecological rift widened as local farming production became dependent upon resource ‘subsidies’ from outside, depleting rather than regenerating the agroecosystem (McClintock, 2010). For instance, monoculture requires the use of external inputs to maintain land fertility and control pests (Gomiero et al., 2008), a function that diversity would play otherwise (Altieri, 2005).

Now, some producers claim that the reason they maintain nopal monoculture is financial survival. My interviewees point out that because of the low price of nopal,¹⁴⁵ they want to generate as much production as possible. Although the final destination of their crop is still the urban market of Mexico City, they now sell it through middlemen and brokers for lower revenue. The competition from nopal producers in neighbouring Morelos also decreases the price. Therefore, the ecological rift deepens because commercialization problems encourage monocropping. The paradox is that it also keeps annual volumes of production high, which allows producers to keep working the land; therefore it has a role in not deepening the town/city labour division (or social rift) as it prevents further migration to urban areas. I do not mean to say that monoculture should be encouraged, but the situation highlights that despite market pressures, nopal monoculture enables producers to keep their lifestyles in a semi-rural landscape. However, the experience of producers who intercrop sheds light on the ways to draw economic and environmental benefits from diversification.

¹⁴⁵ The issue of “low prices” was very often mentioned by producers. The prices are based on different measures of produce volumes. The most common measure is the price per 100 leaves. At the time I conducted the field work 100 leaves were \$10 MXN pesos (less than a Canadian dollar). In the next chapter a discussion on markets and prices will be presented.

Today, 69.8% of all producers cultivate only nopal (OEIDRUS, 2009) (see Figure 5-2). According to my interviewees that are part of this group, ‘intercropping is not an option’ arguably because they hold a small piece of land.¹⁴⁶ Also, they have the perception that it will bring pest problems they do not know how to manage. Based on my typology, monoculture is present in the three parts of the spectrum of farming practices (somewhat, semi and advanced agroecological producers).



Source: OEIDRUS (2009). *Geoestadística del Nopal*. Note: “Intercropped at least once” includes those who have intercropped in the past but are now practicing monoculture.

They also face the problem of pests. In recent years, producers modified the planting system to deal with this problem, by increasing the distance between rows and between plants within rows (OEIDRUS, 2009) to avoid the movement of pest from one plant to another. In the past, they left a narrow distance of only 70 cms between rows and 20 cms between plants within rows in order to intensify. However, over the years, they have learned that such practices complicated weeding and harvesting and increased chances of pest outbreaks. Hence, they now put a distance of 1.20 m to 1.40 m on average between rows, and 20 to 40 cms between plants, which reduces even further the density of production. Such changes respond to agroecosystem erosion resulting from monocultures. My on-farm observations and interviews confirmed that

¹⁴⁶ Less than half a hectare is considered a small plot. The small size of the plot in part resulted from the parceling out of land between the members of the family. A producer says that because of that, her brothers decided to build their own houses and gave up on agriculture.

these practices are in place. My interviewees state that they do it to imitate what appears to work elsewhere or to follow an agronomist's advice.

Thus, there are two intertwined issues regarding monoculture: on the one hand, even though producers find nopal prices insufficiently rewarding, it is currently the only profitable crop in the region. With the intention of maintaining agriculture in this region, official programs focus on supporting nopal production. On the other hand, the small size of plots does not leave much space to encourage diversification. However, cultivating just one crop contributes to further difficulties with the biophysical agroecosystem conditions. Improving profitability should be seen as the basis for the transition to diversification. However, motivations to diversify must arise from producers. Perhaps a way to support biodiversity is through public programs that address ways to manage material difficulties such as labour costs and small plots in the region.

How much do nopal producers value diversification? The fact that 25.8% of producers at least have intercropped once and 4.5% consistently do it shows that there is a segment of farmers with the will to diversify. I interviewed producers in both the group that has intercropped at least once and the group that does it continuously. I will show their reasons and motivations when discussing intercropping.

Intercropping

Intercropping, defined as multiple cropping where two or more crops are planted in a field during a growing season, is fundamental to stimulate natural mechanisms that keep in balance in the agroecosystem and related ecosystems (Mousavi and Eskandari, 2011). Benefits from intercropping are: the efficient use of limited resources (e.g., light, water, nutrients); reduction of insects, disease and weed damage; improvement of soil fertility; and increasing volume of production (Altieri, 2002; Mousavi and Eskandari, 2011). Mousavi and Eskandari (2011) also state that results of this practice include more resilience to perturbations and better yield stability. Because nutrients are more completely absorbed and converted to crop biomass, intercropping leads to yield advantages. Small farmers in particular can benefit the most from intercropping because external inputs are not required to improve or maintain the soil quality (Rosset and Altieri, 1997; Altieri, 2005). They can also rely on alternative crops if one of them is damaged or does not offer good market rewards.

Although we know that there are farmers intercropping at least once (see Figure 5-2), data on the land involved or volume of production of the crops cultivated with nopal are not available. Producers do not record this information because the non-nopal production is for self-consumption. My interviewees just had rough ideas about volumes.

In my field observations, mixed intercropping was the most common type of management. In mixed cropping, two or more crops are arranged with no distinct row arrangement. Corn, vegetables, fruit trees and lima beans are the more frequent crops accompanying nopal (OEIDRUS, 2008). Box 5-2 contains a list of the crops found in my interviewees' plots. Legumes play a better role in fertility, however, corn is still the most common crop to accompany nopal in Milpa Alta. The historical legacy from the time when the region was more corn-oriented seems to be the reason. People of Milpa Alta value corn and keep it in their diets, hence, the nopal-corn mix plays a cultural function.

In my interviews I found that health benefits resulting from consuming a variety of foods, is one of the strongest reasons to diversify. Some reasons to give up diversification are that "it requires more work," "there is no market for this produce" and "do not know how to manage pests from the non-nopal crop."

Box 5-2 Non-nopal Crops in Interviewed Producers' Plots

Beans
Lime beans
Squashes
<i>Chilacayote</i> (a native squash variety)
Chayotes
Lemon trees
Fig trees
Nectarine trees
Apple trees

It is worth mentioning that I found producers on the three points of the spectrum (somewhat ecological, semi-ecological and advanced ecological) who intercrop consistently. This was contrary to my assumption that intercropping would be found only in the advanced ecological group. In all cases of producers who practice intercropping manage three or more hectares. The key difference among these producers is the intensity and the values associated with this practice.

Producers using agrochemicals (somewhat ecological) focus on the benefit of complementing their diets with their own crops. Those who are in the process of removing them or removed them recently (semi-ecological and advanced ecological) stress the health benefits of eating “clean” food, knowing how their food is grown and the ecological advantages for their agroecosystem.

Producers who intercrop consistently, do not use agrochemicals and demonstrate a clear understanding of the multi-functionality of diversification. They are able to link environmental, economic and social advantages related to diversification. For example, besides self-consumption of “fresh” and “clean” food, they acknowledge it helps strengthen soil nutrients and mention broader social objectives such as “food security” for the region and possibly “food sovereignty” for the country. Also, they see it as an economic security in the event that nopal prices decline.

The literature on intercropping states that one of its advantages is that it allows plants to be “stacked up” in the same space to get more production per unit of land. I observed that mixed intercropping systems allow producers to rationalize space, work and nutrients. A producer explains to me his rationale for intercropping as follows. As larger distance between nopal plants is now recommended to avoid pest contagions, he considers intercropping a positive way to use the space and increase overall production. In this way, he is aware of the benefits of productivity and better use of nutrients resulting from this practice. However, limited labour prevents the intensification of this farming method. In the field, he shows me the areas of the plot where he puts beans to fortify nopal plants. “Depending if I have time available I put beans in more areas”, he says. Hence, he only selects areas for intercropping where he observes that nopal plants are weak or growing poorly. Leguminous crops help fix nitrogen, an important soil nutrient. This producer knows this and for that reason uses bean and lima bean as intercrops.

Environmental stewardship also results from intercropping practice. A producer who consistently maintains fruit trees in her nopal plots explains that the benefit is to capture water. Although nopal does not require much water, this producer sees herself as responsible to help refill the groundwater of the region and fruit trees are good for that. This producer has five hectares in total.

Concerns about current chronic diseases linked to consumption of food with pesticides and junk food have become a motivation for producers to get as much variety as possible from their fields. A producer who is in the process of removing agrochemicals states: “We have chards, *chilacayotes* (a native squash variety), squash, oranges, avocados, green and lima beans. Our

home is always full of fresh fruits and vegetables... we don't want to get sick with bad food." In the same vein, another interviewee points out an important aspect of food safety: "If we want to produce healthy food for others, we have to do it also for us... We people, some times, do not know what we are eating. Then, the only way to know what we are eating is that we produce our food."

Intercropping as a way towards sustainable farming is clearly present in the thinking of those who are at the advanced ecological point of the spectrum and intercrop consistently. For a producer in this group who has not used agrochemicals in the last 20 years, aspects of food security, economic security and ecological restoration of the land come together when practising intercropping: "We [he and his family] intercrop because nopal is a perennial crop and there is no way to rotate... The idea is to look for sustainability. Here [in Milpa Alta] there is nopal overproduction [when supply surpasses demand] and with the declining price of nopal, what are we going to do? The good thing is that nature is wise. Our land is good for beans, squash, pears and other crops. But we have wrecked our land, we wiped out even the maguey, we have to correct that mistake. Imagine if there is an epidemic affecting nopal plants! We have to think about how to protect all this... but to make it sustainable we have to strengthen the culture of local food consumption, and consume and buy the foods cultivated here." This producer plants beans in between rows and also planted a variety of fruit trees in the plots. Up to now, all is for self-consumption, although he expresses that "we now have more than what our family needs for consumption."

Profitable commercialization of the non-nopal crops is not yet a reality for any of my interviewees but all express that they "plan", "want" or are "looking for options" to, because in many cases the non-nopal yields are larger than their family consumption needs. However, others have the perception that intercropping is costly with no market rewards. For example, a producer who just started planting fruit trees in her plots thinks that people do not buy fruits and vegetables grown locally. She remarks: "I don't know why we don't consume the fruits and vegetables produced here in Milpa Alta that are clean, free of agrochemicals... The land of Milpa Alta is good for a variety of crops... but you see our women in the *centro de acopio* [the local retailing spot] with their baskets full of fruits and veggies grown here in Milpa Alta, and they go back home without selling them." She is also reluctant to intensify intercropping because it is costly:

“It demands lots of work. I would need to invest more money and have a person exclusively to provide maintenance to the plot everyday”. Her plot is less than a hectare, only 8,000 m².

The section for buying and selling fruits and vegetables within the local retailing center is not exclusively for Milpa Alta producers. In my visits to this center, I asked vendors for the origin of the fruits and vegetables. Puebla, State of Mexico and Hidalgo were the most frequently named. The manager of the center explained that nopal producers are allowed to sell their non-nopal seasonal crops but they must have a special permit. He justifies the spots for vendors from nearby states “to have enough supply for produce whose demand increases in some seasons.” In this context, for nopal producers to get earnings out of their seasonal crops would require a special strategy to manage their limited time for trading (they are very busy producing and trading nopal already!) and for competing with producers from nearby states, whose main activity is seasonal crop production.

In sum, producers’ concerns about healthy soil and their own health is what maintains intercropping, a practice that has the potential to heal the ecological rift caused by monoculture. The barriers to extending this practice are labour, be it in limited family time to work the land or money to pay contract labour, plot size and lack of a local commercialization strategy to get earnings from selling the surplus (after they have satisfied self-consumption needs).¹⁴⁷

Fresh Manure

Raw manure is part of traditional farming practices among nopal producers. Cattle manure is the main manure employed in Milpa Alta, followed by horse and goat manure (OEIDRUS, 2009). Raw manure is an organic fertilizer, partially consistent with conservation land objectives. However, places that supply manure have been progressively disappearing due to urban sprawl and an economic downturn affecting the livestock industry in the adjoining states. As a result, the resource has become scarce, costly and insufficient for meeting Milpa Alta’s farming demands.

Although manure is employed by producers across the spectrum of farming practices, the difference is that those categorized as ‘advanced ecological’ and some as ‘semi-ecological’ use it

¹⁴⁷ Some of the barriers are that the established commercial chains are almost exclusively for nopal. In the local retailing center (centro de acopio) trucks downloading and loading nopal are seen every day from early in the morning. Brokers, middlemen look mainly for nopal. Although there is a section for buying and selling of vegetable and fruits, this is on a much smaller scale, where people shop for family groceries. In my visit to this center I did my personal shopping and found many vendors of veggies and fruits, who come from nearby states. If nopal producers who grow other crops came to sell that produce here, they would have to spend more time trading small scale.

for compost purposes only. The rest uses it just as fresh manure. Here I focus on fresh manure use and later there is a section on composting including manure as an ingredient.

Iztapalapa, a DF borough near Milpa Alta, was traditionally a dairy production region but has declined progressively since the 1950s due in part to a number of laws and urban planning programs were gradually erasing vestiges of rural landscapes in Mexico City over the five previous decades (Losada, 2006). Despite these top-down policies, in the early 1980s producers could still get manure, though in smaller quantities, from Iztapalapa's barns. Iztapalapa's location had a double advantage for nopal producers, who sold their produce in the nearby *Central de Abastos*. As described by an interviewee: "In the past, my father and uncles brought manure from Iztapalapa and Hidalgo. It was a round-trip because they used to trade the nopal in *Central de Abastos* in Iztapalapa, and then they stopped by the stalls to buy manure right there on their way back home. So they came back with manure. It was a complete cycle. But then came the time of urban sprawl and people didn't want to have a manure stalls close by. That's how the manure became scarce." And it became expensive, too.

In the spirit of providing immediate support to producers to ameliorate their economic pressures, raw manure subsidy programs were set up in the region ten years ago. In 2003, just three years after the DF government released the *Programa de Ordenamiento Ecologico para la Conservacion de la Tierra* (2000), the municipal head office of Milpa Alta ran a program to support purchase of raw manure. However, this response was too late. By the time this subsidy program was implemented in 2007, the geographic ruptures between livestock production, farming areas, and the urban center of DF were apparent. Scarcity, increasing costs, and declining soil fertility meant that the available volumes of raw manure turned out to be an unsustainable fertilization method. The program's viability was viewed in terms of its coherence with soil resilience objectives and with local farming knowledge. But the scarcity of manure triggered higher prices and put pressures on the DF's agriculture budget. For it to be sustainable, the program would have required an increase of public expenditures assigned to Milpa Alta. Unfortunately, Milpa Alta is the least populated area of DF and its semi-rural character puts it in a weak lobbying position. The DF government's urban concerns remained the priority.

Milpa Alta's supply point for manure moved from Iztapalapa, DF, to Tizayuca in the adjacent State of Hidalgo after 1976 when Tizayuca became a key dairy production zone supplying an increasing metropolitan population. However, the greater distance to Tizayuca

implies major costs to transport manure to Milpa Alta's fields. Today, the livestock industry in Hidalgo faces a crisis: of the 124 livestock barns built in 1976, only 34 remain in operation, of which only half work at full capacity (Perez, 2007; Camacho, 2011). For this reason, there have been cases in which producers are incapable of using the local subsidy programs, which happened as recently as 2009. That year, 46% of the producers who registered to receive the subsidy were not able to use it given the shortage of manure (Milpa Alta's municipal office, internal document) and high costs of transport.

Apart from increasing transport-related costs due to distance from suppliers, other problems emerged throughout the execution of this program, such as resource mismanagement due to a lack of appropriate guidelines to verify that the subsidy was spent properly by producers. In order for the producer to prove each purchase, they have to wait for a public supervisor to come to the plot to see the manure. However, the timing of incorporating the manure into the soil is crucial; manure activates the cycling of nutrients but volatilizes nitrogen quickly. Because of this, it must be spread and incorporated right after it arrives at a plot.

When the supervisor arrives, producers are supposed to spread the manure in rows to a height of sixteen centimeters over the grooves, which interviewees deemed "nonsense." An interviewee makes his argument clear: "They (the supervisors) come to measure the thickness, and they tell you the height you must keep the manure at. I say, why that much? We need just a thin layer, similar to the layers of composts. What is important is to integrate it fresh to the land. The same effect will result with 16 centimeters or less thick rows. But as they don't know about farming, they ask you to put that thickness on... They tell you, here or there you must put more. So, we have to buy more... otherwise you won't get the subsidy next time. And we end up spending more money and contaminating more with those quantities of manure. That's why we need people well-informed about agriculture." Research about better use of fresh manure in soils with the characteristics of Milpa Alta's report that higher amounts of manure generate better crops, however, this must be applied immediately (Vazquez Alvarado, 2003), which supports producers' criticisms of the program.

In light of the shortage of raw manure and its skyrocketing price, this mismanagement led to economic loss, loss of nutrients, and environmental problems. One farmer described the situation well: "It is like having the fridge full of food, and not taking it out to eat it".

Ultimately, raw manure cannot be a permanent substitute for synthetic fertilizers, not only because of scarcity and long-distance supply issues but also for health and environmental related problems. In the words of one producer: “Fresh manure is a vector of illness for us producers and for consumers. We know that the infectious bugs (in the manure) have a life cycle and incubate faster in certain weather conditions or environments. The problem is mainly for us who are in direct contact with the manure when we apply it. The manure (by the time it arrives) may come contaminated.” On-farm manure production can help ameliorate such issues, but in the meantime manure brought from outside Milpa Alta should be a transitional step toward use of compost, starting with composted manure.

Integration of livestock

Integration of livestock on-farm is a key practice that can help close the biological cycle: livestock generates manure, which then is used as fertilizer and then the land produces the food to feed animals, the producer and the family. I found producers who have the complete cycle and others with just part of it. The former are placed on the spectrum of farming management (see Table 5-1) as “advanced agroecological management”. The latter are in the “somewhat ecological” and “semi-ecological” part of the spectrum. What is common among all of them is that the units of production size ranges between three and five hectares.

In a closed cycle, producers take advantage of intercropping corn and nopal and use both as livestock feed. The strongest reasons to raise livestock are to have “clean manure” to compost and “healthy food” to fulfill meat needs of the family. Some of these producers are certified organic by an international agency and need to prove that the manure is not contaminated. A producer who plans to integrate livestock on-farm, who has international organic certification wants to use it for composting purposes too. However, as his plot size is three hectares, he has limited space for producing the animal feed. He knows nopal can be used to feed animals but does not know how to do it. In the past his family used to have cattle “but we stopped. My parents had other professional careers as school teachers and had no time to raise cattle, just to grow nopal”. This shows that a combination of limited space and lack of knowledge to feed livestock with nopal and other occupations make producers give up on cattle. Nonetheless, this producer sees it as viable to learn from other producers within a producers’ association to which he belongs.

In the incomplete cycle, the livestock, mainly cows, are for commercial purposes principally but while the cattle have not been sold, the fresh manure is used on the plots. Producers complement nopal income with livestock buying and selling. An interviewee in this case sees that livestock is a more promising source of earnings than nopal and therefore plans to remove some nopal and use the space to grow corn for livestock feed. He covers 20% of his fresh manure needs with his own animals. Presently, this producer does not intercrop but his livestock activity is encouraging him to diversify. However, he wants to learn how to feed cows with nopal: “I have heard that some people in the region know how to do it, but I don’t know them. You need to know how much nopal cows can eat.” Research on appropriate levels of nopal ingestion by livestock could encourage farmers to integrate livestock in nopal farms that have enough space, as any surplus could go to feed the on-farm animals.

Composting approaches

I identified three types of composting approaches implemented by nopal producers and one that producers plan to introduce (see Table 5-9). In order to preserve the conservation land area and deal with the environmental impacts of fresh manure and agrochemicals, composting would be the most desirable fertilizing approach for Milpa Alta. Some ingredients needed in the composting practices are already available in Milpa Alta, indeed they help close larger biological cycles. Producers at somewhat-, semi-, and advanced ecological points of the farming spectrum use one or more of these types of composts. I found that producers’ involvement in public training program certifications of SAGARPA-SEDEREC¹⁴⁸ and direct or indirect immersion in organic food markets are key factors influencing compost decisions, such as making it on-farm or obtaining it from off-farm sources. Obstacles to expanded composting are related to compost quality, labour requirements, insufficient knowledge of preparation, and uncertainty about compost advantages over other fertilization approaches.

Table 5-9. Composting Approaches Employed among Nopal Producers

Compost	Origin/Supplier	Ingredients	Purpose
Traditional sheet compost	On-farm/producers	Nopal crop residues and fresh manure (source: On-farm observations)	Re-use nopal crop residues and control nopal supply

¹⁴⁸ See Table 5-4.

			during high season
Public vegetable compost	Off-farm from six compost plants, five managed by the municipality and one by DF government/ Municipal Office of Milpa Alta	Five plants of Milpa Alta: pruning garden from Milpa Alta and local vegetable leftovers (mainly nopal) from the municipal local food retailing center and homes (Rodriguez and Cordova, 2006; personal communication with Francisco Granados, Jan. 2012), combined with layers of soil. Composting plant managed by DF Gov: organic foods left by <i>Central de Abastos</i> , the largest retailing point of DF, pruning material from gardens from all DF boroughs and private premises that generate large volume of organic waste (Rodriguez and Cordova, 2006)	Recycling excessive urban organic waste. Increasing bio-fertilizers sources for DF gardens and agricultural areas
Manure compost	On-farm/producers	Manure, nopal crop residues, lime, and an active biological bacterial ingredient (Source: personal communication with producers)	Producers' need to comply with market valid organic certifications. Re-use of on-farm organic residues
Tamarind chaff compost ¹	Off-farm/private business	Tamarind chaff and non-specified organic matter (Source: personal communication with producers)	Producers' need to comply with organic certifications and save labour

Source: Author's data. ¹ Compost type to be introduced.

An interviewee involved in the training program on Good Practices (provided by SENASICA SAGARPA-SEDEREC) considered employing compost but since she did not yet know how to make it by herself, she thought of using public vegetable compost in order to remove raw manure from her system. However, before making any decision, she consulted the external technician who supervised her training certification and learned that “it was not convenient for us because this compost is not formally registered. Besides, he said, it could bring pathogens, and the quantities would not be enough to cover the entire surface”. This comment reveals that producers may be reluctant to rely on the public compost available because there is no formal means (certification or standards) to know the quality of supply. As a result, it was recommended that she improves on what she was already doing (using raw manure) and wait to learn to do the compost herself. She was told “that it would be much better if we learn to do it.” This interviewee was about to take the last module on organic agriculture of the training program.

Although learning compost-making is important, this producer foresees greater costs with her own compost making in either money or time.

When choosing public compost, producers blindly trust the quality and once the quality is tested they decide to continue using it or not. This is the experience of another interviewee, who decided to try the public compost based on her environmental values. She sees in this compost a good system of recycling leftover vegetables from local food markets and homes: “You know, there’s lots of vegetable waste here, we have to do something with it... and return to the land what is of the land.” In addition, there is an understanding of environmental advantages over manure: “We have been told that raw manure contaminates the aquifers from where the water we drink comes... and the compost is less contaminating..” An additional advantage is that the resource is free of charge for the producer and transportation is also free. “You just have to put your name on the list at the office (the office of Milpa) and you can get compost every three months, if you want”, she reported. However, she is in the first stages of the training program in Good Practices, and as she advances through the process of certification, she might receive recommendations to stop using the public compost, as with the case mentioned above.

This producer applies a variety of fertilization approaches including raw manure, vegetable compost from public compost plants, sheet compost made on-farm, and soft agrochemicals. Such complementarity in the fertilization package reveals a mix of traditional techniques (sheet compost), inputs from green revolution approaches (agrochemicals), and the recently introduced recycled vegetable compost. During my fieldwork, I visited one of this producer’s plots while it was being fertilized. They separated the land into different parcels, some treated with vegetable compost only and others with sheet compost while the ones treated with soft agrochemicals were on another site in the region. Such separation enables the farmer to test the effectiveness of each of these fertilization techniques and compare their respective costs. From her trial and error system, she noted that “public compost has the same effect as raw manure.”

Francisco Granados, responsible for the Department of Sustainable Rural Development for the Municipality of Milpa Alta, comments, “We told producers, look, there is compost, do you want it?... it has better quality than the raw manure, so instead of two trips of fresh manure, we’ll give you one of compost. There were some who did accept the offer and saw the advantages of the compost and spread the word... we did hard work to convince them but producers still have a strong resistance to change, although there is a group of producers who do want to change.”

Producers' resistance, however, may be linked to a lack of formal mechanisms to verify the quality of compost before using it. For producers whose income relies on daily harvesting and sales, any new method implies acceptance of risks over productivity. Standardisation and dissemination of knowledge about the ingredients and processes in the public composting plants and their potential benefits over conventional fertilization approaches may be an alternative to broaden the use of it.

For a group of producers already certified by the international agency Bio-agricert¹⁴⁹ and selling directly or indirectly in the organic niche market, on-farm produced manure compost is the approach that better meets certification requirements. Additionally, it fits with their knowledge of compost-making and use of resources available (manure and organic matter from leftover nopal). The availability of reliable organic inputs is of major concern for certified organic producers, as they must show the origin, type of ingredients, and describe the compost-making process to the certifier agency. For this reason, the public compost is not an option because it lacks information on its production.

The interviewees using this manure compost learned on their own using knowledge from past compost practices in Milpa Alta or from other producers. This resembles a type of farmer-to-farmer learning process. A veteran producer reported that his knowledge of compost-making dates from the time of corn in Milpa Alta:

“I learned the compost-making when I was a child... I had the fortune to see how to make the compost in a traditional way. People used to make them with horse manure, organic waste and ashes. Then, the mixture had to be turned over from time to time; and when the rainy season ended, the compost was almost completely processed. And in drought seasons, we got the compost, plowed it, turned it over and spread it over the corn fields, and we had excellent crops.”

Through years of trial and error, he learned composting techniques that use on-farm resources, such as nopal residues or goat and hen manure. Despite his professional occupation as a gynecologist, he has lived in Milpa Alta throughout his life and never abandoned agriculture.

¹⁴⁹ Bio-agricert is a certifier agency based in Italy. In the next chapter I delve deeper into the relationship between ecological management, certifications and immersions in niche markets.

Staying in the region and in relation with agriculture, he has been able to see different technological transitions -- traditional compost, introduction of manure and proliferation of agrochemicals -- but he never used agrochemicals and his children have post-secondary education and also work the land. From his perspective, both agrochemicals and fresh manure were environmental and economically unsustainable fertilization methods despite government subsidies. “In the spirit of helping stop urban sprawl, the government supports conventional fertilization methods. However, one is very convinced that it is not the best. That is why we started to make composts on-farm,” he comments.

It was, however, much later that he found out about market benefits through organic certifications. By the time he obtained certification by the international agency Bio-agricert in 1995, he had significant experience making compost and intercropping. For him, the certification process did not impose large changes, as his production was already “organic.” This experience raises the question of how many producers in Milpa Alta are already practising advanced ecological management without knowing the potential benefits. In 2011, this producer along with others formed a rural production association, in which he facilitates knowledge exchange with other producers on both on-farm composting approaches and access to organic markets. Given his personal story and his recent experience as representative of nopal producers within the producer-government organization, Product-System of Nopal, he concludes that “to break that custom (intense use of raw manure and agrochemicals) is not easy. What we have to do is to identify the non-conventional, but select, markets.” Then, connection with better markets emerges as an important issue to enhance ecological approaches.

However, according to other producers making on-farm manure compost, the challenge that arises is the increasing amount of labour. Because of the additional labour needs for composting, producers fall short in completing the daily farming tasks. As one producer puts it, “you do either compost or the conventional agricultural work. But you barely have time and labour available for both.” Another response from producers regarding labour issues is the fact that there is “not enough workers in the region,” which complicates the situation for those requiring more labour for advanced ecological management.

Due to this labour challenge, certified farmers plan to purchase off-farm-made compost and save labour. However, such shifts bring about other difficulties like the need to prove the organic quality of all ingredients. In theory, compost is eligible to be subsidized under the municipal

Integral Program to Support Nopal Producers. However, there is no formal procedure to bring it into effect, which explains why most of the producers still use the subsidy to buy fresh manure. In order for the municipality to approve the use of subsidy to buy compost from private companies, the producer must provide proof of the ‘good standards’ of the supplier. However, such a procedure has not been formally defined by the office. Francisco Granados of the municipal office commented that “the process is very informal still. I make calls to the private companies and sometimes visits, but nothing formal.” In the recent past, the municipality had established relationships with external suppliers but these were ultimately not successful, he says: “We opened the doors to one company, but we had problems of quality with this provider and then cancelled that relationship... for now the office of Milpa Alta has no deals with private composting companies”.

Another issue is the lack of research on the advantages of compost over manure, as noted by a producer in the advanced ecological segment: “The majority of the compost options are in their trial and error phase.” Public and private research is new in the field, and important questions remain unanswered. A producer explains:

“INIFAP (National Institute for Research on Forest, Agriculture and fFshery) did a study about the use of compost in nopal plantations. They got results but when asking them if this compost would be compatible with pest and fertilization management, the answer was no. They said it was necessary to go further in the study because the tests were done on very small plots, so they do not know if the method will work in larger plots.”

In the near future, off-farm compost from private businesses will be needed to save labour. Up to now, some producers are making arrangements to buy tamarind chaff compost from a private company because they are in the process of getting international organic certifications. Therefore the relationship with this input provider should be further analyzed with regard to producers’ immersion in organic niche markets.

5.4 Conclusion

The analysis in this chapter explored what nopal producers do on-farm. It was a first step towards a larger understanding of what producers do to remain on the land, a form of human-nature connection. Methodologically, the inquiry starts from the inputs and production segments of the commodity chain, while analytically the data was reviewed using a set of conceptual frameworks available in both agroecology and metabolic rift literature. Because an important part of my research inquiry is to know to what extent ecological approaches have a role in enabling producers to resist urban pressures from the city, the first important finding is that nopal producers of Milpa Alta can all be placed in a spectrum of ecological farming, with different degrees or intensities of “ecologicalness.” This may indicate that there is no purely non-ecological farmer in Milpa Alta. The experiences of farmers examined show that even the ones using agrochemicals combine aspects that are considered part of ecological farming approaches.

Thus, the spectrum becomes the foundation to delve deeper into what prevents or encourages producers to move toward the more advanced ecological end of the spectrum. While analyzing what they do on-farm, I discovered that social relations occurring beyond the farm have a large influence on producers’ decisions with regard to land management. For instance, who they connect with to learn environmentally-friendly management practices appears to be a critical and emerging issue. Throughout the chapter, a few themes appeared to be fundamental in defining their farming management approaches, such as knowledge, use and availability of labour, and rural-urban connections influencing values about agriculture. It is the intertwined character of these dimensions which results in tensions and opportunities for these producers to move toward the more ecological end of the ecological farming spectrum.

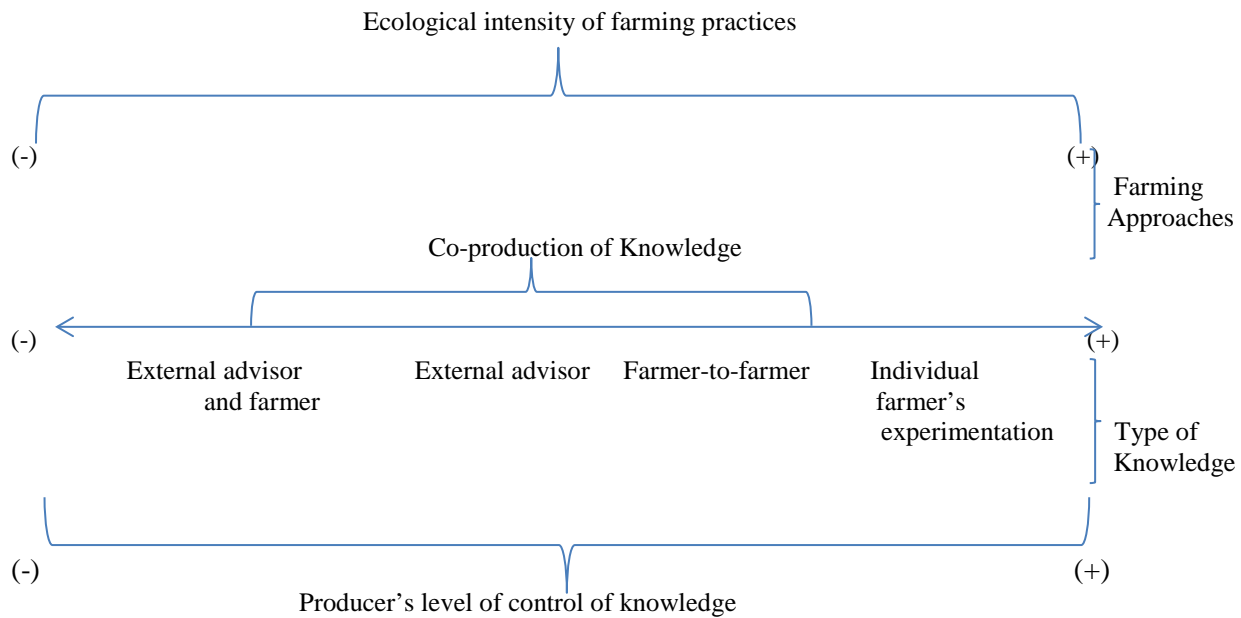
Regarding farming knowledge, the analysis of the spectrum tells us that the type of access and level of engagement in knowledge production, and who they turn to for new approaches, is a key. The variations are explained as follows:

- a. Learning from external assistance: this became apparent in the experience of both producers using agrochemicals and producers using bio-inputs.
- b. Knowledge created between external assistance and the producer. This was reflected in the experiences of those who substituted agrochemicals for bio-inputs and also in the experience of those in training programs.

- c. Knowledge from farmer-to-farmer exchange or individual farmer experimentation. This includes knowledge passed on from one generation to another, and via contemporary farmer-to-farmer relationships. This type of farming knowledge appeared meaningful in the experiences of producers who intercrop, integrate livestock and use more than one composting approach. Most of these experiences are situated in the semi and advanced ecological segments of the farming spectrum typology.

These three types of engagement in farming knowledge that came out of interviews with nopal producers can be distinguished by the extent to which the farmer is involved in producing the knowledge. I translate these three types into the following categories: knowledge from external sources; co-production of knowledge (farmer-to-farmer, farmer-external advisor); and individual farmer production, which all correspond to different intensities in both 'ecologicalness' in farming approaches and farmers' involvement. Figure 5-3 below intends to capture these relationships, type of knowledge in relation to the degree of ecological awareness and practice, and the degree of farmer involvement (or control) of the knowledge production.

Figure 5-3 Farming Approaches and Knowledge



Source: Author

This Figure represents the case of nopal producers in Milpa Alta because when producers appear in the most advanced part of the ecological farming spectrum, their degree of involvement in producing the ecological knowledge is more significant. The more the farmers are involved, the closer they are to advanced approaches. The various ways of producing ecological knowledge is reflected materially on their plots; for instance, they introduce other crops (polyculture), make decisions on the use of manure and nopal leaves for compost, and introduce new composting. As a result, those that indeed practice the more advanced ecological approaches (mixing old and new composting methods, polyculture, manure, etc.) show a pattern of social co-production of knowledge or experimentation.

The data revealed that increasing intensity of ecological knowledge requires nopal producers to have an understanding of site-specific conditions, for instance, observations of the relationship between pests and natural pest control. This was apparent in the individual experimentation of the producer who stopped using agrochemicals and observed that ladybugs could naturally control the pest. Increasing levels of ecological knowledge also requires

development of skills, such as compost making, selecting better crops for intercropping, selecting bio-inputs and so on. Hence, the character of ecological approaches is largely reliant upon people's knowledge. Then, this proves the point that ecological farming is *peoples' knowledge-intensive labour*, a concept suggested in the literature.¹⁵⁰ The farmer is the carrier of this knowledge. In addition, a larger number of people are needed to perform complex ecological management. Nopal producers of Milpa Alta who move toward more ecological farming approaches engage more actively in creating these approaches and also realize that they need more people to accomplish the daily farming tasks. In sum, the process of producing and even applying ecological farming knowledge is people's knowledge-intensive labour because it requires the farmer's presence on the land, their observations and human activity. It replaces inputs with skilled human labour. In other words, keeping up with an ecological approach requires an ongoing relationship between humans and the land.

Availability of human labour in Milpa Alta emerged as an issue either allowing or preventing nopal producers from moving toward more ecological approaches. Producers always mentioned labour as the main obstacle to more ecological approaches, as it increases costs (if contract labour) or time (if family labour). For instance, there is the perception that agrochemicals save time and therefore it is the cheapest option. In addition, producers practising more advanced approaches such as intercropping, composting and integration of livestock agree that it requires more labour.¹⁵¹ Contracting additional labour is an issue especially in a region like Milpa Alta where contract labour comes from other regions and wages are rated based on urban wages. Increasingly, urban-type occupations have reduced the Milpa Alta population fully occupied in agriculture but interestingly this leads to pluriactivity rather than a total abandonment of farming work.

The combination of farm and off-farm work revives the question of whether it is a strategy for reproducing a farming lifestyle, to continue living off the land rather than migrating to the city. Does the pluriactivity prevent or foster the (re)production of ecological farming knowledge? The data shows that both cases are possible. I cited examples of producers diversifying their occupations and therefore being reliant upon agrochemicals to save labour; this places them in the less ecological end of the farming spectrum.

¹⁵⁰ That concept is intended to show the difference between conventional concepts of intensive labour and intensive knowledge.

¹⁵¹ Quantities of labor, that is.

The contrasting example is when one member of the family is entirely dedicated to working the land and the other one has an urban or urban-type job,¹⁵² with which they are able to finance in part the continuity of the farm or continue living in Milpa Alta. These examples recall the discussion presented in the literature review about the rural-urban labour mobility (of the single farmer or the family unit) present in small-scale and peasant-like producers. In the literature, there are two fronts of the debate, one that interprets rural-urban labour mobility as pauperisation of producers' conditions and another that suggests it is a strategy toward controlling and reproducing their own resource base (Van Der Ploeg, 2010; Akram and Kay, 2010; Ozturk et al., 2014) and empowering producers. The data collected makes clear that pluriactivity does support the reproduction of units in general. As for the experiences of those using ecological approaches, I found that the pluriactivity supports ecological approaches. Nonetheless, a more in-depth research to explore this issue would be needed.¹⁵³

Another aspect complementing that discussion is producers' motivation to make a transition to a more ecological approach. Consistently, those who removed agrochemicals are preoccupied with and knowledgeable about health problems arising from the use of synthetics. They note that working the land with agrochemicals threatens farmers and soil health. In terms of consumption, producers who want to remove agrochemicals or have removed them use the term "contaminated food" when talking about produce cultivated with agrochemicals. Interestingly, a relationship with profitable markets did not appear as the principal motivation of producers to adopt ecological approaches in the first place but producers do refer to the need for better market connections in order to continue to support their ecological practices. This indicates a use-value production rationality. However, the data analyzed in this chapter is insufficient to assess to what extent they are tied to this rationality. The examination of the market relationships is necessary and presented in the next chapter.

Although proximity to the city and engaging in urban labour markets may encourage producers to leave the land, it can also influence, inform and enhance ecological approaches that producers relate to positive effects in their health. For instance, proximity to the city facilitates producers' connection with universities and research institutes that favour high levels of

¹⁵² An urban job is a job in the city. An urban-type job could be a job within Milpa Alta but that is more related to services, such as taxi drivers, store manager, etc.

¹⁵³ My data is limited to a few interviews with nopal producers. It was based on qualitative research, which allows me to identify qualitative issues that then can be the subject of research in quantitative or a mixed-approach research.

education and exposure to research activities and training. It also encourages understanding of research results and receptivity to training, as reflected in the openness of producers to learn about the bio-inputs in workshops offered by agronomists from the University of Chapingo. In addition, the nearness with the urban center expands the potential to reuse food waste in composting.

It became clear through the discussion in this chapter that the barriers to enhancing ecological approaches beyond simple bio-inputs substitution are largely institutional and due to labour availability. This became apparent when discussing the disadvantages of the public compost supply, use of subsidy for buying compost, the labour needs for the on-farm-made compost and the limited regulation of private composting businesses.

Overall, this chapter gives a partial account of how a contemporary farmer and even more specifically, a small-scale producer learns and accumulates ecological farming knowledge at the edge of Mexico City. It confirmed that ecological farming is peoples' knowledge-intensive labour. That factor can become a force deepening the metabolic rift, as producers are sometimes forced to substitute labour with agrochemicals. On the other side, the labour-intensive character of ecological agriculture can become an opportunity to mend metabolic distortions if labour is placed at the center of ecological agriculture policies. Programs that frame ecological agriculture as an intimate relation of the labourer and the land can then result in a deeper knowledge of site-specific conditions and prevent further rural-urban migration.

Chapter 6

(Re)Making Market Linkages: Milpa Alta Nopal Producers between Mainstream and Emerging Market Relationships

6.1 Setting the Scene for the Analysis (I): Identifying Mainstream and Non-Mainstream Markets

Social justice and environmental movements addressing food-related issues have proposed enhancing local food systems to contest the industrial and corporate-based food markets (Allen, 2010; DuPuis et al., 2011). However, strategies, goals, scope and transformative capacity vary based on who has agency, institutional frameworks, and demographic and the historic opportunities (Alkon and Agyeman, 2011; Allen, 2010). Some of the most popular examples of local food system structures across the world are the community supported agriculture (CSA), 100-miles, and farmers' organic markets while fair trade emerged as an option for shortening intermediaries and paying a just price to the producers (Jaffe, 2007). Nonetheless, these so-called alternatives evolve heterogeneously in time and place.

The rise and evolution of alternative commercial channels in the South and North have had different dynamics and paths. In the North, it appeared more of an urban phenomenon resulting from urban social, environmental and food movements, which thereafter manifested in a "reflexive consumption" trend¹⁵⁴ (Nigh and Gonzalez, 2014). Meanwhile in the South, it was small-scale producers (including campesinos, indigenous peoples) from rural areas (e.g. coffee producers) related to international NGOs who first engaged in these alternative commercial channels (Nigh, 1997). Today, the movements supporting environmental and food-related issues seem more articulated in the South and have started connecting the rural and the urban. Regarding the specific case of Mexico, Nigh and Gonzalez (2014: 9) point out that:

"Despite the adverse situation facing peasant agriculture, other movements are evident. Diverse organizations and sectors of the urban and rural populations are mobilizing to vindicate the cultural value of food in terms of taste, its conditions of production and its

¹⁵⁴ For Nigh and Gonzalez (2014: 10) the concept of reflexive consumption "has its origins in the North where it first referred to relatively affluent consumers who, having their basic needs covered, aspired to further satisfactions such as nutritional health, solidarity with rural people, sustainability, animal welfare, biodiversity conservation and food sovereignty."

ecological and cultural dimensions as part of the landscape that supports the economy of the smallholder family. Thus, local markets begin to reposition themselves, incorporating ethical issues surrounding family farmers, agroecology and social solidarity.”

In the last years, there has been debate about the problems and co-optation of these ‘alternative markets’ (Muttersbaugh, 2005a, 2005b; Alkon and Agyeman, 2011; Jaffe, 2009; Allen and Kovach, 2000). Having in mind the flaws of the alternatives, I call them simply “non-mainstream markets” rather than “alternatives.” Additionally, I remark on the difference between mainstream market and non-mainstream markets according to the characterisation of Allen and Kovach (2000) using their conception conventional and non-conventional market. For these authors, non-conventional markets tend to market the value of a commodity based on its “production process” (e.g., how it was produced, who produced it), whereas the mainstream market isolates the commodity in its material characteristics’ boundaries and obscures the process of production (fetishizes the commodity) (Allen and Kovach, 2000). From this perspective, the meaning of “mainstream” and “conventional” markets is the same. In contemporary capitalism the conventional or mainstream markets can be framed in terms of the extent to which they rest upon free trade market relationships, highly intermediated trading schemes, direct and indirect subordination to rules set up by corporations (Shattuck and Holt-Gimenez, 2011).

Because my case study involves small-scale producers in Mexico, with a peasant ecological farming legacy, and still relying upon ecological approaches, and because of the geographical proximity to an urban center (the point of consumption), my first insight was that they could engage in the non-mainstream and highly potential local (short) commercial channels (e.g., fair trade, organic, environmental friendly, etc). Thus, I inquired about the market linkages nopal producers have and how these connections impact their ability to be ecological producers. I analyse the data, identifying the challenges and opportunities of both mainstream and non-mainstream and the rationale the producer follows when engaging in one or another. Ultimately, understanding the mechanics of the failure and/or success of the experiences of nopal producers in both mainstream and non-mainstream markets expand our knowledge about the future of small-scale ecological agriculture.

Nopal producers of Milpa Alta operate within the mainstream markets mostly, and recently are engaging in non-mainstream ones. The conditions in which they participate have been

influenced by the transformation of the food market structure and food culture of the urban center nearby. Non-mainstream markets (e.g., organic, fair trade, CSA) generally engaged in the organic commercial channels, locally and internationally. The literature and records of experiences of organic markets show how they operate differently in diverse places (Gliessman and Meyer, 2009). For instance, the contradictions in the organic food market of California discussed by Allen and Kovach (2000) and Guthman (2000, 2004, 2011) are not at all the same as the experience of organic producers in Mexico (Gomez-Tovar et al., 2005; Jaffe, 2008; Muterbaugh 2005). Although in both cases the contradictions are deeply related to dynamics of capitalist markets at large, each case is a different brushstroke over the same larger canvas. The analysis about the organic market is not a naïve defense of the non-mainstream food markets but I find it necessary to frame the case in question in its own historical and institutional context in order to contribute to reconstructing the pathway towards food market alternatives.

6.2 Setting the Scene for the Analysis (II): Regrouping the Data

My analysis in this chapter relates the ecological character of producers' farming practices (range of ecological practices) and the commercial channels in which they are immersed. In the previous chapter, I analyzed extensively the farming practices of nopal producers and developed a typology (see Table 5-1). Drawing on that typology, I now look at the data collected linking producers' positions within the ecological practices range and the type of markets they can access according to the ecological quality of their produce. Because the use or not of agrochemicals is a key to accessing the ecological food markets (e.g. friendly organic, environmental and others), I regroup producers in two categories: "producers using agrochemicals" and "producers without agrochemicals."¹⁵⁵

A common concern among producers across the ecological spectrum of nopal farming of Milpa Alta¹⁵⁶ is the "declining" "low" prices of nopal paid¹⁵⁷ at the local retailing center in Milpa

¹⁵⁵ As presented in Chapter 5, producers of Milpa Alta are in an ecological practices spectrum, which means that even the ones using agrochemicals do mix some ecological approaches. Agrochemicals usage is not substantial in nopal plot management activities in the Milpa Alta region. However, if producers want to enter markets based on the ecological quality of the produce, they must remove agrochemicals completely. Food markets such as organic and others associated with environmentally-friendly farming practices request a label or certification as proof. Then, removing agrochemicals is a key to stepping away from conventional and undifferentiated markets. This is because the organic market must assure the consumer pays for produce that meets the values associated to ecological farming, such as health, environmental or social values.

¹⁵⁶ The spectrum of ecological farming emerged from the analysis of the farming practices provided in the chapter 5.

¹⁵⁷ Data proving the "low price" was presented in Chapter 2.

Alta (*Centro de Acopio del nopal*) and *Central de Abastos* located in nearby Iztapalapa, a municipality in the urban area of DF where the majority of nopal producers commercialize. My data brings to light that the options producers foresee in order to step away from these markets are consistently related to their position within the ecological spectrum of farming practices. Thus, I follow producers through their commercial channels in order to reveal whether nopal producers have been capable of valorizing their produce in markets that promote environmental protection, ecosystem health, and economic fairness for small-scale farmers and campesinos.

Based on the two groups of producers, producers using agrochemicals and producers not using agrochemicals, I discuss how each group engages the mainstream and non-mainstream markets. I also interrogate the data about the extent to which the market linkages compromise or enhance the continuity of advanced farming approaches among nopal producers and/or the transition toward more advanced agricultural practices.

6.3 The Good Times Have Past: The Mainstreaming of Local and Direct Markets of Nopal

The story of market linkages of nopal producers of Milpa Alta began with building up a direct connection with consumers in Mexico City at the time when their farming practices were somewhat more reliant on industrial inputs (agrochemicals). Between the 1950s and 1970s, this crop became the main agricultural commodity of the region. By the late 1980s, the commercial operations had transformed and producers primarily traded with middlemen, brokers, and distributors in the retailing center in Milpa Alta (*Centro de acopio del nopal*). Today, brokers and middlemen come to the *Centro* in Milpa Alta, and take the nopal to Mexico City and other regions (*Plan Rector del nopal*, 2010; 2011). Hence, the distance from the plot site to the trading point was shortened but there is a greater distance from the final consumer. How did this shift from direct to intermediated market happen? The shift is what I call the mainstreaming of a market that was direct and local. Data collected (interviews with producers, producers' organizations, officials, key informants and documentary sources) show that there were once great economic times for nopal producers. Such story deserves attention.

The largest consumption of nopal in Mexico has been and still is found in the central zone of Mexico (states of Puebla, Hidalgo, Morelos, Mexico and DF), which includes Mexico City,

and these states are also the largest producers of nopal (*Plan Rector del nopal*, 2010, 2011).¹⁵⁸ Mexico City has always been among the top ten final destinations for nopal grown in Milpa Alta. However, since Mexico City is also a center where distributors meet to collect the produce and distribute it to other regions, an accurate estimation of the percentage of nopal from Milpa Alta actually being consumed in Mexico City is not available. In Mexico City, nopal is consumed fresh. Processed nopal has an estimated demand of 20% (Market Study, 2006 internal document of Product-System organization).

In the best years of the local nopal market (from 1960 to the early 1980s) direct trading was common between nopal producers and Mexico City's consumers. Producers sold at food retailing outlets in Mexico City, such as La Merced,¹⁵⁹ *Central de Abastos*¹⁶⁰, or traditional farmers markets called *tianguis*.¹⁶¹ The increasing urban population through this period represented a great market opportunity for Milpa Alta producers. Without intermediaries, their profits increased and brought economic prosperity to the Milpa Alta region, for which they named nopal "green gold" (from personal communications with nopal producers).

Although exposure to the city usually threatens rural lifestyles, good economic benefits actually encouraged people to stay on the land. For instance, a few of my interviewees returned to the land in the 1970s, giving up their urban occupations, as the nopal business offered better economic opportunities. A producer narrates:

"Before cultivating nopal, I worked as a teaching assistant, but seeing the economic benefits of nopal, then I decided to get into the business. I was only an assistant to a professor at UNAM, in the Faculty of Physics and Mathematics... My wife's family was in the nopal production business then. It was 1978. When I started growing nopal the price was quite good until the 1980s. We could earn 700 or 800 pesos a day by selling a paca [a package] of nopal, while as a professor one earned around \$3,000 a month. That's the reason I returned and became a producer".

¹⁵⁸ Milpa Alta is the number one producer of nopal across Mexico. Details about cultivated area and volumes of production can be found in the chapter, "Site and Historical Context".

¹⁵⁹ La Merced was the largest wholesale market in Mexico City during the first half of the 20th century. This changed when the *Central de Abasto* was opened.

¹⁶⁰ The largest wholesale market of Mexico City, which opened in 1980.

¹⁶¹ This name is given to street farmers' markets. Tianguis is actually a nahuatl word. Aztecs used to have markets on the city's streets.

The green gold period of Milpa Alta coincided with the period of national development-based capitalism or developmentalism (or “industrial development from within”) characterized by massive rural-urban migration across the nation. This is when the first large urban centers arose in Mexico, including Mexico City, Guadalajara, and Monterrey. The resulting division of labour between city and countryside was quite apparent: rural areas provided food and labourers to the industries located in cities, where factory labour and consumption was located. As far as it concerns Milpa Alta producers, the urban growth may have generated a double movement of leaving and returning to the land given the proximity to the city. The proximity is for Torres (1991) the predominant phenomenon shaping and framing the evolution of Milpa Alta’s agriculture and the subjects’ profile of those who farm in the region. Therefore, for Torres (1991), Milpa Alta’s agriculture should be categorized as an agriculture that develops *within* an urban structure. Although accurate as a methodological approach, that consideration comprises a one-way force in which the urban acts upon the rural, not vice versa. The fact that people return to the land suggests a double movement in which the subjectivities, the farmers, also act upon the urban, preventing its expansion through reproducing the agricultural space.

Greater demand from the city brought a need to intensify nopal production. Land cultivated with diverse crops (corn in milpa systems) and other vegetables was gradually replaced by nopal monoculture¹⁶² and agrochemicals were simultaneously introduced, while the local or nearby sources of organic fertilizer (e.g. manure from cattle) slowly disappeared as the city grew.¹⁶³ As a result, the thin soil of Milpa Alta was threatened by deeper erosion and the agroecosystem suffered from new pest outbreaks.

Given the growth of agricultural activity, nopal production also required more labour than previously and there was a shortage in Milpa Alta, in part because of migration to the city. As a result, agricultural workers from other rural areas of other states moved to work Milpa Alta’s nopal fields (Gomez, 2010). This rural-rural migration to Milpa Alta still happens. Workers come mainly from the states of Hidalgo, Mexico, Puebla and Veracruz (*Plan Rector Sistema Producto*, 2011; Producers’ interviews).

The growing urban local market not only allowed the agricultural activity to continue, but also to prosper between 1960 and 1980. Proximity to the growing Mexico City was an economic

¹⁶² See Chapter 2 for more on the agricultural history of Milpa Alta

¹⁶³ In Chapter 5, I discussed how monoculture and manure supply issues emerged during the years of urban growth..

blessing, but at an environmental cost. Before the nopal prosperity, Milpa Alta was disarticulated from the local markets. For my interviewees who are above the age of 60 years old and have been in the business since the 1970s, nopal enabled them to build market linkages with the city because of the ecological and cultural qualities of this crop. They call it a ‘noble’ ¹⁶⁴plant: “The culture of nopal is widespread, especially in the center of Mexico... and as it is mostly consumed as a fresh vegetable, it prevents illness,” said an interviewee. Part of the popularity of nopal among the growing Mexico City population in those years relates to the fact that a large number of migrants arriving in the city came from rural regions where nopal is part of their diets. Migrants carried with them a taste for nopal.

In addition, a producer notes some biophysical advantages of this plant: “It is a crop that stands without irrigation systems and instead it gives us water, nopal contains lots of water.” Since it is a cactus, nopal requires little water but captures it underground. Another producer highlights that characteristic when saying, “nopal helps retain water in the underground aquifers.”

As a result, nopal became a commodity carrying cultural meaning and ecological qualities which were transferred to the city (urban consumers) through the market. Thus, the ecological and labour wealth embodied in every nopal plant traded remained local because the final destination was mostly the nearby city. Milpa Alta then articulated strong direct market linkages with the city. Nopal became a commodity produced by small-scale producers organized under *ejido* and social regime land ownership and with a peasant background.¹⁶⁵ These are the times of a hybrid rural-urban peasant in the making with strong market linkages. To name the hybrid nature of the peasant/campesino of DF, Torres and Burns (2002: 247) use the term “urban agriculturalist”: “The urban agriculturalists of southern Mexico City see themselves neither as farmers nor as urban inhabitants, but as the unity of both according to the internal cultural and social requirements of their geographical space.”¹⁶⁶

However, urban expansion continued harnessing human labour from the city’s hinterlands, a clear sign of a deepening of the country-city labour division, a social metabolic rift. Meanwhile, the strong local market connections between Milpa Alta and Mexico City promoted

¹⁶⁴ In the popular language of Mexico, something is “noble” when it gives more than what it asks for, when it gives more than what it takes. In this case, nopal is noble because it gives more to people and the environment than it takes from them.

¹⁶⁵ See more about the history of Milpa Alta’s peoples and land ownership regimes in the chapter, Historical and Site context.

¹⁶⁶ Compared to his work of 1991, “El campesinado en la estructura urbana”, Torres Lima shows a more nuanced view about the rural and urban agricultural spaces of DF in later works (2002; 2008; 2010).

monocultures, giving rise to the paradox of good local market links but with agroecosystem degradation. Reduced agroecosystem resilience became the largest cost of this phase. Therefore, the ecological rift developed in conjunction with the social metabolic rift. Both processes converged.

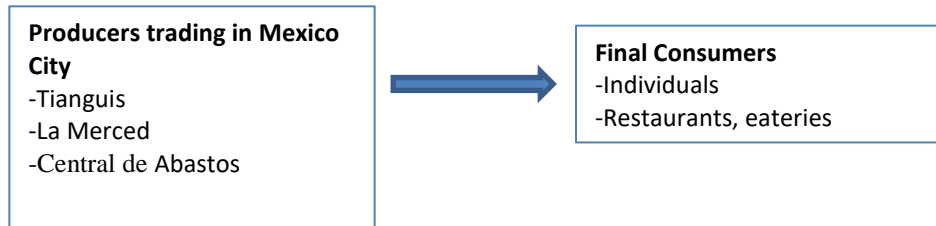
However, with urban growth, commuting to the urban center became increasingly time-consuming and costly, while spots within the markets were co-opted. For small-scale producers, whose farming is partly based on family labour, time invested in commuting is like losing money. A producer who has been in the business for 25 years tells me that she used to have a spot at CEDA (*Central de Abastos*) and traded there but she finally stopped doing it: “I used to go because over there, CEDA, I was paid more there for nopal than here, but when I made the math including the gas and time, it was not a good trade-off. At the end of the day, I made the same money trading here in *Centro de Acopio* than going there.” Another producer tells a similar experience but adds that it is even worse when the producer does not own a spot: “Sometimes you go to CEDA and you don’t even get what you spend for the gas and as I don’t have a proper spot, then I have to sell from the truck and then end up selling it to other people who do have space and they pay whatever they want.”

Then, producers demanded the construction of the local retailing center of nopal (*Centro de Acopio del nopal*) to the local DF government. It was a demand that emerged out of the hardships of commuting to Mexico City. It became a reality in 1995 (personal communication with the manager of *Centro de Acopio del nopal*). However, nopal continues traveling to Mexico City but now through intermediaries. Thus, the commercial segment of the nopal chain extended and now includes two or more middlemen before arriving at the urban consumer (see Figure 6-1a).

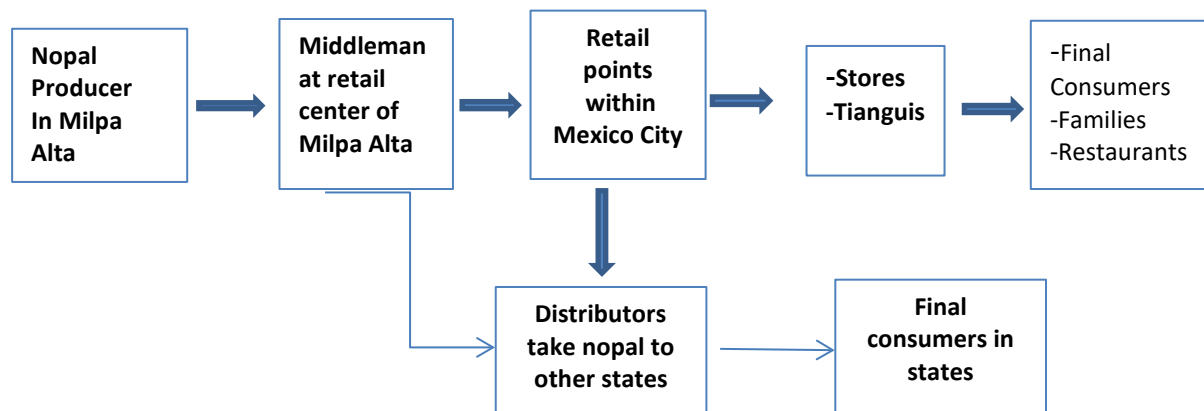
Today, producers take the nopal to *Centro de Acopio* and sell it to middlemen, either local or outside ones, or both. There is an increasing sector of “local middlemen” who trade it with middlemen from outside Milpa Alta. The local middleman is a person that buys the nopal directly from the producer, sometimes cleans it and packs it, to sell to other middlemen. The producers and the manager of the *Centro de Acopio* I interviewed state that a good number of these middlemen take the nopal to CEDA (*Central de Abastos*) in Mexico City where they trade it to owners of local stores, supermarkets, but some others take it to other states of Mexico (see Figure 6-1, b).

Figure 6-1. Commercial Chain and the Chain Expanded

a) Direct and local market linkages predominant between the 1950s and 1980s



b) Intermediated commercial chains predominant from 1990s to present



With the *Centro de Acopio*, producers shortened the distance to the trading point but now meet with middlemen and brokers, not final consumers. Then, the emerging issue became the lowering price of nopal. Brokers and middlemen capture most of the value of nopal. An estimate based on the differential of prices of nopal in the city and the price producers at *Centro de Acopio* reveals that around 45% of the total value of nopal is captured by middlemen.¹⁶⁷ Hence, the closest and largest market for Milpa Alta nopal becomes artificially distant.

It is interesting that the declining benefit of commercializing in Mexico City's retailing outlets coincides with the times the Mexican economy opened to global markets, a process that started in the late 1980s and consolidated with NAFTA in 1993. The distribution of food within Mexico City started to revolve around the network organization of these supermarkets and even

¹⁶⁷ Estimates based on data of prices in Valencia (2010).

CEDA has been losing its position as the first food distribution centre within the city. The changes did not affect producers in terms of competition with foreign nopal producers¹⁶⁸ because nopal is not traded worldwide. The effects had to do with access to urban markets.

There was a drastic restructuring of commercial food networks across the nation (Hawkes, 2006) and Mexico City (Torres, Felipe et al., 2012). CEDA and other big markets such as La Merced lost their positions as first food distributor centers of food within the city. Transnational supermarkets arrived in the city and became the main food provision network, and regional networks were subsumed to the new transnational configuration.¹⁶⁹ As Torres et al. (2012) point out, national supermarket chains had emerged in Mexico in the 1970s and were present at that time, mainly in the big cities, including Mexico City, as a result of the massive countryside-city migration, rapid urbanization and demographic, employment and higher purchase capacity. These national chains were articulated around regional food supply networks. As such, they depended on produce being available locally and local producers were able to participate under better market conditions. Rather, transnational market chains set up rules difficult for regional producers to comply with.

Currently, at a national level, supermarkets (national and transnational chains) control around 70% of retail purchases (35% at Wal-Mart). While public markets and tianguis control 20%, the remaining 10% corresponds to small groceries (Mendoza, 2010). In Mexico City, Wal-Mart not only has threatened traditional retailing systems, such as CEDA (*Central de Abastos*, the largest food retailing outlet of DF), La Merced, municipal markets, and tianguis, but also national supermarket chains. The producers I interviewed all share the sense that Wal-Mart deals are not convenient for them. A number of reasons were mentioned, such as “payments after 90 days”, and “they want standards for nopal” in size, shape and packing standards, which they can’t afford. Despite the fact of more intermediaries in *Centro de Acopio*, producers prefer this spot for the simple reason that they get paid the same day. This indicates a characteristic of a campesino farming mode of production: it is a simple production system, which does not accumulate. They use the money for reproducing their productive means.

¹⁶⁸ Although different countries produce nopal and there is increasing interest in this crop for its health benefits, in the global market it is still a special crop, not as popular as staple foods.

Box 6-1. Timeframe of Payment at Trading Points or Mainstream Market

Time frame of payment in trading points or mainstream market:

- 1) Local retailing point: Same day
- 2) Central de Abastos: one week
- 3) Supermarkets: from 45-90 days

Source: Author's interviews with producers

In addition, in their experience, Wal-Mart pays a fixed price which is most of the time the same or lower than that offered by middlemen or brokers in the local *Centro de Acopio*. Producers state that Wal-Mart and other supermarkets have specific packaging and produce standards that impose costs for them and a waste of produce, for instance, nopal leaves must fit in an average size. As a result, super- and hyper-markets are the new mainstream food markets, but ones that pose more barriers for local small-scale producers like nopal producers. The transnationalisation of the food market in Mexico was a reflection of the arrival of neoliberal global capitalism in Mexico (Torres et al., 2012).

While all these changes occurred at the market level, Milpa Alta was in another transition: DF government was increasingly adopting an “environmental services” approach rather than a productivist one to deal with the agricultural areas (Ramirez, 2003). This was as a result of the apparent ecosystems degradation produced by urban growth. Land degradation and urban ecosystem imbalance converged with the beginning of neoliberal global capitalism. Both were signs that a new phase of capitalism was about to reshape local farming practices and linkages between Milpa Alta and the urban center of DF. The structural economic changes affected the position of small-scale farmers as a whole at the time they were confronting ecological challenges. However, agriculture and producers persist. Furthermore, producers keep seeing Mexico City market as one of their greatest advantages. When I asked them to name their market advantages, the frequent answer is “proximity to Mexico City”. “We have the largest market just one step away and transporting the produce is cheap,” compared to transporting costs of producers far from the city.¹⁷⁰ Their persistence echoes the characteristics of an urban agriculturalist of Mexico City outlined by Torres and Burns (2002: 247):

¹⁷⁰ They meant in comparison to other producers from other states that have to pay more for shipping services to send the produce from a longer distance to the city.

“[S/he] struggles to adapt to processes of change caused by urbanization, which has been carried out not only for technological or economic reasons pertaining to agricultural activities, but also because of the desire to defend a cultural space, a shared territory where relationships with nature and among social groups are consolidated.”

In parallel to the ecological changes, the urban lifestyle brought about health-related problems among the urban population in Mexico as a whole and Mexico City in particular: sedentary lifestyles and sugar-based diets have caused diabetes (Hawkes, 2006; Nigh, 2014). As a result, there is an apparent need for a structural change in the food supply and people's diets in the city and nation-wide. This issue has slowly brought the general public's attention to the quality of food in the urban centers. Middle and upper classes in Mexico have increased awareness and are the ones looking for better quality food (United States Department of Agriculture, 2013). The realization that some diseases among Mexico City's population stem from unbalanced diets based on junk and industrial food may be an opportunity for healthy, local foods, like nopal to be revalorized. It may give nopal producers of Milpa Alta a chance to build different market connections with the city.

6.4 The Continuity of Mainstream Markets and an Emerging Experience in Organic Niche Markets

Today producers in all different ranges of ecological farming (across the typology) participate in the mainstream market, thus sustaining its continuity but the intensity of their relationship with that market does vary. Table 6-1 summarizes per group the intensity of (or reliance on) the mainstream connection. The group using agrochemicals and with no plans to quit them is more dependent upon one market (*Centro de Acopio*), whereas more ecological producers (not using agrochemicals) have diversified connections with different types of mainstream markets and move toward no dependence on this market. Within the group of producers not using agrochemicals, the intensity of the dependence upon traditional markets is different if they hold a market-valid certification of organic production. Whereas the ones without that certification show the same type of reliance on one single market (*Centro de Acopio*) than the ones using agrochemicals and with no plans to remove it.

Table 6-1. Intensity of Relationship with Mainstream Market of Producers Using and Not Using Agrochemicals

Type of producers	<i>Centro de Acopio</i> (Local retail center of Nopal in Milpa Alta)				CEDA (<i>Central de Abastos</i>) (wholesale market)				Supermarkets (located in Mexico City)			
	Absolutely	Partially	Eventually	Not at all	Absolutely	Partially	Eventually	No at all	Absolutely	Partially	Eventually	Not at all
Using agrochemicals												
No plans to remove	X					X						X
In transition to remove	X		X				X					X
Not using agrochemicals												
Nonmarket-valid certification	X					X						
Market valid certification				X		X					X	

Source: Author's data.

The common perception of the producers interviewed, regardless of their position in the ecological spectrum, is that the conventional markets (CEDA, *Centro de Acopio* and supermarkets) do not offer a hopeful future for nopal producers in Milpa Alta given the low prices paid for nopal in these commercial points. Stepping away from the conventional markets and engaging in more profitable ones is a pressing priority, especially for producers who do not use agrochemicals and are located in the “semi-ecological” and “advanced ecological” ranges of the farming spectrum. However, there is a difference in the reasons to continue in the conventional market and in the strategies to step away from it. Interestingly, the variation responds to the position within the ecological farming spectrum and whether or not they use agrochemicals.

Next I will detail the connection of each set with the mainstream markets and market strategies.

Producers using agrochemicals (situated in somewhat and semi-ecological spectrum) and their relationship with the mainstream market

In this group, there are producers who are in the process of removing agrochemicals and others who do not have a plan yet to stop. Producers of this group trade all their produce in local *Centro de Acopio* and eventually at CEDA. They barely know other, non-mainstream markets (mainly ecologically-oriented markets), but have heard of them and would like to know more about them.

Producers with no plans to quit agrochemicals have never connected with public training programs to learn new farming approaches. When asked about whether they would be interested in removing agrochemicals, the answer is that it would be more costly and the market does not pay more (meaning the market at *centro de acopio*). Their knowledge about non-mainstream markets and niche markets is very vague though. Common responses are: “I don’t know where these markets are” and/or “it would be costly to remove agrochemicals.” Another common response is that in any case they use “very low quantities” of agrochemicals and if they removed them “it would imply higher labour costs and no market rewards.” For them, chemicals help save labour and are reliable and affordable.

A typical interpretation of the declining prices among producers in this group is a combination of “increasing nopal surplus” and “increasing competency,” in particular with

producers of the nearby state of Morelos: “Morelos sets the price of nopal. Milpa Alta is definitively going down. In Morelos you see large trucks arriving and filled with nopal,” says a producer.

Certainly, Morelos has gained a position in the nopal market. It occupies the second position as a nopal producer leader, after Milpa Alta, but because the weather is hotter, it promotes the outbreak of more pest and is less benign to nopal plants. As a result, agrochemical use is more intensive in Morelos and requires more investment (Sanchez and Betanzos, 2006).

Producers using agrochemicals see that the way out of the problem of competency and declining prices is the development of an industry of processed nopal. They see in that an alternative benefit from the nopal unsold. A producer expresses: “We waste so much food. So, if we could process the surplus then we wouldn’t waste so much food. It would be easier to send it to other more specific markets.”

The potential of a processing industry for nopal has been a subject of research in local and global organizations and institutions. The local organization, Product-System of Nopal (*Plan Rector del nopal*, 2004; 2009; Market study, 2006) and FAO (2006) has addressed this topic. Part of the motivation of research and analysis efforts is to explore the development of a long-distance market, an export market, for which processed nopal is more suitable, as it can last longer.¹⁷¹ An FAO (2006) study based on countries where nopal is produced and consumed stresses two main barriers for an industry of nopal: 1) the largest demand is for fresh nopal, and there is a very limited demand for processed nopal, and 2) the technical requirements are costly. This FAO study is consistent with the micro-universe of market possibilities of processed nopal in Mexico. The leader of the producers’ organization, Product-System of Nopal, Esteban Olvera, states that developing “an industry for processed nopal is an option, but not very promising at this point for a lack of market demand” (personal communication). His statement is based on the market study the organization commissioned from a group of experts in economics in 2006. The study revealed that locally and nationally only 20% of the total demand for nopal consumption is for processed nopal (Market Study for nopal, 2006, internal document).

Among my interviewees, I found a variety of strategies to connect directly or indirectly with the processing industry. Some producers independently process part of their surplus, and

¹⁷¹ Indeed, a marketing problem with fresh nopal is that it perishes in three to five days with no proper refrigeration systems.

some others produce collectively as members of a rural association. The latter have pre-orders, so they know the quantities they will need for processing. All of them use family labour. Both mentioned a desire to sell to supermarket chains, some located in Mexico City and others located in other regions such as in Tijuana to the supermarket chain Calimax. In both cases the method of processing is mostly artisanal (no machinery) and for that reason they produce limited volumes. In both cases they produce based on pre-orders made by brokers. A few other producers reported having sold surplus to local processors, but do not want to continue doing so because the local industries pay almost nothing for “good quality nopal,” sometimes \$1 MXN peso (less than a cent of Canadian dollar) for roughly 1 kg.¹⁷²

In DF there are approximately 30 nopal processing businesses (*Plan Rector del nopal*, 2010)¹⁷³ but only 0.7% of nopal producers of Milpa Alta sell directly to the local agro-industry during the high season and 0.65% do it in the low season (OEDRIUS, 2009). This means that little of the local surplus production¹⁷⁴ is absorbed by the local processing plants. The type of products manufactured range from foods and cosmetics to medicines.

According to my interviewees, the local industry does not pre-order volumes of nopal, nor arrange prices ahead of time, but waits until the last minute to buy the nopal that was not sold. In an interview with the owner of the nopal processing plant, Nopal Azteca, who started in the 1990s and now has about 14 contract employees, I confirmed what producers reported. In order to gather all the required fresh nopal, he buys during the high season when the prices are low. The surplus of nopal in the region and the high quality were for him the signs of a great business opportunity for starting an agro-industry. This is how his business manages the purchases of fresh nopal:

“We organize our production from February to August, which is the high season and nopal is the maximum quality at the lowest price. Then, we make pickled nopal and the product lasts all the year round. Then, when the fresh nopal is expensive on the fields, we have enough nopal to process and sell. We take advantage of the surplus in the local fields.

¹⁷² Producers do not use the measure kg, but measure volumes based on number of leaves, 100, 200, etc. 1 Kg equals about 20 leaves. They report that the lowest price the local agro-industry pays is \$5 pesos per 100 leaves. For 1 kg, the paid is \$1 peso.

¹⁷³ Internal document of the organization “Product-System of Nopal, DF”.

¹⁷⁴ The data gives only a rough idea of the number of producers selling to local industries, but it does not tell the total of producers that also use part of their production in their own small processing plants.

When the people [producers] have lots of nopal and then their only option is waste it because they cannot sell it, that's when we buy" (Ismael Ramirez, Owner of Nopal Azteca).

In terms of the quality of nopal, Ramirez reports that he buys from producers who do not use agrochemicals and that he knows they have gone through training in Good Practices.¹⁷⁵ However, there are no pre-order agreements between the producers and his company. Though his business is not in the market of organic processed nopal, he engages in the quality food market related with kosher quality and all his production is certified kosher. Although supermarkets like Wal-Mart could be an outlet for this product within Mexico City, for him it is not convenient because their distribution centers are away. Instead, the processed nopal goes to local, selected supermarkets or hypermarket stores within the city and 5% of the production goes to external markets.

For Esteban Olvera, representative of the Product-System of Nopal, DF, the future of nopal in Milpa Alta is more as fresh quality ecological foods rather than processed ones. One of the reasons, he argues, is that industry success depends on entrepreneurial skills, a complex investment structure, and management of production processes and sales. The effort is huge and the market may be difficult to find. Although 20% of demand should not be underestimated, for Olvera it is clear that this is not the best strategy to cope with market problems. So then what to do? For him the strategy should be based on the qualities of fresh nopal. He says,

"What do we have to do? Well, we know of the beneficial effect of nopal, but what we needed to know in the past is the most updated information [scientific evidence] about it. Then our objective is to show to people in general [the benefits] and that is where we see the sustainability [of nopal farming]. We know that nopal is consumed across the nation. Also, we know that it prevents further soil erosion. So, once people know more about the benefits of consuming nopal, then it will be easier for them to accept the processed nopal."

Meanwhile, the FAO (2006) reports that markets for processed nopal present difficulties because they have to be created and rely upon research on market segments, distribution,

¹⁷⁵ A public training certification as seen in Chapter 5.

marketing of products and development of effective commercialization strategies. These are key factors to take into account before establishing nopal processing agro-industries.

Producers who are in the process of removing agrochemicals concur with the view of the representative of Product-System of Nopal DF. What is interesting is that these producers do not know alternative markets. Likewise, the ones without plans to remove agrochemicals have barely heard of them and would like to learn more about it. Therefore, their reasons to quit agrochemicals were not market-related but strongly connected to values such as education, health and the environment.¹⁷⁶ Consistent with the commitment to change, they only use herbicides when the weeds outpace their capacity to deal with them manually. Consequently, they apply “soft herbicides and little quantities” but “just once a year or twice, at most”, the producer declares. For decreasing the quantities, they rotate the land exposed to synthetics (alternating half of the plot with and free of agrochemicals).

Likely the economic future of nopal production of Milpa Alta is promising in markets that value the ecological, fresh quality of this food, which is consistent with both market trends and emerging producers' values. However, for that, it would be fundamental that producers remove agrochemicals totally. Although a significant part of the local government's efforts is aimed at supporting producers to farm without agrochemicals, the goal has not been completed. The norm of ecological agriculture recognizes that some producers can be situated in a transitional phase before achieving fully ecological farming in DF (norm of ecological farming).¹⁷⁷ For the DF government, removing agrochemicals from agricultural areas is a pressing issue because these areas belong to the conservation zone. The official of CORENA, Esteban Marquez (from the Secretary of the Environment of DF), explains that the office is committed to providing technical support for producers to learn to farm without agrochemicals. However, he clarifies that “the objective has not been achieved because the office can't compete with use and customs and the affordability of agrochemicals.” In addition, for him the commercialization problems of the crops cultivated in DF, including nopal, have to do with their “native character.” Here a cultural element associated with native crops in Mexico is peculiar, given the history of colonialism.

¹⁷⁶ In Chapter 5, I emphasized the correlations between producers's values and education and their motivations to quit agrochemicals.

¹⁷⁷ In Chapter 5, I discussed the transition towards ecological farming in regard to the ecological status quo of nopal farming.

“Native crops” are associated with the indigenous world, which has been largely undervalued even after centuries of national independence. Especially in urban settings, the culture associated with anything that is “indigenous” has been difficult to valorize.¹⁷⁸

Therefore, for the director of CORENA, the productive and economic value of farming has to be linked to the “reproduction of the conservation area of DF.” In other words, this values farming based on the environmental services of such an activity. However, marketing environmental services has not become a reality in Mexico City. A producer relates that “we claimed once to be paid for environmental services, but the frameworks and specific programs to have direct economic rewards based on that category was unclear and then we gave up.” The environmental services market option would require a more institutional effort. At a more local level of government, municipal officials of Milpa Alta clearly point out the need to subsidize agriculture’s function to prevent further urban growth and keep green areas around the city.

Given producers’ experiences and the fact that they arguably use low quantities of agrochemicals, the real complexity to being “fully” ecological is how to cover the labour costs that arise when agrochemicals are removed.¹⁷⁹

Producers not using agrochemicals (these are located in the semi and advanced ecological management) and their relationship with the mainstream markets

Technically, all these producers are ecological. At the level of farming practices, the only difference is that some use bio-inputs while others introduced new composting approaches. I assume that the new composting approaches bring more ecological benefits (e.g. compost uses and re-uses local biomass).¹⁸⁰ The ecological quality of these farming practices is officially recognized with certifications, either provided by a government institution or by an independent commercial certifying agency, or both. Therefore, the connection of this group of producers with the mainstream market differs depending on whether or not they hold a market valid certification.

The non-market valid certification is delivered by the Center for Vegetable Sanitation (CESAVE, acronym in Spanish) that belongs to the Federal Secretary of Agriculture, Livestock, and Fishing (SAGARPA). SEDEREC, the Secretary for Rural Community Development of the DF

¹⁷⁸ Evidence of that will be provided later in this chapter.

¹⁷⁹ More details about the additional labour requirements are provided in Chapter 5.

¹⁸⁰ A detailed description of the new composting approaches is in Chapter 5.

government participates in these efforts by linking producers with the certification programs of SAGARPA. The certifications and documents are issued after the producer completes training programs. The training is organized in thematic modules covering on-farm safety and innocuous farming practices, organic farming, processing of nopal and entrepreneurship skills. The producer receives certification after completing each module. It is not mandatory to take all the series of training; the producer decides how many modules to take. The training has no monetary cost for the producer. But if the technician makes a recommendation on adapting or improving the physical infrastructure of the unit of production (e.g., installing fences to prevent entrance of undesirable fauna or a sink for farm workers to clean hands after using chemicals, etc.), the producer has to bear the costs (from personal communication with sub-delegate of SAGARPA DF, Emilio Lopez Cabral). The first module is the “On-farm safety and innocuous practices” (*Inocuidad y buenas practicas*) and it implies that an external technician advises the producer on safe farm management measures. Seemingly, from all the modules available, the office has prioritized the promotion of this one. Top representatives, delegate and sub-delegate of the SAGARPA office for DF¹⁸¹ explained that the office decided to focus on the good and innocuous rather than organic practices because the latter one is more for marketing purposes. Carlos Arroyo, Director of SAGARPA DF, explains:

“The organic certifications have become a marketing element. It is for that reason that the Secretary decided to lead our efforts to the safety and innocuous practices because in many cases what is covered in good and innocuous practices is not covered in the process of organic certification. The organic certification goes to more specific aspects and in dissemination of information (to consumers). And sometimes there are two or more certifications necessary to prove that the food is fully organic. At the end of the day, the consumer does not know exactly which of them is the right one. Meanwhile in the case of the good and innocuous practices we guarantee that the product is truly safe.”

Apparently in order to avoid controversy, they frame the programs for producers as a “transition” step to getting market certifications, like organic. For the director of SAGARPA, DF,

¹⁸¹ SAGARPA has an office for each state. It is kind of a representation of the federal government and they are in charge of the local issues.

“the (public) training and certifications prepare producers to go out and find markets in a more organized way.”

In 2011, there were 11 units of nopal production certified and another six units/enterprises in the process of certification or re-certification (Certification Status SAGARPA DF, internal document). The program has been in place for seven years (since the day of the interview), so it is possible that the number of units that have been certified is larger, but if the producer is not re-certified within a few years then the unit is removed from the list of those certified or in the process of re-certification. Assuming that there was a significant number of units that were certified throughout the seven years, the question that emerges is, what discourages producers from re-validating the certification? My insight is that it is because the certification is not market-valid. So for producers it is enough to continue practising what they learned in the first place without needing to re-certify.

Table 6-2. Non-market Valid Certification

Certification	Certifier	Activities involved	Costs for the producer
Good and Innocuous Practices	Public institution: CESAVE The certification program is funded by SAGARPA (Federal government) and SEDEREC (DF government)	<ul style="list-style-type: none"> - External technical assistance, - Microbiological analysis of heavy metals and pest residues, - Placing graphic signs on-farm - Validity of production process - Learning about use of protection equipment - External audit 	Free
Organic Farming	Public institution: CESAVE The certification program is funded by SAGARPA (Federal government) and SEDEREC (DF government)	<ul style="list-style-type: none"> - Learning to use compost - Learning to control pests naturally - Managing without agrochemicals 	Free

Source: Internal document office of SAGARPA DF; personal communication with director and sub-director of SAGARPA, DF and interviews with certified producers

The market-valid certification is delivered by a private agency or external agent. I found producers with organic, kosher and even US FDA certifications. The latter one proves that the food is not contaminated with agrochemicals. All these certifications have a cost for the producers and it requires the visit of an external inspector to the production site in order to verify the production process comply with the standards. Only in the case of the producer with the US FDA certification did the broker pay the cost of the external technician.

Table 6-3. Market Valid Certifications in Milpa Alta

Certification	Certifier	Activities involved	Costs for the producer
Organic Certification	Private international agency Bio-agricert	15-day visit of an inspector to verify the unit complies with the standards of the certifying agency	About \$1,533 US dollars first seal. Annual re-certification \$996 USD ¹⁸²
FDA US “Chemical-free food”	US FDA	External technician does biochemical test on the cultivated area	Broker pays the costs
Kosher	Private international agency No name provided	Inspection on-site	No data provided

Source: Author’s data

And so it emerges that the remarkable differences between the market valid and non-market valid certifications are that: 1) non-market valid ones are issued by public institutions and have no cost for producers while the market valid ones are issued by private agents or agencies and have a cost; 2) non-market valid certification implies training, external technical advice and the private is mostly about verifying that the production and produce complies with standards set up elsewhere based on consumers’ demands and concerns about where these labels are recognized.

As a result, producers with non-market valid certification still sell all their produce at *Centro de Acopio*. All of them have stopped using agrochemicals at least three years ago. Interestingly, some of them even stopped much before starting the public training and certification and their motivation to enter the training was to “enhance,” “formalize” or have “proof” of their ecologically sound practices. A producer whose motivation was to have proof says,

“We used to use agrochemicals 12 years ago when we started growing nopal,¹⁸³ but we didn’t like it and stopped. The difference is that when we used agrochemicals we only worked on the plot one day and forgot about it for two weeks when we come back to

¹⁸² Gomez-Tovar et al., (1999) indicates that in experiences of small-scale producers organized in cooperatives in the 1990s, foreign certifying agencies offered certification packages for the cooperative and then producers shared the cost. In the case of nopal producers, they were not formally organized in an association and had to pay for certification individually. Getting a certification price package for a group may be one of the benefits they can get through the rural association they were in the process of formalizing at the time I conducted the interviews.

¹⁸³ This producer has 13 years growing nopal, so she used agrochemicals only for the first year.

harvest the nopal. The costs were less... Then we learned that we could have an official document [the public certification] to prove what we are doing [working without agrochemical]. [By then] we were already conscious of not using herbicides and pesticides and nothing like that kind because it is not good for our health and for the health of people who consume our nopal.”

Underlying the motivation to have proof is the idea that it may have a positive impact in the price paid for their produce. This same producer tries to convince brokers and middlemen about the quality of her nopal in her everyday trading operation at *Centro de Acopio*: “I offer them a clean nopal, high quality one... but they [the brokers and middlemen] don’t seem to care about it. What they want is a cheap (low) price nopal.” Thus, this makes apparent that the “proof” of what they are doing is simply not useful at the market level.¹⁸⁴

All producers in this group (no agrochemicals and with a non-market valid certification) know about quality-based markets and refer to their produce as a “good quality” one. In their terms, quality is linked to “health benefits for the consumer,” “benefits for the environment,” and “safe food.” Here a producer refers to safety and health for the consumer: “My ideal as producer is to offer a safe, non-contaminated food and with beneficial effects [meaning health benefits] that helps control illness... but if you put agrochemicals on it that will be prejudicial to the consumer. The ideal is to offer a quality product”. This producer stopped using agrochemicals for two years before entering the public certification program. Before and after obtaining this certification, he trades almost all his produce at the local retailing point *Centro de Acopio*.

What can be done for these producers to valorize the quality of their nopal in the local retailing point given that the quality is proved with a public certification? One producer in this group brings up a pertinent alternative: setting up a special section within the *Centro de Acopio* for people who produce organic and have certifications so they can access a premium price in this local market. However, that is not in the process of becoming real soon (by the time of

¹⁸⁴ This may change with the new regulation and organic label the government of Mexico that came into effect in November 2015. The government of Mexico can issue an organic label to producers who grow according to the Law of Organic Products of 2006 and that apply for the label (SAGARPA website <http://senasica.gob.mx/default.asp?id=3448>). Because the law entered into effect in November, 2015, there is not yet any evidence of impacts on the market connections these producers may have. It will take some time for such impacts to emerge and this topic can be considered in future research. In addition, this regulation does not exclude the continuing participation of private agencies. There will be a competent authority for label matters at the market level.

fieldwork). When I inquired of the manager of the *Centro de Acopio*, Javier Rios, about plans to open a special section for buying and selling agrochemical-free foods, he responded in terms of a desire to carry those foods but seemingly there is no coordination between public policy at the level of production practices and commercialization point: “We want to cover those foods, because we know the international rules are changing and demand food to be grown under those practices (agrochemical-free), but we need the government to help (producers to manage agrochemical-free) to offer a quality produce.”

In sum, a good starting point could be coordination between the public certifying institutions and the administration of the *Centro de Acopio* to open a section of ecologically-grown produce, that is validated by the government institutions.¹⁸⁵ Otherwise, producers will be discouraged from both getting training/certifications and continuing selling at the *centro de acopio*, as they will soon realize they do not access to premium prices in that trading point.

Hence, in order to continue the ecologically-sound practices, producers with the non-market valid certifications want to get out of the conventional market and explore niche markets. They are looking for those ones within Mexico City, but their knowledge about how to connect with them is almost non-existent or pretty vague. For this reason, they have started to connect with other producers already holding a market-valid certification.

Producers who hold a market valid certification still sell a portion of their produce at the mainstream and undifferentiated market¹⁸⁶, meaning *centro de Acopio*, CEDA and some supermarkets. However, they have clear plans to give up these markets in the near future. For now, continuing in mainstream and undifferentiated commercial channels helps them sell the produce they are not yet able to sell in the organic, price-premium market. Participating in the mainstream market is a strategy for keeping as many buyers as possible.

From all the interviewed producers, this type of producer (advanced ecological, agrochemical-free and holding a market valid certification) is the least related to mainstream

¹⁸⁵ Certainly, this would give more power to public institutions over producers as producers’ access to better prices would depend on a certification issued by a governmental office. Issues of patronage and corruption may re-emerge. Rather than avoiding that discussion, this would be an opportunity to consider options for democratizing public spaces of trade. The *Centro de Acopio* is a public space, the executive board is constituted by producers and representatives, and it operates with public funding. Furthermore, the public investment in the training and certification process may be more sustainable because it can become market-valid. Although the training is “free”, the investment from the producers’ side is time. Time in a small-scale, family-owned unit of production is also money. Anyway, this is a step forward toward institutional change supporting organic industry.

¹⁸⁶ In the next section I analyze the involvement of these producers in organic markets and the process of getting a market valid certification.

markets (see Table 6-1). Their buyer's portfolio includes brokers linked to national and international organic markets and non-organic ones, directly trading with health and organic stores in Mexico City.

The positive possible outcomes of the engagement in the local market would be reaching health food stores in the urban center but they still have limited information about how to connect with those markets. Up to now, they have dealt with only one organic food store within Mexico City. In addition, they have the perception, a commonsense one, that the segment of the population in Mexico City willing to pay a premium price for organic foods is quite small. This perception could change if market studies on organic food consumption were available to them. A study by Juarez and Hernandez (2009) about consumption of organic food shows that in Mexico City there is potential for organic food markets. Because of lack of knowledge of market possibilities locally, producers go for an export-oriented commercial strategy to northern markets, based on, another commonsense idea, the fact that northern markets can provide long-term economic well-being.

Although these producers removed agrochemicals 20 years ago, it was just recently that they knew about market certifications and engaged with them. I found a producer who stopped using agrochemicals 25 years ago but got the certification 10 years after. Similarly, another one did it 20 years before and is just now in the process of getting the market-valid certification. Hence, apart from carrying out the cost burden of agrochemical-free management for many years, this reveals that getting to know market-based options to valorize their nopal takes them quite a long time and questions arise as to whether public support, in order to raise awareness about these market-based options, should be in place. I expand on this discussion on the what, how and why these producers engage in the organic markets in the next section.

Regardless of the certification, either market-valid or not, the on-farm practices of the producers in question favour the closing-up of ecological loops locally. They rely deeply upon knowledge of their site-specific agroecosystem, biophysical characteristics and natural sources of their surroundings.¹⁸⁷ However, the local market is highly dominated by mainstream commercial channels that do not pay the cost of their farming approaches. The knowledge of where and how to access niche markets and premium price local markets seems almost non-existent among the

¹⁸⁷ For more details on the practices of agrochemical-free advanced producers, see Chapter 5.

nopal producers without market-valid certification and it is very limited among the ones already holding the market-valid one.

This is clearly a peril to the continuity of ecological agriculture in the region because at some point producers will have to choose over continuing farming ecologically (with no agrochemicals) or ultimately stopping farming, given the “declining prices” paid in the mainstream markets. Moreover, these farmers may stop farming even without trying agrochemicals again because that practice is no longer consistent with their values. A proof of this is that they were willing to carry the economic burden of removing agrochemicals without prior knowledge of market rewards. As a result, the urban consumer of Mexico City that gets the nopal through the local market receives a quality product at a low price. This gives an account of the transference of ecological wealth to the near urban center but under unequal terms because the producer doesn’t benefit equally. Thus, it reveals an emerging rural-urban asymmetry, where the near countryside sends high quality ecological wealth through food to the urban center.

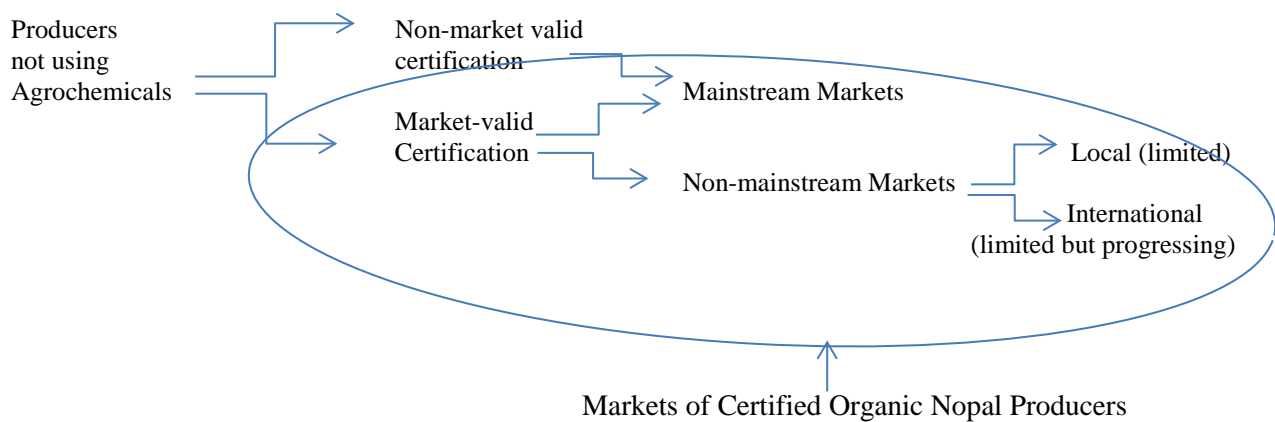
The emerging relationship of Milpa Alta nopal producers with the organic niche of market

Organic certification appeared as the relevant market-valid certification within the group of producers not using agrochemicals. Nopal producers engaged in the local and international organic niche market are at the advanced ecological segment of the farming practices. They stopped using agrochemicals three or more years ago, intercrop consistently, use traditional sheet compost and introduce new composting approaches and some, though not all, integrate livestock. The relationship with the organic niche market is mediated by a certification process conducted by an international organic certifying agency. As a result, I call the international organic certification “a market valid certification.” The formal engagement with the market is when the certifying agency issues them the seal. The experiences and views of these sub-groups shed light on intertwined local and global issues, such as impacts of on-site farm practices when engaging with a long-distance, though arguably ecological food market.

Records and studies of certified organic producers in Milpa Alta are almost non-existent, which may be because it is too new or too small. Torres and Rodriguez’s (2008) survey found that 5% of the total producers in the agricultural areas of DF are certified organic, but they do not provide details of how that 5% is constituted (crops and agricultural region within DF). So, there is no way to know if nopal producers of Milpa Alta are the majority of that 5%. Assuming the

sector of organic nopal producers in Milpa Alta who are certified organic and participating in the international organic market is still quite small, an analysis of them is worth doing because organic markets develop rapidly. Therefore, such an analysis can be a test-tube case to foresee scenarios of market and ecological connections locally and globally. How did they engage in the international niche market? How do they cope with the costs of farming organically?

Figure 6-2. Markets of Certified Organic Nopal Producers



Relationship with the international organic market. How did nopal producers start linking with international organic markets? It turns out that the transnationalization of the Mexico City food market played a role. The first producer¹⁸⁸ obtaining the international organic seal got to know new trends in the international food market through a relationship with a European supermarket chain, Carrefour. He began offering his product to Carrefour in the early 1990s and found good receptivity due to the high quality of his produce. Apparently both the store's director and the producer shared common concerns about unhealthy food habits of Mexicans and the sustainability of food production. However, at that time he didn't have certification, and the supermarket did not pay higher prices for its produce.

¹⁸⁸ This producer has been the leader in forming a nopal producers' organization highly committed to maintaining ecological practices and looking at organic markets. More about that organization comes later in this chapter.

The benefit of this connection was the flow of information about selected organic markets. The producer became interested in “selected markets.” Then, he started to link “quality food”¹⁸⁹ with “selected markets.” Selected markets for this producer, connects high-income consumers and specialized stores. Carrefour is a French brand of the hypermarket, the second largest in the world, just after Wal-Mart. Carrefour moved out of Mexico in 2004 after experiencing harsh competition from Wal-Mart. The remarkable interest in “quality food” is not exclusive to nopal producers in Milpa Alta. According to literature, this is common among small-scale producers, because for them, “[q]uality product markets represent a possibility of resistance to conventional globalization by converting social and cultural differences into a mechanism with which to leverage a larger share of the value from commodity production” (Mutersbaugh, 2005: 384).

The transnationalization of the food market of Mexico City is an expression of mainstream globalization and, it became the force leading nopal producers toward the global quality markets, but not locally. Thus, the transnationalization of the food market of the city pulls away advanced nopal producers from the local market through two mechanisms: 1) the market has been increasingly co-opted by Wal-Mart, which does not pay premium price as it is not a selected market; and 2) the relationship with transnational supermarkets became the source of knowledge about specialized food and the global organic market, which stimulates producers to engage in the export-oriented food market, but a niche one. The market mechanisms then disrupt the market link of local producers with local markets and send them away. This way of engaging the international organic market differs from the experience of small-scale producers from remote rural areas, which mostly got to know these markets through NGOs working on fair trade and other market mechanisms to accomplish social justice. The contrasting fact here is that remote rural villages are far from big national cities, whereas Milpa Alta organic producers are close to one of the largest cities of the world, which is actually the target of the foreign food industry.

So far, the certifying agency involved with the nopal producers of Milpa Alta is Bio-agricert based in Europe. The foreign agency secures access to export markets because national certifications are not accepted by foreign brokers. A producer recalls what a broker said: “Yes, we are going to buy your produce, but we don’t want any certification from the Mexican

¹⁸⁹ Before the dominant discourse of organic food, discourse on quality food and specialty markets was more common in the late 1980s and 1990s.

government. It has to be an international company (certifying agency).”¹⁹⁰ The officials in charge of the public certifications are aware of this. The sub-delegate, Emilio Lopez, says that they have not focused on organic certifications because normally the producer is asked to get the supervision by a private agency. This resonates with a point raised by Bush et al. (2013) about credibility of public-private certifications and the fact that “[a]lthough these (certifications) can be carried out by public bodies, certification systems largely run by private organizations, such as firms and/or non-governmental organizations (NGOs), are gaining prominence.”

Given the brokers’ preference for private agencies, nopal producers engaged in the international organic market see the public, local certification (provided by CESAVE of SAGARPA to nopal producers) as a step that paves the way towards the international certification. My interviewees stressed that before starting the international certification process they decided to start the public certification in good and innocuous practices. Why? They feel more confident about getting approved and getting the seal of the private certifying agency in the first try. The microbiological tests and other recommendations by the external technician during the public training program becomes the first piece of evidence that their product is at least innocuous and safe. In addition, they learned how to record their on-farm practices and so on, which they will need for the international certifier. Put this way, complying with all the standards of the public certification paves the way toward the organic export-oriented market strategy. However, in order for producers to succeed, they must have linkages with the international market.

Certification industry and disputes in Mexico. The market dynamic has benefited the private and foreign certifying companies who dominate the certified organic sector in Mexico. Certainly that responds to the fact that certifiers help brokers validate their claims of offering environmentally-friendly products, but then the question already addressed in the literature arises of whether this system favours a corporate-quality assurance, rather than being a system that rewards producers, especially small-scale producers committed to environmental practices (Bush, Belton, Vandergeest et al., 2013; Muramoto, 2009; Koopler, 2005; Taylor, 2005; Sanz-Cañada and Macias-Vazquez, 2005, Gomez-Tovar et al., 2005; Mutersbaugh et al., 2005). The majority of

¹⁹⁰ Being that the broker does not want certifications of the government of Mexico, so the new regulation may not help producers in transactions where the brokers say which certification is acceptable.

certifiers operating in Mexico are not based in Mexico (see Table 6-4). For some scholars, the encroachment of foreign organic certifiers in southern countries represents a “bio-colonialism” trend (Gomez-Tovar et al., 1999). Additionally, because the produce is grown in the South, producers need to satisfy standards set up in the North if they engage in the long-distance, green, organic market. This has become a kind of a neo-export-oriented market based on ecological green values.

Recently, bio-colonialism is observed at the level of disputes over what is organic. In 2013, the government of Mexico published a new regulation for organic products and a national organic label that can be obtained by any national producer complying with the national organic products law of 2006. The producer can apply for it directly or contract a certification company to undertake the process. Therefore, the new regulation does not exclude the participation of private agency companies, but they must be approved by SAGARPA to operate in Mexico (Table 6-5). However, the effectiveness of the regulation has been delayed due to discussion about conflicts with imported organic products from the United States. With the new regulatory framework, all organic products in Mexico (domestic or imported) must comply with the Mexican organic products law of 2006. The USDA’s global report (2013) “New Organic Certification and Product Labeling Program in Mexico” identifies some divergence between what is allowed and what is not in each country’s respective regulatory frameworks for organics,¹⁹¹ which may prevent some organic, imported products from entering Mexico. The Organic Trade Association’s Organic Export Program’s¹⁹² website reads:

“On April 7, 2015 Mexico’s Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (SAGARPA) called for comments on Mexico’s intent to extend implementation of the Mexican Organic Regulations from October 29, 2013 until October 2016 for those countries engaged in equivalency discussions with Mexico. Although April 29, 2015 is slated as the implementation date for certified organic products unless an extension is in place, the Mexico’s National Service of Agro Alimentary Health, Safety and Quality (SENASICA) has assured the USDA National Organic Program and Foreign Agriculture Service that customs will NOT begin

¹⁹¹ See USDA (2013) for a table comparing these frameworks.

¹⁹² <http://www.globalorganictrade.com/countries.php?idx=4> Accessed May 10, 2016

enforcement at Mexico's borders, thereby assuring the free flow of trade. Due to the length of the comment period on the notice, the earliest date for official publication of the extension could be April 27. Meanwhile, USDA has commented in support of the proposed extension, and encouraged Mexico to publish an official extension as soon as possible. The United States has been in talks with Mexico to make an equivalency agreement for organic products.”¹⁹³

The publication date on SAGARPA's website is November 2015, which suggests it came into effect in late 2015. The link for submitting an application of the national certification is active (last accessed on May 5, 2016).¹⁹⁴ Hence, there has been less than a year that the law has been operating. The situation reflects a power dynamic to impose understandings of what is organic management and what is not, in which a powerful state (United States) fights with another for the prevalence of a regulatory framework that is convenient to its local industry. The situation may suggest another layer of bio-colonialism, which is inflicted through regulations that affect the sovereign determination of farming practices.¹⁹⁵ Seemingly, the United States is reluctant to have a reciprocity agreement in relation to organic food trade, regardless of the fact that both countries, as well as Canada, are part of NAFTA. The USDA Gain Report specifies that the United States has reciprocity agreements in terms of organic foods with Canada and Japan, but not with Mexico, and that even though Mexican organic farming law is quite similar to the USDA NOP standards, Mexican products with the Mexican federal label exported to the United States are forced to comply with additional United States regulations.

¹⁹³ <http://www.globalorganictrade.com/countries.php?idx=4> Accessed May 10, 2016

¹⁹⁴ Access to <http://senasica.gob.mx/?id=6506>

¹⁹⁵ The dispute undermined not only the capacity of issuing the Mexican federal organic label but also the understanding of organic because for local producers to get the label, their practices must correspond to definitions of organic farming stated in the national law of organic farming issued in 2006. Moreover, the United States government was trying to protect the validity of international organic seals within the Mexican domestic market, not its organic market because if a Mexican producer wants to export organic produce to the United States, the Mexican federal label will not be enough, as they have to pass through other USDA regulations, which is reported in the Gain Report of the USDA (2013): “Mexican products exported to the United States must continue to abide by the NOP rules and be certified by a nationally accredited agency.” This list can be found at <http://www.ams.usda.gov/AMSV1.0/getfile?dDocName=STELPRDC5100384>. S”

Table 6-4. Certifier Agencies Operating in Mexico ¹⁹⁶

Certifying Agency	Country (Based in)	Accreditations
Bio-agricert	Italy	European Community JAS /Japan Agriculture Standard, Japan NOP (National Organic Program USA) CAAQ/Quebec (Canada) AB/ Norm CC REPAB (France)
CCOF	California, USA	NOP National Organic Program USA) European Community Canada Organic Regime Japan Switzerland
CERES	International body (no single based country)	Regulation (EC) 834/07 (European Community) NOP (National Organic Program USA) JAS /Japan Agriculture Standard, Japan Global G.A.P. UTZ Certified C.A.F.E Practices TESCO Nurture.
CERTIMEX	Mexico	Mexican Organic Norm Regulation 834/2007 (European Community) NOP (National Organic Program USA) JAS /Japan Agriculture Standard, Japan Small Producers Seal (Latin American and Caribbean Network of Small Fair Trade Producers) Smithsonian Migratory Bird Center (SMBC)
Control IMO	International body (no single based country)	Regulation (EC) 834/07 (European Community) NOP (National Organic Program USA) JAS /Japan Agriculture Standard, Japan Swiss Organic Regulation Bio Suisse International Bio Suisse National Demeter International Naturland Soil Association Global G.A.P Migros Bio Suisse Garantie Swiss GAP Rainforest Alliance Starbucks
Mayacert	Mexico Central and South America	NOP (National Organic Program USA) Regulation (EC) 834/07 (European Community)

¹⁹⁶ This table lists the certifying agencies operating in Mexico before the new regulation came into effect. They may continue operating because the new regulations are actually for products circulating in Mexico, but if an organic product goes to another country, it needs to comply with the regulations of that country.

		JAS /Japan Agriculture Standard, Japan BIO Suisse NATURLAND Shade coffee“Bird Friendly” Certificación UTZ Certified, C.A.F.E. Starbucks Coffee Company Practices
Metrocert	Mexico	ICEA IFOAM NOP (National Organic Program USA) Regulation (EC) 834/07 (European Community) JAS /Japan Agriculture Standard, Japan Canada Organic Products Regulation
Naturland	Germany	Naturland
OCIA	USA	NOP (National Organic Program USA) US-Canadian Organic Equivalence Arrangement (Canada Organic Products Regulation) US-EU Equivalence Arrangement (European Union) USDA-MAFF Trade Arrangement (Japan)
OTCO	USA	NOP (National Organic Program USA) Canada Organic Products Regulation USDA-MAFF Trade Arrangement (Japan)

Source: author's elaboration with information from Gómez-Cruz (2007).

Under the new regulation, SAGARPA lists a number of certifiers (see Table 6-5) whose standards fulfill the requirements and statements of the national organic law. This means that foreign companies with those agencies' label can enter the country. However, if national producers want to export, they may continue getting labels from certifiers allowed in the country they expect to export to.

Table 6-5. Certifier Agencies Approved by SAGARPA under New Regulations

Certifier	Origin
OCIA	USA
Certimex	Mexico
CCOF	USA
Mayacert	Mexico Central and South America
Metrocert	Mexico
IMO Instituto para el mercado ecológico	International body operating in Latin America and the Caribbean
Agricert Mexico	European
Mexico Certificadora Organica S.A de C.V	Mexico
Transcanada Certification Organic Services	Canada

Source: SENASICA-SAGARPA. *Padron de organismos de certificación aprobados para la certificación de productos organicos*. www.sagarpa.gob.mx

The nature of the market linkage of nopal producers with the international organic niche. The benefit of the foreign organic market, according to producers, is that the “price is stable and they have “consolidated sales,” thus avoiding the uncertainties of demand and supply typical of conventional markets, and too low prices (e.g., \$5 pesos per 100 leaves).¹⁹⁷ However, they face higher costs. In addition to higher labour costs, the initial and then the annual renewal certification costs become part of the annual fixed costs of production (see Table 6-3). According to one producer, just becoming officially organic and valid in international markets represented a 70% increase in total annual costs. But they hold the belief that “this is the cost of reaching niche markets”. Likewise, Velasco Valdes’ (2014: 124) research on organic nopal producers of Milpa Alta confirms this fact. In interviews with producers, he found that “[t]he producers’ perception about the difference between the utility margin of conventional and organic nopal is quite similar because of the additional labour costs in weeding, fertilizing, pest control and certification costs required in farming organic.”

According to Velasco Valdez (2014), producers do not find the utility significantly different, at least the price difference that a Mexican consumer pays for regular and organic nopal is huge. The price for 1 kg of fresh conventional vs 1 kg of fresh organic nopal paid by the

¹⁹⁷ At the *Centro de Acopio*, the unit of volumes used to sell nopal varies. Nopal is sold per 100 of leaves, buckets and baskets. Kilograms or tons, are not common measures. Thus, when producers speak about prices they commonly refer to prices per “100 leaves,” or “a bucket,” or “a basket”.

consumer in Mexico in 2014 was respectively \$15 MXN (approximately \$1 CAD) and \$53 MXN (approximately \$4 CAD dollars) (Velasco Valdes, 2014). So, why do producers perceive the margin of utility between one and another insignificant? One possibility is that the price actually paid to the producer for the organic product in the local market is much smaller than the price the local market outlet tags on the organic nopal available to the final consumer. The same may be true in the international market as prices for the final consumer are much higher than the prices paid to the producer.¹⁹⁸

Although information about the percentage of production traded overseas was not shared during the interviews, it is likely increasing because my interviewees state that “external/foreign demand keeps growing.” From their perspective, the overseas niche market better sustains the cost of their practices for now.

Nonetheless, the market channels and market structures organically-certified nopal producers go through resembles mainstream market structures, except for the premium price. The producer meets the broker, who pays a premium price and takes the nopal to Europe.¹⁹⁹ That they connect with the European market really surprised me in the first instance, but then it made sense, as it neatly corresponds with the fact that their connections and knowledge began with the European supermarket Carrefour.

Nopal arrives in England, France and eventually Germany. Producers do not know the type of consumption or final consumer but have some vague notions that it is used as an input for other industrial processes. Numerous European-based websites (see Table 6-6), and even research groups, such as *the Journal of the professional association for cactus development*,²⁰⁰ *FAO network for cactus development (CACTUSNET)*²⁰¹ report nopal as an ingredient in health products, such as nopal powder used as a nutritious complement for purposes that range from losing weight to controlling diabetes.

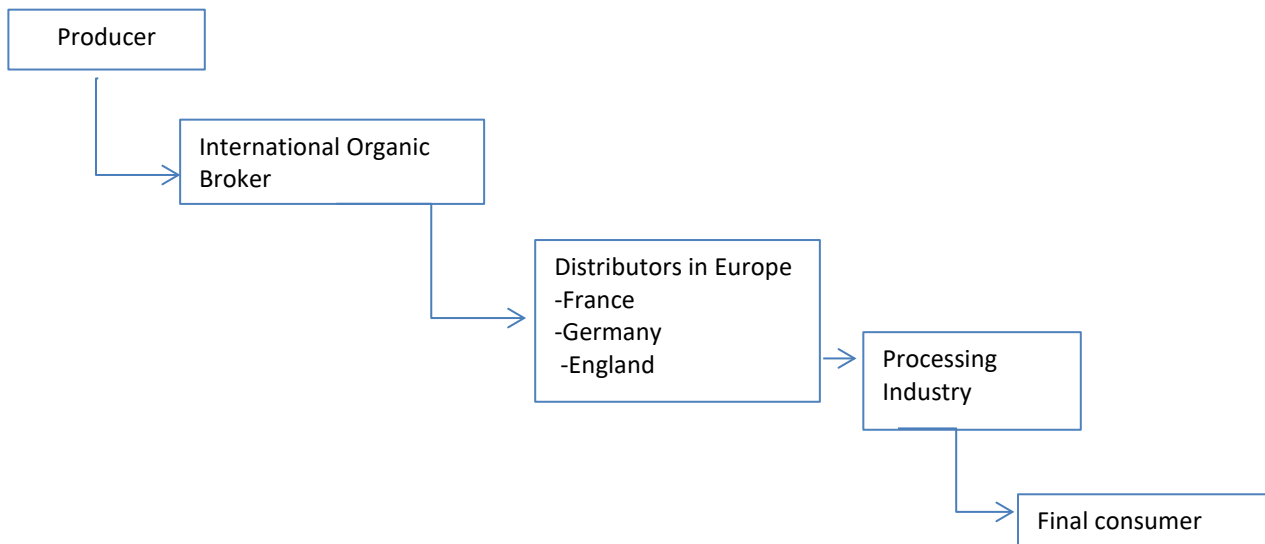
¹⁹⁸ That piece of information seems hard to collect from producers. I couldn't get it and it looks like neither could Velasco Valdez (2014). A systematic official data regarding costs vs. prices of organic nopal is not available yet.

¹⁹⁹ Name of the broker or broker's company was omitted by the interviewee for confidentiality reasons.

²⁰⁰ See the website <http://www.jpacd.org/>

²⁰¹ See <http://www.cactusnetwork.org/>

Figure 6-3. Commercial Chain of Nopal in International Organic Markets



Source: Author's interviews with producers.

Table 6-6. Commercial European Websites Promoting the Health Benefits of Nopal and Nopal in Food Supplements

Country	Type of nopal promotion	Website
United Kingdom	Food supplement in capsules based on organic nopal	http://www.bodykind.com/search/Nopal%20Cactus/product/1862-100-percent-Organic-Nopal-Cactus-90-x-500mg-Vegicaps.aspx?Referer=Google_nopal%20cactus&device=c&gclid=CPWInbHApc0CFQuPaQodk5oApw
United Kingdom	Nopal powder, based on organic nopal	http://www.alibaba.com/countrysearch/UK/organic-nopal-supplier.html
France	Health foods recommendation.	http://www.doctissimo.fr/html/sante/phytotherapie/plante-medicinale/nopal-figue-de-barbarie.htm
France	Commercial supplement (considers nopal a medicinal plant)	http://www.mr-plantes.com/2014/05/nopal/
France	Commercial food supplement	http://www.laboratoires-fenioux.com/nopal-D227/fr

France	Health supplement (considers nopal as good for controlling diabetes)	https://diabete.ooreka.fr/astuce/voir/497271/nopal
Germany	Food supplement as nopal powder	https://www.melodie-express.tv/tv.info/artikel/198436
Germany	Dietary supplement (considers nopal as good for losing weight)	https://www.verbraucherzentrale.de/nopal
Germany	Alternative medicine	http://www.heilenmitpilzen.de/nopal.html

Source: Author's elaboration based on a google search using country domains of France, Germany and United Kingdom. These were the three countries organic nopal is shipped to.

The intermediated market for Mexican organic produce has been a concern of Mexican scholars at the University of Chapingo, such as Gomez-Tovar, Gomez-Cruz and Swantessius²⁰² who wrote: “different to organic producers based in industrialized countries who now significantly have direct trade, in Mexico the commercialization process normally starts with a wholesale trade, mediated by brokers and in some cases by processing companies that operate in the foreign market; then reach a wholesale trader who take the produce to a retail point, after which the produce reaches the final consumer” (Gomez-Tovar et al., 1999: 97). Such a statement remains true, at least for some Mexican organic producers newly incorporated in the organic market like the nopal ones.

Gomez-Tovar et al. (1999) identified two types of markets in which Mexican organic produce circulate: “traditional” and “solidarity market”.²⁰³ The traditional one is the mainstream and the solidarity market represents what once was believed to mean “the alternative” or simply non-mainstream. The latter is specific for some produce and type of consumers, for instance, consumers looking for goods produced under socially just practices. Based on that characterization, organic nopal producers of Milpa Alta go through the traditional channel. What determines which commodity goes through one or another channel? The literature and evidence record that Mexican organic coffee has primarily engaged the international solidarity market

²⁰² These scholars belong to the CIESTAAM, a research group of University of Chapingo. This research center has generated the most important statistical database and critical analysis about the organic agricultural and food sector of Mexico. They have been leaders in organizing a national network of organic farmers' markets (*red de tianguis organicos*) and fostered participative certification programs.

²⁰³ This stands for *Mercados Solidarios* (in Spanish), which means they operate with values of mutual community support.

(Jaffe, 2008; Nigh, 1997). The contrast between coffee and nopal is that coffee is quite embedded in food habits of northern consumers while nopal is not.

International certifications and impacts at the on-farm practices. When I asked interviewees about the actual practices the international certification process forces them to adopt, I found two types of impacts: one is the enhancement of ecological practices already in place and the second is adaptations that do not necessarily improve the ecological performance of the plot but are more for economic reasons. The enhancement makes sense because the farmers stopped using agrochemicals years and even decades ago in some cases, and these producers have gone through the public training and certification. In terms of enhancing ecological practices, adaptation of composting methods is the only practice that the international certification noticeably influences. For instance, instead of the traditional sheet composting made up of nopal leaves and manure, they make compost with calcium, active biological ingredients and a more limited amount of manure. Whether this technique is more effective than other practices is not discussed by certifiers and producers.

International certifiers do not provide any training for the method of composting they require. My interviewees learned it from other producers who had experience with the certification process. A producer who is new in the certified market and was waiting for the seal provided by Bio-agricert, reported that he learned it with the help of peers in an association formed by 15 producers interested in going to external markets. The group was formalized in November 2011 under the legal category of “association of rural production.” Organized in a formal association, they are also able to access public resources through the Product-System of Nopal program. However, the objective is to become an independent enterprise.

The 15 producers together have 35 ha of nopal cultivated using ecological methods, and most of them are in the process of getting international organic certification. Hence, associations help put producers in the realm of full agro-ecological management and facilitate processes to access international markets. But nopal producer organizations do not abound in the region. As few as 18.5% of the total nopal producers belong to associations (*Geostatics of nopal*, 2009) despite the fact that the majority of my interviewees who work independently declared that “we need organization,” “we need to be organized,” and “our main problem is the lack of organization”. However, bad experiences, such as patronage and dishonest leaders, have created

an anti-trust climate in the community. Perhaps, some diffusion about the structure, principles, relations and practices of successful associations would pave the way for the re-birth of co-operative action.

The certified producers, however, do not recognize their own practice as organic. When I asked if producers think their farming practice is organic, they insisted that it should be called natural or ecological rather than organic. Some responded that if it was truly organic they would not be banned from using fresh manure. With the organic certification standards, the manure has to be only an ingredient of compost. Some other producers in the process of getting the international seal argue that the term organic is a “foreign term” to describe their ecological way of farming.

The adaptation of practices for economic reasons stems from the fact that the composting technique required by the organic standards needs more labour than the traditional one. A producer speaks about it in these terms: “Sometimes you do either compost or the conventional agricultural work but you barely have time and labour available for both”. Here it is important to recall that in Milpa Alta, family labour is important and the cost of contract labour is higher than in other states because wages are based on the minimum wage set up in the urban area.²⁰⁴ As a result, organic certified farmers plan to purchase compost made off-farm and save labour. However, that brings up the difficulty of proving the organic quality of all ingredients of the purchased compost.

When I conducted interviews, producers were signing a contract with a company in Texcoco (a borough of the nearby State of Mexico), which produces compost made with tamarind chaff. “We are dealing with the documentation. We must gather all the necessary paperwork (from the compost provider), such as the origin of the compost and so on, which is needed for the certifications and the annual revisions” reported a producer. At the end of the day, it results in additional work for the producers. This is reminiscent of the widely discussed problem of bureaucratization of certification processes based on the organic coffee sector in Mexico and the Global South, as documented by Jaffe (2008), Jaffe and Howard (2009), and Mutersbaugh (2008, 2002). Seemingly, that situation is generalized for small-scale producers of the Global South, as pointed out by Bush et al. (2013): “Compliance is easier for larger-scale,

²⁰⁴ See Chapter 5.

better capitalized production units that can deal with record-keeping and administrative requirements.”

Moreover, behind the paperwork lies a larger impact for small-scale producers because the certification process also restricts or defines the actual choices of practices on-farm that are considered meaningfully ecological and that are economically convenient for a small-scale producer. Thus, as Bush et al. (2013) points out: “[t]he unit of certification largely determines what is included in and excluded from definitions of sustainability.”

In the near future, off-farm compost from private business will not only be needed to save labour but also to comply with the changing rules of organic certifiers. As identified by an interviewee: “the organic norms are changing, and soon we will not be able to prepare the composted manure in the area of production close to the plants.” It is important to mention that this producer manages five hectares putting him in the category of the largest landholders in the region. Therefore, if other smaller holders of Milpa Alta try to enter the organic certified market, they will face major barriers to complying with the standards.

Apart from the paperwork issue, uncertainty remains in the quality of the private off-farm compost. The commercial compost supply is quite limited in the region and even less available are composts designed exclusively to meet nopal plantations needs. As noted by another producer, “the majority of the compost options are in their trial and error phase.” Public and private research is new in the field and important questions remain unanswered.

Although purchasing compost could help producers cope with labour issues in the short term, moving to commercial providers disrupts the ecological reconnections that on-farm fertilizer was creating. Recycling locally available organic residues, reducing raw manure use, and on-site compost preparation are all practices that favour local ecological metabolic relations. It is interesting to note that determining the influence of market-valid organic certification processes in moving farmers from on-farm to off-farm compost reveals the intrinsic relation between on-farm practices and market dynamics. Shifting to tamarind chaff compost produced in Texcoco in the neighbouring state may be setting the scene for farmers to rely more on distant-produced organic inputs. An alternative path likely is the use of public compost (made with local organic residues by the municipality of Milpa Alta). However, the institution in charge of this compost production must first publish their compost production process. Only then, will producers be able to fulfill the requirements of their certifiers.

Participatory Guarantee System

A producer using advanced ecological practices is critical of private organic certification, arguing that it seemed to be a complex process and instead he wants certification as “ecological” and a “participatory certification.” The idea came out of his engagement in composting and agroecological workshops delivered by Jairo Restrepo, a well-known agroecological activist and academic in Latin America,²⁰⁵ and other academics of the University of Chapingo.²⁰⁶ Indeed, the Mexican scholars from University of Chapingo have largely worked on the participatory guarantee paradigm as a result of observing the rapid growth of small-scale producers in the export-oriented organic market. They observed how this mainstream certification system favours large agri-business entering the market, which in contrast with small-scale producers tends to rely on monocrops and input-substitution organic farming models and puts the social and ecological integrity of small-scale organic producers at risk. The problem according to Nelson et al. (2010: 248) is that in the predominant regulations of organics:²⁰⁷

“there is nothing inherent in organic regulations that prohibits the entry of large agribusiness into the market, protects small-scale family farms, limits the extent of monocrop production, or that favours local production and consumption networks. As such, the regulatory definition of organic agriculture offers an essentially input substitution model, in which chemical inputs are replaced with biological ones, but a more holistic vision of sustainability, which includes the interrelated notions of ecological, social and economic justice, is generally not addressed.”²⁰⁸

²⁰⁵ For a biographical note about Jairo Restrepo, see <http://lamierdadevaca.com/web/jairo-restrepo/>

²⁰⁶ I have noted before the importance of this university in the field of organic farming, agroecology and other frontier topics of agriculture.

²⁰⁷ For these authors, in a growing number of countries “legislation governing the organic sector mandates third party certification; and in some cases, accreditation by the International Standards Organization (ISO) as well, for those wishing to use the organic label”, and these standards don’t have a direct/strong commitment towards essentially protecting small-scale farming. Perhaps this responds to larger global institutional trade regulations arguably protecting “free trade”, for instance WTO.

²⁰⁸ In their paper, Nelson et al. (2011) refer to the specific case of two major and influential certify agencies and organizations operating in Mexico, Organic Crop Improvement Association (OCIA) and Naturland. The authors state that throughout the 1990s these two agencies “began to shift to third party certification, in which a disinterested—and presumably objective—third party became responsible for both developing organic standards and verifying producer compliance (Gonzalez and Nigh 2005; Mutersbaugh, 2005). In conjunction with a move to third party verification procedures, certification organizations also stopped integrating organic inspection with the delivery of extension and education because it was believed that providing advice to farmers would create a conflict of interest for inspectors (Gonzalez and Nigh, 2005)” (Nelson et al. 2011: 228).

A producer speaking of the advantages in the “participatory” system foresees a sense of building up a farmer-to-farmer trust and potential possibilities of developing a sense of consciousness and honesty seemed to be the most valuable characteristic. He says: “if we quit agrochemicals, then we have the right to get a label and endorse our neighbours who have done it too. We just have to be honest and conscious. We should be able to do the certification process among ourselves and later on get (together) the external private organic label.” The participatory certification implies the building up of producer agency in the validation process and can even generate farmers’ collaboration and knowledge because it essentially relies upon a “peer review process” that implies the active participation of various stakeholders (e.g., the producers, trained agronomists, consumers). For Nelson et al. (2010), the participatory paradigm, known also as participatory guarantee system (PGS) is a way to maintain the integrity of both ecological and social goals of the organic and agroecological movement.

Despite small-scale producers stressing the importance of this path, the participatory guarantee system is not consistent with ISO standards because it is a peer review and as a result is not viable for the certified organic export industry. Nelson et al.’s (2010: 230) interpretation of the participatory guarantee system is that it is “a movement consciously not geared to organic export markets. Rather, it focuses on local production-certification-consumption networks designed to help support small-scale producers, encourage local economic development, make organic products available at prices that are fair for both producers and consumers, and facilitates food security and sovereignty.” The producer interviewed goes far from this view and foresees a middle way, in which the participatory guarantee system serves as a foundation for a group organizations and then, once organized, gets the private label. Up to now, of the nopal producers interviewed, those who have the private international certification have done the process individually.

Organization is the key for producers practicing advanced agroecological farming and can become the space to maneuver relationships with mainstream and non-mainstream markets and secure the continuity of their ecological way of farming. The producer who spoke in favor of the participatory guarantee system joined the rural association,²⁰⁹ to which the pioneer in international organic certified markets belongs, and has also participated in the government-

²⁰⁹ It turned out to be the same one mentioned by another producer not using agrochemicals and who had gone with the private certification process and was waiting to receive the label.

producers organization, Product-System of Nopal. Seeking markets and organizing independently from the government is one of his strongest motivation to join the group: “We [producers in the rural association] are aware that our objective is to seek market, have a retailing point and that for us to make progress we shouldn’t depend of the government... It is very difficult to work with the government. If there is a secretary of agriculture is because we campesinos exist, but they don’t even move a finger. We are conscious that we producers have to solve problems, but the authority has to do its part as well.” Seemingly the rural association gathers producers with different views about market strategies. Up to now, the story of relative success is the one of the producer entering the international market with a private seal. However, the association can become the space where different views about market strategies meet and are debated.

The local market for organic nopal. Demand for organic food in Mexico City exists and the consumers’ profiles are similar to those in developed countries: “educated people”, “ecological-minded” and “middle to high-income” (Juarez and Hernandez, 2009). Studies about domestic organic markets in Mexico City dating from the 1990s foresaw the growth of urban organic consumption and pointed out that the problem could become one of an insufficient supply of certified organic food (Trapaga, 1997; Trapaga and Torres, 1994). What is missing is research on the linkage of urban food movements and local ecological producers. Stores, restaurants, or coffee shops selling organic and fair trade are nothing exceptional. Systematic research on the origin and evolution of these experiences from the 1990s to now has been missing but is starting to emerge.

As recently as in the 2010s, scholarly work started about the linkage between agri-food movements connecting the rural and urban in Mexico began to happen (Juarez, 2010; Nigh, 2014; Nigh and Gonzalez-Cabañas, 2014). Paradoxically, reports from foreign agencies like Agri-food Canada and USDA seem to have been tracking trends of organic food consumption in Mexico in more details. The USDA Gain Report (2013) states:

“Currently, a Mexican population base with strong purchasing power is being exposed to greater varieties of perceived healthy foods, including processed items and organic. As consumers are becoming more health conscientious, in wake of recent statistics that

suggest Mexico is in the midst of an obesity epidemic, the opportunities for U.S. exported organic products remain high.”

Meanwhile, in 2011 and 2013, Agri-food Canada (2013) reports pointed out that 50% of the organic food in Mexico is imported, thus indicating that this market exists in Mexico. The USDA (2013) reports that the organic industry in Mexico continues to grow, but the largest consumption is of processed organic food. Thus, there is an internal market for organic food that local organic small-scale producers selling fresh food have not been able to reach while the foreign organic industry has.²¹⁰

My organic producer interviewees know very little about the local organic consumer. The burden of knowing and doing everything along the commodity chain is already overwhelming for the producer. The result is that their strategies end up quite geared to the mainstream market trends. For my interviewees who are certified organic producers, the local market is not the most promising path. Within the city, they look for specialty food stores that target the high income population. Part of the strategy is to avoid Wal-Mart. They commercialize their nopal at Green Corner stores, the pioneering organic food chain in Mexico City. Their specialty food niches include some supermarkets, such as Chedraui. These three points for trade is based in the criteria of selected markets, approaching high income population and chasing a “just price”.

Interestingly, they have a toe in the supermarket, but then the question is why avoid Wal-Mart and not Chedraui? In their view, Wal-Mart is not an option because “it does not offer a just price” and “it’s not the market for the high-income population.” However, Wal-Mart is not necessarily cheap. During my active participant fieldwork, I found that low prices in Wal-Mart are a myth. I went to a Wal-Mart store and an organic food store, The Green Corner, on the same day and bought the same quantity of nopal in each store. Surprisingly, I paid more in Wal-Mart than in the organic food store.

In the two stores the presentation of nopal was the same, peeled up (without spikes). Both stores are located in a middle-high income neighborhood at the south of the city (Miguel Angel de Quevedo in Coyoacan). At Wal-Mart, the nopal leaves are put in a container with no labels indicating whether they are organic or not. At certain times, there is a person peeling-up the nopal

²¹⁰ Perhaps what we are witnessing resembles the export-oriented agricultural goods model developed in the South during the early 20th century, but now these are organic agricultural primary goods, whereas the northern countries exported to the South industrialized foods.

right there in a stand. The nopal then is sold undifferentiated (perhaps grown without agrochemicals but who knows.)²¹¹ In Wal-Mart, I had a casual talk with the employee whose job is to place and displace food from the containers in the vegetable section of the store. I asked him where the nopal comes from and the answer was Milpa Alta. He went on to add that the nopal producer pays the salary of the person who peels nopal in the stand, not Wal-Mart.²¹² Meanwhile at Green Corner, the customer knows he is getting organic nopal and it is found in a tray package but I did not find information about where the food comes from. One knows only that the food is organic by the label, the origin being written in small letters of the label.

That the price was higher at Wal-Mart than in the specialized food store was surprising, and especially when producers say Wal-Mart does not pay a just price and Green Corner does. My interviewees trading to Green Corner have established a direct trading system with the store, without intermediaries.

What is different at Chedraui? Producers trading with Chedraui just do it “eventually” and only for the Chedraui stores that are for specialized foods, which are smaller stores, not big supermarkets. “Chedraui has a different clientele,” say an organic producer who sells to this store. These stores target the high-income population. In this way, the organic nopal is included with the foods labeled as gourmet, high-end quality.

All in all, the producers remark about their experiences in the local urban market is that the strategy corresponds to green neoliberal structures: targeting the high-income consumer who can afford the label of organic and healthy foods. This is where they end up when looking for a just price or a price that rewards their costs for managing their farms ecologically. The strategy does not have any connection with cooperatives or local consumer organizations working for food justice and/or environmental justice. Perhaps other nopal organic producers have followed alternative channels but this set of my interviewees reflects the results of a strategy with very marginal institutional support rather they just follow the market forces and trends. On their

²¹¹ Perhaps the providers are producers like my interviewees who have quit agrochemicals but have no a market valid organic label.

²¹² The talk with this employee was not recorded and was only part of my active participatory observation as I asked questions as if I were a regular customer. Although his story is not a matter of this research, I want to just mention a great coincidence: the employee was from Milpa Alta, he lives in Milpa Alta and commutes every day to come to work at this Wal-Mart location and told me his family grows nopal, but it is not a proper business for himself. The encounter with this worker just made me connect interesting dots: it is worker from the land where nopal grows, working for a food supermarket within the city placing and displacing food. Experiences of people like this worker could be a matter of future research on metabolic rift theory that records where the agricultural labour ends up in the city.

production site, their practices are consistent with their environmental values and sense of protection of the land and reproducing agriculture in the region. At the local market place, they maneuver to find some shortcuts and get some benefits within the corporate supermarket structure (participating in selected supermarkets and well-established organic food stores). All in all, within the neoliberal framework, the small-scale and ecological producer is responsible for taking care of the land, bearing the cost of adopting environmental and health values, and being or becoming a good market strategist.

Nopal, like other native and local foods, is a multi-purpose food that benefits producers and consumers. Then, there is the need for a more integrated approach to nopal of DF commercialization locally. The organizing principle of that approach can be that nopal is a multi-purpose food with benefits for human health, local ecologies (e.g agroecosystem and urban ecological balances), the local economy, the culture of local and Mexican cuisine, and ultimately re-linking the rural and urban.

Cultural barriers in the local market and a long-term market strategy for nopal. If there is any future for advanced ecological nopal producers to sustain their livelihoods, trading nopal within the city, the largest restrictions are cultural and economic ones. The producers interviewed reflect a mix of perceptions. Frequent answers are: “the largest market is close to us,” “our natural market is Mexico City,” “the future is here,” “there is no purchase capacity”, and “people won’t pay more for nopal.”

Producers have the perception that in the city, as well as across Mexico, people would not be willing to pay more for nopal, even if it is organic. A producer expresses this reality as follows: “when you speak of nopal, people make an ugly face...”²¹³ Nobody knows what they have until they lose it.” In the first instance, the statement seems contradictory given that nopal is largely consumed in Mexico. It is the sixth most consumed vegetable in the country (*Plan Rector del nopal*, 2011). So the flavor seems not to be the problem. Likely, underlying this perception is a cultural idea about nopal that prevents seeing it as a high-end food, which may become a barrier to valorize locally even the highest quality of nopal.

²¹³ He actually said “*cuando les hablas del nopal, la gente te hace el fushi*”. The Spanish expression is more powerful than just saying “an ugly face.” “*Te hacen el fushi*” denotes much less appreciation for something.

The Chef of a trendy restaurant of Mexico City helped me lift the layers of the cultural imaginary associated with nopal. Chef Rigel Sotelo, who runs an avant-garde restaurant based on principles of fresh, local and seasonal foods describes his cuisine as “spontaneous cuisine”, everything he serves being conceived and made for the client right in the moment. Rigel Sotelo buys his ingredients from small producers in the traditional markets like La Merced, Mercado Jamaica and CEDA (*Central de Abastos*). In Mexico City, avant-garde restaurants are now trendy. When I asked Rigel Sotelo if he believes nopal is being (or can be) part of the menus of the new-age, trendy restaurants, he says:

“Yes, but not as much as it should be. There are some ingredients that have less cachet.”²¹⁴ You find nopal in every taqueria and that means every person eats nopal or knows someone who has eaten nopal. Culturally, nopal is something you get for free in *taquerias* like free toppings. Nopal has such a low status level that is something you eat for free. I have a hard time working with nopal, a little bit more than other ingredients. Any person who goes to the market knows that nopal is cheap. Then, if you come here [his restaurant] and serve nopal, people will say ‘why to pay so much for this food!’ Maybe it does not belong to high-end cuisine because high-end cuisine is a place for expensive ingredients. It is a silly conception, as silly as to know that lobster was seen in the past as garbage food and now it is very expensive. And I like nopal and I know for sure there are amazing things you can do with it in the high-end cuisine” (personal communication, December 22, 2015).

A study about the elasticity of demand for nopal in Mexico shows that when the income increases, people do not consume more nopal, actually they consume less. Flores Valdez et al.’s (1995: 5) study points out that “[t]he nopal consumers in Mexico are low and middle class social classes (based on income), which is reflected in the fact that the largest volume of the product is distributed in popular shops like tianguis, municipal markets and among street vendors or shops.”

This latest evidence relates the lack of cachet of nopal in the food culture of Mexico, although this was not the case in the pre-hispanic culture. In an interview with Chef Maria José Sada, co-owner of the restaurant Azul Histórico, one of the most famous restaurants within

²¹⁴ Caché is a word used in Mexico for distinction, elegance, high class. It comes from the French word cachet. This word is popularly used to denote high taste, elegance.

Mexico City serving high-end Mexican cuisine and which is based on deep knowledge of Mexican foods,²¹⁵ she explains that nopal in the pre-hispanic times “was important in all aspects of life, even in architecture... Certainly, main dishes for Aztec kings had nopal, like *escamoles*” (personal communication, January 5, 2016). Thus, acceptance and appreciation for nopal is something that has existed before. Some foods come in and out of fashion, depending on the historical moment and cultural context. But when I asked Chef Maria Sada, who runs the restaurant with another chef, whether her restaurant’s main menu had nopal, she surprised herself in saying, “No, it is not there.” She laughed when realizing nopal was not on the main menu and said: “I am going to ask the other chef co-owner of the restaurant. He made the main menu. We do have nopales in some breakfast dishes but as a side dish only.”

Perhaps another disadvantage is the slimy consistency of nopal, as Chef Rigel Sotelo pointed out: “I find hard to work with nopal because some people do not like that consistency at all.” He thinks that perhaps that is the reason why nopal is normally cooked in two ways, grilled or boiled. Producers in Milpa Alta think that maybe people in the city or other regions are not familiar with different ways of cooking nopal. Having this in mind, producers of the Product-System of Nopal organization collected a series of recipes to help people know more ways to taste it.

Digging in to the cultural perception in the consumption side, there are positive ideas related to nopal among chefs. For Rigel Sotelo, the first things that came to his mind when speaking of nopal was that “it is a fantastic food, very nutritious, it is wonderful. It is a very noble plant,²¹⁶ although it is hard to work with it in high-end cuisine. I think it is very close to our culture and not only because it is in the Mexican flag but because it is in every corner, in every taco. It gives vitamins to people that only eat tortilla.²¹⁷ I think its place in the nutrition of Mexicans has not been enough recognized. If it were not for nopal we would be a country with higher levels of malnutrition” (personal communication, December 22, 2015).

²¹⁵ Contrary to the restaurant of Chef Rigel Sotelo, her restaurant serves dishes that are quite known in Mexican cuisine, like *chiles en nogada*, *moles*, and *enchiladas*. The restaurant recently won an international prize for being a restaurant that represents the largest legacy of Mexican cuisine.

²¹⁶ It is interesting that at the consumption point of the nopal chain, the word “noble” was also used to note characteristics of nopal. In early sections, I quoted a producer that also said that nopal was a “noble” plant for the way it adapts to the ecosystem.

²¹⁷ In a popular thinking of Mexico, if you are poor, you eat tortillas and beans.

Thus, nopal is not a food lacking good properties, flavour or that is an unknown among the local population. Instead, it is a food undervalued, under-recognized and this is what could put at risk the capacity of Milpa Alta producers to make a living out of nopal.

Both producers and chefs concur that the local market for nopal can become promising but only by embedding nopal in a food culture of fresh, healthy, local and environmentally-friendly foods. Thus, through the organization Product-System, advanced ecological nopal producers pushed forward an initiative to fund research on the health benefits of nopal in the research centre of the National Institute of Nutrition. The results point out that nopal helps treat diabetes and finally appeared in the *Journal of the academy of nutrition and dietetics* in 2014 (Lopez-Romero et al., 2014).²¹⁸ Based on that, a producer emphasizes that Mexico City could be again the future of the nopal market:

“It is the people of the city, the ones needing this type of food. I would like them first (urban people of Mexico City) to understand that they are living a serious (health) problem and that we have a natural alternative (nopal). If you eat it fresh, it has so many good qualities. You don’t have to eat any foreign foods. That’s the key. There is nothing as good as eating a natural food. Even better if it gives us water and help us come down the costs of illness (such as diabetes). We have to do something for the healthy habits in large cities and change consumption of fast food... there is so much obesity and diabetes... after a while there will be not enough money to cover the health costs of so many people. But we have a very “noble” food, right at hand, very close to this large city” (Milpa Alta nopal producer).

Similarly, Chef Maria Jose Sada stresses that “nopal could be more valorized if its health benefits are better promoted in all type of people within the city.” For Chef Rigel, “nopal has to reach those people who haven’t experienced nopal or have had a bad experience with nopal.” Who are those people? He thinks those are the ones who had a bad experience eating nopal cooked in a certain way. Then, probably cooking nopal in different ways not widely known today may be an alternative. Both chefs concur that nopal could be cooked in “amazing forms.” But

²¹⁸ The title of the study is “The Effect of Nopal (*Opuntia Ficus Indica*) on Postprandial Blood Glucose, Incretins, and Antioxidant Activity in Mexican Patients with Type 2 Diabetes after Consumption of Two Different Composition Breakfasts.” See references.

first of all, nopal has to tear down the door of the high-end cuisine. It has to enter that room, perhaps dressed with a new story, a story of the healthy, fresh, local, environmentally friendly nopal. Perhaps that is the discourse that may help reconnect culturally the city with one of its sources of ecological wealth located in nearby Milpa Alta.

Beyond the free markets: A public policy intervention addressing culture, markets and ecology.

Closing the ecological loops in the agricultural farming of Milpa Alta requires efforts in closing some cultural gaps distancing Milpa Alta producers from the urban center of DF. The cultural gap, such as connotations of nopal, weakens the market linkage between producers and consumers locally. The aftermath of weakening the local market connection may generate fragility in the agroecosystem of Milpa Alta. The ultimate aftermath is a larger vulnerability of the ecological balances of the city because this agricultural area is part of the conservation land zone that must be preserved in order to prevent further ecological problems. Free market forces are blind about it, and guide the most advanced ecological producers to the foreign organic market. It is not in the interest of free markets to address the fact that the agroecosystem benefits and nutritious qualities of this food are actually fundamental to the nearby urban population. The dynamics of free markets tend to isolate the commodity from the socio-cultural and historical context in which it is embedded (Allen and Kovach, 2000).

Thus, public policy intervention is needed in order to address factors that the free market forces are incapable of doing. In this case, it is important to strengthen the local market linkage but it needs a kind of multi-purpose policy, encompassing ecology, markets and cultural aspects. I found a program at Secretary of the Environment of DF which at some level touches the three dimensions. The program is a barter market run once every month in which producers from the agricultural areas of DF meet urban people who come to barter in recyclable waste (E-waste, plastics and paper) for local food (see Table 6-7). The program is still operating.

The DF government makes the arrangements with recycling companies. Meanwhile, a co-operative of producers is contracted to arrange production and organize the food supply for the market. The food supply includes fresh produce and some processed items like traditional candies, cheese and mole sauces²¹⁹ (see Table 6-7). The type of food varies based on the season. The initiative was inspired by a similar public program set up in Curitiba, Brazil (*Green Change*,

²¹⁹ Mole is a typical Mexican sauce prepared with a large number of ingredients that together create a unique sauce.

also known as “Trash that is not Trash”) based on the same barter principle where urban citizens barter urban waste for food (personal communication with Paola Da Maria, Director of Barter Market at SMA, March 8, 2012).²²⁰

Table 6-7. Food Supply at the Barter Market

Fresh produce	Other foods
Spinach Radish Purslane Quintonil (a type of pigweed) Quelite (a type of pigweed) Chard Zucchini Zucchini flower Nopal Tomato Seta mushrooms Chayote Parsley Cilantro Lettuce Maize Epazote (or worm seed)	Cheese (different types) Mole sauces (different types) Honey Traditional candies (different types) Rabbit meat

Source: Internal document, Tierra Nueva producers Co-op

In order to explore the potential and challenges of this public program, I interviewed the coordinator of the producers, the director of the barter market at SMA, and did an active participant observation at one of the monthly markets.

The barter market began in 2012 and it has continued to the present (2016). At the time of the fieldwork, the barter market had a single location in a large and historical urban forest called Bosque de Chapultepec, a public park with free access located at the northwest area of the urban center. Today, the barter market moves around the city and is held in five other locations, free and public spaces, some of them urban forest as well. A few of these points are the most densely populated parts of Mexico City.

The director of the program, Paola Da Maria, points out that the market’s main objective is educational. It attempts to build environmental consciousness among the urban population through extending the practice of collecting and recycling solid waste. The criteria to define what

²²⁰ The Brazilian program was set up in the 1980s and its scale and scope is larger than the barter market.

solid waste items to accept at the market were developed based on the kinds of waste generated in a regular household. The participants learn that the solid waste has an economic value. Instead of just buying the solid waste from the household, the Secretary decided to include agricultural producers of the nearby areas. Thus the program has a double benefit: on the one hand, it provides support to producers of the conservation land area because their food is bought by the DF government at a fair price (the price is set by the producer). On the other hand, it spreads awareness among urban populations about the existence of these producers in the conservation land area right here in the urban surroundings and they learn about the local food supply (personal communication, March, 2012).

The emphasis on the “educational” purpose is to bring down expectations that this program solves the gigantic garbage management problem of the city, the conservation land issues, the surrounding farmers’ needs, and the food insecurity of urban population. It is a program with “demonstration effect, an educative impact”, says Da Maria. From 2012 to date, the attendance at the market is three thousand people on average to each market and 60 producers are part of the program and three tons of food is offered. The interest of the urban people in participating in this market is apparent and the food supply is always insufficient to meet demand, she states.

The market operates the first Sunday of every month, opens at 8 and closes at 2 or until food runs out. From my personal experience in the market, I witness people’s considerable interest in it. I arrived at 8 am and the line was already long. I was in the market until 11 am. Families, youth and even elderly were part of the crowd and appear being from different social classes. In the line-up and in casual talks during the three hours, people told me about their interest in the market and the highlight is “education for the children,” “to separate household garbage.”

A family told me that the children are in charge of separating the solid waste at home in the days prior to the market and when coming here it is fun for them just getting the points and buying the food they later on eat at home. I saw families with shopping carts full of solid waste and argued that getting food, fresh and, most importantly, free is the best way to get rid of waste.²²¹ Another couple of young people that happened to be students at UNAM told me that they come to support the small producers from Milpa Alta and Xochimilco (these are the two best

²²¹ It is free because the government pays the farmers, then the urban attendees to the market get credits for their solid waste which then, they exchange for food with the farmers.

known agricultural areas in DF). Once arriving at the outside market tents, there are signs describing the type of solid waste, the categories, the weight allowed and so on. One sees people coming out the exit with a few bags (from 1 to 4) hung in shoulders or hands, but no more than that. The visual effect is powerful as people enters the market with disposable items and comes out with edible ones. In DF, 72% of the waste produced per family is inorganic (including solid waste) while the rest is organic (internal document of SMA and Tierra Nueva Cooperative).

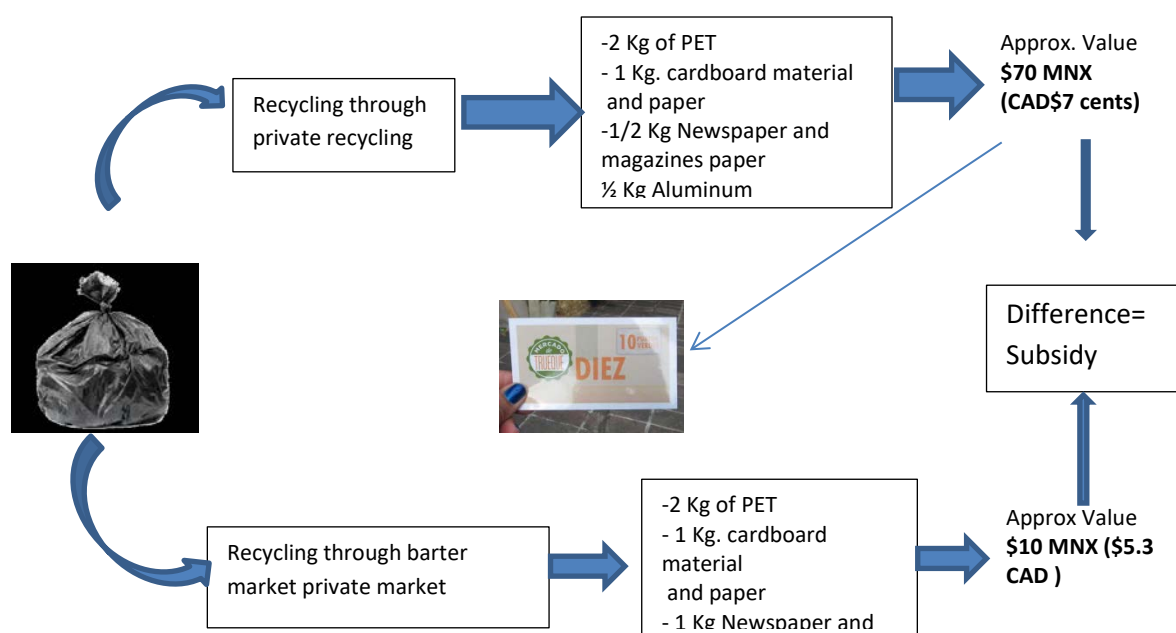
Signs on the type of food one can get, where the food comes from, and how it is produced, are not seen outside the market, but once inside, there are a few indicating where the producers come from and some pictures of producers working on *chinampas* (small plots of lands in Xochimilco) and showing the produce, but no more details about it. Considering that many people do not get to access the market as food runs out, there could be more signs outside of the food area (what food, who, where, how it is produced). This way, the educational purpose gets a balanced outcome, as the attendee learns about waste and food equally. Indeed, on the day of my participation, the market closed by 1 pm because the food had run out, leaving outside probably a hundred people with no chance to barter. When attending the market, food becomes the most important factor because that's the reward for recycling, for the early wake-up, the long line, and the monthly wait for the market.

The system of subsidy. The food supply is subsidized at the market. The subsidy works for both the producer and the barterer. The director of the market explained that the Secretary pays for the solid waste more than what a recycling company does (that's the subsidy for the barterer). Then, when the Secretary sells the solid waste to the recycling company they get less value. In setting the value of the solid waste, the Secretary internalizes other shadow costs of recycling, such as the reusability of the items, the danger of the item if they last longer in the environment and so on. For instance, dangerous solid waste has more value. The barterer receives a bonus with points. As a result, the barterer can get more points if he takes care of doing the job of collecting the most undesirable items for the environment. The producer is subsidized because they are paid a price set by the producer. For instance, a nopal producer will get a higher price than the one paid at *Centro de Acopio* or CEDA. In addition, the Secretary of Environment pays for the food they bring to the market, so the producer's sales are guaranteed and paid at a fair price.

Box 6-2. System of Subsidies for the Barter Market

System of subsidies
Subsidy to producer → difference between price paid for the produce at conventional market and price paid for the produce by SMA for the barter market
Subsidy to barterer → difference between the price a regular company pays for solid waste and price SMA pays at the barter market to the barterer.

Figure 6-4. Example of Barter and Subsidy to Solid Waste



Source: Internal document Cooperative Tierra Nueva and SMA

The system of subsidies is perhaps what prevents the expansion of the food supply. The larger direct subsidy goes to the barterer, otherwise the barter would not be worthwhile because just to get enough points the barterer would have to bring larger amounts of waste and it would become unmanageable and also difficult to manage the market logistics.

The food supply, the producers' side. How are participant producers organized? The coordinator of the participating producers runs a cooperative that gathers food producers of Xochimilco, as well as professionals in diverse areas relating to ecosystem services. The Secretary contracted the cooperative Tierra Nueva to organize the food supply. Thus, the person in charge becomes indeed the coordinator of participating producers at the market. He has to make sure that at least three tons of food is there, at the day of the market and offer a good variety of food. The coordinator must include producers from different regions of the conservation area, including Milpa Alta.

The cooperative offers advice to individuals or groups of producers seeking farming and commercial solutions. They also can give advice or offer services to public institutions. The cooperative sustains itself with their client's (public institutions or individuals) payment for projects. They are then a private organization coordinating producers at the market. However, "the fact that this is a producers' cooperative rather than an event logistics business makes a difference," says Izquierdo, because "the cooperative serves as a place for participating producers at the market to connect with each other after and before the market, then they start sharing ideas, concerns and even solutions of farm relating issues."

The participating producers selected "are not just any type of producers," they must prove their practices are innocuous and ecological. Some ways to do this are by showing a certificate of innocuous practices training. When I inquired about the process to verify their practices, Izquierdo mentioned that some of these producers have been in programs of good practices of SAGARPA-SEDEREC, which counts. However, the verification process is not completely formalized. It seems to be based on trust. I asked about certifications and he said that the producers in the market are working on developing a *communitarian label*. The idea of the communitarian label goes beyond conveying the message that the producers employ ecological or organic practices. They want to state that they preserve *chinampas* and conservation land area as a whole "because the urban people must know we take care of their closest green areas," adds Izquierdo. Izquierdo did not know about the participatory guarantee certification system, which, if put in place could in part contribute to the ideal of the communitarian label.

Erik Izquierdo is a producer, a biologist who graduated from UNAM, and has lived in Xochimilco and has been involved in farming all his life. He farms in *chinampas*.²²² On his farm

²²² A long and narrow floating field on a shallow lake bed, artificially built up by layering soil, sediment, and decaying vegetation and used, especially by the Aztecs, to grow crops. *Chinampas* are typical of Xochimilco area.

there are rabbits, chickens, orchards, and vegetables. He defines himself as a campesino, but a “*campesino de nueva sangre*” (new blood peasant). In his definition, “a new blood peasant is someone that loves the land, lives on the land, and understands the changes of era.” But he is very aware of the disadvantages of linking to the peasant concept because people see peasants as “inferior, dirty, ignorant people... some peasants actually accepted to be seen as that and get down, and that’s a mistake. Some other peasants in the region are still waiting for the revolution (Mexican revolution of the early 20s) to bring them justice. That’s another mistake. We have to keep going, move on, the times have changed”. Izquierdo said that in the market they have people from the National Union of Rural and Peasant Organizations (UNORCA) and from other campesinos organizations.

Produce selected for the market is seasonal and some are unique of the region, but hardly found in regular markets and supermarkets because people do not know how to cook them. When shopping, I found quintonil, an unknown green vegetable to me.²²³ These are the kinds of produce you may not find in a regular supermarket. It is not surprising that the urban population is illiterate in these produce, but then they can ask the producer what it is and how to cook it. This is the type of relationship that happened in the traditional tianguis shopping experience or in the traditional markets like La Merced and La Jamaica. This reminds me of a comment by Chef Rigel Sotelo, whose business is all about using fresh and local food. He says, “it is too sad that today urban people see the local foods as ‘exotic’.” Once removed from the supermarket, a regular urban person [like myself!] loses connection with the local food supply. In contrast, “foods like kiwi that crosses the globe to get to us from New Zealand are better known,” says Chef Rigel Sotelo.

For the coordinator of participating producers at the market, the barter market is a proof that the concept of tianguis can change but keep the spirit. For him, the format of the barter market is a step forward to that end. “The objective is that in 10 years tianguis transforms into something like the barter market,” Izquierdo remarks. The differences between the old and the new concepts of tianguis for Izquierdo is “first of all that in order for the producer to be part of it, s/he has to demonstrate that s/he offers fresh food and grown with good practices.” Another

²²³ Quintonil or amaranth is a type of greens that grow around the milpa system (the three sisters). The producer of the stand explained to me it is the *Mexican lettuce*.

aspect is that they get a just price. The idea is that in the future, the private sector also funds markets of this type.

According to the producers' coordinator, because this is a public program, producers are asked how they grow their food. It is not enough to be just any producer. Producers get to know that they can benefit from commercializing here if they enhance their practices in an ecological direction. Erik Izquierdo stresses that "producers can't do everything, they need support in building commercial linkages". For him, the fact that participating producers are paid a just price for their produce contributes to the continuity of sustainable agriculture. It fosters the conservation of *chinampas* in Xochimilco, for instance, and all the conservation land in general. Moreover, the coordinator of participant producers operates all the logistics of food supply packing and transportation to the market. The program of the barter market covers the transportation costs to the urban center on the day of the market. This way, "the producer does not have to worry about that, they can just take care of cultivating, harvesting and packing the food to be sold at the market". This way, the program covers aspects nopal producers I interviewed stressed as barriers to coming to trade in the city, such as commuting and a place to sell for a just price.

The idea that producers cannot do every activity of the production and commercial chain matters for small-scale producers that rely on family labour. The shortage of labour is even apparent in this commercial model that secures the food trade. Izquierdo explains that the participation at the market has encouraged models of labour solidarity among producers. Sometimes producers cannot come the day of the market because they have other farming duties; meanwhile some other producers sometimes fall short in labour in the harvesting phase to have everything ready for the day of the market. The advice to them is to organize exchange labour, so the ones that are unable to be present at the market help in harvesting to the ones that can go to the market and take care of their stand.

Scaling-up the educational purpose. The barter market is a test case that shows areas of opportunity for developing fruitful policies in DF. So far it has had a demonstrative effect for the people that participate in it, but also for government offices and departments that deal with producers (and whose priority is to maintain agriculture in DF). So, the experience of the barter market shows that what people grow, the native foods, can be appreciated by urban eaters and

that a way of valorizing could be in demonstrating the value of these foods not only from the perspective of nutrition, but also to sustain the local urban environment.

The barter market is a non-mainstream market experience, one that arises from a direct public policy intervention. Having a public space for urban people to trade waste for food is a way to connect the rural and urban. In this practice, the participant, both the producer and consumer, is not a simple food consumer or a producer but a citizen that learns of issues relating to local food and waste production. It touches interests of rural and urban populations. In contrast with the experience of advanced ecological nopal producers engaged in the long-distance organic market subject to free market forces, this type of non-mainstream market does not imply large costs for producers to approach the local urban population, *the ones that need the healthy food produced locally*.

6.5 Integrated Analysis

This chapter focused on market linkages of nopal producers. This was a continuation of the methodological approach taken throughout the research. I started with notions of alternative markets and non-mainstream markets and traced where producers with different levels of on-farm ecological practices trade and the conditions of the trading. My assumption prior to scrutinizing the data was that the more ecological the nopal production, the more connected with the non-mainstream market and highly probably with the local market because of the apparent proximity to a modern and globalized city. Such proximity appeared as an opportunity for them to valorize the ecological quality of their produce locally. In debates on alternatives to the social and ecological setbacks of the long-distance agri-food systems, (re)localization of food production and consumption is at the center (Friedmann, 2005; Allen, 2010) and short commercial chains are a strategy. Knowing that nopal is a very local food, I assumed this would reveal a short commercial chain and, as a result, higher opportunities to valorize the ecological quality of the produce locally.

Although the commercial chain does exist, the local market linkage has been weakened, and there is evidence of engagement in global markets, which producers foresee as a strategy to sustain, in the near future, the cost of their ecological practices and thus remain on the land. In other words, a very short local commercial chain shows signs of moving towards a global commodity chain. Interestingly, the engagement in the global market is in a non-traditional food

chain; one associated with the non-mainstream food market. How can a food like nopal that outside Mexico may be seen as “exotic” or “ethnic” possibly participate in the global market? Furthermore, how is it possible that this food, produced by small-scale producers with a peasant and indigenous legacy, at the edge of an enormous city, engage in a global market? This chapter has partially answered these questions, as well as stimulated engagement with a macro perspective of the changing global agri-food relations.

Thus, for a distilled interpretation of the findings, I expand the conversation with the literature of food regime analysis seen in Chapter 3, and play with the concept of articulation, de/re-articulation of commodity chains provided in Chapter 4. I intend to explain the local-global dynamics that have shaped and re-shaped the nopal commodity chain with a particular focus on the commercial segment. Ultimately, the character and trading dynamics may help explain the process of reproduction of Milpa Alta as an agricultural place and a reconstruction of the rural-urban relationship locally.

The food regime framework allows analysis of the world economy as it relates to agriculture (Bernstein, 2016) with the politics of food consumption and production related with different phases of capitalist accumulation (Friedmann, 2005). I use the food regime analysis as a tool of hindsight because it provides a comparative-historical perspective that serve as the basis for interpreting current events and processes. As Bill Pritchard (2009, cited in McMichael, 2016: 650) suggests, food regime analysis “can help order and organise the messy reality of contemporary global food politics, but its applications are necessarily contingent upon an unfolding and unknowable future.” The commodity chain is the complementary method that allowed me to link local dynamics as concerned the case under study with global processes.

The short commercial chain of nopal from Milpa Alta to the urban area of DF does exist and continues to be dominant. However, it seemed to be stronger prior to the encroachment of transnational supermarkets in Mexico City (from the 1990s onwards). The regional articulation to a short commodity chain connecting with the nearby city, in the period between the 1950s and 1980s, was favoured by a convergence of social, ecological and cultural processes. During this period, the food regime associated with the national development project coincided with a productivist approach to agriculture, which, according to Friedmann and McMichael (1989) operated in the years 1945 to 1973. As a result, the countryside in part underwrote the industrial development in at least two ways: by providing the labour force for industry and by producing

cheap and massive volumes of food using less labour, for the urban wage population (Friedmann and McMichael, 1989). The literature centers on the role of regions producing staple foods, where Milpa Alta and nopal certainly were not main players. However, it is possible to see that Milpa Alta was also subsumed in that project, as it provided labour and cheap food for the growing Mexico City.

The urban growth of Mexico City was fed with national rural migration. Rural people arrived to the city carrying not only their work force, but also food culture, which nopal was part of. But these rural newcomers occupy lower social and economic status within the city, which placed nopal in the lower social status as well. Reflections of the actors interviewed from both the production (interviews with nopal producers) and consumption (interviews with chefs) sites demonstrated this. Low economic social strata could afford the cheap nopal. The healthy and nutritious quality of this food has been underestimated and understudied. This crop was kept invisible in the reading of the macro stories of agricultural development. The association of nopal with indigenous, pre-colonial history and culture seemed to reinforce that underestimation, as well as the public perception of its low socio-cultural status, which, as one policymaker noted, makes it difficult to valorize.

In the macro reading about the role of the countryside in the times of the national development project, the rural areas closer to growing cities may have been the first ones disappearing given the high pressure from the city for labour. Milpa Alta contrasts with that assumption. There was a double, perhaps contradictory, dynamic in place toward decreasing the labour and retaining it in the region. On the one hand, the introduction of agrochemicals helped mitigate the decreasing availability of labour. The employment of industrial inputs in agriculture made their use acceptable and even a sign of improvement. On the other hand, there was local demand for this food, which encouraged retention of labour (there was the perception that agriculture was profitable). Another factor is that nopal crops suited the social and ecosystem conditions existing at the time. Compared to grains, nopal is a plant that does not require lots of nutrients. A third element tempering the outmigration from Milpa Alta to Mexico City may have been the social property regime of the land.

Additionally, with the urban growth explosion of Mexico City, demand for water became a pressing issue and any crop requiring large amounts of water could not be cultivated. Thus, nopal's low demand for water was compatible with the urbanisation process happening nearby.

Overall, the cultural and ecological factors played a fundamental role in selecting nopal as the commercial crop of the region. Meanwhile, the rural-urban migration process (and therefore demand for nopal) alongside local wholesale food markets (e.g., Mercado de La Merced, Central de Abastos, Mercado Jamaica) and farmers' markets (e.g., tianguis) became the consolidating element of the local short commercial chain of nopal. Thus, small-scale producers, with peasant and indigenous legacies and holding social property regimes, articulated to a local and short commercial chain.

From the detailed data examined in this chapter, the end of the good times of nopal, as pointed out by interviewees, is marked by the beginning of disruptions of the short commercial chains locally. Such an outcome has little to do with a declining demand for nopal. Indeed, this food continues to be popular and hugely consumed. But brokers and intermediaries entered the scene. The combination of a local commercial chain expanded by intermediaries and the fact that nopal remains as a low-status food (therefore low price), reduces producers' profits. Nonetheless, these shifting conditions are linked to macro processes. The end of good times (late 1980s) is marked by the maturity of agri-food relations of the food regime underpinning the industrial and national development project. The supermarket in the city, first based in national brands that emerged in the 1970s in Mexico (Torres et al., 2012) was maturing and with it the taste and diets based on industrially processed foods. The supermarket model became the outlet for processed food for massive urban consumption.

Supermarkets could be interpreted as the linkage between industrialisation food production and consumption of it. In the food regime analysis, the 1980s are well recognized as the fall of the food regime (Friedmann and McMichael, 1989; Shattuck and Holt-Gimenez, 2011). Thus, supermarkets are part of the legacy of that food regime. The transition to another, arguably third food regime, responds to a change toward a neoliberal, global capitalist project (McMichael, 2009, 2005; Friedmann 2005; 2009), where the state serves the market. However, it is a market predominantly constituted and controlled by big corporations and therefore the state serves corporations (McMichael, 2016). For McMichael (2016:650), the emerging third food regime is then corporate. Transnational supermarkets are part of the set of powerful food corporations concentrating the value of the agri-food chains (Friedmann, 2005). Wal-Mart transnational is the most apparent example.

The described changes in the agri-food relations towards a neoliberal corporate regime resonate with the data examined. Transnational supermarkets, especially Walmart, are today a Mexico City landmark and a force transforming cultural diets, as well as a barrier for local small-scale producers to participate directly in the city's food market. As a result, the encroachment of transnational supermarkets in the city cuts the link with the local market and confines local small-scale producers to the traditional retail outlets but now highly intermediated in markets like La Merced, Central de Abastos, and tianguis. When adding a broker or intermediary in the local chain, it disarticulates even further the connection of producers with consumers because it introduces the broker's interests that are normally different from the interests of producers or final sellers.

Though I expected to confirm that transnational supermarkets pull small-scale and local producers out of the local food market, the surprise was to find that the supermarket also operates like the connector of most ecological producers with the global organic niche market. Hence, the transnational supermarket is the force pulling them out from the local market and the way to get into the non-traditional international niche market. Furthermore, the most advanced ecological producers were the most ready to engage in the long distance organic niche of market. The finding truly challenged a couple of assumptions I had when I started the study. Firstly, I had the idea that the more ecological the producer, the more articulated with short commercial chains. Secondly, I assume that the geographical proximity with the city would facilitate conveying the message of nopal's benefits and increase chances to valorize it locally. It is important to stress that the transnational supermarkets do not administer the formal engagement of producers in the global organic food chain. Indeed, these transnational supermarkets are just conveyors of global food trends, notions of selected markets based on targeting high income customers and consumption trends such as organic foods.

Because producers' experiences tend to move to the advanced ecological spectrum, then the pressing issue becomes finding a market to valorize and cover the costs of the ecological management, and the emerging relationship of the advanced ecological producers becomes the template to foresee scenarios.

The proximity to a city food market dominated by transnational retail corporations disconnects the producers locally but articulates the advanced ecological producers in a global

commodity chain, in which they had never before participated.²²⁴ Furthermore, this proximity links small-scale producers of very native foods with the neoliberal environmental values of food consumption markets locally and globally. I point out neoliberal environmental values because the strategy is to reach the high-income consumer or the market that pays the extra price, which is apparent in their connection with selected markets within the city and connecting with the organic broker that pays the premium price.

Interestingly, locally they approach the selected market (stores and high income neighbourhoods), globally they go through intermediated markets and the final consumer is unknown. There are probabilities that the nopal going far away is used as an input of industrial processes. So, if nopal turns out to be an input for processed organic foods or the health foods industry, it brings up questions of whether this food will return to Mexico in the form of processed organic foods, as the imported processed food seems to gain prominence in the local market (see earlier sections of this chapter). Is this a sign of replication of North-South agri-food relations where the South supplies the fresh food, but now the “organic” one, for the global northern food industry?²²⁵

The analysis may suggest a more complex tension underpinning the third food regime, which McMichael (2016: 649) understands as “a tension between abstract globalism (fractionated industrial ‘food from nowhere’) and concrete localism (ecologically farmed food and nested markets: ‘food from somewhere’).”²²⁶ Small-scale producers and ecologically farmed products, associated with indigenous taste, are also subsumed in an abstract globalism within the non-traditional agri-food industry. The organic produce from small-scale farms located in regions that had barely participated in external markets now become part of an abstract but environmental neoliberal globalism. Meanwhile, the concrete localism counterpart is not always and not

²²⁴ The evidence from various sources indicate that commercialization of nopal is local and national markets (*Plan Rector del Nopal*, 2007; Tavera Cortes and Salinas Callejas, 2007)

²²⁵ Guthman (2004, 2011) addresses this sort of question in her book *Agrarian Dreams*, but she takes on the case of the local California organic industry that took over the local small-scale organic food growers. The question I am posing has to do with the takeover of small scale organic producers at global scale. In such a case, small scale organic producers serve the global organic industry (industrial food industry), which by the way has more potential in northern countries, given their history and the heritage of industrial agriculture. Guthman (2004, 2011) explains that situation in the case of California, which has a long history of industrial agriculture. Given the advanced state of the organic industry in California, its case could be a platform to foresee scenarios elsewhere, but paths can divert into many different experiences in different countries, based on the specific local institutional arrangements (State regulations, policies to small-scale organic producers) and the nature of social movements. Though the case of California gives powerful insights into the directions the global organic food industry may take, the specific details of California are not always typical in other countries.

²²⁶ See more of this discussion in Chapter 3

necessarily linked with local consumers' awareness of the politics of food production (where the food comes from, social terms of production, etc.). As a result, the case of nopal reveals an engagement in commodity chains operating in the realm of both abstract environmental relations global and locally.

Nopal in environmental globalism agri-food relations

How is it possible to explain the relationship of small-scale, southern producers, whose produce is not familiar to world consumers (but is locally popular), to a long-distance, ecological, value-based food chain without even engaging in discourses of social food movements and rural development? The mechanism linking them is the certification process. The organic label is the doorway. The certification process is the organizing regulatory mechanism within the agri-food relations of abstract environmental globalism (market based on ecologically produced foods) but it is predominantly a private regulatory body.²²⁷ The institutionalization of organic standards and the heavy influence of private corporations informing state decisions in legal frameworks of organic agriculture standards have been noted (Guthman, 2004; Allen and Kovach, 2000; Nelson et al, 2010; Friedmann, 2005).

In the case examined, the certification is dominated by private agents while the participatory guarantee system (which is more non-profit and socially oriented) has not prospered. The local state has minimal intervention and lets the private agencies operate and self-regulate what qualifies as organic. The recent regulation introduced by the federal government of Mexico may have some effect locally, but it does not change the need for a label issued by a private certifying agency in order to export their produce. In addition, there are also signs of the state supporting indirectly the private "organic market way." For instance, the public programs offering free training in specific practices and paperwork management paves the way for producers to take the route of private certification.

The subjects of these public training programs can become the obvious clients of the private certifying agency because producers still perceive that the foreign market secures stable prices. So, this reduces the hidden cost of the global certifying organic industry, as they no longer need to include a training piece within the package of certification. However, as far as the data

²²⁷ Some countries have started to develop their own certification agencies and mechanisms, but still the private certify agencies predominate.

analysed is concerned, there is not enough evidence that relates public training of producers and producers actually contracting private organic certifications. The recent introduction of the national organic label (delivered by SAGARPA) may re-direct producers' interest in marketing locally rather than globally but that can only be proved later.

What the case of nopal producers contributes to the critical literature of the politics behind organic certifications is that the private market mechanisms of certification facilitates capital forces entering the space of native "exotic" crops. Then, the certification mechanism enables the space where these types of crops are cultivated and the people who grow them using ecological methods now participate in the long-distance food market.

In contrast to coffee, oats and wheat, nopal is not a well-known commodity and its flavour is less familiar for the global consumer. However, an increasing interest in discovering unknown flavours and foods with healthy qualities among global consumers makes it possible to market unknown foods. This phenomenon seems to be an extension of changes in consumption values opposing homogenous and unhealthy diets based on industrial food, that are central to the social movements that gave rise to a green capitalism as related to agriculture (Friedmann, 2005). But the fact that new crops enter the scene reflects that capitalism, in its arguably green phase, has been able to discover "new spaces" of accumulation. Nopal and other native crops entering the global market through organic certification processes could be seen as the discovery of new sources of future accumulation in agriculture to consolidate the third environmental food regime.

It is possible that the certifying agency can become the new relevant corporate actor within the environmental neoliberal corporate food regime, the link uniting environmental food production and consumption. The operation of international certifying agents in the Global South seem to be playing a fundamental role in organizing and securing an organic fresh food supply consistent with consumer-driven commodity chains and consumer-values in northern markets. Hence, the nature and operations of the private certifying agency are crucial to understanding how ecological, small-scale producers from the Global South engage in the new corporate environmental regime.

However, nuances must be mentioned as well. Nopal producers perceive that this engagement enables them to continue working the land. In addition, the certification process encourages producers' organizations to learn from one another to better undergo the certification process. Therefore, this type of articulation to the global market through ecological market labels

allows reproducing the place of Milpa Alta as an agricultural space and the local people as growers; it is also a way out of disadvantageous local trading relations (confined to low-prices, low status food, intermediated markets and traditional retailing points). However, the certification standards can negatively influence the on-farm ecological practices.

Data show that certification standards push producers to shift from on-farm recycling of inputs to purchased organic inputs, to reduce costs of labour. Is this a sign that ecological long distance food markets will ultimately correlate with long-distance inputs, off-farm inputs? If so, then the potential and benefit of the long-distance market for small-scale producers should be seen just as a temporary way out of the local inconvenient trading conditions. Labour is a pressing issue in places where the tension of extracting labour from the urban site is more vivid. The cost of labour and the cost of certifications and time-consuming training should be considered when balancing the overall costs and economic benefits of the organic market. Because participation in organic certified markets was an issue that emerged from the field, in the plan of data collection I did not include an overall inquiry of costs vs benefits of marketing as organic; hence, this could be a subject for future research.

Nopal in abstract environmental localism-type agri-food relations

The stories of how producers of Milpa Alta trade the organic nopal within the city and my own shopping experience at the best known organic food store in Mexico City reveal abstract environmental agri-food relations in place.²²⁸ Moreover, it is a relationship purposefully looking to link high income populations via selected markets. As a result, on the consumption side, there is also a selective access to the best food, limited to those who have the capacity to pay for the ecologically produced food and ecological, health-minded consumer. Hence, at the market level and the consumption side they meet with a structure of food consumption relying upon neoliberal values to consumption of non-traditional foods, which rely upon the individual choice for healthy food and economic capacity (Fairbairn, 2010) and the ability of retailing points to market and value these foods. This scenario is not unique to Mexico or the Global South, but exists across the globe and reflects a conventionalization of what were originally called alternative markets (Allen and Kovach, 2000, Guthman, 2004). Shattuck and Holt-Gimenez (2011) describe the

²²⁸ Again, I have to say that the collected experiences may reflect just part of the picture of how local ecological food producers relate to the local market. My engagement with the local market was based on the experiences of the interviewed producers as I followed up their particular experiences from farm to market.

scenario as the slow co-optation of radical and reformist food movements demanding ecological and justly-produced food into corporate agri-food relations.

From the producers' side, this strategy shortens the commercial chain because the traditional channels are highly intermediated and confined to the traditional shopping outlets. Taking this path is not the producers' fault. Without further institutional support to sustain the costs of managing ecologically (labour and certifications), this is perhaps the only option left to them. The nopal producers of Milpa Alta operate in small-scale units of production, their land suits this crop. They carry the ecological costs, which are money- and time-consuming. In addition, linking with the high-income and ecologically labeled markets became a strategy to shift nopal's position from the low to high social status. However, in this non-mainstream market, the particular story of nopal i.e., where it comes from, who produces it and how, the benefits of nopal farming to the city's environment and population's health, and so on, remains obscured in the selected supermarkets of gourmet foods and organic food stores. Thus, nopal enters disguised and borrows the fame and status of either the name organic or gourmet to be better priced. In this scenario, the most ecological nopal producers re-articulate locally, getting on board the trend of urban organic food consumption led by retailers. Hence, the relationship with the local non-mainstream market turns out to be abstract as well. Through such articulation in the local market, the reproduction of Milpa Alta as an agricultural place and its people as people of the land, may be limited to the few producers able to find and self-finance the local niche market.

What is the missing link in order to make a concrete connection rather than an abstract one with the local market? I would say it is the articulation to an urban social movement. The organic producers presented here happened to enter the organic market isolated from consumers or citizens' movements claiming the right to ecologically-produced food in the urban setting.²²⁹ Where are those movements? Although producers did not explicitly express a desire to be part of a social food movement (either rural or urban one), the data shows values, practices and ideas that evoke characteristics of social food movements that Shattuck and Holt-Gimenez (2011) identified as part of the third food regime. For Shattuck and Holt-Gimenez (2011), within the third food regime, food movements divide into reformist and radical ones. Taking into account

²²⁹ It does not mean any organic or ecological producer among nopal producers of Milpa Alta is not connected with pro-local and socially-just food advocacy groups, nor that an urban food movement does not exist in Mexico City. It may simply suggest the need for research that purposefully looks for groups of rural producers linked with urban food social movements locally.

such categorisation, ecological nopal producers' values and practices (certified or not certified as organic) resonate with some aspects of the *empowerment orientation* of the reformist food movement because they stick with the agroecologically-produced local food and develop new business models (e.g., reorganizing themselves for consolidated sales, engaging with specialized urban food stores).

Simultaneously, producers stress the potential benefits that a local re-link can render for both the production and the consumption sites. Reasons are not abstract but concretely related to the reality of the locality, such as proximity that reduces costs, urban people of Mexico City needing healthy, natural foods to confront health problems, need for the urban people to be aware of the environmental function they play for sustaining the city, nopal's cultural significance as part of the local taste. All of that resonates with the orientation of radical food movements, following Shattuck and Holt-Gimenez' (2011) characterization, toward regionally-based food systems and the human right to food that is locally sourced and culturally-appropriate. Thus, in practice these small-scale producers navigate within neoliberal market structures to sustain themselves but in the process they push values to more radical ends. This overall process may create spaces of transformation by creating new rural-urban alliances based on new market and values to food relations.

A stronger connection with urban social food movements may be the pivot to reshape a short local commercial nopal chain in order to oppose or contest the abstract environmental localist and globalist relations nopal ecological producers are involved now. Public intervention to reconnect production to the consumption site is required. The barter market is an exemplary model of the type of public intervention that de-fetishizes local food consumption relations. Scaling-up that model would help to re-value local food while promoting a socially-just food system. In the experience of the barter market, producers get a just price while consumers realize that local foods are the proper crops for the local agroecosystems and what producers can and know how to produce in the city's hinterlands. Certainly, public intervention is not the answer to all that needs to be done but could be a powerful way of pushing forward existing initiatives, for instance, cooperative producers organizations, development of local labels based on systems of trust and built upon concepts of ecological food relevant for the locality, and/or a label that conveys the message to the urban consumer about the quality and the multiple functions that the production of this ecological food renders for their own urban context.

Chapter 7: Integrated Conclusions

7.1 Introduction

My research began with the question of how farmers of metropolitan Mexico City adjust their agroecosystems and relationships with local and global markets in response to their exposure to a globalized mega-city. My analysis of nopal producers of Milpa Alta and their relationship with Mexico City has revealed *processes that deepen and repair rural-urban disruptions*. My research informs broader debates on localized agri-food relations in contemporary capitalism. Having arrived at the final stop of this research journey,²³⁰ I offer a reflective synthesis confronting remaining questions that relate the findings and the theoretical approach.

Having completed the presentation and discussion of findings on the commodity chain (Chapter 5 on inputs and production, and Chapter 6 on commercialization and consumption), I now discuss overarching topics. The first relates the human-nature-society debate in the metabolic rift theory. In this theoretical discussion, I proposed an integrated approach to metabolic rift theory and agroecology in order to go further in challenging human-nature separation through reliance upon ecological (production of) farming knowledge. Based on the literature, I took the stand that agroecological practices may be consistent with an arguable use-value rationality of the peasant way of farming. The second piece of the discussion concerns the uneven rural-urban relationship within capitalism. According to my theoretical framework, unevenness is expressed by the unequal exchange of both labour and ecological wealth within capitalist markets. As a counterpoint of such unevenness, I suggested that peasant use-value production rationality may open space for fostering an urban-rural re-balance. I address each of these topics, seeking to expand understanding of the complex human and non-human nature relationship, as well as challenges and opportunities to mending rural-urban disruptions in contemporary capitalism. For this latest endeavour, the case study is the foundation to envision ways of mending rural-urban rifts.

²³⁰ I use the word journey literally because the method employed in this research, the commodity chain, was a travelling across spaces, the rural and urban. Nopal commodity chain was the path towards accessing the site-specific conditions of the place under investigation (Milpa Alta and DF), while nopal was the vehicle. The path and the vehicle were driven, having at hand a mix of theoretical approaches (metabolic rift theory, food regime analysis and agroecology) as a route map to interpret the landscape of topics I was encountering. However, as is usual in research, the theory and the methodology operate only as guides. The final destination is always uncertain.

7.2 Confronting the Production Rationality of Peasant-Like Farming of the 21st Century: Mending the Nature-Society Separation, (Re) Linking the Rural and Urban

As shown in the literature review of the metabolic rift, the distinction between use-value and exchange-value production rationality is fundamental in deepening the human and non-human/nature separation or rift. It is argued that employing labour for the production of exchange-values drives an accelerated exploitation of the resource base (human and non-human). Drawing on Marx's work, scholars engaged in the metabolic rift theory project (Foster, 1998, 1999, 2014; Moore 2000, 2011; Clark and York, 2008; Schneider and McMichael, 2010) by focusing on the problem of labour, either from the perspective of the town-country division of labour (Foster, 1998, 1999; Foster and Holleman, 2014; Moore, 2000, 2011) or the labour practice (Schneider and McMichael, 2010; Clausen, 2007; McLaughlin and Clow; 2007, Wittman, 2009; Gunderson, 2011; Longo, 2012). The centrality of labour rests in its key role in mediating human and nature relationship and led me to a nuanced view of the human and nature relationship that overcomes dichotomies of society and nature. From that, I leaned towards scholars that frame *human and non-human nature* as parts of a wider environment (Lewontin, 2007; Magdoff, 2011). Thus, humans are part of nature relating to the broader environment through the action of labouring. Humans then interact with the wider environment by labouring the land, forests, oceans, and so on. What determines the character of that relation (e.g. distorted, rifted, or organic metabolic) is the "purpose" for which labour is employed. Certainly, the purpose of labour is a socio-cultural and economic construction. Using the political economy foundation of my theoretical framework, I rely on two categories to distinguish the purpose of labour: 1) labour employed for the reproduction of use-values; and 2) labour employed for the reproduction of exchange-values. Presumably, the use-value production rationality favours a human-nature organic, even metabolic, co-production rather than a distorted one. Agroecology provided me with a framework to enable an enquiry that materially represents such co-production in agriculture as "instead of focusing on one particular component of the ecosystem, agroecology emphasizes the interrelatedness of all agroecosystems components and the complex dynamics of ecological processes" (Rosset and Altieri, 1997: 290).

With this backdrop, I examined the farming practice (Chapter 5) or *labour practice* that lets us see the material human nature and non-human nature interaction such as: changes and adaptations inflicted over the biophysical production base in Milpa Alta nopal fields, and human

labour implications. The analysis articulated evidence of the direct correlation of changes in the material, physical base of production and the quality and quantity of labour available in the Milpa Alta region. On the one hand, I found that shortages of labour and growth of the nearby urban market led to the introduction of agrochemicals decades ago from 1950s on, during the so-called *green gold times of nopal*, although arguably in low quantities and the intensification of nopal monoculture.

The intensification of monoculture responded to the apparent opportunity of growing demand. The yield was the product of land management that replaced human labour with external inputs and less biodiverse fields. Meanwhile, the growing demand was constituted by the rural migrants arriving in the city. Hence, the wider countryside of Mexico built and sustained the market linkage of the city with the rural Milpa Alta. Nopal appealed to the taste of the rural population now urbanized and that fact reveals a cultural factor forging the rural-urban connection. Indeed, it was a rural-rural relationship in disguised. Rural people from Milpa Alta communicated with other rural populations, mediated through food and the city market for food. This cultural connection propelled the cultivation of nopal. The land was good for nopal and the peoples of Milpa Alta had knowledge of crop management. On the Milpa Alta side, there was also a cultural factor fostering nopal farming.

Nopal prices have ever since responded to seasons (low and high season) and remain in the low-value foods (see Chapter 3). Hence, in order to get enough value, producers had to rely on the volume of production and that encouraged monocultures. Despite the low value of nopal and shifting diets and tastes of Mexico City's population in the last two decades, Milpa Alta producers continue growing this crop, in small units of production. The plot size remains small because of the process of parceling out the land. As families divide the land for the children, some use them for farming and some for other purposes, ultimately reproducing the agricultural orientation of the region.²³¹ All in all, the shifts in cultural consumption did not lead them to shifting to a more profitable crop, according to the cultural food consumption in the city, rather they adapted their practices and are on the way to reconstituting their market linkages. Nopal seems likely to remain for the long term as the main commercial crop and, therefore, continue to be the food commodity connecting the region with the city.

²³¹ See more about this topic in Chapter 2.

However, the trend is pointing towards producing a qualitatively different nopal, one produced by intensifying ecological plot management.²³² Keeping up with nopal, rather than changing to another commercial crop, may indicate that Milpa Alta producers want to rely on an accumulated site-specific knowledge of their agroecosystem and build it up. As such, it is a sign of a strategy for *self-control of their resource base*, to reproduce themselves, a characteristic linking them with the peasant condition thesis held by Van Der Ploeg (2008) and discussed in the Chapter 3.

In the peasant condition, control of the resource base allows producers to enlarge autonomy and reduce dependency on external knowledge and input sources. Then, the shift to quality nopal represents the evolution of their existing resource base by innovating and developing ecosystems and labour management strategies to remain on the land. However, the evidence shows tensions in the process of self-control of the resource base as farming ecologically is not necessarily farming economically for these small-scale farmers.

In a second level of analysis of nopal producers, I discussed the relationship between the typology of farming practice found and their market connections (Chapter 6) and examined how these linkages, advantages, and setbacks developed. Together, this analysis (Chapter 5 and 6) now allows me to address the question: “Are nopal producers operating significantly under the use-value rationality?”

In the literature on agroecology and recent debates on peasantry,²³³ peasants operate under the use-value rationality²³⁴ in which labour is employed to reproduce the resource base²³⁵ but is not necessarily isolated or untouched by capitalist circuits. The reader should have noted already that throughout my research I never assumed that nopal producers are peasants.²³⁶ This was purposeful because I took the position that the peasant is a *fluid category* (Van der Ploeg, 2008). Instead of pre-defining nopal producers as peasants, I explored the peasant condition (what they do, strategies for self-controlling resource base, and so on) and how they relate to the modern

²³² The use of agrochemicals and management of monocultures have not removed entirely other practices that are part of the ecological farming legacy of past generations; even producers using agrochemicals fall along an ecological spectrum, though at the least environmental-friendly point.

²³³ These debates were reviewed in Chapter 3.

²³⁴ From the analysis of the literature (Chapter 3), it turns out that peasants are one of two truly different small scale producers (peasants and small entrepreneurs).

²³⁵ For more about what is a resource base, see the literature review.

²³⁶ Rather, I carefully approached them as “small scale producers with peasant and ecological farming legacy.”

world (the urban and modern markets). So, are nopal producers of Milpa Alta employing labour for reproducing their resource base?

In the literature on agroecology and new peasant studies, it is frequently argued that ecological management enables enlarged autonomy and creates spaces to contest capitalist production rationality. For Van der Ploeg (2010), relying upon ecological management is a peasant's strategy to transform the land into ecological capital. For this author, "[i]n the past peasants were obliged to use their land as ecological capital. There simply was no alternative. Today there are many, sometimes seductive alternatives. In the new context, using (and further developing) the land as ecological capital is increasingly a choice that reflects agency and preference. The new peasants are not obliged to do so; they opt for it, even if it often implies a tough struggle with the socio-technical regimes in which they operate" (Van der Ploeg, 2010: 5).

However, the examined case provides not only strengths but also new vulnerabilities arising from the process of building up *land as ecological capital* (or using the terms of the metabolic rift, reproducing the use-value of the land). The vulnerabilities are directly related to the need for more labour, which I categorized as a *peoples' knowledge intensive labour*, and new commoditized relations when moving towards ecological management and engaging in selected niche markets. It is well worth asking: What are the new vulnerabilities and strengths arising out of producing a qualitatively different nopal through a *purposeful*, as Van der Ploeg (2010) suggests, ecological management? What is the exchange-value obtained from a highly ecological nopal reproducing the use-value of the agroecosystem? Though this could be a research question for a follow-up to this dissertation, I approximate a response by interpreting the intertwined and particular dynamics of market relations, ecological capital and labour in each of the three categories of the farming spectrum (somewhat, semi- and advanced ecological farming).

Table 7-1 "Variables influencing the reproduction of the use-value rationality" is a succinct picture of this, which I then develop seeking to find the sources of strength and vulnerability producers confront when producing mainly under the logic of use-value rationality but conditioned by certain exchange-value circuits.

Table 7-1. Variables Influencing the Reproduction of Use-Value

Category of farming spectrum	Variables		
	Market	Ecological Capital	Labour
1) Somewhat Ecological	<ul style="list-style-type: none"> • Dependant on low price circuits (low exchange-value) • Undifferentiated market 	<ul style="list-style-type: none"> • No increase in land as ecological capital 	<p>Labour needs do not increase</p> <p>↓</p> <p>No new labour costs</p>
2) Semi-Ecological	<ul style="list-style-type: none"> • Remain in low price circuits • Remain in undifferentiated market while in search of higher value markets 	<ul style="list-style-type: none"> • Increases land as ecological capital but the system is in trial and error • Improved replenishing methods for the land such as: <ul style="list-style-type: none"> a. Replacing agrochemicals with bio-inputs → Incurring new costs b. Reducing agrochemicals complemented with government compost supply → costs are subsidized 	<p>Labour slightly increased</p>
3) Advanced Ecological	<ul style="list-style-type: none"> • Engage in select markets (local and international) but still selling a portion of the produce in the undifferentiated low price circuits. • Towards diversifying market connections 	<ul style="list-style-type: none"> • Increases land as ecological capital • Farming relies entirely upon natural resilient management → Incurring new costs 	<p>Labour significantly increases</p> <p>↓</p> <p>Incurring new labour costs</p>

Use-value and exchange-value production dynamics in the somewhat ecological type of farming

Producers are immersed in input capitalist circuits to obtain agrochemicals and external knowledge dependency. Agrochemicals compromise the health of the land and the labourer. In other words, nature and human-nature are mediated by artificial inputs that break the natural replenishing of the biomass and biophysical cycles, but these chemical inputs ameliorate the need of costly labour, which is an issue in the region (see Chapter 5). The land is not being reproduced as better ecological capital. Hence, their continuity on the land may be more influenced by land ownership.

Van der Ploeg (2010) points out that land ownership today is not the sole factor creating connection to agriculture, but it is still playing a role. As far as land ownership among nopal producers in Milpa Alta is concerned, the communal and ejidal ownership regime has played a role, even in the situation where the ownership has been slowly evolving into a blurred status of “private property” and “unknown status of property” (see Chapter 3). The private property may be a result of the parceling out of the land among members of a family for different purposes.

What prevents further biophysical disruptions in this category of producers are the combinations of other more ecological practices with the use of agrochemicals. Apparently, for producers these producers, the low value of the crop at the market level (circuits of exchange-value) is not an incentive to move in a different direction. This creates a negative dynamic because the unchanged quality of nopal forces them to remain dependent upon low-value trading circuits.

The resulting model in this segment of the farming spectrum is a one of low (probably stagnant) reproduction of the ecological capital in the land plus low exchange-value. That equation would more likely enhance the process of separation of people from the land in the near and long terms. Human-land separation may be accelerated with recent changes in the legal frameworks to the social regime property in Mexico that may unchain the selling of the land. In sum, without enhancing the use-value of the land (enhancing land as ecological capital), the people’s separation from the land may be a very likely result.

In this segment, the reproduction of the use-value (or reproducing land as an ecological capital), and self-control of their resource base is compromised, as is the reproduction of the agricultural orientation of the space and place. With that, the forces distorting the metabolic

human-nature relationship and the wider nature relationship are unleashed, affecting not only Milpa Alta but also the urban area because of further ecological imbalances.

Use-value and exchange-value production dynamics in the semi-ecological type

Producers in the semi-ecological type of farming are on the way toward reducing dependency on capitalist circuits of industrial inputs (agrochemicals). Nonetheless, their vulnerability increases, as they have not consolidated sources for naturally replenishing the soil nutrients and biophysical properties.

They remain in the low-value trading system and barely know about other options. Why do they carry out the changes? Two possible factors may explain it: firstly, the realization of new strategies to replenish the quality of the land that also benefits their health; and secondly, they do not incur new labour costs yet as they rely upon the system of public subsidies for getting organic matter (fresh manure and public compost) and some are still in the process of replacing agrochemicals.

The uncertainty is about the quality of the organic matter because they do not control its production and delivery. Hence, though they move towards independence from external industrial inputs, at the moment they become more dependent on a supply controlled by the government.

It turns out to be a model with an uncertain strategy of reproduction and enhancement of the land use-value (or producing land as ecological capital), while linked to low-value exchange circuits. However, the engagement in new land management strategies may further the producers' commitment to ecological knowledge production, as proved by their active participation in public training programs, even without knowing how to valorize their nopal, and openness to reconstituting market strategies.

Some producers in this segment connect with an emergent commercial circuit of bio-inputs. The bio-inputs allow them to work their resource base by significantly reducing risks to the health of the land and labourers (family or contracted workers). Bio-inputs, combined with other eco-practices such as polyculture, livestock integration, fruit trees, etc., secure the quality of the resource base without necessarily intensifying labour requirements but control of knowledge is compromised. Labour requirements are greater for them than for their peers using agrochemicals, but more research is needed to contrast specific quantities of labour and the quality of labour in

the model of bio-input substitution, in comparison to both agrochemicals and advanced ecological practices.

Overall, compared to their peers in the somewhat ecological level, producers in the semi-ecological segment move towards naturally replenishing the resource base but with dependency on new external sources (commercial bio-inputs and external knowledge and government subsidies). Seemingly, the advantage for now in terms of costs is that their management strategy does not harness significantly more labour.

On the other hand, for producers in this part of the spectrum, moving towards producing a high-quality nopal is useful as a strategy that potentially breaks the dependency on low-value exchange circuits.

Use-value and exchange-value production dynamics in the advanced ecological spectrum

Advanced ecological producers have developed self-controlled knowledge of specific biophysical requirements of their agroecosystem. They show agency in the knowledge production system they rely upon (see conclusions of Chapter 5). Their inputs are a combination of their own on-farm resources and they have slowly reduced dependency on the subsidized organic supply from the government. They replaced fresh manure with composting and they make decisions on how to use the subsidized manure (e.g., as an ingredient of composting).

They rely on the high quality of the organic matter (rich in nutrients, high efficiency in natural fertilization and pest control methods) to secure their continuity in the nopal market, but they require *peoples' knowledge intensive labour* in order to perform farming tasks. The cost of labour is a significant issue for them.

The replenishing of the use-value of the resource base (or producing land as ecological capital) requires the harnessing of much more labour. It intensively uses both human nature (labour with site-specific knowledge) and the wider nature (e.g., use of more local organic matter for making compost, employing the nutrients of intercrops, etc.). The positive outcome is a deeper human-nature and wider-nature interaction that promotes an organic metabolic relationship but it is uncertain whether their market connections move them towards enhancing or disrupting positive organic relationship.

Some producers in this part of the spectrum are in the process of consolidating new market linkages or at least diversifying connections to get more value out of their nopal but not of all

them. Some are stuck in the conventional low-value market and for these producers managing with advanced ecological practices brings them into a place of highest vulnerability. For instance, biodiversity strategies such as polyculture are dual, as it is strength and vulnerability at the same time. It is a source of vulnerability because producers have a small plot and sacrifice production of the commercial crop for a non-commercial one. One of the reasons small holders practise monoculture is because they have to secure a volume of production of the commercial (commoditized) crop to receive enough income and remain in the market. On the other hand, using the land for non-tradable crops poses some disadvantages (this is in addition to the new labour costs that their overall advanced ecological management demands).

So, without securing a market to sufficiently valorize their quality nopal, polyculture may soon be removed from the land resilient strategy and that action could compromise the source of natural nutrients needed to keep a reliable agroecological nopal production system. Such a feedback dynamic between biodiversity and dependency on a food commodity market brings to the surface the struggles advanced ecological producers face to continue their practices when immersed in an unfavourable market exchange (low-value crop, market barriers in the city, etc). In this case, the commodity relationship based on a low-value crop creates tensions around the continuity of the reproduction of high use-value (land as ecological capital).

The experiences of producers in this part of the spectrum show that they intensified ecological practices without prior knowledge of alternative markets. Why were they and still are willing to bear the economic and uncertainty burden of the shifting practice? Though more qualitative research exploring the values of advanced nopal ecological producers is needed, my insight is that the more knowledge of their local agroecosystem and the realization that the land quality actually improves, the deeper these people's attachment to farming become. The attachment is then reinforced because they are owners of the land. In this context, land ownership combined with an improved ecological quality of the land may strengthen a different connection to it. Some of these producers have, or had in the past, performed urban jobs (worked at the university, or as doctors, engineers, high school professors and so on). These professional backgrounds seem to strengthen, rather than weaken, their intention to stay on the land. In addition, producers in this part of the spectrum hold hopes of finding markets that valorize the quality of their crop. In sum, the reproduction of the integrity of the land and worker reinforces continuity of the agricultural orientation of the people and Milpa Alta land.

The selected group of advanced ecological nopal producers with access to niche and selected markets (and access to higher prices and more stable trading conditions) are able to partially cover the costs of harnessing more human-nature and wider-nature of the local agroecosystem. However, another source of vulnerability comes into play. This is because their on-farm management decisions are sensitive to external rules such as standards required by certifying agencies.²³⁷ As a result, independence and autonomy that derive from enhancing their knowledge control may reverse. The stories and experiences of how nopal producers engaged in the organic market presented in Chapter 6 led me to speculate in this direction. However, the organic market is an exchange-value circuit momentarily useful to continuing working the land without putting at stake its and the workers' health while getting slightly more value than in the conventional exchange commercial circuits.

Altogether, the intertwined use-value and exchange-value dynamics reveal that nopal producers move strongly towards a use-value rationality in between *conventional use-value reproduction* (simply rooted in the land) and *emerging purposeful improvement of the use-value*, by adding ecological capital to the land. So with these considerations, nopal producers can be linked to peasant use-value rationality, although on one side of the picture is a *campesino* under the conventional framework (rooted in the land because of coming from generations living on the land); and on the other side there is the emerging sector of *campesino* carrying the burden of the cost of ecological production, harnessing intensive peoples' knowledge labour and certification costs while also experiencing new vulnerabilities and tensions around keeping their capacity to control their farming knowledge and resource base.

Struggles to obtain labour is the greater vulnerability, contradicts somewhat ideas that peasant communities of the global south are wealthy in labour force. The peasant units of production of the 21st century are marked by experiences of increasing exposure to urban life and national and transnational migration processes fostered by macro-social changes such as global market relations and urbanization. Thus, labour may be the emerging impediment to continuing to reproduce and control the resource base ecologically.

The case examined reveals that because of the labour factor, farming ecologically is not necessarily farming economically for some campesinos of the 21st century. Such a reality may

²³⁷ More about the struggles and particular challenges stemming from the engagement in the international organic certifying market was provided in Chapter 6.

resonate with those living in the countryside of Mexico and in the Global South, places marked by migration. For that reason, the use of agrochemicals may now be a strategy to cope with labour costs. The case of Milpa Alta has made this issue more apparent. Therefore, shifting to more advanced ecological management makes them stronger and vulnerable at the same time, not just in the direction of autonomy and independence. A strategic use of linkages with emerging local and global ecological (organic) food markets may open up an opportunity for reconstituting the labour force needed to reproduce the ecological rationality of their use-value production.

Moving towards enhanced eco-friendly practices: Policy recommendations and future lines of research

With the evidence available, the more likely scenario is that producers are moving towards enhancing eco-friendly practices rather than furthering the less ecological ones. Top-down forces, like policy approaches to agricultural areas of DF, take producers in that direction and let us see areas of possible policy intervention and lines of research.

The policy approach to the agricultural areas of DF enforces adaptation of ecological practices (principally no agrochemicals). On the one hand, at the municipal level, the most influential policy subsidizes fresh manure and the public composting supply, whereas the DF-federal government policies (through SEDEREC and SAGARPA) focus on training producers for formalizing their farming into the schemes of organic farming. However, all of the public subsidies and programs lack support for covering increased labour costs that advanced ecological practices invoke. Composting is an effective practice to re-use and recycle local biomass to nurture the land, but it is also labour intensive. In this regard, enlarging the subsidy of public compost may be the most useful measure to close the ecological loops locally and to indirectly cover the labour costs of ecological management.

In addition, a policy of this kind benefits both the rural and the urban areas of Mexico City because the city is an enormous source of organic waste.

In a metropolis of 20 million people, 28% of the waste produced per family in the city is organic (Tierra Nueva cooperative, internal document 2012). The agro-ecological field of study asserts that reducing the distance between where food is grown and where it is consumed makes nutrient cycling practical and enables a material reconnection of country and town (Lappe and Frances, 2016). Lappe (2016) points out viable options to enhance regenerative farming practices

through re-using human organic matter produced in the city and then transferred to farming peri-urban areas or nearest countryside. She brings up real examples, such as the program of capturing phosphorous from the urban sewage in Sweden and other countries of the European Union²³⁸ or the use of the human waste stream richest in both nitrogen and phosphorous, like urine, in the Netherlands, West Africa, Niger villages and other regions.²³⁹

These systems for capturing fertilizers from human organic matter are reminiscent of the *humanure* concept Marx coined when developing the metabolic rift idea. For Marx, the disruption of the nutrient pathway, whereby nutrients move from the soil through humans and back to the soil in the form of *humanure* constitutes the irreparable rift, which occurs with the physical separation of humans as fertilizer producers and which impacts soil fertility (Schneider and McMichael, 2010). Though Schneider and McMichael (2010) consider the *humanure* idea oversimplistic and outdated, the contemporary efforts and ideas to capture human organic waste produced in cities (from the humans physically separated from the land) to fertilize land are realistic and possible and it is a biophysical alternative to reconnecting organically urban dwellers with the land.

Certainly, institutional efforts for developing the methods and technology to make this possible need to be in place. An element favouring this type of approach is the nearness of farming areas and cities because the overall cost of transferring the human organic matter may be less. Such a factor is present in the case under investigation (Mexico City and Milpa Alta), given their proximity to one another and the fact that food still connects both populations. A composting supply made with organic waste generated in Mexico City and transferred to the agricultural area nearby would help rebalance the urban-rural organic wealth exchange. With a proper combination of nutrients in the compost and good compost delivery from the public

²³⁸ Lappe (2016) reminds us that in 2012 the European Union called on members to reuse virtually 100 percent of phosphorous available in sewage systems by 2020, and that Sweden already requires 40 percent of phosphorous in sewage to be recycled back into the soil. More about the technology needed to effectively use this resource can be seen in Gerald Ondrey, “P-Recovery on the Move,” Chemical Engineering News, February 1, 2013, 17, http://ostara.com/wpcontent/uploads/2015/11/feb13_ChemicalEngineeringNews.pdf; Cordell and White, “Life’s Bottleneck,” 180.

²³⁹ “In 2014, Amsterdam’s public water utility invited male residents to use urinals specially designed to collect urine to fertilize rooftop gardens, playfully calling it ‘peecycling’. In West Africa, 700 families in eight Niger villages are recycling all the nutrients in their own waste back to their fields using waterless toilets and simple urinals—low energy and low cost— and enjoying enjoying yields equal to or better than those obtained with chemical fertilizers” (Lappe and Frances, 2016).

programs, the ecological quality of the resource base of nopal producers would improve and might prepare producers to go into formal ecological food markets.

As presented in Chapter 5, the public compost supply program still has some flaws in terms of the quality, record of ingredients and production process. This prevents producers from using it to enter the organic market that requires them to document the origin and process of the natural inputs. Training producers to make their own compost could overcome these gaps but the problem of labour would persist. It is for this reason that a combination of subsidies for labour, training, and public compost supply would better accommodate the needs of transitioning towards advanced ecological farming approaches in a more stable setting.

In addition, policies to help close ecological loops on-farm are needed to help with transitioning to a fully integrated ecological agriculture. In the region, there are nopal surpluses (not sold at the market) and fresh manure supply is far from the region. So that is a window of opportunity to promote raising livestock in the region and feeding them with the nopal surpluses. It would bring several social and ecological benefits. First, producers could use nopal surplus instead of wasting it. However, only a few producers in the region have the knowledge of how to make livestock feed out of nopal. The only interviewee who knows it learned it from his parents (see Chapter 6), retaining it because the family never gave up raising cattle. There is no information available on how many nopal producers raise livestock and how much of the livestock feed is made with nopal. Public policy efforts to collect that information and disseminate the knowledge would close the ecological loop (part of the manure needs for composting could be obtained on-farm, with cattle feeding from the nopal plants). Certainly, more research is needed to know how much of the diet for livestock could come from nopal and the regional impacts of feeding cattle with other resources.

Regarding training programs, a complete approach has to necessarily include a coordinated policy to create commercialization spaces of selected foods through direct producer and consumer relations. Up to now, training is the focus of some of SEDEREC and SAGARPA programs. Currently, the public policy based on training indirectly supports the producers' engagement in the international and national organic niches by "preparing" them to go on to the private certification process that enables them to trade internationally (see Chapter 6). However, the examination of experiences of nopal producers in the international organic market leads me to think that this participation formalizes a new set of costs on local people's intensive knowledge,

labour and private certification, while getting involved in highly intermediated trading relationships (from production to final consumption). As a result, the experience in this market is somewhat contradictory. In the first place, the international organic niche market seems to offer better prices to producers but the costs outweigh the benefits²⁴⁰ (see Chapter 6). Up-to-date systematic research comparing costs and prices paid to the organic nopal producer is scarce because nopal has only recently entered the organic market making formal research is quite limited.²⁴¹

7.3 Confronting the Rural-Urban Unequal Exchange: Deepening or Mending Metabolic Disruptions

At this point, it is clear that the use-value rationality prevails among nopal producers in Milpa Alta while they engage mostly in low exchange-value circuits. However, because nopal is produced through practices that range from somewhat to advanced ecological, the use-value of this commodity remains high.

The data analyzed about trading channels leads me to the conclusion that a significant portion of the higher use-value of this food ends up in an urban food market and then urban human bodies. Mexico City is still the largest recipient of the nopal produced in Milpa Alta. Another piece of evidence suggests that this quality nopal (higher use-value) starts going to northern countries through the trade channels of the global certified organic food industry, presumably to urban northern consumers.²⁴² Taking this into consideration, what does the intensification of use-value, represented in the quality nopal transferred (or traded) to the urban contexts (local and global ones) tell us about the production of a new (un)even rural-urban relationship in contemporary capitalism? This question follows up on an insight gleaned when discussing frontier debates of the commodity chain methodology (see Chapter 4) and when finding the intellectual common grounds of this methodology and metabolic rift theory debate that relates to unequal ecological exchange. In that debate, scholars (Bair and Werner, 2011)

²⁴⁰ Based on this fact, I insist that the engagement in the organic market should be just a temporary market strategy.

²⁴¹ This research and the MSc thesis by Velasco (2014) are the only ones addressing the experience of nopal producers of Milpa Alta in the organic market. Velasco's work focuses more on a proposal for a business model, whereas my research identified wider issues surrounding organic nopal and framed it in global politics of food culture, agriculture and local-global food markets.

²⁴² There is no research demonstrating that the organic nopal that goes from Milpa Alta to northern countries is finally consumed in urban contexts but I speculate that this is the case as it is more likely that urban consumers or urban special markets (including Latin American migrants) buy "exotic" foods rather than rural areas.

examine how the site-specific conditions that is the space and place where the commodity is produced, strongly influence the shaping and reshaping of commodity chains. Therefore, capital alone does not determine the commodity chains.

Building upon that perspective, I suggested that the space and place, in the terms of Werner and Bair (2011), could be materially represented in the use-value of the commodity. Then, commodities produced under intensive ecological methods carry on the ecological wealth of the space and place where they are produced. This position transcends Van der Ploeg's (year) idea of *land as ecological capital*. While Van der Ploeg (year) sees that the added ecological capital remains only in the space of production (land or the agroecosystem), I suggest that the added ecological capital generated with the ecological practices based on *people's knowledge intensive labour* not only remains in the space of production (land or the agroecosystem) but is embodied in the commodity. In sum, the ecological wealth of the space and place is contained in the food as a commodity and exchanged when entering trading circuits. As such, when trading this quality food, more rich ecologies are exchanged.

Ecological capital is physical matter that develops within a physical *space* and is produced with labour and practices of the people of the *place*. Thus, a produce (later a commodity) grown in an ecologically rich space has the ecological wealth of the space in it and that is what increases its use-value, in this case the use-value of the food. When humans consume a food grown in a rich environment, it boosts biological functions in their bodies and that is a way to see an increased use-value of the food. Meanwhile, the food grown with chemicals and in polluted environments has detrimental nutritious impact for humans and that erodes its use-value.

Nopal production in Milpa Alta moves toward intensifying space and place-based ecological practices, but the produce remains in low-value markets. Chapter 6 presented evidence that the majority of nopal producers not using agrochemicals still place a significant portion of their produce in conventional, mainstream, undifferentiated markets located in Mexico City. Therefore, the urban population consumes a nopal cultivated in an enriched biomass and natural nutrients obtained through managing with compost, fresh manure, people's knowledge intensive labour and other practices analyzed in details in Chapter 5.

In exchange, nopal producers receive low monetary value. The low prices are presumably bound to a culture and history linking nopal with "low status." Though nopal is entering the group of foods that carry meaning as "healthy" and increasingly are recognized as such among

the urban population, still there is the perception that nopal regardless of its quality (e.g., ecological) should be among the cheapest foods. How to transform the cultural perception of this native food among local population? A potential avenue to explore is reconnecting local urban consumers with the ecologies of the food they consume, that is, the ecologies around nopal farming and its importance for the urban ecologies and urban diets. The point is to work on the strengthening of an organic relation between food, the producer in the agricultural area, and eaters in the urban space. This relation echoes the concept of biocultural agri-food relations that Baker (2009: 18) develops and entails “a shifting from a material focus on production to social reproduction” and as such “represents an acknowledgement of use-value, reflecting social, cultural and ecological relations versus exchange-value, reflecting capitalist relations”. This concept has ample resonance with the discussion on use-value I developed.

What markets could possibly valorize the higher use-value of nopal or biocultural relations behind it? Could a higher price capture the space and place-based use-value of quality nopal? The certified organic sector initially appeared as an opportunity to do so. Though it could be argued that certifications in the global organic food market emerged as a tool to de-fetishize the space- and place-based use-value of ecological food production, producers involved in that market indicate that the price is higher, but repeatedly state that the costs increase as well and struggle to reproduce ecological practices based on organic standards. Then, the question is how is the price of the place-based use-value particular to nopal determined? Is the “premium” or extra price mechanism of the organic market able to evenly valorize the site-specific accumulated knowledge, the value of the biophysical nutrients of the compost, the fresh manure employed in nopal plots, the fruit trees planted along the nopal plants?

These questions seem valid, as the premium price is also standardized, even though farming producers’ strategies are diverse and incur different costs. In other words, the premium price obtained by an organic nopal producer in Milpa Alta is likely the same extra price a nopal producer in another region may get, which disregards that each nopal is grown under different agroecosystems and farming management arrangements.²⁴³ Examination of empirical data and research on price formation in each crop of the global organic market is necessary to pose

²⁴³ For instance, the type of peoples’ knowledge intensive labour and the biomass resources used in the production may be different in different regions.

accurate responses but in the meantime one can heuristically assert that given that the extra price is based on standards of production, the corresponding price is also standardized.

Without considering the diversity of space- and place-based farming management, the regulatory mechanism based on organic standards develops a “system of trust” where the general public (consumers, citizens, producers) trust that these regulations guarantee the biocultural value of the ecological production of the produce. Isn’t this a capital’s self-valorization strategy, where new spaces and places (human and non-human nature) of food are commoditized and enter the capital game? When Phillip McMichael (2013:136) engages in discussions of the use-value of peasant practices, he brings to the fore the example of organic certified shrimp and considers that certified and/or green consumerism may be capital’s self-valorization strategy, through which “capital commodifies and factionates ecology,” and again ultimately “the price form abstracts from, and invisibilizes, biological process.”

That capital commodifies nature is nothing new but the space and places embedded in native foods like nopal is an example of capital forces entering the otherwise “untouched” spaces; or as Neil Smith (2007) frames it, it is a new generation of commoditization of nature. Native foods marketed as organic and getting into the South-North global market carry wealth in the form of human and non-human nature (people’s knowledge intensive labour and other biophysical nutrients, biomass, etc.).

This conclusion applies to other foods that are more widely known, such as quinoa. Nopal may follow quinoa’s example. Quinoa is a native food cultivated for centuries in the Andes of South America, mainly consumed and produced by indigenous peoples of that region and hardly known in northern countries a couple of decades ago. Today, it has gained space in the food shelves of health stores and even supermarkets of faraway countries, principally northern countries (Brett, 2010). Even though quinoa may likely now be exported to southern countries as well, its boom started with exports to northern countries and taking advantage of the wave of green and health-based consumerism. Certifications allow consumers to get a snapshot of where the food comes from and who produces it (Brett, 2010). The story of quinoa is synthesized in a label that justifies the price of the product now placed on the shelves of distant, select, niche markets.

Native foods in the organic market is a new use-value entering the exchange-value circuits and corresponds to green capitalist exploitation of nature that Neil Smith (2007: 17) refers to as

“a major strategy for ecological commodification, marketization and financialization which radically intensifies and deepens the penetration of nature by capital.” For Smith (2007: 17), these commodities are “simultaneously excavated (in exchange-value terms) from pre-existing socio-natural relations and as part of their production they are reinserted or remain embedded in socialized nature -- the more ‘natural’ the better.”

On the other end of the spectrum there is coffee, a food well known in global markets and among global consumers prior to the birth of organic food industry. Coffee production is necessarily southern-based because of the tropical ecosystems where it grows. Therefore, as coffee is concerned, the organic certified industry did not touch a new space or discover a new commodity, but when valorizing the ecological practice of some coffee producers, coffee was refashioned. What was new? I speculate that it is the *people’s knowledge intensive labour* deployed in the land managed ecologically that allowed the re-marketization of coffee, which implies a commodification of an abstract space, the space of site-specific history of the people who grow it because they use the local people’s ecological knowledge legacy to market the produce. The market stream of organic coffee went primarily from South to North and this can be seen in IFOAM documentation of the destiny of organic coffee in the last decades (IFOAM, 2015).

Moreover, fresh organic food commodities are subject to developmentalist narratives. While exporting the produce overseas under the ecological, healthy, nutritious food labels and mainly to northern markets, these spaces (poor villages of the global south) and places (of small producers, campesino peoples) enter a development pathway (Brett, 2010). Thus, it is the global market that administers the development and its beneficiaries. It dismisses the uneven selection of who can produce under the standards required in the new export market and who can consume it based on the prices established for final consumers.

Because the price of this food is presumably higher, it implies an uneven selection of the consumer and leans toward those who have the purchase capacity. Hence, it is an uneven relation on both the production and consumption sides. In the North, not all consumers can access the newest stream of healthy, nutritious, chemical-free foods coming from far away. First of all, the access is typically restricted to consumers with knowledge about food quality and the means to pay for it. It is in the global cities where the probability of finding nutritious, certified organic foods is higher. Certainly, research on who in the North consumes native ecological foods

imported from the South and distinguishing consumption in rural and urban areas is needed to develop this argument further.²⁴⁴

When exchanging ecological food commodities for monetary value, there is an exchange of social relations that harness site-specific, place-based practices with biocultural meanings. So, if not the price, then what and how can the economic value of place-based biocultural practices be reflected? Perhaps it is necessary to transcend the exchange-value calculus as McMichael (2013) calls for. Transcending it is for McMichael (2013: 137) “a methodological issue, concerning Marx’s theory of value as a social relation represented by price, which objectifies social (and ecological) relationships... What appears to be a universal rationality is in fact an abstraction and form of denial of space-based practical value. In other words, value theory implies (but elides) other relationships embodying distinctive forms and understandings of value”. For McMichael (2013:137), “peasant practices force such recognition insofar as they address the agrarian question by seeking to repair the metabolic rift”.

The case of nopal producers I examined is a more nuanced version of that last statement by McMichael (2010). The practices of nopal producers do move towards mending the broken human-nature relation at the farm level but at the market level they engage in relations that deepen the disrupted human-nature relation by engaging in low exchange-value markets locally and/or long distance and costly (in terms of certification and labour requirements) green markets. The progress toward mending the human-nature achieved at the farm level is then compromised or may be reversed at the market level.

This evidence problematizes the notion shared by McMichael (2013) and Van der Ploeg (2010) that the added value (in use-value/ecological value) stemming from the peasant practices does not contribute to capital accumulation in external value-chains. McMichael (2013: 147) states, “value-adding augments the reproductive value of agricultural resources on farms rather than contributing to capital accumulation in external value-chains... Ecological capital then represents an alternative form of valorisation as the core of the farming enterprise (even though it may realize market exchange-value, but now on the farmer’s terms).”

²⁴⁴ From my personal experience living in Toronto and traveling across Ontario while doing my doctoral program I have realized that the so-called “ethnic foods” are normally found in large cities. Surprisingly, processed nopal is sometimes in supermarkets like Loblaws or stores in the popular Kensington market. On the other hand, quinoa is very much in the health food stores and is gaining space in supermarkets. Who consumes quinoa and nopal in Toronto? What streams brought them to this city? These may be some questions for a future research regarding transnational rural-urban relations mediated through ecological food markets.

In contrast, the case examined shows peasant practices based on the reproduction and development of use-value that may be actually contributing to capital accumulation in external value-chains, for instance organic food value chains. However, this is not a conclusion generalizable to all peasant communities of the world. What I want to make note of is that the reproduction of use-value (ecological capital) based on peasant practices is becoming increasingly compromised. This is an area of environmental concern for the planet as the spaces these communities inhabit and their ecological knowledge have been seen as an area to preserve and a practice to scale-up in the search for socio-environmental global justice.

However, the question that remains is what are practical options for creating the “*other relationships embodying distinctive forms and understandings of value*”? A solution provided by McMichael (2013:137) seems to go back to “*re-valuing local food relations*” and “*re-valuing self-organization*,” two conclusions that have been around in the literature of social food movements, food justice, the politics of agroecology, food regimes and food systems, mainly produced (though not exclusively) in northern contexts. What I found different in McMichael’s reference to local food relations is that he articulates it around peasants and food sovereignty discourses that resonate with both northern and southern contexts. For McMichael (2013:139) the food sovereignty arising from peasant movements “is not a vision premised on abstracted concepts of (market) value, rather it foreshadows a political ontology directly valuing self-organizing practice through networks of co-operation (Holt-Gimenez, 2008), including collapsing the urban/rural divide and repairing the metabolic rift (Schneider and McMichael, 2010).”

The research available on this matter overemphasizes the rural side -- for instance the peasant side, the farming practice, the farm -- but shows little about practical rural-urban alliances already in place or of potential development. My research demonstrated that even when small-scale, peasant-type producers employing ecological farming practices are located close to the center of consumption, it does not necessarily allow them to engage in exchange-value circuits on their own terms and benefitting the reproduction of their space and place, as it is normally assumed. Rather, the results stress attention to the need to make and create rural-urban alliances.

Overall, the discussion and evidence concerning the relationship between Milpa Alta and the urban center of DF (Mexico City), suggest that one fruitful avenue is to make apparent the biocultural connections and multiple functions that the use-value of nopal -- as both a farming

space that preserves the environment and as an edible food -- plays for people residing in rural and urban spaces. Keeping up with the biocultural linkages, then the claim for articulating local markets and food systems goes far beyond a nationalist or vernacular bias and builds upon the fact that the ones who better understand the ecological and cultural meaning of nopal are the ones who have inherited the practice of growing it, who know the taste of this food, the culinary culture behind it and have experienced the benefit of eating it. Indeed, the dismissal of these biocultural connections (re)produces *a distorted metabolic relation between town and country* because the more the urban population relies upon distant food, the more it disregards and forgets how much the vitality of their bodies and health depends on the ecologies around them.

The experience of the transnational connections with the organic food market points out that the biocultural connections are more difficult to expose in long-distance relationships between the space and place of production and consumption.²⁴⁵ The organic food industry has connected rural spaces and places with distant urban eaters but these consumers have less agency over the ecologies of that food. The agency is fetishized through prices. So, according to this line of reasoning, what space then remains for a transnational rural-urban alliance and for overcoming a transnational rural/urban divide? This is a question that I can address in future research.

²⁴⁵ Certainly, this statement can be challenged against the experience of migrants with the -food and culinary traditions they preserve in their own place and that can be preserved thanks to global trade.

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Appendix A: Questionnaire for Semi-structured Interviews with Nopal Producers

Date:
Name:

Community:

SECTION I. Profile of producer and unit of production

A. General Information

Age	Gender M F	¿Where were you born? Del. Milpa Alta Other: _____ If not from Milpa Alta, How many years have you been living in this community?	In the community you are: Ejidatario <input type="radio"/> Neighbour <input type="radio"/> Lessee <input type="radio"/> Owner <input type="radio"/> Usufructuary <input type="radio"/>
What is your position in your family?		Activities and responsibilities you do around farming.	

B. Characteristics of the family unit

#	Name	Age (year)	Sex F. M	Education	Residence	Principal Occupation

C. Characteristics of the unit of production

Size (Has)	# of workers	Principal crops apart from nopal Maize <input type="radio"/> Oats <input type="radio"/> Wheat <input type="radio"/> Others _____
Type of unit: Family _____ Cooperative _____ Enterprise _____ Other _____		

SECTION II. The nopal food chain, from inputs to commercialization

1.Inputs

1.A Labour (Family Labour)

Family Labour	Number	Constantly (daily basis)	Partially	Eventually	Activity	Contribution to the family income as % of monthly family expenditures
1. How many members of the family do nopal farm work						
2. How many members of the family do farm work related to other crops?						
3. How many members of the family do receive a wage for non-nopal work?						

4. How many members of the family live outside Mexico and send remittances?						

1.B Non-family labour

2. Who did work on your nopal plots this year?

Farm work	Total		Family		Jornaleros (Contract workers)		Colaboration		Total of jornaleros
	No. Persons	No. Days	No. Persons	No. Days	No. Persons	No. Days	Personas	Días	

1. Where do the contract workers that work with you come from? DF? Other States? Which ones?

2. What are some issues to find contract workers to work in the nopal plots?

1.C Inputs and tools

What types of tools do you use?

Rotavator_____ Hoe_____ Talacho_____ Mincers_____ weeding tools_____

Pesticide dispenser_____

Special Gloves _____ Knives _____ Plastic boxes _____

Truck_____ Other (please specify)_____

Manure and fertilizers

	Constantly	Partially	Eventually
What herbicides do you use? (Name and frequency)			
What fertilizers do you use? (Name and frequency)			

Do you use organic fertilizers? (Name and frequency)			
--	--	--	--

Inputs purchase.

How do you pay your inputs?	Savings or own income	Credits	Government support or subsidies
Machinery and tools			
Herbicides			
Fertilizers			
Organic fertilizer			

Place of purchase

Where do you buy:	Milpa Alta	Mexico City	Other states	Outside the country
Machinery and tools				
Herbicides				
Fertilizers or manure				

Do you purchase your inputs directly from the input's supplier?

	Always	Frequently	Eventually	Rarely	Never
Machinery and tools					
Herbicides					
Fertilizers					

2. Production

Type of product and volume of production per product					
Fresh Nopal	Orgánico Nopal (yes, No)	Average vol. Of production	Processed nopal	Average volume of production	Organic processed nopal (yes, no)

1. How long have you been growing nopal?
2. What do you do to increase your nopal volumes of production?
3. Have you stopped growing other crops in order to grow more nopal?
4. What are some advantages/disadvantages to stop cultivating other crops in order to increase nopal production?
5. What are some major problems to increase nopal production?

2.A Costs of production

How do you cover your costs of production? (Approx percentages)

Government support (% Aprox)	Own money (self-financing) (%)	Loans (%)		
		Family or friends	Bank	Others

1. Can you cover the cost of production with the revenues obtained when selling your produce?
2. What percentage of family expenditures can you cover with your nopal revenues?
3. Can you cover your food, clothing, transport, health with your nopal revenues?

2.B Farming technics/methods

6. Do you do crop rotation? (Advantages and disadvantages)
7. Do you intercrop?
8. Have your pest problems increased recently? If they have, what are possible reasons explaining the increase of pest problems?
9. How do you treat pest problems?

2.C Farming knowledge

10. How did you learn to work the land?
11. What are some new farming techniques you have learned and applied recently? How did you learn them?
12. When you have a technical problem with your crop, how do you solve it? Who helps you solve it?

Other producers of the locality _____ Contract workers _____ Relatives _____

Technicians from Milpa Alta _____ Technicians from Mexico City _____ Other _____

13. For what reasons did you get external technical support the last time?
14. Who did provide you the technical support the last time? Did you pay for it?
15. What do you do with the nopal that you are unable to commercialize/sell?

3. Comercialization

4. Who do you trade with your produce?

Type and Frequency			Level of market and Frequency		
Where	Retailer	Wholesaler	Local	National	International

5. Which of the markets above do provide you with better opportunities? why?
6. Do you commercialize directly? Always? If “Not at all”, why not?
7. Are there special requirements to transport nopal? What are they?
8. What product presentation is preferred by your buyers? What are the costs involved to do that presentation? What are the implications of absorbing those costs for you?
9. Do you participate in fairs within other delegations (municipalities) of DF?

SECTION III. Producers without using agrochemicals

1. What was your motivation to stop using agrochemicals?
2. How do you call/label your farming approach: ecological, organic, natural? Why?
3. Did you use to employ any free-chemical traditional fertilizer before you stopped using agrochemicals?
4. What changes did you have to do in your plot management? What techniques did you learn when shifting to agrochemical-free management? Who helped you to learn the new techniques? With what frequency do you receive technical assistance? Do you pay for it?
5. Do you consider “ecological” any of the techniques you used to apply before you changed to a fully agrochemical-free system?
6. How do you treat your pest problems under the free-chemical system?

Financialization and costs of transition to agrochemical-free approach

7. Have you used any type of government funding to shift to agrochemical-free system?
8. Did your labour costs increase when you shifted your farming approach? Any approximate percentage?
9. Did your fertilizer costs and manure increase? Any approximate percentage?
10. Who and where do you purchase your fertilizers?

Certification

11. What certifications do you have? Who provide them to you? Do you pay for them?
12. How is the certification process? How long does it take to obtain the certification(s)?

Comercialization

13. Did new buyers appear once you changed to an organic/agrochemical-free farming approach?
Local (Who) Nationals (who) Internationals, (who) Is that trade under direct trade or through brokers or middlemen?

14. In your personal story as producer, is there a real difference after you changed to organic/agrochemical free system? What and why?
15. Do you cover your family costs of food, education, clothing, recreation with the nopal production?

Association for the production

16. If you associate with other producers, what are your reasons? What are the advantages? What type of association are you involved in? bussines-oriented, cooperative, other?

SECTION IV. Perception of the future of farming in Milpa Alta

1. What do you think necessary to improve nopal producers' conditions in Milpa Alta?
2. What changes in the environment have affected the nopal farming activity in the región?
3. What are the advantages and disadavantages of doing farming work in a region close to Mexico City?
4. What are your reasons to be involved in farming?
5. What would be some possible reasons for you to stop farming (nopal) in the future?
6. Have you ever thought to sell your land? What would the reasons be to sell your land?

Appendix B: Production Costs of Nopal Production in DF (2007)*

Concept	Process	Number of times	Number of Hours	Quantity	Unit of Measure (UofM)	Average Cost per:		Weighted costs
						UofM	Hectare	
Plot work	Mechanic	1	4				350	350
Weeding	Manual	1	2				150	150
Application of pesticides	Manual	1	1				150	150
Aplication of fertilizers	Manual	1	1				250	250
Stem cutting	Manual	1	3				150	150
Cutting and packaging	Manual	1	3				150	150
Manure				6	m3	120	720	720
Sulfur				2	Kg	5	10	10
Cupravit*				2	Kg	137	274	274
Lime				2	Kg	1	2	2
Tamaron*				1	Lt	149	149	149
Plastic boxes				50	Pza	34	1700	1700
Technical Assistance				1	Ha	5000	5000	5000
							Total Cost per Hectare	9055
							Productivity per hectare: \$textTG:	30

Source: SAGARPA. Costos de producción del nopal en el DF for the year of 2007. Original document is in Spanish

*My translation from the original document in Spanish.