

Farming for What, for Whom?
Agriculture and Sustainability Governance in Mexico City

by

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ABSTRACT

City governments are increasingly incorporating urban and peri-urban agriculture into their policies and programs, a trend seen as advancing sustainability, development, and food security. Urban governance can provide new opportunities for farmers, but it also creates structures to control their activities, lands, and purposes.

This study focused on Mexico City, which is celebrated for its agricultural traditions and policies. The study examined: 1) the functions of urban and peri-urban agriculture that the Government of Mexico City (GMC) manages and prioritizes; 2) how the GMC's policies have framed farmers, and how that framing affects farmers' identity and purpose; and 3) how the inclusion of agrarian activities and lands in the city's climate-change adaptation plan has created opportunities and obstacles for farmers. Data was collected through participant observation of agricultural and conservation events, informal and semi-structured interviews with government and agrarian actors, and analysis of government documents and budgets.

Analysis of policy documents revealed that the GMC manages agriculture as an instrument for achieving urban objectives largely unrelated to food: to conserve the city's watershed and provide environmental services. Current policies negatively frame *peri-urban* agriculture as unproductive and a source of environmental contamination, but associate *urban* agriculture with positive outcomes for development and sustainability. Peri-urban farmers have resisted this framing, asserting that the GMC inadequately supports farmers' watershed conservation efforts, and lacks understanding of and concern for farmers' needs and interests. The city's climate plan implicitly considers farmers to

be private providers of public adaptation benefits, but the plan's programs do not sufficiently address the socioeconomic changes responsible for agriculture's decline, and therefore may undermine the government's climate adaptation objectives.

The findings illuminate the challenges for urban governance of agriculture. Farms do not become instruments for urban sustainability, development, and food security simply because the government creates policies for them. Urban governments will be more likely to achieve their goals for agriculture by being transparent about their objectives, honestly evaluating how well those objectives fit with farmers' needs and interests, cultivating genuine partnerships with farmers, and appropriately compensating farmers for the public benefits they provide.

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LIST OF ACRONYMS AND DEFINITIONS

Campesino – a peasant farmer.

Chinampa – a rectangular artificial island in a shallow lake, constructed from lake sediment and organic material, and held in place by willow (*Salix bonplandiana*) and cypress (*Taxodium mucronatum*) trees. Pre-Hispanic Mesoamerican populations in the Basin of Mexico developed this highly productive system for food cultivation, as well as for urban expansion in the lacustrine environment. The Aztecs dramatically expanded the chinampa system during the period of their political dominance in the region (1325-1521).

CORENA – *Comisión de Recursos Naturales de la Secretaría del Medio Ambiente de la Ciudad de México* (Commission for Natural Resources of the Secretariat for the Environment of Mexico City).

Ejido – an area of communally held land, established following the 1910 Mexican Revolution via land redistribution to smallholders and indigenous farmers. *Ejido* members, called *ejidatarios*, were given rights to use land for individual cultivation, residential settlement, and communal use. In 1992, via an amendment to Article 27 of the Mexican Constitution, *ejidatarios* were given the option of obtaining individual title to their farm plots, ending the era of Agrarian Reform. The institution of the *ejido*, however, persists. There are 44 agrarian communities, including *ejidos* and indigenous *comunidades*, in Mexico City.

GDF – *Gobierno del Distrito Federal* (Government of the Federal District). As of January 29, 2016 officially known as the Government of Mexico City (GMC).

GMC – *Gobierno de la Ciudad de México* (Government of Mexico City), previously known as the Government of the Federal District (GDF).

Milpa – an indigenous crop-production system common throughout Mesoamerica that typically revolves around the cultivation of heirloom maize, poly-cropped with other crops such as beans and squash.

Multifunctional agriculture – (or agricultural multifunctionality) the idea that farming activities can serve multiple functions beyond the production of food and fiber, such as providing ecosystem services, and contributing to cultural identity and community building, among other functions.

Peri-urban zone – the outer edge of a city, or transition space between urban and rural areas, often characterized by mixed urban, natural, and agricultural land uses.

Pueblos Originarios – “original villages.” 291 pre-Hispanic, indigenous villages in the territory of Mexico City, some of which have been absorbed by the city’s expansion, and some of which continue as semi-rural villages in the Conservation Zone.

SC – *Suelo de Conservación* (Conservation Zone, literally “Conservation Soil”). The conservation zone in Mexico City encompasses 59% of the City’s territory, and was established in 1930 by presidential decree to protect the city’s watershed and promote aquifer recharge.

SEDEMA – *Secretaría del Medio Ambiente de la Ciudad de México* (Secretariat of the Environment of Mexico City).

SEDEREC – *Secretaría de Desarrollo Rural y Equidad para las Comunidades de la Ciudad de México* (Secretariat for Rural Development and Equity for Communities of Mexico City).

UPA – urban and peri-urban agriculture.

PREFACE

The fourth chapter of this work was co-authored, and has been accepted for publication. The co-authors have granted permission to include the text in this dissertation. My co-authors, and the publication details, are as follows:

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Chapter 1

INTRODUCTION

Problem Statement

For the last century, food and agricultural policy and development have been the purview of national governments. In the last decades, however, city governments across the Global North and South have adopted food and agriculture policies, mostly targeting urban and peri-urban agriculture (UPA) (Marsden & Sonnino, 2012). This shift may signal a change in the status quo, towards more subnational (local, regional) governance of food and agriculture. This shift is widely seen as positive for advancing sustainability ideals. Many have posited that in the absence of substantial policy action at the national level, local and regional food systems can promote alternative food systems values, such as support for family farms, short supply chains, community building, and environmentally-friendly farming practices (e.g., Friedmann, 1993; Koc, MacRae, & Desjardins, 2008; Lyson, 2004). Decentralized or local governance can make the policy process more responsive to the people, improve policy enforcement, and can create new political spaces in which more people, including those traditionally marginalized in political processes, can participate in shaping food system outcomes (Ballamingie & Walker, 2013; Wekerle, 2004; World Bank, 2007). Several scholars have highlighted that food and agriculture can be at the heart of synergistic policies to achieve multiple objectives at the local or regional level. This latter possibility is highly relevant to cities seeking to manage diverse sustainability challenges. For example, urban food policies can link agriculture with health, nutrition (e.g., Reynolds, 2009), food security (G. Lang

& Miao, 2013; Rocha & Lessa, 2009), livelihoods (Redwood, 2009), waste management, natural resources (Smit & Nasr, 1992), and climate change adaptation objectives (Lwasa et al., 2014). By facilitating and regulating UPA, urban governments could, in theory, maximize benefits across farmers, consumers, and the city as a whole, and mitigate risks associated with UPA (de Zeeuw, Van Veenhuizen, & Dubbeling, 2011). International development agencies have praised cities with policies for food and agriculture, calling them resilient, inclusive, and green (e.g., Food and Agriculture Organization (FAO), 2014a; World Bank, 2013).

Though urban governments may seem far removed from the rural communities where most food is produced, there are several reasons to pay attention to urban governance for food and agriculture. The majority of the global population now lives in cities. This means that food consumers are concentrated in urban areas, with important implications for the food system (Seto & Ramankutty, 2016). Food insecurity is now felt most acutely in cities, because most residents purchase rather than grow their food, and thus are more vulnerable to price fluctuations (FAO, 2011b). Urban consumers' needs, tastes, and ideals will influence food and land use policies, food markets, and farmers' decisions. Cities' spatial, economic, and political footprints go well beyond their official boundaries (Cronon, 1991; Young et al., 2006); they are teleconnected to distant processes and places through the effects of urbanization and land change (Seto et al., 2012). The political interests and values of urban voters—likely poorly informed about the social, economic, and environmental realities of rural life and primary production—may have an outsized affect on agrarian and rural populations, with implications for the food system. Since the early 1980s, urban governments have become more involved in

economic development (Harvey, 1989), and expanded their domains of governance into sustainability and climate change adaptation (Béal, 2011; Jonas & While, 2007).

Changes in urban governance for food and agriculture can be understood in the context of broader shifts in the food system. Critical scholarship on agriculture and development has examined changes in the structures and flows of international capital and power arrangements to identify major food regimes (McMichael, 2009). The first food regime (1870-1914) is associated with the colonial system. The second (1947-1973) is defined by the post-WWII paradigm of strong national agricultural development and regulation, modeled by the United States. In the late 1970s, economic instability led to weaker nation states, which strengthened transnational agro-food corporations in food system governance (Friedmann & McMichael, 1989; McMichael, 1992). In response to this and to the neoliberal reforms of the 1980s and 90s, many scholars advocated for food system relocation (e.g., Friedmann, 1993; Kloppenburg Jr., Hendrickson, & Stevenson, 1996; Lyson, 2004). Local food movements, policies and institutions have since proliferated across the global North and South, including in cities of all sizes (Ladner, 2011; Mougeot, 2000; W. Roberts, 2014; Sonnino, 2016). This trend may be part of a resistance movement against the dominant food regime, promoting food sovereignty, democracy, and multifunctionality (Harris, 2009; Laforge, Anderson, & McLachlan, 2016; McMichael, 2009, 2011; Pechlaner & Otero, 2008), or part of an emerging third food regime focused on consumer health, fair trade, and environmentalism (Friedmann, 2005).

As the number of local food movements has risen, however, another wave of critical scholars has questioned the extent to which they are alternative to the dominant

food system, and who gains and who loses in local food systems (e.g., P. Allen, 2004; Guthman, 2008; Hinrichs, 2003). Such scholars have argued that relocalization is one strategy among many, rather than an end goal, for food system sustainability (e.g., Born & Purcell, 2006). In recent case studies of *urban governance* for food and agriculture (e.g., L. K. Campbell, 2016; N. Cohen & Reynolds, 2014), scholars have applied an *urban* political economy framework, which explores the role of urbanization in the dynamic relationship among economic issues, government institutions, and the distribution of wealth and other benefits (Harvey, 1989). These studies have examined the political processes by and new political spaces in which urban and peri-urban agriculture arrive (or not) on the urban agenda.

For my dissertation research, I also chose to make a case study focused on urban governance of food and agriculture, to illuminate which actors were influential in shaping the food and agriculture agenda in the urban context, and why. I selected Mexico City as my study site because it is internationally recognized as a leader in food systems, sustainability, and climate change adaptation policy, and because it is a megalopolis that is mix of developed and developing worlds (Connolly, 2007), whose governance has been transformed in the last 30 years through the process of decentralization (Falleti, 2010).¹ A report by the FAO (2014a) on urban and peri-urban agriculture in Latin America named Mexico City the second greenest city in the region. It highlighted that the Government of Mexico City (GMC) had established the Secretariat for Rural

¹ Starting in the late 1980s, the city's government was restructured from federal management to autonomous rule. It held its first popular election for heads of government of the city in 1997. Since then, Mexico City's politics have been dominated by the left-leaning Party of Democratic Revolution (PRD), whereas national politics have been dominated by the centrist Institutional Revolutionary Party (PRI) since the 1920s.

Development and Equity for Communities (SEDEREC) in 2007, and passed legislation guaranteeing the right to food in 2009. Furthermore, the report suggested there was an active, dynamic network of government and civil society actors advancing food system policy, stating, “urban agriculture has been placed firmly on the policy agenda of the Federal District government through the efforts of SEDEREC, and *through initiatives of NGOs, neighbourhood assemblies, and youth groups*” (p. 28, emphasis added). A banner on the same page of the report reads “Civil society has made a significant contribution to popularizing agriculture in the city” (p. 28-29).

Mexico City’s population is diverse and highly segregated: elites live in the verdant neighborhoods in the west of the city; low income residents live in high-density neighborhoods to the north and east; and indigenous communities and *ejidos* are predominantly in the city’s protected watershed in the south of the city (the *Suelo de Conservación*; “Conservation Zone”). These spatial distinctions roughly correspond with distinct food stakeholder groups: high-end consumers, the urban food insecure (numbering over 1 million people), and indigenous smallholders, respectively. Each of these groups has unique food system interests and needs. I was interested in whether and how these groups negotiated their different interests in food-system and urban-development outcomes, and the extent to which national or international actors were also influencing city-level policies for food and agriculture.

A few weeks of preliminary fieldwork in July 2013 and March 2014 confirmed that diverse UPA activities were present, and that farmer and UPA organizations existed in Mexico City. I connected with a government functionary at the borough (*delegación*) level who introduced me to urban and peri-urban farmers, agrarian community leaders,

farmer organization representatives, and buyers of local produce. I talked to farmers about how they got started in farming, their ambitions, the advantages and disadvantages of farming in or near the city, and what government programs and market opportunities they had participated in. To build rapport, I avoided asking about power and politics. I felt I had enough information to proceed with investigating the network of actors that shaped Mexico City's celebrated agricultural policies.

When I returned to Mexico City for my extended fieldwork in June 2014, however, my interviews soon made it clear that I would not be able to even confirm the *existence* of a grassroots network active in food and agricultural governance in Mexico City. No government functionary, farmer, or activist could tell me *anything* about food system advocacy at the city level. No one could tell me with certainty what or who were the driving forces behind the establishment of SEDEREC or the city's food security law. I found no written documentation of the policy processes or actors that created them: only the laws themselves. The policy makers who might have had the answers to these questions denied any knowledge, were unavailable, or never responded to my requests for interviews. As far as I could tell, Mexico City's food and agricultural policies were created from the top-down. I concluded that city-level policy change for food and agriculture was not a priority, or even on the agenda of relevant civil society groups.

The better question for the case, then, was: why did the urban government adopt agricultural policies if there were no community groups advocating for this change? Who or what did the city government make its agricultural policies for? In my interviews and at rural development meetings, the food system issues of household and urban food security, farmers' livelihoods, and local, sustainable supply chains came up as policy

objectives. But, the issue that dominated discussion of agriculture in the city was the strong link between the fate of the city's watershed—which feeds the aquifer that supplies 60-70% of the city's water supply (Gobierno del Distrito Federal (GDF), 2012)—and the decline of peri-urban indigenous agriculture. On the topics of rural development, natural resource management, and conservation, I heard story after story from farmers of their distrust and frustration with the government, and vice-versa. Mexico City's agricultural policies were clearly about much more than promoting local, sustainable food systems. Farmers, their lands, and their water sources had been enmeshed in Mexico City's natural resource management for centuries. The historic and enduring tensions between Mexico City and the agrarian indigenous villages at its periphery contrast sharply with the international praise that Mexico City's agricultural policies have received, as well as with the broader discourses on the potential of urban governance for food and agriculture.

Aim and Scope

The aim of my research was to understand the politics of agriculture-urban interactions in sustainability governance; specifically, what benefits the urban government aimed to realize by extending governance to agriculture, how it managed agricultural activities, and how that governance affected farmers. To do so, I needed to understand agriculture's presence and purpose in urban space from the urban government's perspective, not just from a food systems perspective. The government created policies that promote change at the farm-level; but, the target population of a policy—in this case, farmers—is not necessarily the target beneficiary of that policy

(Ingram & Schneider, 1991; Tompkins & Eakin, 2012) . I also needed to understand how farmers have responded to the urban government's evolving demands from and expectations for them. Specifically, I asked:

- What functions of agriculture does the urban government manage for and prioritize? What tradeoffs does this prioritization present for urban sustainability food system sustainability, and food security?
- How has the urban government's framing of farmers in its policies evolved as the city has emerged as a political space for food and agriculture? How have farmers responded to the government's framing of them and their activities?
- How has the inclusion of agrarian activities and lands in the city's climate-change adaptation plan created obstacles and opportunities for farmers?

Overview of the Study

To answer these questions, I conducted fieldwork in Mexico City for nine months between June 2014 and June 2015, as a member of the interdisciplinary research team MEGADAPT (The Dynamics of Multi-Scalar Adaptation in the Megalopolis: Autonomous action, institutional change and social-hydrological risk in Mexico City), a collaboration between Arizona State University and the National Autonomous University of Mexico (UNAM). Data was collected through participant observation at farmer organization and community garden workdays and meetings; community, agricultural and conservation events; farmer trainings; local markets; and decision-making forums. I conducted informal and semi-structured interviews with government and agrarian actors (farmers, farmer organization representatives, agrarian community leaders). Following

my fieldwork, I did an in-depth analysis of government documents (laws, plans, reports) and budgets. The chapters that follow are each self-contained and provide the theoretical and contextual background and methods necessary for understanding the analysis and results, as well as the discussion and conclusions.

Chapter 2 establishes a baseline for understanding Mexico City's current policy priorities for agriculture. I examined the laws, reports, and programs pertinent to agricultural activities in the year 2014, as well as results from interviews with urban government agents to identify what functions of agriculture the GMC manages for and prioritizes, measured in terms of rhetoric, programs, and financing. The analysis revealed that despite its rhetoric about food security, the GMC manages agriculture primarily as an instrument for watershed conservation and ecosystem services provisioning, and dedicates the vast majority of its financial support for agriculture to farmers in the peri-urban zone.

In chapter 3, I analyzed frames and narratives about agriculture and farmers in policy documents dating from 1980 to 2015 to identify how the evolving discourse within existing power relations between the urban government and farmers has produced new identities for the government and the governed (farmers). The analysis shows how the narratives in policy documents have promoted an increasingly contradictory and idealistic vision of what agriculture in the city should be and do for the city. The documents framed *peri-urban* agriculture increasingly negatively over time, associating it with environmental degradation and economic problems. In contrast, the documents associated *urban* agriculture with positive outcomes for development and sustainability. Interviews with farmers and agrarian community representatives revealed that few

farmers are willing and able to fulfill the GMC's goals for the sector, and there is evidence that peri-urban farmers feel marginalized and neglected both economically and politically, despite the fact that the GMC has created new policies and institutions for the sector's development.

Chapter 4 examines the obstacles and opportunities that Mexico City's 2014-2020 Climate Action Plan—*El Programa de Acción Climática: Ciudad de México* (PACCM)—has created for farmers through the inclusion of 15 adaptive actions that target agrarian actors, activities and lands. Analysis of the Plan itself, as well as interviews with PACCM coordinators, government officials, and agrarian actors showed that the PACCM implicitly considers peri-urban farmers to be private providers of public adaptation benefits for the city, through measures intended to also benefit farmers. But, the Plan does not articulate how agrarian actors and lands fit into the city's larger vision for adaptation, nor does it adequately address the specific vulnerabilities and socio-economic dynamics shaping agrarian actors' decisions, which may undermine the government's climate change adaptation objectives.

The research results demonstrate that farms do not become instruments for urban sustainability, development and food security simply because the government creates policies for them. They illustrate several challenges that urban governments may face in extending their authority to agricultural actors, activities, and lands, particularly to established farmers at the city's periphery, as well as the challenges of attempting to manage farms and farmers for multiple objectives. The results highlight the importance of transparent policy objectives, and honest evaluation of how those objectives fit with

farmers' needs and interests, the need to cultivate genuine partnerships with farmers, and appropriately compensate farmers for the public benefits they provide.

Chapter 2

FOOD SECURITY OR URBAN SUSTAINABILITY?

THE AGENDA FOR AGRICULTURE IN MEXICO CITY

Introduction: Does Urban Policy for Agriculture do what we Think it Does?

As the global population has become more urban, food insecurity has become more of an urban problem. Scholars and urban governments have also recognized urban and peri-urban agriculture as a multifunctional activity that can contribute to urban sustainability and food system sustainability (de Zeeuw et al., 2011; Lovell, 2010; Zasada, 2011). A growing number of urban governments have adopted policies for urban and peri-urban agriculture (UPA). Though these are widely considered to be food policies, urban governments may actually manage UPA for economic, environmental, or other objectives unrelated to food. Moreover, we must question whether agriculture is the appropriate and/or most efficient instrument for meeting an urban government's non-food objectives, as well as the extent to which those objectives present synergies and/or tradeoffs for food security and food system sustainability in each context.

This chapter examines Mexico City's policies for agriculture in the broader context of its goals for urban development. The city is celebrated for its UPA policies and practices (FAO, 2014a; United Nations Educational, Scientific and Cultural Organization (UNESCO), 2016). I wanted to identify its objectives for managing agriculture, and the functions it has prioritized in UPA policy. I also wanted to know

how agriculture is integrated into the city's development goals, and examine the tradeoffs between urban sustainability and food security.

Literature Review: Food System Sustainability and Cities

Over half the global population now lives in cities, which presents new social, economic, and environmental challenges to the food system (Fraser, Mabee, & Figge, 2005; Godfray et al., 2010). Principle among these challenges is food insecurity.² Global hunger reached a historic level in 2009 (FAO, 2011b). Chronic food insecurity affects women, children, and the urban poor the most (FAO, 2011a). Food insecurity is particularly acute in cities because of, among other things, the challenges of food access: most residents purchase rather than grow their food, and thus are more vulnerable to price fluctuations. In cities, food insecurity can occur at the individual, household (M. J. Cohen & Garrett, 2009), as well as neighborhood and community levels (Winne, 2008). Moreover, urbanites have higher rates of diet-related diseases than residents of rural areas (Popkin, 1998). Food security is part of food system sustainability, which is concerned with improving all the elements, activities and outcomes related to food production, processing, distribution, preparation, and consumption, without compromising the economic, social, or environmental systems that now support current and will support future generations (HLPE, 2014). The phrase “food security” is used to mean different things. For the purposes of this chapter, two meanings of food security are relevant: 1) food security as related to hunger, and 2) food security as “a component of a

² The FAO (2014d) defines food security as “a situation that exists when all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life” (p. 50). The components of food security include food availability, accessibility, adequacy, and acceptability (Rocha, 2008).

community's developmental whole" (Mooney & Hunt, 2009, p. 469). For the purposes of this chapter, the former definition refers to individual and household food security, and the latter with community and citywide food security.

Today, most food production and distribution rests on the productivist ideals and practices championed in the Green Revolution (see Pingali, 2012). Productivism in agriculture prioritizes maximizing production through farm modernization to ensure national food self-sufficiency and/or to increase exports of cash crops for economic development (Wilson, 2007). To promote productivist ideals, rural development mechanisms have included access to credit, technology and improved inputs (high-yield seed varieties, irrigation, synthetic fertilizers, pesticides). Despite production gains since the 1960s, poverty, malnutrition and food insecurity have persisted (Pingali, 2012). Furthermore, the lack of appropriate policies around Green Revolution technologies resulted in significant environmental degradation, including soil degradation, chemical runoff, and inefficient water use (Altieri & Rosset, 1996; Pingali, 2012). These mixed outcomes—greater choice and quantity of foods for millions of people, but persistent food insecurity for many other millions, coupled with negative impacts on the environment, health, and social structures—presents a serious dilemma for the modern food system (T. Lang, Barling, & Caraher, 2009).

Because national governments have done little to respond to the complex challenges of the current food system, and because simpler, local food systems are seen as more sustainable, advocates for alternative food systems have pursued subnational policy change (P. Allen, 2004). As a result, cities have become new political spaces for food and agriculture (N. Cohen & Reynolds, 2014; Haysom, 2015; Morgan & Sonnino,

2010; Sonnino, 2016). Governments of major metropolises have adopted food policies and plans, including London (London Assembly Planning and Housing Committee, 2010), New York City (City of New York, 2011), and Beijing (Yang, Hao, Liu, & Cai, 2016). Some municipal governments (e.g., Toronto's, Los Angeles') are now identifying themselves as food system innovators or leaders (Sonnino, 2016). In some cases, the objective of subnational food policy—such as in cities—is to develop policy alternatives, which could be scaled up to higher levels of government (P. Allen, 2010; Barling, Lang, & Caraher, 2002; Harper, Shattuck, Holt-Giménez, Alkon, & Lambrick, 2009; Morgan, 2015; Mount, 2012; Sonnino, 2016; Wekerle, 2004).

Many municipal food policies and plans focus on urban and peri-urban agriculture (Sonnino, 2009). UPA, like rural agriculture, is recognized as serving—or having the potential to serve—many different functions beyond production (Table 2.1). In the academic literature, household food security is widely considered to be the central function of UPA, particularly in the developing world (e.g., Bryld, 2003; Koc, MacRae, Mougeot, & Welsh, 1999; Mkwambisi, Fraser, & Dougill, 2011). UPA has been shown to contribute to household food security by increasing dietary diversity and calorie availability, and can make the urban poor less vulnerable to increases in food prices. In some places, particularly African cities, UPA has also been found to contribute to household income (Zezza & Tasciotti, 2010). Some scholars have highlighted UPA's potential contribution to community and city-wide food security, positing that local food production can make residents less vulnerable to fluctuating oil prices and the eventuality of peak oil, because local production reduces the costs associated with food transportation (e.g., G. Lang & Miao, 2013). UPA can also be instrumental in achieving

urban objectives unrelated to food and agriculture (Mougeot, 2000; United Nations Human Settlements Programme, 2009; Zasada, 2011). For example, UPA can contribute to urban climate adaptation (e.g., Satterthwaite, Huq, Pelling, Reid, & Lankao, 2007), land-use planning (e.g., Aubry et al., 2012; Hollander, Pallagst, Schwarz, & Popper, 2009), and waste management (e.g., Smit & Nasr, 1992).

Table 2.1

Functions of UPA According to Academic Review Articles on UPA

UPA function	Definition	Examples & synonyms
Culture & community	The cultural traditions and knowledge inherent in UPA practice and food preparation. Access to rare ethnic foods (Lovell, 2010)	Tradition, identity, community building, gardening and nutrition education, recreation, public space
Ecological services	The environmental processes that UPA activities and agricultural land uses support (Lwasa et al., 2014)	Soil & water retention, biodiversity, genetic diversity, air quality, local climate regulation, CO ² sequestration, CO ² emissions reduction, green space, nutrient cycling, organic waste management, watershed management, food production
Economy	The ways UPA contributes to household, city, and regional economic development	Livelihoods, employment, business development, local economy, rural development
Food security	The ways UPA reduces hunger and/or improves food access at the household or community level, and contributes to a community's or city's developmental whole (Mooney & Hunt 2009)	Food access; food self-sufficiency; food sovereignty food that is locally produced & distributed
Health	The ways UPA contributes to improving physical and mental health	Nutrition; mitigating diet-related disease; mental health, therapy
Primary production	Production of primary goods: food, fiber, timber, ornamental crops through UPA activities	Food, fiber, ornamental production; food availability

Sources: (Bryld, 2003; de Zeeuw et al., 2011; FAO, 2011a; Lovell, 2010; Lwasa et al., 2014; Mougeot, 2000; Smit & Nasr, 1992; Zasada, 2011)

The meaning, beneficiaries, and operationalization of agricultural multifunctionality in policy are still unclear. Though the multifunctionality of rural agriculture has been widely debated in the European context (e.g., McMichael, 2011;

Renting et al., 2009; Wilson, 2007), there has been far less critical exploration of the multifunctionality of urban and peri-urban agriculture. A great deal of the existing literature on UPA takes an advocacy approach, rather than a critical approach (Tornaghi, 2014). There are at least three reasons for this. First, the urban-rural dichotomy is still pervasive in government, with the result that urban institutions either do not or are just beginning to address food and agriculture issues (Pothukuchi & Kaufman, 1999). Second, in cities, agriculture has to compete with higher-value land uses (Bryld, 2003). Urban planners and developers still widely consider agricultural landscapes to be areas for future urban development (Lovell, 2010). Third, most urban agriculture projects are small scale and generally are not as productive as rural agriculture (de Zeeuw et al., 2011; Lovell, 2010). Thus, UPA advocates have sought to justify agriculture in cities on the basis of the many functions it can serve in addition to production.

The multifunctional potential of agriculture has a political dimension, because certain functions may be more or less desired by different social groups and decision makers in different contexts and at different scales. The political dimension of agricultural multifunctionality is especially relevant in cities, where there are historical tensions between urban and agricultural interests, and because urban governments have limited experience managing food and agricultural issues (Marshall, Waldman, MacGregor, Mehta, & Randhawa, 2009; Pothukuchi & Kaufman, 1999). Few researchers have examined what functions urban governments actually manage UPA for, and for whose benefit. However, there is growing evidence that food is not the priority of many cities' UPA initiatives (Lohrberg, Licka, Scazzosi, & Timpe, 2016; Sonnino, 2016). While being supportive of UPA as a means to achieve non-food objectives may

enhance food system sustainability (Koc et al., 2008), it may also subordinate food system objectives to urban development objectives.

The goal of urban governments' agricultural policies is ambiguous: is it food security and food system sustainability, and/or urban sustainability? It is important to understand the goals of UPA policies, particularly when they are seen as models of food policy that could be scaled up to higher levels of government. Therefore, I have taken a more critical approach to UPA (following Tornaghi, 2014), focusing on its governance, to analyze the extent to which Mexico City's UPA policy is designed to attain urban sustainability, or food system sustainability and food security. I analyze the relative importance of different functions of UPA with respect to the city's development goals, and discuss synergies and tradeoffs between urban and food sustainability.

Background: Agriculture in Mexico City

The massive urbanization of Mexico City during the twentieth century has overshadowed the city's deep agrarian roots and tradition of small-scale agriculture. Mexico City is located in the Basin of Mexico, where people have practiced agriculture for at least 4000 years, cultivating endemic varieties of maize and other crops³ (Sanders, Parsons, & Santly, 1979). Indigenous farmers used diverse cultivation practices, including *milpas*, managed wetlands, and the celebrated *chinampa*⁴ system (Ezcurra,

³ The Basin of Mexico was also home to two of the largest Pre-Hispanic cities of the Americas: Teotihuacán (100 BC – 7th or 8th century AD) and the Aztec capital of Tenochtitlán (founded 1325). Both had state-managed agriculture (Sanders et al., 1979). Aztec agriculture was “once considered among the most productive agricultural systems in the world” (Hewitt de Alcántara, 1987, p. 198).

⁴ *Chinampas* are artificial islands constructed in the basin's shallow lakes, which are highly productive agricultural units (Torres Lima, Canabal Cristiani, & Burela Rueda, 1994). The earliest *chinampas* were constructed in the thirteenth century (Candiani, 2014). The vast majority of the historic *chinampa* zone has

1990; Losada Custardoy et al., 1998; Parsons, 2006; Torres Lima et al., 1994). After the Conquest (1521), the Spanish introduced extensive forms of agriculture, such as livestock grazing, on haciendas around the city's periphery (Gibson, 1964). These diverse forms of agriculture coexisted in the Basin until the twentieth century.

During the twentieth century, Mexico City grew dramatically to become a sprawling metropolitan area that, by 2010, was 787 times larger than the urbanized area in 1900, extending into the neighboring states of México and Hidalgo (Félix Guerra et al., 2012; Ward, 1990). In 2010, the metropolitan population exceeded 20 million people, 37 times its population in 1900 (Félix Guerra et al., 2012; McCaa, 2000). Mexico City proper is smaller, however, with an area of 1,485.49 km² and a population of nearly nine million (Table 2.2). The city has been described as a mix of developed and developing worlds (Connolly, 2007). Its social challenges include considerable poverty (28.4% of the city's population), a shortage of accessible and adequate housing (Pezzoli, 1998), food insecurity (11.7%), and overweightness and obesity (78.9% of adults; see Table 2.2). Of the city's 16 boroughs (*delegaciones*), the highest numbers of people who lack access to food—concentrating 51.2% of people facing this circumstance—are found in the urban boroughs of Iztapalapa, Gustavo A. Madero, and partially-urban Álvaro Obregón. However, extreme lack of access to food and extreme poverty (between 3-6.5%) is greatest in Iztapalapa, and the rural boroughs of Tláhuac and Milpa Alta (Ríos Bolívar & Elizondo Cano, 2016). Information on the social characteristics of people who are food insecure in Mexico City could not be found. Environmental challenges include air quality, fresh water supply, and controlling urban expansion (Connolly, 2007;

been urbanized. UNESCO (2016) recognized the remaining *chinampas* of Lake Xochimilco as a World Heritage site in 1987.

Sheinbaum Pardo, 2008). Today, the Government of Mexico City⁵ (GMC) aspires to “[consolidate] the presence and influence of Mexico City as the nucleus of a leading megalopolis in Latin America and the world... [and] an example of urban sustainability and innovation” (Gobierno del Distrito Federal (GDF), 2013, p. 153, author's translation). Agriculture in Mexico City proper declined dramatically over the twentieth century as urbanization increased (Cruz Rodríguez, 1995; Pensado Leglise, 2001). As part of the

Table 2.2

Socio-Economic and UPA Data for the Administrative Unit of Mexico City

Description	Data	Reference
Total area	1,485.49 km ²	SIAP, 2014a
GDP	2,204,492 million Mexican pesos (MXN)*; 17.1% of national GDP**	*SIAP, 2014a; **GDF 2013
Population	8,874,724 people; 7.4% of national population	SIAP, 2014a
Population living in poverty	2,502,500 people; 28.4% in 2014	Rios Bolivar & Cano, 2016
Population facing food insecurity	1,031,500 people; 11.7% in 2014	Rios Bolivar & Cano, 2016
Adults overweight and obese	78.8% in 2012	Barquera et al., 2013
Area of the SC	85,554 hectares (59% of city area)	GDF, 2012
Area planted in SC	17,607.73 ha (11.9%) in 2014	SIAP, 2014b
Productive units in SC	11,881	INEGI, 2009
Average parcel size	1.7 ha	INEGI, 2009
Agriculture as % of city's GDP	0.1%	SIAP, 2014a
Value of production	Over USD \$100,000,000	FAO, 2014a
Volume of production	Agriculture: 451,474 tons (96.4%) Livestock: 16,423 tons (3.6%)	SIAP, 2014a
Standout commercial crops	Nopal, poinsettia, cow's milk, pork meat	SIAP, 2014a
# Products	81 total. 50 food products, 21 ornamental	SIAP, 2014a
% Rain fed production	89.6%	SIAP, 2014a
Participants in primary sector	Estimates range from 16,000* to 35,000**	*Quintanar, 2014; ** SEDEREC, 2014
# Agrarian communities	44 <i>ejidos</i> & indigenous communities	GDF, 2015
# Agrarian subjects	22,500 people (<i>ejidatarios</i> & <i>comuneros</i>)	GDF, 2015

⁵ On January 29, 2016, the formal name for the administrative unit of Mexico City was changed from the *Distrito Federal*, or Federal District, to the *Ciudad de México*, or Mexico City. Thus, I refer to the city government as the Government of Mexico City; however, this administrative change is not reflected in the documents analyzed in this study, which still refer to the *Gobierno del Distrito Federal* (GDF).

response to the Mexican Revolution (1910-1920), President Lázaro Cárdenas (1934-40) redistributed over half of Mexico City's territory to *ejidos*, areas of communally held land, whose members—smallholder and/or indigenous farmers—were given rights to use the land for individual cultivation, residential settlement, and communal use. However, this redistribution coincided with growing demand for urban housing, which drove up land prices and led to the illegal sale and urbanization of *ejido* lands (Cruz Rodríguez, 1995; Davis, 1994).

The government intervened to slow urban expansion, not to conserve or support agriculture, but to protect the water and forest resources of the Basin of Mexico. Starting in the early twentieth century, the government established small conservation parks around the south of the city (Schteingart & Salazar, 2010). A consolidated conservation area, the *Suelo de Conservación* (SC, see Figure 2.1), was established in 1992 (Sheinbaum Pardo, 2008). The SC encompasses 59% of the city's area (85,554 hectares), essentially the southern half of the territory of Mexico City, comprised of agricultural land, forest, lacustrine ecosystems, and indigenous villages (*Pueblos Originarios*). Today, this watershed feeds the aquifer that supplies 60-70% of the city's water, making its protection vital for the city (Gobierno del Distrito Federal (GDF), 2012). The GMC seeks to protect the ecological services the SC provides, including aquifer recharge, air quality, carbon sequestration, biodiversity conservation, climate regulation, and agricultural production (GDF, 2012; 2013). Thirty-two percent of SC land is zoned for agricultural use (GDF, 2000). Some of this land has high aptitude for commercial agricultural production, principally in the boroughs of Tlalpan, Xochimilco, Milpa Alta,

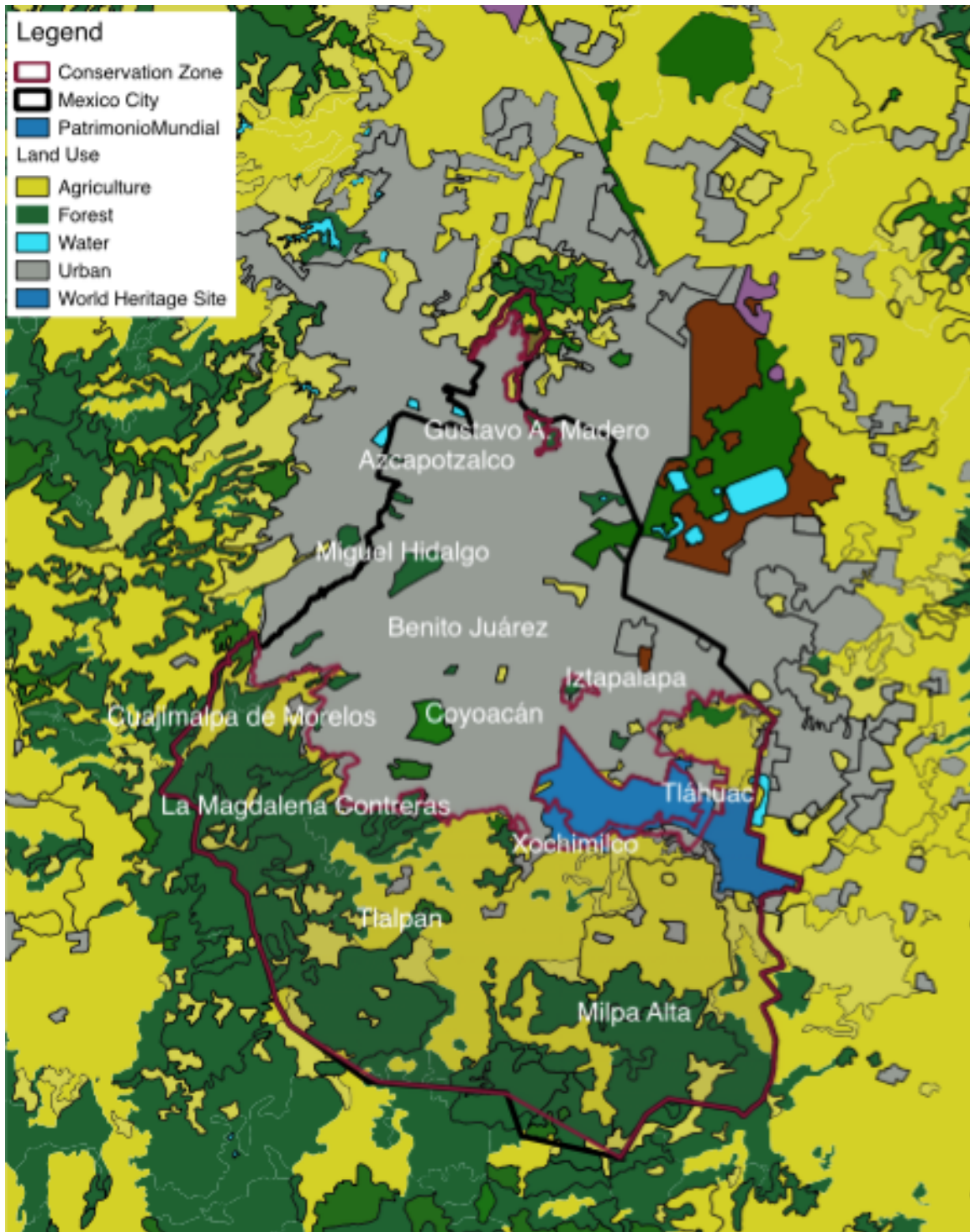


Figure 2.1. Map of Land Use in Mexico City (Data source: Instituto Nacional de Estadística y Geografía (INEGI), 2014)

and Tláhuac; however much of the land in the SC is suitable for subsistence agriculture at best (GDF, 2012, see pp. 50-51). The city's Secretariat for the Environment (SEDEMA) is responsible for managing and regulating SC land; however, 71% of the SC belongs to agrarian communities—*ejidos* and *Pueblos Originarios*—who share management responsibilities (GDF, 2012).

These same communities and farmers became implicated in watershed degradation when, in the 1960s, small-scale agriculture became less economically competitive. In response, farmers began transitioning to livestock grazing, or illegally selling or urbanizing their farmland (Cruz Rodriguez, 1995). The decline of farming and increase in urban expansion threatened the city's watershed. This led the GMC to initiate efforts to develop and modernize the city's agricultural sector under the productivist paradigm. In 1978, it established the Coordinating Commission for Agriculture and Livestock Development (*Comisión Coordinadora para el Desarrollo Agropecuario del Distrito Federal*, COCODADF) to distribute input packets, and provide technical assistance and training to farmers. In 1981, it partnered with the federal agricultural agency (SARH, now SAGARPA) to provide supports for machinery and labor (COCODADF 1984; Pensado Leglise, 2001). Agricultural land in Mexico City continued to decline by an average of 173 hectares per year from 1970 to 1997 (GDF, 2007). Between 1995 and 2014, area planted declined 33.9% (SIAP, 2014b).

In nearly four decades of direct agricultural management, the city has set policies for UPA that changed from emphasizing productivism to sustainable development. The city gained electoral independence in 1998, which triggered a shift toward environmental management under the liberal Party of the Democratic Revolution (PRD). In 2000,

SEDEMA established the Agricultural Council (now called the Council for Sustainable Rural Development, CDRSDF), which includes government officials, smallholders, and agrarian community representatives. While in the last decade alone, over 250 cities worldwide have set up institutions to advise on or govern urban food and agriculture policies (W. Roberts, 2014), to date, Mexico City is the only city to have established a formal agency to govern *rural* development: SEDEREC (Secretariat for Rural Development and Equity for Communities, *Secretaría de Desarrollo Rural y Equidad para las Comunidades*), created in 2007. Today, SEDEREC manages the CDRSDF. Yet, decisions for UPA and rural policy have been and continue to be top-down, with no input from agrarian actors in policy formation processes (Dieleman, 2016; Losada Custardoy, Rivera, Cortes, & Vieyra, 2011; Torres Lima, Rodríguez Sánchez, & García Uriza, 2000). Nevertheless, Mexico City has received praise for its urban food and agricultural initiatives. In 2014, the Food and Agriculture Organization (FAO) ranked Mexico City the second greenest city in Latin America for its diverse and innovative agricultural activities, institutions and programs, and promotion of organic practices (FAO, 2014a).

The numbers of farmers and hectares dedicated to agriculture in the territory of Mexico City have shrunk but persist,⁶ as do the city's *ejidos* (Table 2.2; SIAP, 2014a). It is estimated that the city's farmers still produce 20% of the city's food supply (FAO,

⁶ Others have described UPA in Mexico City today in detail (Arias Hernández, Canabal Cristiani, Barrera, & Hernández Mejía, 2004; Canabal Cristiani, 2000; Dieleman, 2016; Losada Custardoy, Bennett, Cortes, Vieyra, & Soriano, 2000; Losada Custardoy, Bennett, Soriano, Vieyra, & Cortés, 2000; Losada Custardoy, Cortes, Rivera, & Vargas, 2011; Losada Custardoy, Cortés Zorrilla, Rivera Martínez, & Losada Custardoy, 2006; Losada Custardoy et al., 1998; Losada Custardoy, Rivera, et al., 2011; Losada Custardoy, Vargas, Cortés, Luna, & Alemán, 2015; Losada Custardoy et al., 2001; Quintanar, 2014; SIAP, 2014a; Torres Lima et al., 1994; Torres Lima et al., 2000; Torres-Lima & Burns, 2002; Torres-Lima & Rodríguez-Sánchez, 2008).

2014a). Data on UPA activities in Mexico City are limited and incomplete. Estimates of the number of current practitioners range from 16,000 (Quintanar, 2014) to 35,000 (SEDEREC, 2014). Most practitioners belong to indigenous communities and ejidos, and farm on communal lands in the SC (Dieleman, 2016; Losada Custardoy et al., 1998). In the SC—which I define as the peri-urban zone—agriculture takes the forms of *chinampas*, *milpas*, greenhouses, agroforestry, livestock rearing, and aquaculture (SIAP, 2014). Agricultural parcels in the SC are overwhelmingly small scale (less than five hectares) (INEGI, 2009). Products include heirloom maize, nopal, maguey, forage oats, ornamental plants, and a variety of fruits, vegetables, and animal products (SIAP, 2014).

Mexico City does not have a strong tradition of *urban* agriculture (agricultural activities in the urbanized, built-up part of the city); most of the city’s residents access food by purchasing it in grocery stores, markets, or through subsidized food marketing (FAO, 2014a). It is not known how widely urban agriculture is practiced, nor how it is distributed spatially. Urban agriculture mostly takes the forms of community gardens and household gardens or greenhouses on rooftops and in backyards (GMC, 2015). These produce higher value fruits and vegetables (SEDEREC, 2014); there is also urban livestock rearing (Losada Custardoy et al., 2006). Because of the low profitability of urban and peri-urban farming activities, most farmers’ households earn their livelihoods primarily through employment in the urban economy, with agriculture as a secondary activity (Cruz Rodríguez, 2001; Losada Custardoy et al., 1998). Other key challenges include lack of access to credit, irrigation water, organic inputs, markets, and cultural differences between indigenous and urban communities (Dieleman, 2016; FAO, 2014a; GDF, 2013).

Methods

To understand the GMC's goals for agriculture, and the differential emphasis on certain functions of UPA, I applied text analysis (Bernard, 2011) to government documents and interviews with government functionaries, and analyzed the city's UPA programs. The government documents analyzed were the development plans, environmental and land use plans, laws, assessments, and annual reports that focused on urban development, environmental management, food and agriculture. The earliest documents were written in 2000 and the most recent in 2016 (Table 2.3).

In addition, I analyzed semi-structured interviews with eight urban government officials working at the city or borough levels on issues of agriculture, conservation, and rural development. Participants were selected based on information from government agency websites, contacts made at meetings and events on agriculture or rural development, and recommendations of other interviewees (snowball sample). Interviews lasted between one and two hours, and were audio-recorded. Participants discussed his/her understanding of the function of UPA in Mexico City, how rural actors interact with the government agency for which the participant worked, and their expectations for the future of agricultural lands and activities in the city. Notes from the interviews were analyzed with the support of MAXQDA 12 (VERBI GmbH, 2016). Direct quotes were transcribed from the respective audio recording.

I analyzed city-level programs for UPA to identify their objectives, target beneficiaries, mechanisms, funding amounts and funding source(s). I focused on the 19 programs available in 2014 through SEDEREC and SEDEMA. Although some of

Mexico City's boroughs have their own UPA programs, I did not analyze them because they only apply within borough boundaries.

Table 2.3

Documents analyzed

Document type	Document Title	Reference
General Development Plan	The General Development Program of the Federal District (<i>Programa General de Desarrollo del Distrito Federal 2013-2018</i> , PGDDF)	GDF, 2013
Sector Development Plan	Sector Program for Social Development with Equity and Inclusion 2013-2018 (<i>Programa Sectorial de Desarrollo Social con Equidad e Inclusión 2013-2018</i>)	GDF, 2014a
Land use plan (for SC)	Ecological Ordinance of the Federal District (<i>Ordenamiento Ecológico para el Distrito Federal</i> , 2000)	N/A
Environmental Plan	Green Plan Mexico City (<i>Plan Verde Ciudad de México</i> , 2007)	GDF, 2007
Environmental Plan	Climate Action Program Mexico City (<i>Programa de Acción Climática Ciudad de México 2014-2020</i>)	GDF, 2014b
Land use information (for SC)	Geographic Atlas of the Conservation Zone of the Federal District (<i>Atlas Geográfico del Suelo de Conservación del Distrito Federal</i>)	GDF, 2012
Food security assessment	Food Security and Nutrition Assessment in Mexico City (<i>Diagnóstico de la Seguridad Alimentaria y Nutricional en la Ciudad de México</i>)	Rios Bolivar & Cano, 2016
Annual report of operations	Tercer Informe de Gobierno del Distrito Federal (<i>Jefe de Gobierno</i>)	GDF, 2015
Annual report of operations	Secretariat for Rural Development and Equity for Communities (SEDEREC, <i>Secretaría de Desarrollo Rural y Equidad para las Comunidades</i> , 2014)	SEDEREC, 2014
Annual report of operations	Secretariat for the Environment (SEDEMA, <i>Secretaría del Medio Ambiente</i> , 2014)	SEDEMA, 2014
Law	Law for Environmental Protection of Land in the Federal District (<i>Ley Ambiental de Protección a la Tierra en el Distrito Federal</i>), 2000	N/A
Law	Environmental Norm NADF-002-RNAT-2002 (<i>Norma Ambiental NADF-002-RNAT-2002</i>), 2003	N/A
Law	Law for Food and Nutrition Security of the Federal District (<i>Ley de Seguridad Alimentaria y Nutricional del Distrito Federal</i>), 2009	N/A
Law	Law for Sustainable Agricultural and Rural Development of the Federal District (<i>Ley de Desarrollo Agropecuario Rural y Sustentable del Distrito Federal</i>), 2011	N/A
Law	Law for Climate Change Mitigation and Adaptation and Sustainable Development of the Federal District (<i>Ley de Mitigación y Adaptación al Cambio Climático y Desarrollo Sustentable para el Distrito Federal</i>), 2011	N/A
Law	Law for Economic Development of the Federal District (<i>Ley para el Desarrollo Económico del Distrito Federal</i>), 2014	N/A

I assessed the relative importance of each function of UPA (Table 2.1) by identifying how many GMC documents, programs, and interviewees explicitly associated UPA with each function, and how much funding was dedicated to programs that supported each function. If a data source mentioned a function (or one of its synonyms, e.g., column 2 of Table 2.1) at least once in relation to UPA activities, I considered it to be acknowledged by the respective source. I also coded for whether the source targeted urban and/or peri-urban agriculture, and emphasized food system and/or urban sustainability outcomes.

Using urban government documents, programs, budgets, and interviews as data sources made it possible to evaluate the government's prioritization of each UPA function more accurately than would be possible using just one kind of data. It allowed for the possibilities that differences in funding might reflect differences in expenses rather than in priorities (e.g., a tractor is more expensive than facilitating a workshop on vermicomposting), and that rhetoric might not be supported with actions or expenditures.

Results

Together, the sources analyzed show that the GMC acknowledges all six functions of UPA (Figure 2.2); however, the rhetoric of these sources suggests the GMC's programs and policies support much broader benefits than what they actually do. Clear priorities for certain functions emerged in our analysis: ecological services, primary production and economic development. Given that fewer programs and significantly fewer resources are dedicated to advancing the UPA functions of food security, health, and culture and community as compared to primary production, I infer that these

functions are not the GMC’s priorities for UPA, and that the GMC’s support for these functions is largely rhetorical. Given the high rates of obesity among Mexico City’s population, it is surprising that health is the lowest priority function of the GMC’s UPA policy. In the sources analyzed, the GMC describes UPA as contributing to both household and citywide food security, but its programs do so largely through food production, with few provisions to improve food access. This is reflected in the distribution of programs and funds, which overwhelmingly emphasize peri-urban agriculture, with only 2.5% of funding dedicated to urban agriculture (Table 2.4).

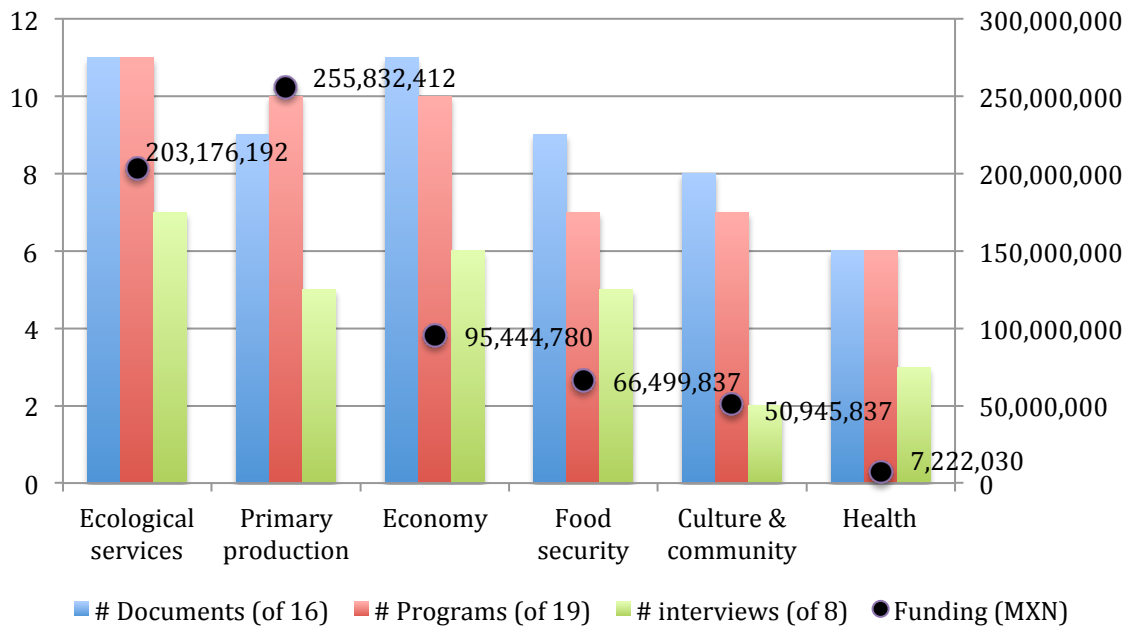


Figure 2.2 Functions of UPA as Supported by the Government of Mexico City. The secondary axis and data labels refer to funding in Mexican Pesos (MXN).

In the GMC’s General Development Plan (GDF, 2013) and 2015 annual report (GDF, 2015), UPA appears within various policy themes. Peri-urban agriculture is organized under the policy theme of sustainable economic development in the SC, and

social development, linked with the objective of inclusion and development of indigenous populations. Urban agriculture is organized under the theme of equity and social inclusion for human development, linked with the objectives of food security, nutrition, and education. The policy themes to which the GMC has explicitly linked UPA contrast with the priorities that emerged in my analysis of these and other documents—ecological services and primary production— with the exception of economic development (Figure 2.2).

Table 2.4

Policy Support for Urban vs. Peri-Urban Agriculture

	Total	Urban	Peri-urban (SC)
# Programs	19	6	13
Funding (MXN)	292,177,515	7,222,030 (2.5%)	284,955,484 (97.5%)
Associated with functions in documents reviewed (16 total)			
Ecological services	11	2	10
Primary production	9	3	9
Economy	11	3	8
Food security	9	6	6
Culture & community	8	3	7
Health	6	4	3

It is important to specify how the GMC defines the functions it has prioritized: ecological services, primary production, and economy. With ecological services, the GMC is looking to protect farmland (and other ecosystems, e.g., forests, grasslands, wetlands) in the peri-urban zone (the SC) that “provide environmental services necessary for maintaining the quality of life of the inhabitants of the Mexico City” (GDF, 2012, p. 10, author's translation). The ecological services the GMC highlights are water provisioning, air quality, biodiversity (including genetic diversity of native crops:

amaranth, maguey, nopal, with an emphasis on maize), climate regulation, soil and water retention, agricultural production, and recreation. With its support for primary production, the GMC refers to maintaining agricultural land use, and maintaining and/or increasing the production of food, timber, and ornamental crops (GDF, 2011; SEDEREC, 2014). With the UPA function of economy, the GMC sees primary production as a mechanism for economic development: increasing employment and improving livelihoods. The GMC sees increasing agricultural productivity, quality, and food processing technologies as mechanisms for economic development, especially in the SC, together with tourism and other types of primary production (e.g., aquaculture, agroforestry).

The city government sees these three priority functions as deeply interconnected in the peri-urban zone: improving the economic performance of primary production is strongly associated with preserving the ecological services that the SC provides. The reverse is also true: the low profitability of peri-urban agriculture is understood as an underlying cause of informal urban expansion in, and degradation of, the SC. The GMC recognizes the need to balance the ecological function of agricultural *land* for the *city*, and the economic function of agricultural *production* for the *farmers and indigenous communities* that manage the land. For example, the *Atlas Geográfico del Suelo de Conservación* (Geographic Atlas of the Conservation Zone, GDF, 2012, p. 46) states:

In terms of the viability and future of Mexico City, the maintenance of the integrity of the territory and resources of the *pueblos originarios* is not only a decisive issue for said pueblos, but also for the city as a whole. The *pueblos originarios* require their territory and its resources to subsist, but also, the city requires the integrity and sustainable management of the land and its resources of said pueblos to be viable. If the pueblos do not have the means to develop in equitable and just conditions, the conservation and sustainable resource use that Mexico City requires will not be possible. (Author's translation)

The GMC uses a productivist rural development lens to diagnose the problems of and solutions for peri-urban agriculture. For example, the General Development Program (GDF, 2013, p. 75) outlines the development potential of, and obstacles facing the *pueblos originarios* as follows:

The *pueblos originarios* that are situated in the conservation soil possess great natural and cultural richness, which generates great potential for development of alternative tourism, as well as the production of nopal, vegetables, forage oats, romerito, maize, ornamental flowers and amaranth. However, the profitability of these business activities has been null or low, owing to the difficulty for producers of obtaining credit, the lack of modern and adequate infrastructure for climatological events, the disconnection with markets and scarce technical assistance. (Author's translation).

In the same vein, SEDEREC—the city's rural development agency—seeks to address these challenges through a productivist mandate: to promote the profitability and productivity of the agricultural sector by providing access to credit, markets, and modern infrastructure. According to the productivist rural development model, these interventions will increase production, and through commercial sales will improve farmers' livelihoods and the regional economy. Rural development in Mexico City differs from the national standard, however, in that the relevant agencies (SEDEREC, SEDEMA, SAGARPA) provide training in agroecological practices, instead of promoting adoption of improved seeds and chemical inputs. SEDEREC frames its development activities in the newer discourse of economic and environmental sustainability, human rights and food security (SEDEREC, 2014, p. 23):

Promote actions to elevate the competitiveness of the agricultural and livestock sector, promoting a stable and dynamic economy that reconciles social development with environmental and economic sustainability, from a focus on equality of human rights, guaranteeing the right to food, through the support of food security. In this sense, it promotes training and rural extension... to promote the intensive cultivation of good agricultural practices, avoiding the use of agrochemicals and guaranteeing food safety. (Author's translation)

Nevertheless—and arguably in contradiction to its emphasis on production—the GMC sees ecological functions as far more important than the other benefits of agriculture: “Even when the agricultural aptitude [of the land] is high, the benefits that the inhabitants of the Valley of Mexico receive in terms of environmental services are far superior to the benefits they obtain from agricultural activities” (GDF, 2012, p. 50, authors’ translation).

The government functionaries interviewed also emphasized the importance of economic and ecological services provided by UPA (Figure 2.2). Several interviewees described agriculture as providing the land-use management function of urban containment: restraining urban expansion in the conservation zone where ecological services are produced. For example, a former high-level delegation official argued that while agriculture can contribute to household economy, it principally exists to slow urban expansion: “Structurally, yes, it [agriculture] has a function: to maintain these lands in that land use to continue containing urban expansion, on one side. On the other, it also helps sustain the families...” (author’s translation). Some even linked agricultural land use directly to aquifer recharge. A SEDEREC functionary stated:

Something that has not been valued as such, which we [in SEDEREC] almost have in our guidelines, is stopping urban expansion. The challenge is that people don’t sell [their land], but rather that they see the land as something that provides; that they feel that richness. And part of our function is to incentivize people to produce. The other part is sustainability. We have here the greatest aquifer recharge of the city... we need to conserve these farmlands so there is good filtration. (Author’s translation).

The GMC’s support for UPA as a household food security strategy is stronger in rhetoric than action. UPA activities are considered in the city’s food security evaluation as food production (not food access) (Ríos Bolívar & Elizondo Cano, 2016); but, UPA is not mentioned in the city’s food security law, nor is it included in the city’s official food security strategy (Secretaría de Desarrollo Social (SEDESOC), 2016). Yet, interviewees,

documents, and programs all say that UPA is a means to ensure citizens' constitutional right to food security. For example, the city's Social Development Plan (GDF, 2014a, p. 223) states:

Healthy food goes hand in hand with small-scale, sustainable urban agriculture, and the implementation of productive projects in backyards and on rooftops, as well as support for productive reconversion through organic production, agroecological practices, and subsistence, which can contribute to exercising the right to food and to a sustainable environment. (Authors' translation)

Four of the seven GMC programs that have the explicit goal of promoting food security are low-cost educational programs, which seek to spread knowledge of and skills for agroecological and intensive practices. But because property ownership is a basic eligibility criterion for SEDEREC UPA programs with tangible financial, infrastructural, machinery, or input supports (GDF, 2014c), most of Mexico City's urban poor are excluded from participating. The GMC has no programs to make land or gardening space available to people who do not own property and so lack the means to put this training to action. The closest it comes to providing access to cultivable space is a SEDEREC program for community greenhouses in large apartment complexes in the urban zone (See Appendix A: program 2. The program is funded in partnership with the Government of New Zealand). As of 2015, SEDEREC had established community greenhouses in only 24 of the city's 7,500 large apartment complexes (GMC, 2015; SEDEREC, 2014). People who are food insecure, but neither live in one of these 24 apartment complexes nor own land, are unlikely to have the means to produce their own food, unless they join one of the city's few privately organized community gardens. Access to land in the SC is likewise limited for those who do not already own or have access to property. Thus, the GMC's UPA policy can increase household food security

only for a select population: existing farmers, property owners, and residents of select housing complexes. It is unlikely that this select population is necessarily vulnerable to food insecurity, though this could not be confirmed, as data on the social characteristics of people suffering food insecurity in Mexico City could not be found. The GMC's emphasis on primary production could be interpreted as support for community or citywide food security; however the little support it dedicates to local commercialization (see Appendix A: programs 3.1, 5.2) does not support this interpretation.

Funding is another measure of the urban government's priorities, as it can help demonstrate the extent to which the government puts its rhetoric to action. The GMC has allocated 1% or less of its annual budget to SEDEREC since 2008 (Asamblea Legislativa del Distrito Federal (ALDF), n.d.; GDF, 2008a), which suggests that fulfilling SEDEREC's mandate for rural and agricultural development are not top priorities for the government. GMC funding for UPA is, however, complemented by Federal funding and grants from foreign governments; nearly 50% of SEDEREC's 2014 program budget was from external sources (SEDEREC, 2014). The federal agency SAGARPA provides over 80% of the funding for its joint program with SEDEREC (see Appendix A: program 1.4). This is why primary production is the most well-funded function of UPA; so it can be inferred that the level of support for primary production reflects the *federal* government's priorities.

To summarize: the analysis shows that the GMC recognizes all six of the general functions UPA is said to provide (Table 2.1). However, there is a mismatch between the *stated* objectives of Mexico City's UPA policies and programs and their *actual* objectives. The GMC's planning documents discuss UPA as a strategy for food security,

social development, and economic development. But programs, funding, and legal and operational documents indicate that the GMC prioritizes the functions of ecological services, economic development, and primary production. The strategy behind the GMC's UPA policy appears to be to increase the profitability of agricultural land uses through high value, higher volume production so that the land is not developed, and thus continues to provide essential ecosystem services to the urban area.

Discussion and Conclusion

The case of Mexico City shows that the functional importance of agriculture to urban managers may have little to do with the food system. Urban managers may see UPA as an instrument for achieving urban environmental, economic, and/or other objectives, but feel compelled to frame agricultural policies in terms of food systems and/or food security. It is therefore important to pay attention to what functions of UPA an urban government prioritizes, because the *stated* policy objectives and outcomes may not match the *actual* objectives and outcomes. Many urban governments do not consider local food production (relocalization) an end goal for urban food security, but rather, one of many strategies for enhancing the city's sustainability (Sonnino, 2016). If urban governments clarified their objectives for UPA in partnership with farmers, then 1) the city could incentivize the desired policy outcomes more efficiently, and 2) farmers could articulate what they are able and willing to contribute to urban objectives.

UPA can and does provide multiple benefits that can be felt across scales by different groups; but this requires asking the question of what agricultural functions are relevant to decision makers and social groups at different scales, in different contexts.

The outcomes of a food system “depend on the actors and agendas that are empowered by the particular social relations in a given food system” (Born & Purcell, 2006, p. 196). In cases like Belo Horizonte, London, and Toronto, where civil society actors were involved in developing municipal food strategies, food security and health were strong features of the resulting policies (Reynolds, 2009; Rocha & Lessa, 2009; Wekerle, 2004). Perhaps the UPA functions of food security, health, and community are valued and promoted more by civil society than by municipal governments. The case of Mexico City suggests that in urban contexts where civil society has fewer opportunities to contribute to policy formation, food security may not be prioritized in UPA policy.

The GMC does not ignore food security in its UPA policies, but it does not support food security as much as ecosystem services, economic development, and primary production. Certainly, primary production is one aspect of food security (availability); however, in the urban context, food *access* is a crucial concern (Rocha & Lessa, 2009). The GMC’s UPA policies do very little to improve food access for the city’s food-insecure population, because they do not provide space to grow food for people who do not own property. Perhaps the GMC does not see UPA as an effective way to address household food insecurity, or believes its other household food security initiatives, such as community kitchens and food subsidies (see SEDES0, 2016) are sufficient. But, if this is the case, why does the GMC claim that its UPA policies address food insecurity? Those who benefit from the GMC’s UPA policies are: 1) the people with the time, interest, and space to participate in agricultural activities for leisure and/or subsistence; 2) the farmers who are willing and able to grow and market products for high-end urban consumers, and 3) those willing and able to pay a premium for and/or

seek out local food. More broadly, UPA policies benefit the whole urban population because of the ecosystem services they support.

The GMC's current UPA policies indirectly support ecosystem services by providing minimal supports for farmers to develop or transition to commercial agricultural production. The city's UPA programs are, in many ways, environmentally-friendly versions of national productivist agriculture programs. They encourage small scale, agroecological, commercial agriculture, which is now considered a model for sustainable agriculture (e.g., FAO, 2014c; Gliessman, 2005). These policies could enhance food system sustainability; however, much of the agricultural land in the SC is not suitable for commercial production, and agriculture is, for many urban residents, not a competitive economic activity as compared to urban employment opportunities, as reflected by declining participation in the city's agricultural sector. If the GMC wants to ensure that agricultural lands in the SC provide ecosystem services, it should consider providing direct support for that outcome, such as expanding payments for ecosystem services. Policy mechanisms would likely be most effective if developed with farmers' and agrarian communities' participation, so that their needs and interests can be considered along with the GMC's.

The GMC's UPA policies are at best misleading, and at worst may be counterproductive. The GMC's rhetoric suggests that food security is being addressed by what is, in reality, a land-conservation policy that supports food production, but does very little to improve food access for the city's food insecure population. By maintaining a productivist rural development approach despite changing needs and expectations of both producers and consumers, and the consistent decline of the sector over several decades,

the GMC may ultimately contribute to the degradation of the ecological services on which the whole city depends. Furthermore, the GMC may be wasting the few resources it does invest in UPA because its objectives are obscured and the policy mechanisms it is using are indirect, and inefficient.

A case like Mexico City challenges our understanding of what constitutes food policy, and what it means to be a food-chain actor (Sonnino, 2009). From a post-productivist perspective, is all UPA policy necessarily food policy? To what extent will policy support for one UPA function lead to the incidental provision of other functions? Is linking agriculture to other policy issues a means to the end of advancing food system sustainability, or ensuring food security? Should Mexico City's UPA policies be adopted in other contexts or at higher levels of government? These are difficult questions. How decision makers and scholars answer them will influence what forms of agriculture flourish, who can practice agriculture, and where. Governments that create transparent policies and avoid unintentionally conflating one agenda with another can remove some of the barriers to solving problems like urban food insecurity and ecosystem-service provision.

There are few grounds on which to object to urban governments using agriculture as a means to advance their cities' development and/or sustainability agendas. But as food security and food system sustainability rest on agriculture, it makes little sense to minimize them when making policy. Mexico City could support UPA as a household food security measure, for example, by facilitating access to land or gardening space so that more residents can participate in UPA activities. It could help UPA contribute more to community and/or citywide food security by doing more to establish local channels for

commercialization. To achieve its ecosystem services objectives, it could provide more economic support to the individuals and communities who maintain the SC, which is essential to the city's long-term sustainability.

UPA is only as important to urban decision makers as the objectives to which they see UPA as instrumental, especially where policies are made from the top down.

Therefore, it is a mistake to assume that UPA policies automatically address food system sustainability or food insecurity, even if rhetoric suggests they do. Instead, development agencies, practitioners and researchers must understand what functions urban food policies actually support. Though inconsistencies in urban policies for UPA may lead to inefficiencies and missed opportunities, it is equally important to investigate what these inconsistencies indicate about urban governance for agricultural lands, activities, and actors, and the future of agricultural activities in and around cities.

Chapter 3

REPRESENTATIONS OF FARMERS AND AGRICULTURE IN MEXICO CITY'S POLICIES

Introduction

Cities have become new arenas for food and agriculture politics (N. Cohen & Reynolds, 2014; Morgan & Sonnino, 2010). Development agencies, sustainability activists, and researchers have lauded the incorporation of agricultural activities in cities as a trend advancing urban sustainability, food security, and food system sustainability objectives (e.g., FAO, 2014a; Mougeot, 2000; W. Roberts, 2014; Rocha & Lessa, 2009; Sonnino, 2016), including democracy, social justice, and community empowerment (McIvor & Hale, 2015; Seymoar, Ballantyne, & Pearson, 2010; Wekerle, 2004). In several cases, support from local government has been an important factor in the success of local food and agriculture initiatives (e.g., N. Cohen & Reynolds, 2014; Halloran & Magid, 2013; Rocha & Lessa, 2009). Local and alternative food politics, however, “can be sites of possibility and of domination,” (Laforge et al., 2016, p. 2). This dual nature of food politics emphasizes the need to better understand the power dynamics—specifically, how participating in food production creates the possibility for emancipation, while at the same time governance structures create new policies to control this phenomenon—in alternative political spaces such as cities (Ballamingie & Walker, 2013; L. K. Campbell, 2016; N. Cohen & Reynolds, 2014; Guthman, 2008).

To govern is to control the possible field of action of others (Foucault, 1982). Importantly, policies can only operate on governmentable subjects or populations

(Manuel-Navarrete & Pelling, 2015). Thus, part of policy-making is the construction of target populations. In this way, policies empower and legitimize certain actors, practices, and priorities, but they can also disempower and delegitimize certain actors and activities (Schneider & Ingram, 1993). Policies have a feed-forward effect, in which they shape and are shaped by existing institutions, cultures, and decision makers, and influence the behavior and self-understanding of the subjects and groups they target (Ingram, Schneider, & Delion, 2007; Mettler & Sorelle, 2014). In other words, policies both reflect and create reality. Thus, the extent to which urban policies provide opportunities for farmers is shaped in part by how these policies frame farmers and agriculture, and by the objectives or expectations they set for the sector.

Using the case of Mexico City, this chapter examines 1) how the urban government's construction of farmers as a population subjected to urban policies has evolved as the city has emerged as a new political space for agriculture, and 2) how farmers have responded to the city's construction of them and their activities as locally governable. Mexico City is a megalopolis internationally recognized for its Urban and Peri-Urban Agriculture (UPA) policies, as well as its indigenous agrarian traditions at the fringe of the city. I analyzed frames and narratives about agriculture and farmers in policy documents dating from 1980 to 2015 to identify how evolving discourses within existing power relations between the urban government and farmers have produced new identities for the government and the governed. Interviews with current urban and peri-urban farmers illuminated farmers' responses to the most recent phase of the government's efforts to place and inscribe them into certain relations of production and signification.

The analysis shows how the narratives about agriculture in urban government documents have framed peri-urban agriculture more negatively over time, associating it with environmental degradation and economic problems, but has at the same time promoted an increasingly contradictory and idealistic vision of what agriculture in the city should be and do for the city. Few actual farmers are willing and able to fulfill the city's policy goals for the sector, and there is evidence that peri-urban farmers feel marginalized and neglected both economically and politically, despite the fact that the urban government has created new policies and institutions for the sector's development. This may be in part because farmers are not necessarily the target audience for these narratives; the government may be using its agricultural policies to position itself as a sustainability leader to an international audience (Newton, 2005). The city's negative framing and idealistic vision of agriculture may ultimately be counterproductive for reversing the decades-long decline in peri-urban agriculture, which has serious implications for the conservation of the city's watershed.

In the last decades, city governments have increasingly become key players in globalization, environmental governance, and sustainability (Marcotullio & McGranahan, 2007). Through globalization and neoliberalization, power has become more distributed and decentralized (H. Campbell, 2009; McMichael, 1995). Coincidentally, sustainability became an influential framework for development and policy (Kates, Parris, & Leiserowitz, 2005; World Commission on Environment and Development (WCED), 1987). Global urbanization trends made cities seem like an obvious intervention point for advancing sustainable development (Department of Economic and Social Affairs (DESA), 2013; Lee, 2007; Sánchez-Rodríguez, 2008). The role of local government for

sustainable development and climate adaptation was formally recognized by the United Nation's (1992) Agenda 21. Sustainable development and climate initiatives have expanded the scope of urban authority from its traditional focus of providing and maintaining services (e.g., water delivery, waste removal) and order (e.g., security, land use planning). In modern cities, urban elites have promoted place-based economic growth (Logan & Molotch, 2007). Now urban governments are considered responsible for creating conditions for growth and innovation through "urban entrepreneurialism" (Harvey, 1989) and improving environmental quality and sustainability (Béal, 2011; Jonas & While, 2007).

The rise of urban agriculture and local food systems is part of the larger trends that have transformed urban governance. The alternative food movement gained momentum in the late 1980s, in response to the U.S. farm crisis, and in the early 1990s, with growing awareness of urban food insecurity (P. Allen, 2004; Winne, 2008). The movement, led by farmers, environmentalists, consumers, and researchers, rejected the conventional agricultural systems measures of success: high productivity and profits. Instead, it celebrated and promoted the small family farm, healthy communities, agroecological farming techniques and on-farm diversity, and short supply chains (Beus & Dunlap, 1990; Lyson, 2004). In cities, urban agriculture gained recognition (particularly from civil society and activist groups) as a potentially potent food security strategy when it contributed significantly to avoiding a food shortage in Havana, Cuba following the fall of the USSR (Altieri et al., 1999). The governments of several major cities, including New York, London, and Toronto, have now adopted food and/or agricultural policies (Sonnino, 2016).

Governing urban and peri-urban agriculture requires that cities create new ensembles of institutions, procedures, analyses, reflections, calculations and tactics that allow the implementation of policies targeted at emerging populations of urban farmers or at existing populations of peri-urban farmers, not previously subjected to urban government. The creation of this new form of governance is not trivial. Urban policies for food and agriculture may require shifts in agriculture-urban dynamics, both materially and symbolically. For the last century, many urban governments discouraged agricultural activities within city limits, and had a difficult, if not contentious relationship with farmers and agrarian communities in the urban periphery over natural resource management and allocation (A. Allen, 2003; Marshall et al., 2009; Pothukuchi & Kaufman, 1999). The population concentration and economic influence of cities can make for uneven power dynamics with rural actors and interests (Marshall et al., 2009; Tacoli, 2003). The trend of urban governments adopting institutions and policies for food and agriculture may indicate a new era in which farmers and cities can collaborate to realize mutually-beneficial outcomes for urban and food system sustainability. It also means city officials are learning to govern urban and peri-urban farmers; farmers, however, may or may not allow themselves to be governed by urban authorities. Mexico City has taken up this challenge by adopting UPA policies, and adapting them over time. To begin to assess the successes and failures of these endeavors, it is necessary to examine the content of urban policies.

Literature Review

Policy Narratives

From a constructivist perspective, policy is both symbolic and instrumental: it endows meaning to a situation or process, and prescribes strategic interventions to mitigate or resolve the problem (Stone, 2012; Yanow, 1996). Policies can be understood as stories composed of frames and narratives. Frames bound the system socially and geographically, and identify what actors, elements, interactions and functions of a system are important for realizing certain objectives or outcomes (Leach, Scoones, & Stirling, 2010). By deploying specific frames, actors seek to influence how others interpret a given situation or process (Benford & Snow, 2000; Hajer, 1995). A narrative weaves frames into a plot: it simplifies a complex issue by defining the problem, explaining how it emerged, and outlining what needs to be done to fix it. The significance of the narrative is derived from a normative argument, or moral of the story, that is woven into the narrative plot (F. Fischer, 2003). Thus, a policy idea is essentially an argument that favors a particular way of looking at a problem by developing a “shared understanding based on a set of normative and empirical beliefs” (F. Fischer, 2003, p. 60; Roe, 1994). Snow and Benford (1988) and Benford (1993) break down the narrative into three key framing tasks: diagnostic framing, which identifies the problem and assigns responsibility; prognostic framing, which proposes interventions or actions to fix the problem; and motivational framing, which develops consensus and mobilizes action.

Narratives often evolve as conditions change, or to respond to new narratives that challenge the dominant narrative (F. Fischer, 2003; Leach et al., 2010). Still, dominant policy narratives can persist even when there are contrary perspectives or practices

because they are embedded in institutions (Bausch et al., 2015; Mettler & Sorelle, 2014), or because they aid certain political interests, and fit the bureaucratic need for clear, “measurable manageability” (Leach et al., 2010, p. 131; see also Forsyth, 2003). However, clarity and simplicity are not necessarily the objective of policy narratives. Legislators can deploy ambiguous symbols as a strategy for placating both sides of a policy debate, facilitating compromise, or quelling resistance (F. Fischer, 2003; Stone, 2012).

An example of an enduring dominant policy narrative is that of agricultural productivism. During the Cold War era, the United States Government prescribed productivist agricultural practices to address the problem of hunger in “underdeveloped” countries. “Underdeveloped” countries were defined as those populated largely by peasants engaged in traditional agriculture, cut off from world markets. The framing of “underdeveloped” suggested a country was inferior, impoverished, and vulnerable to collapse from internal and external threats (Escobar, 1995). The fate of these countries became symbolic in the Cold War: the US Government feared that civil unrest, driven by population growth and hunger, could lead these countries to fall under Soviet influence. Fighting hunger thus became a key strategy for containing Soviet expansion. The U.S. and its allies launched the Green Revolution to maximize farm production by modernizing the traditional agricultural sector. This involved providing farmers with technology, training, credit, and improved inputs (hybrid seeds, synthetic fertilizers, irrigation, pesticides) (Baranski, 2015; Pingali, 2012). Modern, productivist agriculture—as measured through technology use, input use, and high yields—thus

became a symbol for progress, economic growth, and food security (Cullather, 2004; Scoones, 2005).

Though the Cold War is long over, the productivist narrative still dominates national and international rural development policies (evidence of its influence and endurance is that agriculture that uses productivist practices is now widely referred to as “conventional” agriculture). It has endured despite that productivist strategies have generated episodes of grain overproduction and commodity price collapse, increased environmental degradation and risk, lead to a dramatic reduction in the number of farmers, and have failed to eradicate food insecurity and malnutrition (Hardeman & Jochemsen, 2012; Manuel-Navarrete et al., 2009; Pingali, 2012; P. Roberts, 2008). However, as the economic, cultural, and environmental repercussions of productivist policies and practices have become more evident, some activists, scholars, and development agencies have sought to reform or replace productivist practices and values, and with them, an alternative paradigm of environmental sustainability, social equity, and community (P. Allen, 2004; Beus & Dunlap, 1990; Thompson & Scoones, 2009). This has led to a new appreciation for concepts and frameworks that had been at the margins of the productivist narrative for decades, such as agroecology (e.g., Altieri, 2002; Wilken, 1987), civic agriculture (Lyson, 2004), and regenerative agriculture (Sherwood & Uphoff, 2000). Local food movements, including local policies (such as urban policies), are considered instrumental for propelling alternative food practices and values forward, as national governments have in large part maintained a productivist (conventional) policy approach (Feagan, 2007; Kloppenburg Jr., Lezberg, DeMaster, Stevenson, & Hendrickson, 2000; Mount, 2012).

Policies Construct Their Target Populations

Policies not only define a problem and course of action, but also articulate, implicitly or explicitly, “which actors are empowered or disenfranchised” (Hall & White, 2008, p. 32). Policy designers often have several choices of who will be the target population for policy intervention. Who they choose is shaped by institutional factors, such as electoral conditions (Ingram & Schneider, 1991). Through narratives, policymakers socially construct the targeted individuals or groups (“target populations” or “subjects”) affected by policy intervention through normative and evaluative characterizations, essentially value-laden stereotypes (Schneider & Ingram, 2005). They position different actors and groups relative to government objectives by distributing benefits and burdens (Schneider & Ingram, 1993). In other words, a policy indicates, directly or indirectly, which actors are virtuous or dangerous, and which actions are rewarded or punished (F. Fischer, 2003). Groups with more power, who have positive social constructions (“advantaged groups” such as business leaders, veterans) tend to have more influence on legislative agendas and receive more beneficial policies than less powerful groups with more negative social constructions (“deviants” such as criminals, drug users) (Schneider & Ingram, 1993). The social constructions in policy narratives can be especially influential because they carry the weight of the authority of the state (Schneider & Ingram, 1997).

The social construction of a target population within a policy are intended to affect that population’s sense of identity and purpose, and sense of appropriate behavior (Foucault, 1982). However, messages about the target population embedded in policy

narratives “are also absorbed by the broader society that is the intended audience of this spectacle” (Newton, 2005, p. 166). Target populations, however, are not passive; they have agency to challenge or change their status (DiAlto, 2005; Pierce et al., 2014; Wolmer & Scoones, 2000).

While it serves a political purpose, social construction of target populations can be counterproductive for realizing policy objectives, for example, when a decision maker selects a less appropriate policy tool on the basis of the social construction of the target population. The decision maker may select a regulation rather than an incentive because the target population is considered undeserving, or an incentive rather than a regulation because the target population is considered powerful and beneficial (Schneider & Ingram, 1993). These decisions not only reflect on the target population, but also on those in power: they demonstrate how the dominant group frames itself, its interests, and others whom it sees as a threat to its continued power (DiAlto, 2005). Understanding the social construction of target populations in policy design “helps explain why public policy, which can have such a positive effect on society, sometimes—and often deliberately—fails in its nominal purposes, fails to solve important public problems, perpetuates injustice, fails to support democratic institutions, and produces an unequal citizenship” (Ingram et al., 2007, p. 93).

The social construction of farmers as a target population can be illustrated with the previous example of productivist agriculture. Rural development policies positioned farmers relative to national food security and economic development objectives, framing them as a dependent group needing state support to achieve household economic security. Under the productivist, modernist narrative, the state praised farmers who embraced the

newest technology, produced high yields of a single crop, and kept tidy fields, deeming them deserving of favorable policy tools (Scott, 1998). It has been shown that some farmers strive to meet these ideals (e.g., Burton, 2004; Egoz, Bowring, & Perkins, 2001). Farmers who were small-scale, resisted technology or produced many crops in a single field have been framed as backward, inefficient, or unviable, and become less likely to be prioritized in policy (Birner & Resnick, 2010; Cotter, 2003; Kay, 1997). These framings have served to empower large-scale, commercial farmers, and marginalize smallholders, traditional and indigenous farmers, and farmers who are less commercially oriented (Bebbington, 1999; Keleman, 2010). As reflected in alternative food narratives, framings of farmers have become more nuanced as different policy objectives, such as environmentalism, sustainability, local food security and food sovereignty have come into favor and different kinds of agriculture are considered more appropriate for meeting those objectives (P. Allen, 2004; Altieri, 2008; FAO, 2014b).

The ways these competing frames for agriculture are playing out are now especially visible in cities, where food consumers are concentrated, urban consumers seek to reconnect with the environment and their community through food (Mayes, 2014), alternative food activists use food production projects to “bring good food to others” (Guthman, 2008, p. 431), where food insecurity is felt most acutely (FAO, 2011b), and where urban governments attempt to respond to multiple sustainable development objectives under pressure from local, national, and international actors (Marcotullio & McGranahan, 2007; Satterthwaite, 1997). My analysis illustrates how these competing frames have emerged over time in Mexico City’s policies for food and

agriculture, and what they have meant for the social construction of farmers in and around the city.

Background

National Context

Throughout most of the twentieth century and up to the present, Mexico's national rural development policies have promoted farm modernization to increase yields in pursuit of national food security and economic development (Appendini, 1998; Eakin, 2006). Despite these policy priorities, Mexico's agricultural sector continues to be bimodal: large-scale, commercial farming and semi-subsistence small-scale farming exist together. The *ejido* system was established following the 1910 Mexican Revolution to redistribute farmland to smallholders. *Ejido* members, or *ejidatarios*, were granted usufruct rights to land for communal, cultivation and residential uses. Starting in the 1940s, the government's efforts to modernize the countryside through Green Revolution technologies was related to the desire to turn Mexico into a first-world economy, no longer dependent on farming for employment. Many of Mexico's smallholders (farming 5 hectares or less), however, were unable to adopt productivist practices because they did not have access to irrigation, had small, sloped parcels that were not conducive to mechanized management, and/or farmed parcels in microclimates in which hybrid seed varieties could not thrive (Gates, 1988).

With the neoliberal reforms of the 1980s followed by the North-American Free Trade Agreement (NAFTA) of 1994, the government shifted national agricultural policy to focus on market transactions for large-scale, commercial farmers (Appendini, 2014;

Eakin, Bausch, & Sweeney, 2014). Mexico's small-scale peasant farmers—*campesinos*—were no longer considered essential for national food security (Appendini, 2009; Eakin, 2006). These smallholders—71.6% of all productive units in Mexico today (Robles Berlanga, 2010)—primarily produce staple crops such as maize and beans for subsistence or semi-subsistence (SAGARPA, 2014), maintaining Mexico's rich diversity of heirloom varieties (Keleman, 2010; Nadal, 2006; Turrent Fernández, Wise, & Garvey, 2012). In 1992, the Mexican Constitution was revised to allow for the privatization of ejido land, ending the period of land reform (Cornelius & Myhre, 1998). Many of Mexico's smallholders and *ejidos* have persisted, contrary to expectations that they would abandon the primary sector, and privatize and/or urbanize their lands following the reform (Eakin, Perales, Appendini, & Sweeney, 2014; Robles Berlanga, 2010). Though *ejidos* have been resilient to several shocks, migration and urbanization could undermine their future (Barnes, 2009).

Politics and Agriculture in Mexico City

Agriculture in Mexico City has deep indigenous roots. In the Valley of Mexico, where Mexico City is located, people have been farming for at least 4000 years (Sanders et al., 1979). Urban agriculture was significant under Aztec rule (1325-1519): the celebrated chinampa⁷ farming system was a major food source for the city, as were

⁷ *Chinampas* are artificial islands constructed in the shallow lakes of the Basin of Mexico, starting in the thirteenth century (Candiani, 2014). Under Aztec rule, the chinampa system expanded dramatically for food production and urban expansion (Torres Lima et al., 1994). The chinampa cultivation system is celebrated for both its cultural significance and high productivity. Today, the Basin's lakes have almost completely been drained, and the vast majority of the chinampa area has been urbanized. The city's remaining chinampas are now in a protected area within the *Suelo de Conservación* (SC, Conservation Zone). UNESCO recognized the chinampa zone as a World Heritage Site in 1987 (UNESCO, 2016).

milpas and managed wetlands (Ezcurra, 1990; Losada Custardoy et al., 1998; Parsons, 2006; Torres Lima et al., 1994). Following the Spanish Conquest (1521), indigenous communities continued to farm the chinampas and lands surrounding Mexico City (Gibson, 1964).

Over the twentieth century, agricultural land around Mexico City became deeply entwined in the processes of urbanization (Cruz Rodríguez, 1995, 2008). Urban expansion in Mexico City began to accelerate toward the end of the 1800s. Starting in 1920, large areas of Mexico City—eventually over half its territory—were redistributed to indigenous communities to form *ejidos*. This drove up land values at a time when there was increasing competition for land for urban housing. Despite that ejido land is communally held, and at the time could not be sold or used for non-agrarian purposes, several of Mexico City’s 81 ejidos were illegally urbanized (Cruz Rodríguez, 1995). Between 1960 and 1970, the urban area increased 43%; between 1970 and 1980, it expanded another 35% (Ezcurra, Mazari-Hiriart, Pisanty, & Aguilar, 1999). Starting in the 1970s, the city’s expansion was greatest in its southern, rural boroughs—key areas for aquifer recharge—growing at an average annual rate of 6.1% between 1970 and 1997. Between 1990 and 2001, this meant an annual loss of approximately 300 hectares per year of conservation land, including farmland (Sánchez & Díaz-Polanco, 2011). As I explain in greater detail in the results, a water shortage and other environmental crises led the government to address watershed conservation and environmental management through new laws, agencies, and land use plans (Connolly, 2007). In 1992, the watershed was made into a protected area known as the Conservation Zone (SC, *Suelo de Conservación*) covering 59% of the city’s total area (Sheinbaum Pardo, 2008). The city

obtains 60-70% of its water supply from the aquifer that the watershed feeds, making its protection vital for the city (Gobierno del Distrito Federal (GDF), 2012).

Politically, Mexico City is a case study in decentralization. Prior to 1997, the President of Mexico appointed the city's mayor, and thus controlled the city's political representation. This meant that, like the rest of the country, Mexico City's politics were dominated by the centrist Institutional Revolutionary Party (PRI, *Partido Revolucionario Institucional*). A social movement demanding electoral independence for the city arose in response to the federal government's poor response to the 1985 earthquake. The movement eventually succeeded: in 1997, the city held the first direct election of its representatives. Since then, the city's government has been under the leadership of the left-leaning Party of the Democratic Revolution (PRD, *Partido de la Revolución Democrática*) (Falleti, 2010; Wright, 2004). The PRD's agenda includes environmental conservation, sustainable development, and human rights (Partido de la Revolución Democrática (PRD), 2015). The PRD has advanced this agenda by creating legislation and other institutions guaranteeing rights to water, housing, and food, as well as for climate change adaptation, environmental management, and rural development. Under PRD leadership, Mexico City has joined several international urban organizations for climate adaptation and sustainable development, such as C40 Cities and the Rockefeller Foundation's 100 Resilient Cities.

Today, Mexico City is a mix of developed and developing worlds (Connolly, 2007). It is the economic center of the nation, but its challenges include high poverty rates, affordable housing shortages, food insecurity, and obesity (see Table 2.2), water supply, and water distribution (Tortajada, 2008). By 2010, over 20 million people lived

in the metropolitan area, reaching into the neighboring states of México and Hidalgo (Félix Guerra et al., 2012). The urbanized area was 787 times as large in 2010 (Félix Guerra et al., 2012) as in 1900 (Ward, 1990). However, Mexico City proper is smaller, with a population of nearly nine million (Servicio de Información Agroalimentaria y Pesquera (SIAP), 2014a; see Table 2.2). Urban expansion in Mexico City has slowed since the 1990s (Aguilar, 2008), but the government still struggles to protect the SC from unplanned urbanization, which not only diminishes aquifer recharge, but also has implications for environmental quality, and quality of life in the city. The city’s water challenges have made watershed conservation increasingly important (GDF, 2012).

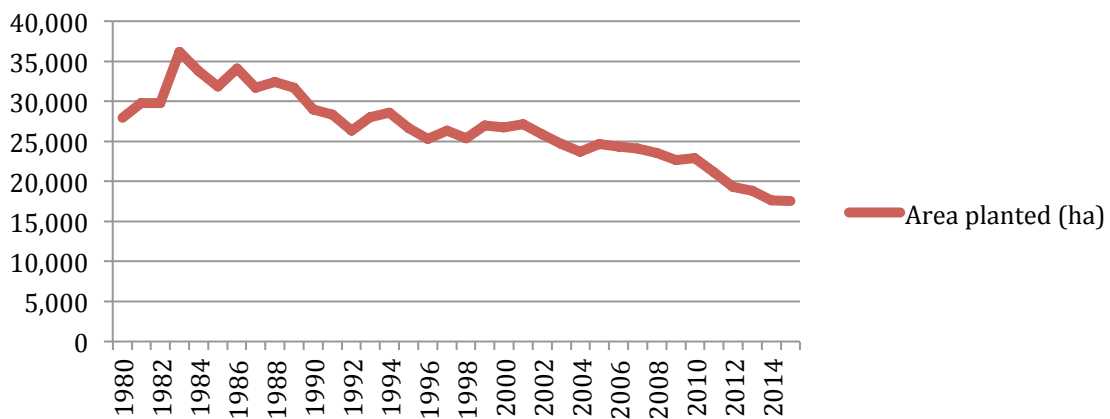


Figure 3.1. Area planted in Mexico City Over Period of Analysis (Data source: SIAP, 2015)

Despite a steady decline in the last quarter of the twentieth century, agriculture has persisted in Mexico City, with strong ties to indigenous culture and communities, and *ejidos* (Cruz Rodríguez, 1995; see Figure 3.1). The indigenous villages dating from pre-Hispanic and colonial times are now known as *pueblos originarios*, “original villages.” Sixty-four *pueblos originarios* are officially recognized (Gobierno del Distrito Federal

(GDF), 2013). Where there were once 81 ejidos in Mexico City (Cruz Rodríguez, 1995), there are 44 agrarian communities (*ejidos* and *comunidades*) today (Gobierno del Distrito Federal (GDF), 2015). In addition to agricultural activities, several of these agrarian and indigenous communities are involved in environmental conservation (Sánchez & Díaz-Polanco, 2011).

Today, most agriculture is practiced in the peri-urban zone (defined here as the SC), and still has strong ties with indigenous culture; most peri-urban farmers are affiliated with the city's agrarian and indigenous communities. Peri-urban farms are mostly small scale (5 hectares or less) and rain fed (see Table 2.2). Products include heirloom maize, nopal, maguey, forage oats, ornamental plants, fruits, vegetables, and animal products (SIAP, 2014). Mexico City has urban agriculture (Losada Custardoy et al., 1998; Quintanar, 2014), but not a strong tradition for its practice. It is not known how widely it is practiced, or how it is distributed spatially. Urban agriculture in Mexico City exists in the forms of community gardens, household gardens, greenhouses on rooftops or backyards, as well as backyard livestock rearing (Secretaría de Desarrollo Rural y Equidad para las Comunidades (SEDEREC), 2015). The low profits from agricultural activities have meant that most farming households earn most of their livelihood from urban employment, and practice agriculture as a hobby or secondary activity (Cruz Rodríguez, 2001). In what follows, I trace the urban government's policies for agriculture through these social, economic, environmental and political changes.

Methods

To identify and interpret Mexico City's policy narratives about farmers and agriculture, policy documents from the period of analysis were examined using qualitative text analysis (Bernard, 2011) with the support of MAXQDA 12 (VERBI GmbH, 2016). The period of analysis begins in 1977—the year the government began to formally create policies and institutions explicitly focused on rural and agricultural development in Mexico City—and ends in 2015, the year in which data was collected. The documents analyzed included urban development plans, reports, and laws pertinent to rural development and agricultural activities (Table 3.1). I used an inductive coding approach to identify themes about how the city perceives agriculture and its role in the city. I first read through the policy documents to identify diagnostic, prognostic, and motivational framing tasks (Benford, 1993; Snow & Benford, 1988) associated with agriculture in each source, and noted when and how the frames changed. Based on these observations, I identified three policy phases. To identify the government's social construction of farmers and agriculture within each phase, I noted implicit and explicit normative valuations of farmers and farming activities. I contextualize the results of the analysis with secondary data and academic literature.

To assess the impacts of the policy narratives, I complement the document analysis for phase three with results from semi-structured interviews with farmers and other agrarian actors that illustrate how farmers have responded to the city's most recent policy narrative and social construction of agriculture. I conducted interviews with 46 urban and peri-urban farmers, representatives of farmer organizations, and ejido leaders (Table 3.2). I define urban farmers as those who farm within the built-up, urbanized part of the

city, with no personal ties to *ejidos* or indigenous communities in the SC. I define peri-urban farmers as those who farm in the SC, who have personal ties to *ejidos* or indigenous communities in the SC. Participants were identified through a process of snowball sampling through contacts made at agricultural and rural development meetings and events. The majority of participants were from the heavily forested borough (*delegación*) of La Magdalena Contreras, which is a conservation hotspot because it contains the only remaining living river in Mexico City. These interviewees help illuminate the tensions and synergies around natural resource management, conservation, and agricultural activities. Fourteen interviewees were from other boroughs. Interviews lasted between one and four hours, and were audio recorded. The participants discussed their interactions with government officials and agencies, their perception of policy support for agriculture and farmers, and the challenges and opportunities facing farmers in Mexico City. As with the document analysis, I used MAXQDA 12 to inductively code notes from the interviews, focusing on the participants' identity, normative assessments of themselves or other farmers, how policy structures their decisions, their perceptions of power dynamics between agrarian actors and the government, and their sense of efficacy or agency. I then examined how these results compared with the social constructions and ideals promoted in the policy narratives. Direct quotes were transcribed from the audio recordings. The interview analysis helps illustrate what the government's social constructions of farming has meant for what farmers and farming activities are empowered by the ideals put forward at each stage, and what this implies for farmers participating in urban policy processes for domains such as natural resource management, environmental conservation, and local food systems.

Table 3.1

Policy Documents Analyzed

Document	Reference
Phase 1 (1977-1996)	
Urban development Plan: General Plan of the Director Plan, II strategic level (<i>Plan de Desarrollo Urbano, Plan general del plan director, II nivel estratégico</i>)	Departamento del Distrito Federal (DDF), 1980
The Coordination Commission for Agricultural and Livestock Development: Organization Manual (<i>Comisión Coordinadora para el Desarrollo Agropecuario del Distrito Federal: Manual de Organización</i>)	<i>Comisión Coordinadora para el Desarrollo Agropecuario del Distrito Federal</i> (COCODADF), 1984
Phase 2 (1997-2006)	
General Development Program of the Government of the Federal District 1998-2000: Work Program of the Government of the Federal District (<i>Programa General de Desarrollo del Gobierno del Distrito Federal 1998-2000: Programa de Trabajo del Gobierno del Distrito Federal</i>)	Gobierno del Distrito Federal (GDF), 1998
Program for Sustainable Rural Development of the D.F.: Program Synthesis (<i>Programa de Desarrollo Rural Sustentable del Distrito Federal: Síntesis Programática</i>)	Consejo de Desarrollo Rural Sustentable del Distrito Federal (CDRSDF), 1998
General Development Program of the Federal District 2000-2006 (<i>Programa General de Desarrollo Del Distrito Federal 2000-2006</i>)	GDF, 2001
Ecological Ordinance of the Federal District (<i>Ordenamiento Ecológico para el Distrito Federal</i>), 2000	OEDF, 2000
Law for Environmental Protection of Land in the Federal District (<i>Ley Ambiental de Protección a la Tierra en el Distrito Federal</i>), 2000	N/A
Environmental Norm NADF-002-RNAT-2002 (<i>Norma Ambiental NADF-002-RNAT-2002</i>), 2003	N/A
Phase 3 (2007-2015)	
General Development Program 2007-2012 (<i>Programa General de Desarrollo 2007-2012</i>)	GDF, 2007
Decree to reform, add and revoke diverse articles of the Organic Law of Public Administration of the Federal District (<i>Decreto por el que se reforman, adicionan y derogan diversos artículos del la Ley Orgánica de la Administración Pública del Distrito Federal</i>), 2007	N/A
Decree to issue the law for Sustainable Rural Development of the Federal District (<i>Decreto por el que se expide la ley de Desarrollo Rural Sustentable del Distrito Federal</i>) 2008	N/A
Activities Report: Secretariat for Rural Development and Equity for Communities (<i>Informe de Actividades: Secretaría de Desarrollo Rural y Equidad para las Comunidades</i>), 2008	SEDEREC, 2008
Law for Sustainable Agricultural and Rural Development of the Federal District (<i>Ley de Desarrollo Agropecuario Rural y Sustentable del Distrito Federal</i>), 2011	N/A
General Development Program of the Federal District 2013-2018 (<i>Programa General de Desarrollo del Distrito Federal 2013-2018</i>)	GDF, 2013
First Activities Report: SEDEREC (Primer Informe de Actividades: SEDEREC), 2012-2013	SEDEREC, 2013

Second Government Report: Secretariat for Rural Development and Equity for Communities 2013-2014 (<i>Segundo Informe de Gobierno: Secretaría de Desarrollo Rural y Equidad para las Comunidades 2013-2014</i>)	SEDEREC, 2014
Third Government Report: Secretariat for Rural Development and Equity for Communities (<i>3^{er} Informe de Gobierno: Secretaría de Desarrollo Rural y Equidad para las Comunidades</i>), 2015	SEDEREC, 2015

Table 3.2

*Summary of Interview Participants (N=46)**

Participant type	Number interviewed
Peri-urban farmer	29
Urban farmer	8
<i>Ejido</i> or indigenous community (<i>comunidad</i>) representative	8
Farmer organization representative	5

*Some participants fell into more than one of the categories in column 1 (e.g., he farms in both the urban and peri-urban zone, she is a farmer and an *ejido* leader), thus the sum of interviewees in this table exceeds the actual sum of interviewees.

Results

Since the 1970s, peri-urban agricultural actors, activities, and lands in Mexico City have been linked to concerns of environmental quality and environmental management, when the urban government began to actively manage its watershed, and agricultural activities within it. Agrarian communities (*ejidos* and indigenous communities) control 71% of the watershed in the SC (GDF, 2012), of which 32% is zoned for agricultural use (OEDF, 2000). The government has introduced several measures to preserve the SC, including rural development initiatives and regulations to prevent the urbanization of farmland. However, Mexico City's agricultural sector has continued to decline. Between 1960 and 2007, the number of farming units (a proxy of the number of farmers) fell 37% (Instituto Nacional de Estadística y Geografía (INEGI), 2009; Secretaría de Industria y Comercio, 1965). The largest decline in area planted occurred before 1970 (Cruz Rodríguez, 1995). Since then, the decline has continued, but

at a slower rate: between 1980 and 2015, area planted declined at an average rate of 1.15% per year. However, the rate of decline has increased since 2007 (SIAP, 2015; see Figure 3.1).

Over the period of analysis, the policy narrative for agriculture, and the social construction of peri-urban agriculture and farmers has become increasingly nuanced, negative, and contradictory, unfolding over three distinct phases (Table 3.3), which I describe in greater detail below. In the first phase (1977-1996), the policy narrative revolved around productivist rural development to increase production and profits from agricultural activities in the watershed as part of watershed protection and conservation efforts. In the second phase (1997-2006), the government prioritized sustainable development and environmental quality of the watershed. It framed peri-urban agricultural activities as a source of contamination via agrochemical use and urbanization of farmland, and a threat to urban quality of life, necessitating both development and regulation. In the third phase (2007-present), the government added food security as a policy priority, while maintaining its efforts in sustainable development and environmental quality. It framed peri-urban agriculture as vulnerable, backward, and a threat to environmental services for the city, and peri-urban farmers as impoverished, disconnected, and ignorant about agriculture's impact on the environment. During phase three, the urban government recognized urban agriculture for the first time. In contrast to its negative framing of peri-urban agriculture, it positively framed urban agriculture as contributing to multiple sustainable development objectives at the individual level and for the city at large.

Interviews with farmers and agrarian community representatives, together with the decades-long decline of the agricultural sector, suggest that the city’s efforts have done little to improve agriculture’s economic performance or political standing in Mexico City. Many participants embraced the city’s development and environmental objectives, but were unable or unwilling to fulfill all aspects of the city’s goals and ideals for the sector. *Ejido* and *comunidad* representatives also framed agriculture negatively in the context of their new objectives for conservation and agrotourism. In what follows, I elaborate on these results and explore their implications for agriculture-urban dynamics, and for achieving sustainability, natural resource management, and other policy objectives.

Table 3.3

Results Summary: Framing Tasks Over the Three Phases

Phase	1977- 1996	1997-2006	2007-2015
Diagnostic framing	Peri-urban agriculture is unprofitable and backward, being abandoned at high rates	Peri-urban agriculture is unprofitable; urbanization threatens farmland; farm abandonment & inappropriate farm practices threaten environmental quality; indigenous heritage is declining with implications for environmental quality	Peri-urban agriculture is unprofitable, backward, vulnerable, & marginal; farm abandonment and farm practices threaten environmental quality, indigenous heritage is declining, threatens environmental quality. Urban agriculture contributes to individual well-being & city’s sustainability
Prognostic framing	Maintain peri-urban agricultural land use; provide govt. programs to generate highly profitable agricultural activity that includes agro- industrial companies, services, inputs distribution, commercialization	Maintain peri-urban agricultural land use; provide govt. programs to generate highly profitable agricultural activity; promote organic/ agroecological practices; regulate farming practices and land use activities.	Peri-urban: maintain agricultural land use. Provide govt. programs to generate highly profitable agricultural activity; promote organic/ agroecological practices; regulate farming practices and land use activities. Urban: Provide govt. programs to promote wider practice of urban agriculture

Motivational framing	Protect environmental equilibrium of the watershed; rural development	Conserve environmental quality, natural ecosystems, natural resources, & environmental services of the watershed; no change in land use; conserve indigenous identity and tradition; sustainable development	Conserve environmental quality, natural ecosystems, natural resources, & environmental services of the watershed; conserve indigenous tradition; promote sustainable rural development; enhance urban sustainability, food security, food safety, local food systems
Social construction of farmers & agriculture	Traditional, low yield, unprofitable	Low-yield, unprofitable, uses inappropriate technologies; weak-link in realizing watershed conservation objectives, threat to urban well-being; is land manager through indigenous identity, values traditions	Peri-urban: Unprofitable, unsustainable, impoverished, vulnerable, disconnected from markets, technology and credit, ignorant about farming and its impact on the environment, undermining environmental services for the city; a strategy for natural resource management, genetic diversity conservation, & household livelihoods. Urban: a strategy for improving health, food security, education, employment, & community of vulnerable urban populations, urban greening, slowing urban expansion; enhances urban sustainability.
Characterization of the ideal farmer & farming practices	Modern, productive, profitable; serve as land buffer between urban area and watershed, provide aquifer recharge	Productive, profitable, environmentally benign, uses modern technology and agroecological/organic practices; maintains indigenous tradition of land management	Peri-urban: environmental steward, indigenous-identifying, profitable, productive, uses modern technology to organically farm high-value crops or ecologically-valued native crops, sells locally. Urban: socially marginal actor using agriculture to improve food security, health, income, & environment.
Average rate of change in area planted*	-0.08%	-0.46%	-3.83%

*Author's calculations based on data from SIAP, 2015.

Phase 1: 1977-1996

In the late 1970s, the city faced several environmental crises: declining air quality, a tree disease afflicting the city's forests, and a pending water supply crisis, amidst

population growth and declining water resources (Connolly, 2007; Ezcurra et al., 1999; Schteingart & Salazar, 2010). Mexico City's peri-urban farmers, who had been neglected over much of the twentieth century, first became policy targets of the urban government when the administration (under federal control under the PRI) linked the economic performance of agriculture with watershed protection (Pensado Leglise, 2001). The government created a new agricultural development commission, which offered Mexico City's farmers national productivist development programs, and involved agrarian communities in natural resource management. The government included agricultural lands in the watershed conservation area (which later became the SC), formally assigning it the functions of aquifer recharge within the conservation area, and land buffer between the city and the forest, for the benefit of the city. This phase puts forward the most neutral framing of agriculture over the period of analysis: the documents from this phase do not explicitly diagnose a specific problem, normatively frame or even describe agriculture; they do not mention farmers, indigenous people, or agrarian communities. They do, however, explicitly state the government's goals for agricultural development: high profitability and modernization. The implication is that traditional agriculture was not profitable or productive, and therefore problematic for the city's conservation objectives; but, by modernizing their operations, farmers could contribute more to realizing the government's watershed conservation objectives.

This phase began when the government created the Coordination Commission for Agricultural and Livestock Development (COCODADF, *Comisión de Coordinación para el Desarrollo Agropecuario*), "to generate agricultural and livestock activity of high profitability, through an integrated strategy that includes agroindustrial companies, and of

services, inputs distribution and commercialization” (COCODADF, 1984, p. 6; author’s translation). COCODADF’s creation coincided with other major responses to the city’s air quality, forest, and water supply crises. Soon after, in 1980, COCODADF partnered with the federal agricultural agency, SARH (*Secretaría de Agricultura y Recursos Hidrológicos*, later SAGARPA). SARH applied the same productivist approach to agricultural development as it had in the rest of the country, supplying Mexico City’s farmers with fertilizers, farm machinery, and technical assistance (COCODADF, 1984; Pensado Leglise, 2001). It encouraged increased productivity by, for example, creating a presidential award for high productivity of maize in 1981 (COCODADF, 1984). Nationally, the 1970s and early ‘80s were the peak years in which the government tried to spread hybrid maize technology to smallholders (Eakin, 2006; Redclift, 1983). What made Mexico City’s policies unique from the national policies was that it was married with the local agenda for conservation.

The PRI government also tapped the city’s agrarian lands and communities for natural resource management and watershed protection. In 1978, planners first proposed a conservation area to protect the watershed, essentially the southern half of the city’s territory, comprised of forests, wetlands, farmland, and indigenous villages (Sheinbaum Pardo, 2008). In the city’s 1980 land use plan, agricultural lands were characterized as a “cushion” (*área amortiguamiento*) or buffer zone between the conservation area and urban expansion. The plan stated a preference for intensive, specialized agricultural activities—with no mention of traditional agriculture or subsistence agriculture—on appropriate lands in the buffer zone: “It [the Plan] establishes agricultural and livestock use preferentially on the lands of high agricultural capacity: it will be the intensive and

specialized type [of agriculture]” (DDF, 1980, p. 28, author’s translation). Agricultural lands also constituted a significant portion of the conservation zone in the boroughs of Milpa Alta, Tláhuac, and Xochimilco. In 1981, COCODADF partnered with SARH to provide supports for infrastructure for natural resource management “to attend to ecological aspects [of the high mountain forests of the SC]” (COCODADF, 1984, p.7, author’s translation). The conservation area first proposed in 1978 was officially established in 1992, called the *Suelo de Conservación* (SC, Conservation Zone) (Sheinbaum Pardo, 2008). Seventy-one percent of this land is in the hands of the city’s *ejidos* and indigenous communities (*Pueblos Originarios*), who share management responsibilities with the urban government.

Phase 2: 1997-2006

During phase one, the PRI government used productivist development mechanisms to promote increased production and profitability in the city’s peri-urban agricultural sector, as part of its efforts to protect the city’s watershed. The shift to phase two began with the left-leaning PRD’s rise to power in Mexico City’s first elections in 1997. In parallel with global recognition of the role of cities in advancing sustainable development, Mexico City’s new PRD administration made sustainable development, watershed conservation and environmental services the focus of the city’s rural policies. It treated farms as instruments for urban wellbeing via the provision of environmental services. Though it continued to promote increased production and profitability of agriculture, it expressed greater ambivalence about farming activities, as it prioritized environmental *quality*. It framed peri-urban agriculture as a weak link in achieving that

objective, requiring regulation and public investment for its development. The government thus defined the farming practices that it saw as compatible with the city's environmental objectives as agroecological and organic practices, and regulated against the conventional practices promoted in phase one, such as agrochemical use. Most farmers were affiliated with agrarian and indigenous communities, and the government began to frame ecosystem management as an aspect of indigenous heritage. Essentially, these conflicting framings asserted that on one hand, farmers contaminated the environment through their conventional practices, but on the other hand, environmental stewardship was part of farmers' indigenous identity, values, and traditions, which needed to be preserved. The ideal for agriculture came to be framed in terms of both productivism and environmental quality: farming was to be not only productive and profitable, but also environmentally benign through the use of modern technology, and agroecological or organic practices.

The PRD administration embraced the city's new political autonomy from the federal government, and acknowledged the city's growing political significance in a decentralized world. Through international partnerships with other national and municipal governments, local and multilateral authorities (i.e., the European Union, United Nations, the World Bank, and others), it sought to "Consolidate [the city] as a progressive political reference of global stature... We will carry out this project, based on social justice, participatory democracy, and administrative efficiency and transparency, beyond national borders" (GDF, 2001, p. 57; author's translation).

Within its boundaries, the PRD government cited environmental services, and threats to their provisioning, as the motivation for rural policy action, and began framing

the importance of the SC in terms of the environmental services it provides for the city. It describes the SC as the “greenbelt of the city” which “offers diverse environmental services: the capture of carbon particles, climate regulation, aquifer recharge, the maintenance of springs, rivers, and lakes, and the conservation of flora and fauna species, some of them endemic” (GDF, 2001, p. 64, author’s translation).

The new administration described nested threats to its environmental objectives. It framed institutional limitations and political neglect under Federal PRI rule as indirect drivers of environmental degradation because it did not correct what it framed as the direct driver: agriculture’s continued low profits. The new administration also cited the PRI’s lack of integrated vision for rural development as a problem: “Rural development lacked an integrated vision between agricultural and livestock activities, and the conservation and restoration of natural resources, which has led to competition between both activities, and the deterioration of both” (GDF, 2001, p. 65; author’s translation).

The government framed agricultural abandonment, resulting from low profits, as a direct threat to environmental quality and urban wellbeing (OEDF, 2000, p. 18-19):

With respect to the SC, the principle threats to environmental quality are associated with change in land cover (for example, from agricultural use to urban use)... This change in land cover is due, in part, to the transformations of the socioeconomic dynamic of the SC. The primary sector has been slowly diminishing in importance in the region, owing to an ever-larger proportion of inhabitants dedicated to activities in the tertiary [service] sector. This has resulted in the abandonment of agricultural lands, which has facilitated their invasion and division for urban development. (Author’s translation)

The PRD administration also defined the agricultural *practices* that it saw as compatible with its new environmental objectives, citing “agricultural activities with inappropriate technologies” as a driver of environmental decline (CDRSDF, 1998, p. 12, author’s translation). It introduced regulatory policies— The Ecological Ordinance

(OEDF, 2000) and Environmental Norm NADF-002-RNAT-2002 (2003)—to promote agroecological and organic farming practices and regulate against conventional practices (i.e., pesticide use, synthetic fertilizer use, transgenic seed use), in the interest of protecting, conserving, and restoring SC ecosystems, natural resources, and biodiversity. The Ecological Ordinance also zoned SC land based on maximizing environmental services and productive capacity, and established guidelines for agricultural, livestock, and forestry management.

Although the PRD leaders blamed environmental degradation in part on institutional neglect under the PRI, they carried forward many of the PRI's strategies for addressing these challenges, including promoting agricultural development via industrialization and commercialization (GDF, 1998, p.49):

It is not possible to leave rural development to the forces of the market, and this is especially true in the case of the Federal District, given that no legal agricultural product can compete with the value of urban land. The government of the Federal District will intervene directly to compensate for these faults, promoting agricultural activities and discouraging urban construction in these areas, at the same time assigning all types of resources in ways that encourage sustainable forms of land use... It will give support, promotion, and advantage primary and agroindustrial production and productivity, particularly with credit for production and commercialization of agricultural and animal products, and at the same time generate employment. (Author's translation)

In contrast with its framing of agricultural activities as a source of environmental contamination, the government began to invoke indigenous tradition and identity in promoting environmental management activities: "support rural communities in recuperating their organizational forms, traditions, and values, strengthening their identity and territorial responsibility" (CDRSDF, 1998, p.15, author's translation). It cited subsistence agriculture as a justification for conserving the SC (OEDF, 2000), though it

did not provide explicit support for subsistence agriculture (in rhetoric or action) until phase three.

Phase 3: 2007-2015

In the third phase, the government's framing of agriculture became more complex as it recognized more categories of farmers, and saw agriculture as providing additional functions for the city related to *urban* sustainable development and food security. This complexity illustrates the government's deepening ambivalence about farmers and agriculture's presence in the city. It continued to promote productivism and environmentalism, adopted the objective of food security, and promoted a local food system with shorter supply chains of high value produce. In contrast with the previous phases, the government discussed not just the activity of farming, but the farmers themselves. For the first time, it promoted urban agriculture, and legitimized subsistence farming. Through these changes, the government made agriculture relevant to the broader urban population. But, it framed certain agricultural actors and activities as either a *source* of urban vulnerability or a *strategy for mitigating* urban vulnerability, at times in contradictory ways. On one hand, the government's narrative about peri-urban agriculture elevated traditional, indigenous farms in the SC as spaces to preserve for the environmental services they provide. On the other hand, the farmers who maintain these farms were negatively framed as vulnerable, backward, and impoverished; disconnected from markets, technology and credit; and a source of environmental contamination. The ideal farmer in the SC during this phase was narrowly characterized as an indigenous-identifying environmental steward who is also an entrepreneurial farmer, using modern

infrastructure to organically farm high-value or ecologically-valued native crops, and selling them for a profit in high-value markets in the city.

The government's framing of *urban* farmers and agriculture contrasted starkly with those in the *peri-urban* zone. It positively framed urban agriculture as a strategy for improving the quality of life of vulnerable urban populations, which also provides the positive benefits of employment, health, food security, and urban greening, thus enhancing urban sustainability, and contributing to multiple development objectives. The ideal farmer in the urban zone would be a socially marginal actor (e.g., women, the elderly) who starting farming to improve their food security, health, or income. The irony of the contrasting social construction of urban and peri-urban agriculture is that the city's future actually depends on thousands of peri-urban farmers—which the government recognizes—for management of the city's watershed, from which the city derives 60-70% of its water supply (GDF, 2012). However, urban agriculture's impact on the city now and in the future is unknown, but the presence and potential of urban agriculture are symbolic for the city's sustainable development.

The PRD government sought to further elevate Mexico City's global profile through international sustainability and climate change adaptation initiatives and agreements. The current (2013-18) administration aspires to “[consolidate] the presence and influence of Mexico City as the nucleus of a leading megalopolis in Latin America and the world... [and] an example of urban sustainability and innovation” (GDF, 2013, p. 153, author's translation). In 2014, the Food and Agriculture Organization (FAO) named Mexico City the second greenest city in Latin America for its rural development and urban agriculture initiatives (FAO, 2014a). Mexico City has also become a member of

several international organizations focused on urban climate change adaptation, such as the Rockefeller Foundation's 100 Resilient Cities, the World Mayors Council on Climate Change, and C40 Cities (see GDF, 2015). Mexico City's Government has also hosted international meetings on climate change: the World Mayors Summit on Climate in 2010, where 138 mayors from around the world signed the Global Cities Covenant on Climate ("The Mexico City Pact"), and the C40 Mayors Summit in 2016.

This phase began in 2007, when the urban government, still under PRD leadership, created the Secretariat for Sustainable Rural Development and Equity for Communities (SEDEREC), an agency dedicated to promoting rural development, and to helping fulfill the government's social equity goals for indigenous communities, *pueblos originarios* (*Decreto por el que se reforman, adicionan y derogan diversos artículos de la Ley Orgánica de la Administración Pública del Distrito Federal*, 2007). SEDEREC took over the responsibility for rural development from the city's Secretariat for the Environment (SEDEMA).

In addition to creating a city-level agency dedicated to rural development, the city introduced legislation that established food security as one of its objectives. In 2008, the government used the frame of food security with reference to agriculture (*Decreto por el que se expide la ley de Desarrollo Rural Sustentable del Distrito Federal*, 2008). In 2009, the urban government passed legislation guaranteeing the right to food (*Ley de Seguridad Alimentaria y Nutricional para el Distrito Federal*). By 2012, SEDEREC was citing food security and food safety as motivations for sustainable rural development and to justify conservation of the SC (SEDEREC, 2013). The government's revised objectives for rural development are reflected in SEDEREC's (2014, p. 23) mandate:

Promote actions to elevate the competitiveness of the agricultural and livestock sector, promoting a stable and dynamic economy that reconciles social development with environmental and economic sustainability, from a focus on equality of human rights, guaranteeing the right to food, through the support of food security. In this sense, [SEDEREC] promotes training and rural extension... to promote the intensive cultivation of good agricultural practices, avoiding the use of agrochemicals and guaranteeing food safety. (Author's translation)

In support of the government's food security and nutritional objectives, in 2007, SEDEREC introduced programs to promote agricultural activities in backyards and in the urban zone: on rooftops, balconies and patios. These programs supported agriculture for commercial production, and for the first time, subsistence. Backyard agriculture was also seen as a way to preserve traditional rural knowledge. For example, SEDEREC described its 2007-8 rural backyard program (SEDEREC, 2008, p. 7): "It [the program] consists of strengthening subsistence to benefit the family economy through the generation of food, which contributes to reverting the effects of malnutrition and rescuing traditional knowledge of families that live in the rural zone" (author's translation). These programs offered training, technical assistance, supports for agricultural inputs (e.g., seeds, livestock), nutrition and environmental education, and support for community greenhouses in large residential units. The target population for the urban agriculture programs was marginal urban residents, such as youth, women, and the elderly. Urban agriculture was not regulated. Its expansion was associated with multiple positive benefits, including employment, health, food security, and urban greening. For example, SEDEREC (2014, p. 14) describes its program supporting urban agriculture as follows:

To achieve food security, our Program for Sustainable Small Scale Agriculture in Residential units, focuses on food production, which has the objective of slowing the gray march of concrete and asphalt of the Federal District in order to convert it into a green patchwork of food production for home consumption of healthy, clean vegetables and fruits wherever they are required; improving health, raising awareness, educating; creating employment and self-employment, cooperation, and the recuperation of social cohesion for the inhabitants of the capital. (Authors' translation)

Meanwhile, in the peri-urban zone (the SC), phase three documents continued to diagnose the challenges of rural development in the SC as low profits from agricultural activities, and agricultural abandonment. As in previous phases, the government provided productivist programs for SC farmers, some in partnership with SAGARPA. To address concerns over environmental contamination and degradation, SEDEREC introduced programs to train farmers in agroecological practices. It supported the production of high-value crops such as organic vegetables, describing them as “healthy and innocuous,” (free of agrochemicals) to contribute to food security, nutrition, and/or household income (SEDEREC, 2014, p. 14). It encouraged the sale of organic, high-value crops in local high-end markets. It also introduced the native crops program to support genetic diversity and cultural tradition through maize, nopal, amaranth, and maguey production.

How the government framed urban agriculture contrasts starkly with how it framed agriculture in the SC. Where the government saw urban agriculture as positively contributing to multiple development objectives, peri-urban agriculture was framed as a development problem, with the fate of the city resting on its shoulders. The economic decline and abandonment of agriculture was seen as undermining the city's environmental goals and natural resource management. For example, the 2007 general

development plan (GDF, 2007, p. 44) contrasts a “vulnerable” rural sector with the “modern” urban economy:

In Mexico City, the most modern productive processes and technologies of communication and global commerce coexist with an informal economy... and a vulnerable rural subsistence sector, where, ironically, rests the future of the sustainability of the Valley of Mexico. (Author’s translation)

Where urban agriculture was framed as a strategy for improving quality of life for vulnerable urban populations and enhancing urban sustainability, agriculture in the SC was framed as a driver of vulnerability that reduced quality of life for farmers and the city at large. The 2013 General Development Plan (GDF, 2013, p. 76) states:

The low profitability and sustainability of the agriculture, aquaculture, agroforestry, and ecotourism sectors deteriorates the form of life of the women and men who pertain to the *Pueblos Originarios*, as well as the rural population of Mexico City, and the capacity to help in the conservation of environmental services for the city remains with them. (Author’s translation)

As in phase two, phase three documents acknowledged low institutional support (e.g., lack of technical assistance, credit access) as a driver of the challenges facing peri-urban farmers. However, the phase three documents lamented the lack of productivist qualities of those farmers, and pointed to their vulnerability and marginality as drivers of these problems. This essentially blamed the farmers themselves for these problems, together with the economic and political system that has failed to transform them into the government’s ideal for commercial farms (GDF, 2013, p. 75):

The *pueblos originarios* that are situated in the conservation soil possess great natural and cultural richness, which generates great potential for development of alternative tourism, as well as the production of nopal, vegetables, forage oats, romerito, maize, ornamental flowers and amaranth. However, the profitability of these business activities has been null or low, owing to the difficulty for producers to obtain credits, the lack of modern and adequate infrastructure for climatological events, the disconnection with markets and scarce technical assistance. The majority of productive practices in this zone cause contamination and degradation of the soil, through compaction and agrochemical use, which causes losses in productivity and profits and generates a tendency toward the abandonment of these activities and identity loss for the rural communities of the Federal District. (Authors' translation)

But the government also saw traditional agriculture as a potential strategy for natural resource management and improving household income, though notably not for food security, nutrition, green space, etc. as with urban agriculture. The 2013 General Development Program states that it aims to “Protect and conserve ecosystems, as well as improve and strengthen the traditional and agroecological production systems... for the preservation of natural and genetic resources of the Conservation Zone, through systems that improve income and quality of life for rural families” (p. 476; author's translation).

The government used a productivist lens to assert that the low profits of agricultural activities are due to farmers' incompetent soil management and input use, backward infrastructure and farming practices, and financial marginalization. But, it framed the outcomes of the sector's lack of competitiveness and subsequent abandonment in terms of indigenous identity loss and environmental degradation, rather than in terms of lack of economic competitiveness, which would logically follow from a productivist perspective. It did not acknowledge that in phase one, the government spent nearly 20 years undermining indigenous farming practices and promoting the conventional practices (i.e., mechanization and synthetic input use) that it cites for environmental degradation in phases two and three. Yet, since the 1970s, the government

has assessed agriculture's success in terms of profit and persistence, not cultural heritage, or even environmental stewardship and environmental services, despite that these objectives have driven restrictions and normative valuations for farming since the start of phase two.

The government's phase three narrative for agriculture in the SC can be summarized as follows: indigenous culture and identity (including agricultural traditions) are associated with environmental stewardship, natural resource management and environmental services, which are essential for the sustainability of the city. But, the problem is that farmers in the SC are not sufficiently productive and profitable, in large part because of farmers' vulnerability, marginality, backwardness, and mismanagement, as well as lack of public investment. This is leading farmers to abandon agriculture. The motivation to respond is that if this problem continues, farmers will lose their indigenous identity, which has negative implications for natural resource management and environmental services for the city. The solution, therefore, is for farmers to maintain their indigenous identity, and become profitable and productive through modernization and commercialization with the help of public investment. But, productivist agricultural practices cause environmental degradation, so they must use agroecological or organic practices. The government thus placed the responsibility of environmental conservation, natural resource management, profitable agricultural production, and cultural preservation on the shoulders of economically marginal indigenous farmers. In the urban zone, however, any kind of urban agriculture is framed as contributing positively to the practitioner's wellbeing and the city's sustainability.

Farmers' Responses to their Social Construction in Phase 3

I asked current farmers and agrarian community representatives about their experiences farming in the city, and their perceptions of the city's policies. Though several farmers identified with some aspect of the government's ideals for agriculture, many peri-urban farmers felt neglected by the government, and described feeling economically and politically disempowered as a farmer or *campesino*. In contrast, urban farmers did not make strong statements about power dynamics between farmers and the government. The agrarian community representatives explained how their communities shifted their focus from farming to conservation and agrotourism. This further suggests that peri-urban agriculture is not empowering or emancipatory, and may have a limited future in Mexico City.

Among both urban and peri-urban farmers, some participants' perspectives on their farming activities mirrored the city's ideal for agriculture: i.e., small-scale, organic production using modern technologies (e.g., hydroponics, greenhouses, rainwater harvesting) and catering to urban demand. All the farmers who strongly identified with the government's ideal expressed a strong interest in learning about new ways of farming, both new skills and new crops. Many of them also expressed interest in teaching others to farm using organic practices.

For urban farmers, the city's ideals were reflected in their use of organic practices and modern technologies, and their values around learning, health, food quality, and reducing waste through recycling plastics and composting organic waste. One urban farmer with a rooftop greenhouse described farming in the city in contrast to farming in the countryside, saying urban farming was about "learning new things, no? Because in

the countryside you focus on producing maize, wheat, oats, other types of crops. Here it is more about vegetables, and learning to use spaces [efficiently], how to recycle, no?” (author’s translation). Another urban farmer started with a flower garden and now produces for her family’s restaurant. On her transition to organic farming, she said, as if confessing,

I already knew how to plant a plant in a planter, but not organic vegetables, because before, I would buy, well, *chemicals*, because I wanted my flowers to come up beautifully. But since I have learned all this, and everything is organic, I make the compost. I get a lot of vegetable matter, rinds and all that, from here [the restaurant]. (Author’s translation)

For this urban farmer, like several others I interviewed, the city’s ideals were also reflected in her long-term goal of scaling up to her activities to start selling her produce. Unlike many of the participants who were peri-urban farmers, none of the urban farmers made explicit comments about the government’s social construction of farmers, nor about farmers’ power dynamics with the government. Though they had all received some kind of government support (e.g., partial financing for their greenhouse)—and nearly all commented on the problem of government corruption—the government was not an explicit factor in how they understood themselves or their activities. In general, they expressed a strong sense of satisfaction from their farming activities, and saw a lot of possibility in it. This may be because the government has only recently created policy for urban agriculture, or because most of the urban farmers I spoke with have been farming for no more than five years.

There was less alignment between peri-urban farmers and the government’s ideals. One peri-urban farmer who strongly identified with the government’s ideals commented:

There is a lot of demand [in Mexico City]... We have experienced it: we sought organic certification, and that opens even more doors. So, this was our strategy: get certified, place ourselves in three niche markets, but there are more. They come up to you, they ask 'what else do you have, I need this volume. I need you to supply me all year.' (Author's translation).

Yet, this farmer also confirmed, "there are very few of us who can organize to meet [this demand]."

Few other peri-urban farmers shared the government's ideals and spoke positively about them. Other interviewees, such as a man who had recently stopped farming, explained the lack of farmers to fill the demand by arguing that the type of farming envisioned by the city simply was not profitable, even when using modern technologies.

He commented that most consumers still were not willing to pay the premium:

Yeah, we could do organic, but unfortunately... organic production still isn't valued... People say they prefer it, but if you produce organic tomatoes and it costs you 20 pesos to produce a kilo, but in the market for traditional [conventional] production, which comes with a lot of chemicals, it costs you six pesos, where do you buy? The one that is six pesos, not the one that is 20 pesos, because the economy is bad... There is [a market for organic products], but you have to look for it, you have to pay [organic] certifiers... and sometimes there aren't the necessary resources... I mean, you invest so much... it is not sufficiently economically profitable. With effort, you start to say no, maybe I should go help an electrician, and make agriculture or livestock a secondary or tertiary activity. For the costs of production you need for an intensive production, to produce a lot in a small space so you have business, because we have many millions of inhabitants in the Federal District and everyone eats, and I'm telling you, you can produce well, and healthily, but no, they don't buy from you at the price of its [the product's] actual value. (Author's translation)

Similarly, some peri-urban respondents rejected the idea of modernizing through technology and farming for profit, and perceived the government's programs as empty promises. They saw their peri-urban farming activities as rooted in tradition and environmentalism, and embraced the idea of protecting their lands and traditions from urban expansion, not because of a policy incentive, but in spite of government intervention:

We farm because of our grandparents, who always taught us about the countryside... In principle, we always planted for those values and for love of the countryside, nothing more... to instill in the people who come after, to cultivate the countryside, because it helps the environment...this is what we have dedicated ourselves to, so the children continue to plant and don't come here to build, don't bring urban growth here, because, well, this degrades the environment, and it's going away. (Author's translation)

Several peri-urban participants felt the government neglected and marginalized *campesinos* (peasant farmers), even though they provide important benefits for the city. But, they cited rural tradition as the key motivating force for farmers who have persisted in agriculture, not the public sector:

Practically, the farmers, the *campesinos* here... we don't have the support of the government. It isn't there. I think we are the most abandoned, because it could be perhaps an engineer, a lawyer, a teacher if you like, but they [government functionaries] haven't turned around to see this side [the countryside]... and here is where there is still a lot of conservation land... there are a lot of situations, but for the most part, here we continue conserving [the land], I think because of their [farmers'] love for their lands, also a part of the tradition also is the love they have for this place. (Author's translation)

One farmer, who uses organic practices, modern technologies, has installed infrastructure for soil retention on his farm (natural resource management), and commercializes his produce—as the government has encouraged—asserted that, to be a *campesino* was not only to be neglected, but also to be disenfranchised:

They will never accept that a *campesino* is right... the whole country is like this. How many cases have there been in the news in which *campesinos* are right about something, and the government doesn't accept it?... We don't have this power. So, the *campesino* complains, and they [the government] don't care. (Author's translation)

This same farmer felt that the government was more attentive to farmers in the urban zone than the peri-urban zone:

SEDEREC is the secretariat for rural development in the Federal District... but, the actors in this secretariat aren't here (in the SC). They are doing, if you have seen the news, they are making family gardens in the urban areas, inaugurating and protecting. I don't disagree, to the contrary, [it is] good, but without forgetting these [peri-urban] areas... The [government] actors aren't here... they do not enter. (Author's translation)

Several participants were also concerned about the negative implications of the current dynamic for the future of the sector and the SC. One farmer laid the burden of fault on other farmers who are unwilling or unable to use the opportunities the government provides:

The government is working to create strategies for supports, so that they [farmers] make projects, and have more [economic] activities in the zone [the SC], but there is no response from the producers. Even though there are supports and resources, but these don't make the farmers productive. They [farmers] are asking all the time for machinery, infrastructure, equipment, livestock, various things, but if you visit the countryside, you see something else. The amount of support isn't reflected in the productivity. It's stagnated, it's stuck. There is no growth on the part of the producer. (Author's translation)

Another farmer based his concern in cultural and economic change, describing the lack of opportunity for the youth in rural areas, especially as they have become more educated.

In our rural areas, our children are very prepared, but they have abandoned this because it isn't feasible... They are professionals and they aren't working for the cause of protecting the land. If all the professionals leave here, our children, they are looking to find work down there [in the urban zone], and a way of life down there. And the land, well very few want to know about her... We are the ones who in some way live in the most contact with the countryside, with the area, and we know how to value it. We are here, we think about preserving it with some economic end, but very few are doing it, feel in their blood the necessity of protecting this... We are very few. The groups with power and the economic groups who are behind the powerful have predominated. (Author's translation)

Interviews with former and current representatives of agrarian communities emphasized these communities' shift away from agriculture, toward conservation, ecotourism, natural resource management, and preventing urban expansion. A representative from an *ejido* stated, "For the *ejido*, the most important objective is conservation of the land that we are losing daily. Because, conserving the land we know what follows, no?... Conserving land, we have flora, fauna, and water" (author's translation). Another representative from the same *ejido* associated agriculture in the *ejido* with urban expansion. He compared the conservation outcomes with ecotourism.

When asked if agriculture had declined in the ejido, his response echoed the government's framing of agriculture, blaming farmers for urban expansion:

Yes and no, because people are taking it up again. Now they are returning to it, because practically there was even some abandonment. So, even with the government programs, they [farmers] didn't achieve what we are achieving now [with ecotourism]... because if we don't make sure that people are busy and that they have income, a remuneration for their work, well they start to sell their land. And this is one of the most serious problems that we have. (Author's translation)

With regards to conservation and tourism, individual farmers do not have access to the same government programs (e.g., payments for ecosystem services) through SEDEMA as agrarian communities, though versions of those programs exist for individuals through SEDEREC. Individual farmers complained about regulations on their conservation-related activities, for example, one farmer related:

They [government functionaries] say to us: you are going implement it [environmental management]. But, under our norms, our legal difficulties, so that you can development the forest. First, we have a forestry ban which allows us to do nothing more but see them [trees]. We can see the forest, but we can't even maintain it. Once I was reported for planting trees... it's as if they have tied our hands because we can't maintain the forest without the authorization of someone who knows less than we do. (Author's translation).

Discussion and Conclusion

Urban governments are producing policies across new domains, including environmental conservation, sustainable development, and food systems. Through frames and narratives, policies put forward normative assessments (social constructions) of actors and actions, with implications for who receives benefits and burdens, and who is empowered or disenfranchised (Schneider & Ingram, 1993). In the case of urban sustainability policies, these messages are not only directed at and absorbed by target groups, but also by broader society and the international network of development agencies, NGOs, and other cities promoting urban sustainability. Regardless of the target

audience (constituents, national government, international agencies, other cities), these narratives have on-the-ground impacts for target groups, which can either support or undermine policy objectives. In other words: policy content matters (Mettler & Sorelle, 2014). But perhaps because of limited experience, ambitious goals or external pressures, urban governments may set unrealistic expectations as they move into new policy domains, thus setting target groups up for failure (Ingram et al., 2007). In essence, they may be ineffective in creating governmentality (Foucault, 1982). In the case of Mexico City's policies for farmers, effective governmentality would mean traditional peri-urban farmers could successfully transition to commercial, modern, organic farming, and/or environmental conservation and natural resource management activities. These are not bad ambitions. But, they may not be what farmers are willing or capable of doing under the social, economic, environmental and political circumstances they are in. This would suggest then, that the GMC should co-create this new identity with farmers, rather than impose it.

How a policy frames a target population also says a lot about the authorities behind the policy (DiAlto, 2005). Policy can be used to signal stability, values, or actions, not just to constituents, but also to other authorities, such as development agencies, or the national government (Howlett & Ramesh, 2003). In other words, aspirational visions for urban sustainability embedded in policies may be strategic in the short term for entrepreneurial cities positioning themselves as emergent global leaders to attract residents, businesses, or international funding (Gibbs & Krueger, 2007; Jonas & While, 2007). Food strategies are now part of urban branding (e.g., Toronto; see Sonnino, 2016), and a criterion for cosmopolitan green cities. This means that food and

agriculture policies socially construct the *city's identity* as a sustainability leader as well as that of the target population through the use of international discourses and other means. But, international discourses may have limited relevance in local contexts (Forsyth, 2003), and echoing them may ultimately be ineffective or counterproductive for achieving local sustainability objectives.

Social constructions of subjects in policy narratives have implications: target populations will respond to them, to embrace or resist them (DiAlto, 2005; Foucault, 1982). In urban sustainability policy, there is a need for closer attention to the normative framing of target populations such as farmers, how this shapes *who* participates in urban initiatives and/or alternative, local food systems and *how* they participate, as well as the barriers they create for realizing policy objectives. Social constructions of target groups in policy may be unavoidable when the goal is to govern these populations, but counterproductive ones (i.e., framing the actors the city depends on for natural resource management as problematic, unmotivated, irresponsible, or incapable) may be avoided by grounding policies in the target population's realities (challenges, aspirations, trajectories, capacities) rather than in decision makers' ideals or international discourses for how target populations should be or act. This may be more likely to happen through genuine partnerships based on more equal power dynamics and collaboration.

Urban food systems are about more than reorienting markets and material connections; they involve competing values and power dynamics (Born & Purcell, 2006; L. K. Campbell, 2016). Mexico City is an example of urban government attempting to shape farmers' identities and purpose around the needs and ideals of the city, which are informed by alternative food and sustainability values, among other interests. As food

activists have done in other contexts (e.g., Guthman, 2008), the Government of Mexico City has promoted an ideal of agriculture that speaks to certain interests and values. But this vision has limited grounding in actual farmers' limitations, motivations, and capacities. This is evident in the city's positive framing of urban agriculture and negative framing of peri-urban agriculture, despite that urban agriculture is a new phenomenon in the city that is not widely practiced, and that peri-urban agriculture is a centuries-long tradition with thousands of practitioners who play an important role in the city's natural resource management and sustainability. As a result, the city's UPA initiatives are not appealing to or helping many of the city's farmers; they have failed to slow abandonment of agricultural activities and environmental stewardship. For those who have persisted in farming, there is evidence that some feel marginalized and neglected by urban policies, even when they meet the basic criteria that would achieve the government's goals: they have maintained their land in agriculture, use agroecological practices, modern technologies, and sell their produce.

As Mexico City illustrates, making farmers (or other natural resource managers) a target for policy intervention is by itself insufficient for making real progress toward sustainable objectives. Target populations also have agency to accept or resist how they are socially constructed (DiAlto, 2005; Pierce et al., 2014) or subjected to authority (Foucault, 1982). The tone and content (social construction of the target group and the selected policy tools) inform these actors where they stand in the urban political arena, and what to expect if they participate (Schneider & Ingram, 1997). Over the course of several decades in Mexico City, the government has implicitly and explicitly told farmers they are problematic for the city's needs and expectations. Not surprisingly, farmers are

not very politically active in Mexico City. Unlike racial or gendered categories, “farmer” is not an immutable identity. Considering the negative and marginal status of farmers in political and economic terms, again, it is not surprising that many in Mexico City have been willing to shed that identity, as evidenced by the decades-long decline in the agricultural sector. This is especially true because Mexico City’s peri-urban farmers have other (urban) economic options. The government’s current social construction of farmers is at best ineffective, and at worst counterproductive for meeting the city’s conservation and natural resource management objectives.

In contrast, the city’s agrarian communities have had more opportunities than individual farmers in conservation and natural resource management, and some have reoriented their priorities to help meet the government’s conservation objectives. This could be considered an example of environmentality, in which the government has used technologies of power and the self to create new subjects who are concerned about the environment (Agrawal, 2005). It is too early to tell, but these programs, targeted at the scale of agrarian communities rather than individual landholders, could be a successful strategy for meeting the government’s conservation objectives. However, it raises the question of what place agriculture will have, not only in the city, but also in the agrarian communities themselves.

Farmers’ and other natural resource managers’ empowerment and participation in the urban sphere will be increasingly essential for achieving goals in natural resource management, urban sustainability, and food system sustainability. Encouraging farmers to maintain agricultural activities and lands, and to participate in natural resource management for the city’s benefit will likely entail (among other things) policies that set

realistic expectations, promote genuine partnerships, and frame key collaborators in a more positive, empowering way. To avoid creating policies that project ideals but fail to address actual sustainability challenges, policymakers, through their actions and rhetoric, should encourage farmers to actively participate in policy design processes, and take their voices seriously.

Chapter 4

ADAPTATION FOR WHOM, TO WHAT?

CHALLENGES AND OPPORTUNITIES IN AGRICULTURE-URBAN

COLLABORATION FOR CLIMATE CHANGE ADAPTATION

Abstract

As leaders in climate change governance, urban governments have the opportunity to interact, coordinate, and collaborate with different sectors and actors to set and pursue both private and public adaptation goals. Urban and peri-urban agriculture (growing and raising food and non-food products within or at the periphery of an urban area) is recognized as both vulnerable to climate change and also a potential strategy for urban climate adaptation and mitigation. However, few cities have formally incorporated it into their climate change policies. Mexico City is one exception. Its 2014-2020 Climate Action Plan—*El Programa de Acción Climática: Ciudad de México* (PACCM)—outlines actions and programs to benefit the city’s peri-urban agrarian communities and farmers. This chapter examines the PACCM to explore the drivers, obstacles, and opportunities of agriculture-urban collaboration for climate change adaptation. We examine: 1) how and why agriculture became part of the PACCM; 2) the stressors and vulnerabilities that the PACCM’s agrarian actions and programs seek to mitigate, for private and/or public benefit; and, 3) the barriers to and opportunities of this collaboration. We analyzed the PACCM programs that target agrarian actors, activities and lands, and interviewed government officials, PACCM coordinators and authors, agrarian community leaders, and farmers about the Plan’s development and implementation. We found that the

PACCM implicitly considers peri-urban agrarian actors as private providers of public adaptation benefits for the city, through measures intended to also benefit agrarian actors. But, the Plan does not articulate how agrarian actors and lands fit into the city's larger vision for adaptation, nor does it adequately address the specific vulnerabilities and socio-economic dynamics shaping agrarian actors' decisions, which may undermine the Plan's success. The results suggest several guidelines to promote the private provision of public adaptation. First, governments and private providers must explicitly communicate their needs and expectations for the collaboration so that both parties' needs can be addressed during policy development. This includes taking into consideration socio-economic change. Secondly, to encourage private actors to provide specific adaptation benefits, governments must develop policy mechanisms that explicitly and directly promote the desired benefits, ideally in collaboration with private providers. Finally, policy processes and outcomes that promote private provisioning of public adaptation benefits warrant close attention to how winners and losers, and synergies and tradeoffs are mediated.

Introduction

Cities play an important role in climate change adaptation,⁸ both as material entities that contribute to climate change, and as political entities leading efforts to reduce carbon emissions and adapt to the affects of climate change. On both fronts, cities are making new governance arrangements and bringing new actors and sectors into the

⁸ Climate change adaptation can be defined as “the processes and actions that enable people to cope better with increasingly challenging weather and climatic conditions” (Tompkins & Eakin, 2012, p. 3).

sphere of urban politics. These changes may provide new opportunities for adaptation to and mitigation of climate change and other risks.

One new arrangement is collaboration with the agricultural sector (de Zeeuw et al., 2011; Lwasa et al., 2015; Simon, 2012; United Nations Human Settlements Programme, 2009). Because agriculture, forestry, and other land use activities contribute 24% of global net greenhouse gas (GHG) emissions (Intergovernmental Panel on Climate Change (IPCC), 2014), it is widely acknowledged that farming practices must be changed as part of mitigation efforts (Food and Agriculture Organization (FAO), 2008). But agriculture can also help urban areas adapt to climate change. Urban and peri-urban agriculture⁹ has been found to provide climate adaptation through urban greening, microclimate mediation, nutrient cycling, water infiltration, flood mitigation, and enhanced biodiversity and ecosystem services. Agricultural activities near cities can also provide GHG mitigation by reducing greenhouse emissions from food production and transportation and methane emissions from landfills (Lwasa et al., 2015).

But peri-urban agriculture is also *vulnerable* to climate change and other stressors (Eakin & Appendini, 2008; Eakin, Lerner, & Murtinho, 2010). Climate change increases climate variability, and changes crop suitability, production potential, and the characteristics and availability of agricultural land (G. Fischer, Shah, & Velthuis, 2002; Misselhorn et al., 2010). Farming households face crop failure, market shocks, and declining livelihoods (Morton, 2007). Their vulnerability may translate into reduced

⁹ Urban and peri-urban agriculture includes the diverse set of activities for growing and raising food and non-food products within or at the periphery of an urban area. It is practiced by diverse actors, often on small parcels or in confined spaces, and can include many different crops and products. It is closely interconnected with the urban system, and complements, rather than replaces, rural production and imported foods (McIntyre, Herren, Wakhungu, & Watson, 2009; Mougeot, 2000).

food security at all scales (FAO, 2008). Climate change also threatens agriculture's capacity to provide ecosystem services (Misselhorn et al., 2010). Farmers and agrarian communities face many stressors and vulnerabilities beyond climate change, including economic, social, and environmental stressors (Eakin, 2005; Eriksen & Silva, 2009; O'Brien & Leichenko, 2000; Taylor, 2013). Urbanization threatens agricultural land use in peri-urban areas, but it also creates opportunities for farmers to move into non-farm economic activities (Eakin et al., 2010; Simon, 2008).

In Mexico City, agriculture has long had an uneasy relationship with urban development and planning. Over the last century, farmers have lost land and voice to urbanization; the future viability of farming hinges less on adaptation to climatic threats than it does on the process of urbanization itself. But Mexico City has included peri-urban agricultural activities in its Climate Action Plan (PACCM, *Programa de Acción Climática Ciudad de México* 2014-2020). In fact, Mexico City's is one of the few urban climate plans that include programs explicitly for agrarian actors, activities and lands; the inclusion demonstrates both the potential connections and tensions between urban climate policy and peri-urban agriculture (Gobierno del Distrito Federal (GDF), 2014b).¹⁰

This chapter explores the drivers, obstacles, and opportunities of agriculture-urban collaborations for climate change adaptation using the case of Mexico City's plan, offering an empirical case of public funding for the private provision of public adaptation benefits, of which there are few (Kotchen & Moore, 2007). It identifies the motivations for and assumptions behind including agrarian actors and rural land uses in the city's

¹⁰ The formal name of the administrative unit of Mexico City was changed on January 29, 2016 from the *Distrito Federal*, or Federal District, to the *Ciudad de México*, or Mexico City. Thus, in the text I refer to the city government as the Government of Mexico City (GMC); however policy documents dating from before this change still refer to the *Gobierno del Distrito Federal* (GDF).

climate plan and describes the mechanisms the government uses to promote adaptive actions by agrarian actors. It analyzes the obstacles for peri-urban agrarian actors serving as private providers of public adaptation benefits for the city, and explores opportunities for improving climate adaptation through collaboration with the agricultural sector.

Literature Review: Private Provision of Public Adaptation

Both governments and private actors adapt to stressors, vulnerabilities, and disaster events, but often for different reasons. Governments are mandated to provide and protect the public good, which includes mitigating risks and responding to disasters associated with climate change. Private actors, in contrast, are assumed to adapt if they perceive a private benefit, following the logic of economic rationality. In other words, private actors will adapt if they believe the benefits exceed the costs, and if they know they will experience the direct benefits of their actions. Regardless of who adapts and why, other actors will be affected, for good, bad, or both: there is interplay between private and public actions and responsibilities (Mees, Driessen, & Runhaar, 2012; Milman & Warner, 2016; Tompkins & Eakin, 2012). Public adaptation can benefit some private actors more than others; for example, the public sector can subsidize or provide disaster insurance for specific populations (Erdlenbruch, Thoyer, Grelot, Kast, & Enjolras, 2009). Likewise, there are cases of private adaptation for public benefit; for example, farmers who contribute to urban flood risk management by retaining or slowing runoff on their lands through farming practices (e.g., reduced grazing), green infrastructure (e.g., hedgerows, ponds), or hard infrastructure (e.g., retention walls) (Milman & Warner, 2016; Posthumus, Hewett, Morris, & Quinn, 2008).

Private adaptation for public benefit can be supplied accidentally or deliberately. Accidental provision occurs as a positive externality of actions carried out by private actors for other purposes or motivations (e.g., increased profitability of an agroforestry product stimulates reforestation, and incidentally results in greater carbon sequestration and lower probability of landslides). There is little empirical evidence on deliberate private provisioning of public adaptation. Deliberate providers are theorized to have three motives for supplying public adaptation goods: 1) they value the good more than the cost and are therefore willing to supply it to others (known as Olsonian privilege groups); 2) they have altruistic motivations; or, 3) they are motivated by profit or maximizing their welfare in other ways (Tompkins & Eakin, 2012).

Obtaining public adaptation benefits from private providers is challenging because the provision of a benefit can occur at a different spatial and/or temporal scale from where/when the benefit manifests. In addition, a minimum number of private actors may need to participate for the benefit to be felt. And, a provider's interests may not align with public interests, especially where the provider incurs new risks, costs, or perceives few direct benefits. Thus appropriate institutional mechanisms (e.g., incentives, rules) are necessary to encourage private provision of public adaptation. Mechanisms used to motivate providers who seek increased profit or welfare include compensatory payments (e.g., grants for infrastructure installation and maintenance, land purchases), public markets for public goods (e.g., payments for ecosystem services), regulations (e.g., a logging ban), and reassigning property rights (Mees et al., 2012; Tompkins & Eakin, 2012). Over time, an accidental private provider might evolve into a deliberate private provider, such as when a landholder who has accidentally provided

ecosystem services by using her land for grazing animals is confronted with new incentives to urbanize her land. In these cases, where the provider's role in adaptation may not have been articulated and did not previously require institutional mechanisms, as a deliberate provider, their role needs to be made explicit, and supported through institutional mechanisms.

Like all policy, climate adaptation policies and plans are inherently political: they mediate winners and losers among actors, and synergies and tradeoffs among different goals. They emerge in a specific context that shapes climate adaptation decision processes and outcomes (Næss et al., 2015), including which collaborations emerge, what policy goals and mechanisms are selected, who is considered vulnerable, and who benefits. These elements warrant special attention where a public authority is incentivizing private investment in adaptation for private and/or public benefit. The collaboration between the Government of Mexico City (GMC) and the peri-urban agricultural sector, formalized in the PACCM, is one such example.

Background

Agriculture, Conservation, and Climate Change in Mexico City

Mexico City urbanized rapidly over the twentieth century to become the megacity it is today (Aguilar, 2008; see Table 2.2). Concerns about aquifer recharge and degrading effects of urbanization on the environment led the urban government to establish a contiguous conservation area in 1992, known as the *Suelo de Conservación*, or Conservation Zone (SC) (Sheinbaum Pardo, 2008). The SC covers 59% of the formal territory of Mexico City, essentially the whole southern half. It contains forests (53%),

grasslands (10%), wetlands and water bodies (1.5%), agricultural lands (20%), and human settlements (12%) (GDF, 2012). The Ecological Ordinance of the Federal District (*Ordenamiento Ecológico del Distrito Federal*) (GDF, 2000) zoned agricultural, forest, and urban land uses in the SC, and established regulations for those land uses. Seventy-one percent of the SC is in the hands of 44 agrarian communities (*ejidos*¹¹ and indigenous communities), who share management responsibilities with the city's Secretariat for the Environment (SEDEMA) (GDF, 2012), participating in activities maintain environmental quality, prevent and respond to forest fires, and manage natural resources. The Ordinance severely restricts and regulates land-use activities in the SC.

The SC provides ecosystem services such as carbon sequestration, biodiversity conservation, climate regulation, and agricultural production (GDF, 2013). Of particular importance is aquifer recharge: 60-70% of the city's water comes from groundwater (GDF, 2012). To protect ecosystem services, the government regulates land use, builds and funds soil- and water-retention infrastructure, and pays landowners, including agrarian communities (Schteingart & Salazar, 2010). Such programs have existed since the 1980s. Despite these measures, urban expansion into the SC continues, although it has slowed since the 1970s (Aguilar, 2008). Illegal urbanization in the SC is due, in large part, to the lack of affordable housing. By 2010, there were 859 irregular settlements occupying 2,800 hectares (6,919 acres) of the SC (GDF, 2013).

The economic viability of agriculture in Mexico City began to decline in the 1960s, which led farmers to abandon agriculture for urban employment (Pensado Leglise,

¹¹ An *ejido* is an area of communally held land, established following the 1910 Mexican Revolution via land redistribution to smallholders and indigenous farmers. *Ejido* members have rights to use the land for individual cultivation, residential settlement, and communal use. In 1992, *ejidos* were given the right to privatize their lands; however, many *ejidos* have persisted.

2001). According to official census data, the number of farming units in Mexico City fell 37% from 1960 to 2007 (*Instituto Nacional de Estadística y Geografía* (INEGI), 2009; Secretaría de Industria y Comercio, 1965). Area planted fell nearly 90% over nearly the same period, from its peak of 165,657 hectares in 1960 (Secretaría de Industria y Comercio, 1965) to 17,608 hectares in 2014 (*Servicio de Información Agroalimentaria y Pesquera* (SIAP), 2014a).¹² Between 1995 and 2014 alone, the area planted dropped 33.9% (SIAP, 2014b). Today the SC is a peri-urban space with both rural and urban characteristics and activities. Much of its population is poor, although poverty rates have gone down in recent decades. A recent study speculated that the reduction in poverty rates in the SC between 1990 and 2000—from 77.3% to 51.6%—likely reflects the shift of the SC’s economically active population from agricultural activities to better-paying urban activities (Aguilar, 2008). Agricultural abandonment is associated with urban expansion on *ejido* land (Cruz Rodríguez, 1995), as well as the decline of ecosystem services (Aguilar, 2008).

Currently, only 0.6% of the population within the city proper lives in the SC, and roughly 0.3% of the city’s population participates in primary sector activities (i.e., agriculture and forestry) (SIAP, 2014a; see Table 2.2). Many farmers are affiliated with agrarian or indigenous communities (Dieleman, 2016; Losada Custardoy et al., 1998).

¹² Agricultural land use in Mexico City at any point in the twentieth century is hard to determine because of the rapid rate of urbanization over that period (see Ezcurra et al., 1999; Ward, 1990). I provide the official 1960 census data as a point of reference, with the caveat that it may not accurately reflect the reality of land use at that time.

As in Mexico, the farmer population is aging¹³ (nationally, 59% of farmers are over the age of 50) (*Secretaría de Agricultura Ganadería Desarrollo Rural Pesca y Alimentación* (SAGARPA), 2014). Many of those who practice agriculture do so as a secondary economic activity, for subsistence, or as a hobby (Cruz Rodríguez, 2001; Losada Custardoy et al., 1998).

Climate Change Policy in Mexico City

Climate change has been on the policy agenda in Mexico City since 2000 (GMC, 2016b; Hughes & Romero-Lankao, 2014). The Secretariat for the Environment (SEDEMA, *Secretaría del Medio Ambiente*) published the city's first climate change strategy in 2004, as part of the city's Environmental Protection Plan, which focused on air quality, ecological restoration, and energy-saving measures (GDF, 2004). With funding from the World Bank and strong support from Mayor Marcelo Ebrard Casaubón, the 2004 strategy was revised and expanded in 2008 to address cultural changes, financing, and technology adoption to reduce emissions and mitigate risks associated with climate change (GDF, 2008b). It included adaptation actions directly related to agriculture, such as protecting native maize varieties, managing soil and water resources, and promoting organic farming practices.

In 2011, the GMC institutionalized climate change as a policy area by passing the Law for Mitigation and Adaptation to Climate Change and Sustainable Development of the Federal District (*Ley de Mitigación y Adaptación al Cambio Climático y Desarrollo*

¹³ Mexico City was not included in the cited study; no specific data on the age of farmers in Mexico City could be found. Thus, I extrapolate from the national and regional data that the majority of farmers in Mexico City are also over the age of 50.

Sustentable del Distrito Federal). The legislation authorized the government to develop political and funding instruments for climate change adaptation and mitigation, and established a legal mandate for SEDEMA to implement climate actions regardless of the political party in office (Hughes & Romero-Lankao, 2014).

In 2014, again with strong support from the new mayor (Miguel Ángel Mancera), SEDEMA published a new Climate Action Plan for Mexico City (the PACCM) that expanded the previous plan. The new plan encouraged, coordinated, and integrated other city agencies into climate change adaptation and mitigation. SEDEMA involved government functionaries, researchers, experts, and NGOs in plan development, and then did an online consultation with the public. The resulting plan increased the number of climate actions to 69: 38 new, 15 continued, and 12 revised from the 2008 plan. Four “actions” were to develop land-use plans. Each action is the responsibility of a city agency; two of these agencies work closely with the agrarian population—the Secretariat for Rural Development and Equity for Communities (SEDEREC, *Secretaría de Desarrollo Rural y Equidad para las Comunidades*) and the Natural Resources Commission of the Secretary for the Environment (CORENA, *Comisión de Recursos Naturales de la Secretaría del Medio Ambiente*).

The main objective of the 2014 plan is to “increase the quality of life and sustainable development with low carbon intensity in Mexico City” (GDF, 2014, p.73). Mexico City emitted 31 tons of CO₂ equivalents in 2012, 80% of which came from energy consumption for transport, industry, commerce, services, and electricity. Agriculture is estimated to contribute less than 1% of the city’s total emissions. Collectively, agriculture, forestry, and other land uses contribute an estimated 2% (GDF,

2014). The city's 2016 report on climate adaptation identifies Mexico City's principle climate risks as floods and mudslides, heat waves and high temperatures, vector-transmitted diseases, and drought in the SC (GMC, 2016b, p.7).

Although the 2004 plan discussed agriculture primarily as a *source* of GHG emissions and environmental degradation, the 2014 plan explicitly characterizes agriculture as *vulnerable* to climate change. It identifies rural lands, forests, and agricultural activities as especially vulnerable to climatic change and extreme climate events, including hydrological stress on crops, increased pest incidence, reduced yields from rain-fed production, and altered phenology of some species. The PACCM also recognizes the economic stressors of low profits and low employment facing the agrarian population (GDF, 2014). The government does not provide an estimate of how much SC lands, agricultural or otherwise, contribute to the city's climate mitigation efforts.

Methods

I analyzed the 2014 PACCM document, focusing on the 15 actions (programs; see Appendix B) directly relevant to agrarian actors (farmers, landholders, and representatives and members of agrarian communities) and land uses (i.e., agriculture, natural resource management), conducted semi-structured interviews with PACCM coordinators, government officials, and agrarian actors, and used text analysis on both sets of data (Bernard, 2011). Notes from the interviews were coded inductively, with codes emerging from the sources, with the support of MAXQDA 12 (VERBI GmbH, 2016). Though the sample is not representative, for reference I provide the number of participants who spoke about a given issue (see Appendix C). All the interviews were

audio-recorded. Direct quotes were transcribed from the audio recording of the interview in question.

I conducted interviews with 33 agrarian actors in Mexico City from July 2014 to June 2015. Participants were farmers, representatives of farmer organizations, and agrarian community leaders. They were identified at rural development events and meetings, and by recommendation (snowball sample). Most participants were from the heavily forested borough of La Magdalena Contreras; the other six were from other boroughs. The majority (25 of 33) had off-farm employment, or was retired from off-farm employment. Interviews lasted between 1 and 4 hours. The participants discussed their objectives for and challenges in agriculture and/or conservation activities, their concerns for the sector, their perception of and interactions with existing government agencies and programs for rural development and conservation, and their expectations for agriculture in the SC in the future.

Seven urban government officials and coordinators involved in the plan's development and implementation were also interviewed. Participants were selected based on information from government reports, websites, and recommendations from other interviewees. These interviews were conducted in person, via phone, or via Skype, from June 2015 to January 2017, and lasted 45 minutes to an hour. Participants responded to questions about: 1) how the themes and mechanisms related to agrarian actors and lands emerged in the PACCM, 2) what role agrarian actors played in the plan's development, 3) the objectives and intended beneficiaries of the actions relevant to agrarian actors and lands, and 4) the greatest successes of and barriers to realizing the plan to date.

To identify the motivations behind, objectives of, and barriers to the agrarian programs, the PACCM (GDF, 2014) and notes from interviews with government officials and contractors were coded inductively. To identify the GMC's understanding of the public and private benefits provided, and the beneficiaries of those actions, I relied on the PACCM document and the interviews with government officials as data sources (Appendix B). I identified the benefits and beneficiaries, and assessed their relative importance through deductive coding, by identifying how many of the PACCM actions explicitly identified them at least once. Finally, I contextualize the results with secondary data about government programs.

Results

Drivers

According to interviews with people involved in the development of the 2014 PACCM, one of the motivations for involving agrarian actors in the Plan was recognition of the vulnerability of the agricultural sector to climate change. In the participatory stage of the plan's development, plan coordinators, together with environmental NGOs, researchers, and government functionaries who represented agrarian interests in the plan's development, recognized agriculture's vulnerability to climate change. Farmers and agrarian communities did not participate in the plan's development (see Sect.1.5.5).

Other motivations for including programs for agrarian actors and lands were utilitarian and pragmatic. One interviewee explained that government agencies were motivated to participate in the PACCM because it was a way to improve the chances that the Legislative Assembly of Mexico City (ALDF) would approve their budget requests;

in other words, it helped secure their annual operating budget for programs marked as climate change adaptation actions. Including agrarian programs in the PACCM was due in part to the fact that city agencies had existing programs for natural resource management, conservation, and agriculture. These programs recognized agrarian actors as land and resource managers, and could easily be reframed as climate change adaptation programs. So, in the development stages of the PACCM, SEDEREC and CORENA proposed a number of actions for the plan based on their existing programs. In sum, the inclusion of agrarian actors and lands in the PAACCM in part reflects SEDEREC's and CORENA's efforts to solidify and justify their programs and budgets by framing agriculture and forests as vulnerable to climate change, as well as providing adaptation benefits to the city at large.

Objectives

Despite the fact that most of the PACCM's agrarian programs originated in existing policies and programs, it was clear from the PACCM document and interviews with PACCM coordinators that the intention was to include actions that would produce mutual benefits for urban and rural sectors. However, the explicit goal of most of these actions is to mitigate climate-related stressors for the public in general rather than for farmers in particular (Appendix B). These include reducing GHG emissions (5 actions), diminishing the threat of extreme precipitation and consequent erosion, landslides, and floods (3 actions), and managing the groundwater supply. The main benefits mentioned in the PACCM agrarian programs are ecosystem services (13 actions, including soil retention, water retention, aquifer recharge, green space, carbon capture, air quality,

biodiversity, recreation, climate regulation, and nutrient cycling), and quality of life and wellbeing of urban residents (4 actions). These benefits are largely derived from agricultural lands, rather than agricultural activities *per se*; in other words, their provision depends on farmers maintaining their farmland and forests in non-urban uses. The benefits to farmers are identified as local economic development and livelihood stability (5 actions), and maize genetic diversity (2 actions). Other benefits mentioned (in only one action) included local organic food production, crop pest management, and public health.

One SEDEMA official elaborated on the link between economic benefits for farmers in the SC and ecosystem services for the city:

There are two levels: one is the city level, and the importance in terms of environmental services that maintain a quality of life for those of us who live here. But, it is also at a more local level, with these communities: they are the owners of this territory [the SC], and it is a material element from which they subsist. So, we have two interests to confront: the need to conserve this space for environmental services for Mexico City, and on the other hand the need for development of these *pueblos* and communities, which have been limited by the conservation of this space. (Authors' translation)

Mechanisms

The mechanisms used by the GMC to encourage adaptive actions among agrarian actors include expanding channels for local commercialization of farm products (a financial incentive); payments for ecosystem services (a market for a public good); financial supports for water and soil retention infrastructure (compensation); land use regulation and monitoring; and training in natural resource management, agroecological practices, and meeting commercial quality standards (Appendix B). The GMC's program offering payments for ecosystem services (action ENV5) is currently only available to agrarian communities, not individual landholders. The payment program provides a

minimal incentive of 400 Mexican pesos per hectare per year, equivalent to one person's labor for one week at minimum wage, and requires significant transaction costs (e.g., compiling application materials, attending mandatory training sessions, accounting) of the communities' leaders (GDF, 2015). Land use regulation and monitoring limit agrarian actors' land use choices without offering any incentives or compensation. Training programs provide new information to encourage agrarian actors to change their practices, on the assumption that they will be motivated by potential yield improvements and increased product value (e.g., organic produce fetches a higher market price than conventional produce; soil conservation techniques might result in higher yields).

Adaptation Provider and Benefits

In most of the PACCM actions analyzed, it is difficult to distinguish between who is the intended provider and who is the intended beneficiary of adaptation, the government, or agrarian actors. Two PACCM coordinators saw the actions relevant to agrarian actors as being designed to help agrarian actors adapt to climate change rather than to contribute to the city's adaptation. For example, in actions SC5 and ENV4 (as referenced in Appendix B), the urban government provides private adaptation benefits for farmers and food consumers by monitoring heirloom maize for contamination from transgenic maize, and by expanding the city's seed bank to conserve genetic diversity of heirloom maize.

But, in most of the Plan's actions, agrarian actors are implicitly presented as providers of public adaptation benefits, with the government providing some support for adaptive actions. These public adaptation benefits can be summarized as environmental

services (especially soil and water retention to reduce risk of floods and landslides, aquifer recharge for the city's water supply, and biological and genetic diversity conservation to adapt to an uncertain future), and reduced GHG emissions from the purchase of local, sustainable products. The PACCM identifies three ways that farmers would privately benefit from their provision of these public benefits: yield gains from improved soil fertility and moisture; economic gains related to increased demand and market opportunities for their products; and the maintenance of cultural traditions strongly linked with heirloom maize varieties. It implies that these benefits would enhance farmers' and the city's resilience to climatic and environmental change. For example, in action SC4 (microbasin management for rural development and soil and water conservation on agricultural lands), the government provides supports for soil- and water-retention infrastructure to improve landholders' resource management. The desired outcomes are the farm-level benefit of improved agricultural production, and the public benefits of soil and water retention, aquifer recharge, and reduced risk of landslides. In this program, farmers would be providing public *and* private adaptation benefits with government support.

Agrarian actors recognized that their activities and lands provide private and public benefits. For example, one interviewee who farms and works in government at the delegation level explained:

[Farming] is an opportunity for self-employment, to be able to develop more, and to even have the opportunity to create jobs... I'm referring to two points, and everything follows from this, which is to conserve what we have in the city in terms of natural resources... agricultural activities are part of the periphery of the city, where fortunately we still have natural resources that are fundamental for quality of life which is at minimum necessary for mental health: air, water... it's an area for a big percentage of aquifer recharge... I identify a lot with nature, and it seems to me that we have to continue taking care of this for everything it means: carbon absorption, water capture, [and] maintaining important biodiversity. (Authors' translation)

Though many interviewees identified their motivations for farming as economic (e.g., income, self-employment), participants also mentioned tradition, culture and enjoyment (e.g., love of the countryside—“*amor al campo*”), household food security and self-reliance, and health (Appendix C). None of the participants were unwilling to provide public benefits; in fact, the majority identified environmental stewardship and/or ecosystem services as a motivation for their agricultural activities.

Obstacles

Interviews with agrarian and government actors revealed four key obstacles for the success of the agrarian climate actions in the PACCM (Appendix C). First is the economic stress of low profits from agricultural activities. Most of the farmer interviewees have continued to practice agriculture and/or participate in conservation activities as a secondary economic activity. Though they enjoy this work, many stated that agricultural activities are not profitable without investing significant time and effort. Several described it as an unreliable or insufficient source of income. Some said they thought it might be possible to earn sufficient income from farming if they pursued it full-time, switched crops (e.g., to vegetables or animals), had infrastructure to help increase their production (e.g., greenhouses), or combined it with other economic

activities such as tourism. Still, many felt that accessing high-end markets, and transporting their produce to markets and/or clients was a key challenge. Farmers cited other limits to and stressors on their activities, including urban expansion, water access, infrastructure needs (e.g., irrigation systems, greenhouse repair), limited space, and government regulations. Yet the PACCM expects farmers to develop their farms into profitable commercial enterprises (e.g., actions SC1, SC4). While the PACCM acknowledges both the economic stressors facing agrarian actors and the pressures of urbanization, it ignores the fact that most agrarian actors have more gainful employment opportunities in the city.

A second obstacle is that the incentives and compensation the GMC offers agrarian actors are small, but carry big transaction costs. Agrarian actors explained that the government only awards part of the amount requested or needed, and many farmers do not have enough financial capital to complete their projects, especially when the activity is only marginally profitable, if profitable at all. These actors described strict requirements, complex bureaucracy, and major time commitments required, just to *apply* for government supports. Several complained that many government employees are incompetent, and/or rarely follow up on farmers' requests for help or information. The majority of agrarian actors in the study perceived the distribution of government supports for environmental and agricultural activities to be motivated by politics and nepotism, tainted by corruption and mediated by local political leaders (*caciques*). For example, a farmer from the borough of Tláhuac explained:

Unfortunately, SEDEREC [the rural development agency] programs are centralized, they are labeled. They are for a certain person who will receive the economic resources... they arrive to *campesinos* [peasant farmers] but only to the friend, or mate, or relative so they have more resources... As a *campesino*, I can't easily access [program benefits]. (Authors' translation)

A third obstacle is insufficient political participation of agricultural actors and representation of their concerns. Interviews with PACCM coordinators revealed that PACCM decision makers chose not to involve farmers or agrarian communities directly in the plan's development. Instead, their interests were represented by government agencies and environmental NGOs. From the decision makers' perspective, the complexity of the SC context, and the diversity of problems and needs among agrarian actors (and an apparent lack of a unified voice or agenda from agrarian actors) were barriers to even inviting agrarian actors to contribute. One interviewee explained:

Unfortunately, our participation with the people associated with the agrarian communities or also with the forest, with conservation... was representative. It was never direct with *ejidatarios* or *comuneros*, because, first, it was already hard to find the entry point for us to understand what was happening in the area [the SC]... During our work meetings, we [the PACCM coordinators, SEDEREC agents, researchers from the University of Chapingo, environmental NGOs] arrived at the conclusion that it was going to be very difficult to integrate [agrarian actors and communities] as a direct voice because there are a lot of them, and among them there are many social problems, with land tenure, economic problems, et cetera... We decided together that we were going to work in a representative manner, and look for support directly from SEDEREC with the people who already work in the countryside and with the NGOs that were already working there. (Authors' translation)

As a result, farmers and agrarian communities were unable to present their needs and interests relevant to climate change or other issues, or to discuss whether and how they would be willing to participate in climate change adaptation. Nor were they able to propose alternative actions for the Plan. Many farmers stated they had little political representation in urban politics, few opportunities to voice their opinions and needs, and many cited examples of being ignored when they did so. For example, in July 2014, the

ALDF organized the first *Campesino* Parliament of the Federal District (*Primer Parlamento Campesino del Distrito Federal*), in which Mexico City's farmers were invited to the legislature building to discuss the challenges they face. Two farmers whom I interviewed told us that by the end of the event, only one high-level government official had stayed to listen to the farmers, which made the farmers feel like the event had been a waste of their time.

A fourth, longer-term obstacle that both farmers and government actors acknowledged is cultural and generational: the aging farmer population, loss of rural tradition and knowledge, and lack of interest among and/or economic opportunity for youth in farming and natural resource management. One PACCM coordinator said:

We are talking about these generations... who were born, learned [farming], and it is what they know. Their kids and grandkids are of the generation that studied, or already have a taxi, or already have a more urban perspective. They aspire to having a car like the guy who lives in Condesa [the city center]. When these generations start to become the landholders in this territory [the SC], primary activities are going to decline. For 1500 pesos, it's better to drive a taxi and sell the land. (Authors' translation)

Some farmers lamented that other farmers do not want to work, are unwilling to dedicate enough time to make farming more profitable, or will eventually lose interest in farming all together. Describing her concerns about development in the area, one grower from Magdalena Contreras was worried:

...People are going to lose interest in the countryside. Because, if there are no people who like it, or who see it as difficult, or who don't put in much effort, well, [they think] I would be better off going to work in the United States, right? Or go work in an office, and leave the countryside because it doesn't provide enough to live from. So, well, we are going to die of hunger, because who is going to plant? Because these people see [agriculture] as ugly, or dirty. So, it is difficult that people who are interested in [farming] have their wings clipped, it would be chaos. There is no other way besides planting, and the number one most basic thing is food, so it worries me. (Authors' translation).

While these concerns cause many participants to feel pessimistic about the future of agriculture in the city, others were optimistic. These optimistic participants reasoned that agriculture would continue because there will always be food demand, and that niche markets (i.e., organic, local) will provide economic opportunities.

Opportunities

Government and agrarian actors acknowledged the need for policy changes to improve both economic development in the SC and agrarian actors' capacity to provide public benefits, to achieve mutual benefits, or win-wins. PACCM coordinators acknowledged that the economic needs of the SC population must be met, and that doing so will likely involve economic diversification. But, as one participant put it, the city's environmental objectives present opportunity costs for economic development, and finding a solution that meets both environmental and economic objectives would merit the "Nobel Prize for ecology." Many agrarian actors felt that government agents should spend more time in the field to familiarize themselves with the SC context and the challenges farmers face there, provide more technical assistance, and develop programs more appropriate for smallholders in the SC. While in the field, government agents would also see who is actively farming, and could distribute supports accordingly. Others recommended giving bigger financial awards to farmers to help them develop their farming projects. A few participants recommended improvements in planning, to integrate urban and rural land use plans and policies, and coordinate across objectives for conservation, ecosystem services, and economic development. One interviewee suggested an alternative management scheme for the SC modeled after the United States

National Park Service, in which the government could fund conservation, agricultural, and tourism activities, and pay a professional staff to maintain environmental quality, ideally comprised of agrarian community members.

Discussion

Private provisioning of public adaptation is complex because disparate actors have different expectations and understandings of what their roles are, how they should fulfill those roles over time, what the outcomes should be, and what mechanisms should be put into place to ensure that certain benefits are provided. Adaptation has costs and risks, so the role of private provider of public adaptation benefits may not be one that everyone is willing or able to fill. For the agricultural sector, climate change adaptation is also complicated by other stressors, including socio-economic change in the short and long term (Eakin, 2005; O'Brien & Leichenko, 2000). In new employment opportunities, as well as economic stress and urbanization pressure, many peri-urban farmers, have diversified their livelihoods with urban employment, reflecting a new rurality in which farmers' lifestyles and livelihoods are a hybrid of urban, rural, and international influences (Lerner & Eakin, 2011).

These results from Mexico City show that the GMC has little choice but to work with agrarian actors to ensure the provision of desired public adaptation benefits. The GMC has limited funds to invest in public benefits, and is constrained by corruption within the government and within agrarian communities. These constraints might mean that mechanisms requiring less government involvement are more attractive to decision makers (Tompkins & Eakin, 2012). But, to achieve its adaptation goals, the GMC will

need to develop a genuine partnership with agrarian actors. The GMC needs to be explicit about its expectations of those actors. It needs to take into account the specific vulnerabilities facing the peri-urban agrarian sector and the socio-economic changes that sector is undergoing. It needs to explore the circumstances under which agrarian actors are willing and able to provide public benefits. Finally, it will need to treat agrarian actors as *deliberate* adaptation providers—perhaps even more so than as providers of food and fiber—by offering them appropriate, direct incentives and compensation for the public benefits they provide.

The GMC has implicitly expected peri-urban agrarian actors to be private providers of adaptation benefits because it assumes that agrarian actors are willing to commit to and rely on agricultural production in the SC for their livelihoods, and thus will be motivated to take adaptive actions to increase production. Yet, to sustainably provide adaptation benefits, agrarian actors would either have to earn an adequate living from their agricultural activities such that they would be individually vested in the adaptive benefits promised through the PACCM (representing Olson’s notion of a privilege group), or they would have to have a secure enough income that they could afford to be altruistic (Tompkins & Eakin, 2012). But agrarian actors in the SC are highly heterogeneous: some provide public benefits accidentally, others seek the private adaptation benefits associated with participating in PACCM programs, and still others seek full compensation for any public benefits they are expected to provide. For many, urbanization has provided new economic opportunities through urban employment and (illegal) land sales (Aguilar, 2008).

A second assumption is that relatively little public investment is necessary to make agriculture viable in the SC. The GMC's efforts to support development and adaptation in the SC are commendable, as are its efforts to create adaptation strategies that are mutually beneficial to city dwellers and agrarian actors. However, the PACCM mechanisms intended to support agrarian actors are insufficient, and the long-term result will likely be underprovision of public adaptation benefits. This dilemma resembles a poverty trap (Banerjee & Duflo, 2011): neither agrarian actors nor government is willing and able to invest enough to make agricultural activities profitable or to realize the desired public and private benefits. If the government provided no additional support for adaptation, many adaptation services would still be provided accidentally, though perhaps not as efficiently as they would through coordinated efforts with landholders, supported by economic incentives. Over time, urbanization will continue to threaten these lands and undermine the services they provide.

Direct compensation for the provision of public benefits would be fair, considering that the GMC's land use regulations and conservation measures have created considerable opportunity costs for agrarian actors by constraining their economic options for the benefit of the city's water supply and risk management, and also considering the high transaction costs of participating in government programs for private provisioning of public adaptation. Agrarian actors should be compensated for the time they spend providing public adaptation at a level at least comparable to urban employment (e.g., as a taxi driver, construction worker, etc.), and should also be compensated for the rent of their lands. Adaptation providers would not need to depend *solely* on this compensation for their livelihoods, but would be better able to provide public adaptation services in

ways compatible with off-farm employment. This approach might help those interested in farming to pursue or maintain those activities, and make illegal land use changes less appealing for landholders. Other measures would also be needed to address the shortage of affordable housing that drives the demand side of the urbanization process.

The case of Mexico City suggests three guidelines for government efforts to promote private provisioning of public adaptation benefits. First, to achieve adaptation goals in collaboration with private providers, governments must provide mechanisms that explicitly and directly promote the desired outcomes, rather than assuming that the desired outcomes can be achieved indirectly through particular livelihood activities and economic development initiatives, such as agriculture. Direct compensation mechanisms (e.g., grants for infrastructure installation and maintenance, land purchases), and/or markets for public adaptation benefits (e.g., payments for adaptation services, payments to compensate resource managers for opportunity and transaction costs incurred from providing public benefits) may be effective mechanisms for achieving the desired adaptation outcomes (Tompkins & Eakin, 2012), together with appropriate technical training. In Mexico City, for example, the government could extend to individual smallholders conservation and natural resource management programs (e.g., supports for soil-retention infrastructure, infiltration ponds; payments for ecosystem services) currently available only to agrarian communities with larger landholdings. The government could also amend its land use plans to allow alternative uses for lands currently zoned for agriculture, uses that benefit the landholder while also providing the adaptive benefits the government seeks. The GMC has the opportunity to do so now, as it revises its land use plan (see GMC, 2016a).

Secondly, whether it is accidental or deliberate, private provisioning requires engagement with the providers themselves, and explicit communication of needs and expectations on both sides. Developing mechanisms for private provisioning in consultation, if not collaboration, with private providers is likely to yield more sustainable and mutually beneficial outcomes. In Mexico City, the government's recognition of the potential adaptation gains from agriculture-urban collaboration is progressive and commendable. However, relying on existing, insufficient programs, and not including agrarian actors in the PACCM's development, were missed opportunities to co-develop appropriate policy mechanisms, increase agrarian actors' participation in urban political processes, and improve trust between government and agrarian actors.

Thirdly, cases of private provisioning require closer attention to the politics of adaptation. Demands for private provisioning could reinforce historical power imbalances between the government and potential adaptation providers. Establishing a genuine partnership could provide opportunities to correct historical power imbalances, and result in truly mutual benefits for adaptation.

In cases where agrarian actors serve as private providers of public adaptation benefits, compensating them directly for desired public benefits rather than for agricultural production might appear to ignore or undermine food system adaptation goals. In Mexico City, these goals include supporting Mexican smallholders, traditional farming practices, and conserving maize genetic diversity. However, farming households, the city, and the food system adapt and develop differently. To pursue synergies for adaptation and development across these systems, the objectives for each, and the resources and actions needed to achieve those objectives, should first be

evaluated separately. In some cases, the objectives for these systems should be addressed separately, and actions to achieve these objectives compensated for separately. Doing so would make policy objectives clear, and facilitate the creation of policy mechanisms that adequately and appropriately respond to the specific vulnerabilities and stressors affecting both adaptation providers and beneficiaries. It would allow more space for adaptation and transformation while striving for development and adaptation objectives.

Conclusion

Peri-urban agriculture is recognized as vulnerable to climate change and as a potentially strategic sector for urban adaptation to climate change. Yet little research has been done on how urban governments have collaborated with agrarian actors or how adaptation has been conceptualized in these arrangements. Likewise, few have asked whom the adaptations are intended to benefit. This analysis of Mexico City's Climate Action Plan reveals the urban government's perception that agrarian actors are largely accidental providers of public benefits: that is, the public benefits are positive externalities of adaptive actions that agrarian actors would take anyway to improve their farms. But short-term economic and urbanization pressures are driving many agrarian actors into urban employment. Many of these actors maintain agricultural and conservation activities as a secondary source of income or hobby. If the government wants these actors to provide public adaptation benefits, they will have to approach them as *deliberate*, profit-maximizing adaptation providers, and provide them with direct compensation and/or incentives for the desired benefits, independent of any particular livelihood activity.

To collaboratively advance climate change adaptation, urban decision makers will need to establish a mutual understanding with their collaborators of who is adapting for whom, why, and how. Both adaptation providers and beneficiaries will have to explicitly communicate what they need and expect from the collaboration so that specific vulnerabilities and socio-economic changes may be taken into account. The government should develop mechanisms that directly promote the desired adaptation benefit, ideally in collaboration with private providers. To promote more productive collaborations, research could explore the politics of adaptation inherent in such collaborations; for example, how histories of social, political, economic, and environmental interactions affect institutional structures, trust, and conflict today, and how policy processes and outcomes mediate winners and losers, and synergies and tradeoffs between development and adaptation goals. This case study of Mexico City illustrates both the potential for adaptation and the pitfalls of such private-public partnerships. Genuine collaboration over time, with clearly defined roles, benefits, and costs may increase the capacity of actors in agriculture-urban collaborations to advance adaptation to climate change.

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Chapter 5

CONCLUSION

This study explored the politics of including agriculture and farmers in urban policies for sustainability in Mexico City. It examined the urban government's expectations for agriculture in its diverse policies, how it managed farmers and their agricultural activities, and the implications of this governance for farmers and the stated policy goals (conservation, food security, and climate change adaptation). Mexico City is an interesting case because it is a megacity with a long tradition of Urban and Peri-Urban Agriculture (UPA), with internationally recognized institutions, policies, and programs for sustainability, climate-change adaptation, and food and agriculture. It also stands out as a case where the urban government adopted policies for UPA from the top-down, with no public pressure to do so. The study examined: 1) the functions of urban and peri-urban agriculture that the Government of Mexico City (GMC) manages and prioritizes; 2) how the GMC's policies have framed farmers over time, and how that framing affects contemporary farmers' sense of identity and purpose; and 3) how the inclusion of agrarian activities and lands in the city's climate-change adaptation plan has created opportunities and obstacles for farmers in and around the city.

The study contributes to current conversations about the role of urban governments in facilitating food system sustainability and other sustainability transitions, the role of farmers and agriculture in cities, and the winners and losers of sustainable development. Cities are seen as essential spaces to advance sustainability objectives on multiple fronts, including food security and climate change adaptation. Through planning

and policy, urban governance is considered instrumental to realizing those objectives (Brugmann, 2007; Lee, 2007; Marcotullio & Solecki, 2013). UPA has been posited as an important means for improving urban food security, as well as instrumental for cities in realizing sustainability and adaptation objectives through the provision of multiple social, economic, and environmental benefits to farmers and the city (e.g., Ackerman et al., 2014; de Zeeuw et al., 2011; Mougeot, 2000). UPA is also considered to have the potential to increase democratic participation at the local level (e.g., McIvor & Hale, 2015). The multiple benefits of UPA are largely assumed to occur naturally and be synergistic. UPA's multifunctionality is treated as an asset to elevate the visibility and relevance of agriculture in urban contexts, while the lack of local governance facilitating and regulating agriculture in the urban context is often cited as a weak link in realizing UPA's potential for providing multiple benefits (e.g., Bryld, 2003; Lovell, 2010). Cities that have adopted institutions and policies for agriculture and food have been praised as innovative, inclusive, resilient, and sustainable (FAO, 2014a; Sonnino, 2016; World Bank, 2013). Much of the UPA literature assumes that urban policies for agriculture and food were created to improve food system sustainability, food security, and/or farmers' livelihoods. As more urban governments around the globe expand their domain of governance to include farmers and agriculture, it is necessary to critically examine these claims.

The results of this study of Mexico City show that the GMC manages agriculture as an instrument for achieving urban objectives largely unrelated to food: to conserve the city's watershed and provide environmental services. In 2014, peri-urban agriculture received 97.5% of the city's budget for agriculture, while urban agriculture received the

remaining 2.5%. Yet, contrary to what this funding distribution would suggest, current policies negatively frame *peri-urban* agriculture as unproductive and a source of environmental contamination, while associating *urban* agriculture with positive outcomes for development and sustainability. Peri-urban farmers have resisted this framing, asserting that the GMC inadequately supports farmers' watershed conservation efforts and farming activities, and lacks understanding of and concern for farmers' needs and interests. The city's climate plan implicitly considers farmers to be private providers of public adaptation benefits, but the plan's programs do not sufficiently address the socioeconomic changes responsible for agriculture's decline; a decline that may undermine the government's climate adaptation objectives.

The analysis demonstrates that managing agriculture for multiple benefits to meet farmers' and the city's needs may be more elusive and problematic than the policies themselves and the academic and development literature suggest. The case shows how different objectives for and functions of agriculture may be theoretically compatible, but not be aligned on the ground. It highlights how the assumption that multiple functions of agriculture are inherent and/or synergistic can lead to a lack of clear policy objectives and inappropriate policy mechanisms, which may ultimately be counterproductive for both farmers and the city. It shows that even under the assumption of synergistic and inherent functions, decision makers may prioritize certain functions more than others through policies. It also demonstrates that historical power dynamics between urban and agrarian interests, as well as dominant narratives about agriculture, continue to shape urban policies for agriculture, and discourage farmers' participation in urban politics.

In Mexico City's UPA policies, discourse, policy design, and policy objectives are not aligned. Specifically, the government frequently mentions food security in its agricultural policies, however not all of these policies are designed to, nor do they necessarily aim to address food insecurity by improving access to food. Its policies are largely designed to modernize agricultural practices and increase productivity, as a means for watershed conservation and the provision of environmental services. In other words, the GMC treats the primary outcome it seeks—environmental services—as a byproduct of agricultural production, and the value of environmental services as a function of the agricultural economy. Yet, peri-urban agriculture in Mexico City has been in decline for decades, which means that to achieve its objectives as outlined, the government must reverse the trend. It has not succeeded at this in the 40 years since the urban government began agricultural development efforts.

Why has the Government of Mexico City adopted a discourse—food security—in policies that are not designed to address that issue? Why does it praise urban agriculture, but dedicate only 2.5% of its budget for agriculture to its development? I have interpreted these aspects of the GMC's policies as city authorities participating in international discourses about UPA, food security, and sustainability. Mexico City has been rewarded for its UPA policies with praise from the FAO (2014a), which illustrates that food and agriculture issues are among the greening strategies urban governments use to enhance their competitiveness on the global stage (Béal, 2011; Jonas & While, 2007). In other words, similar to how UPA is considered multifunctional for farmers and cities, policies for UPA, food and sustainability should be recognized as multifunctional for urban governments. The GMC can claim to address multiple problems through a single

suite of policies and programs targeting one mostly marginal population (farmers), and self-promote on the international stage. However, international discourses and ideals will not necessarily align with local needs and realities (Forsyth, 2003). For example, UPA is widely described as a means for enhancing household and urban food security (e.g., Altieri et al., 1999; G. Lang & Miao, 2013), but it may not be the appropriate instrument to enhance food security for most residents of Mexico City (though it likely does not detract from food security, either).

Multifunctional agriculture, in a broad sense, can be defined as “a way of farming that serves *multiple functions* and that reduces the emphasis on food and fibre production,” including environmental goods, economic diversification, and local food systems (Wilson, 2007, p. 186, emphasis in original). Framing agriculture as multifunctional (implicitly or explicitly) has powerful implications for the practice of agriculture and its future (Marsden, 1999), but has several limitations for policy, particularly where agriculture is being managed to provide benefits for others. First, it can lead policy makers to list several policy objectives for a single policy action or domain, and thus over promise and under deliver in response to real needs. For example, despite the GMC’s rhetoric about food security and economic development, its primary policy objective for UPA is to address a serious natural resource management issue: the city’s water supply. The danger of the GMC loosely using the food security discourse to frame its UPA policies is that it suggests the government is doing more to address food insecurity than it actually is, and the needs of the city’s food insecure residents—over one million people—may go unmet. It must be recognized that not all functions are equally provided in all contexts at all times; some functions must be explicitly elicited and

managed, as demonstrated in cases where farmers are involved in watershed or flood management (more on this below). Rather than adopting policies with multiple or unclear objectives, decision makers should be direct about the functions of agriculture they prioritize in a given policy and why. However, this raises the key question of whose values and needs determine what functions of agriculture are prioritized in a given context.

Second, multifunctionality can lead policy makers to select inappropriate policy tools for achieving their primary objectives. For example, the GMC has mainly used policy tools for farm modernization, together with farmer training and environmental regulations, to discourage farm abandonment and ensuring the provision of environmental services. But, under this policy design, the provision of environmental services is at the mercy of changes in markets for urban land and agricultural goods, and therefore has an unpredictable future.

Third, the diverse roles assigned to farmers under a multifunctional framework, and the expectations that accompany those roles, can be contradictory. Farmers are expected to modernize and increase production to contribute to food security (Godfray et al., 2010), as well as meet the changing and fickle demands of niche markets (Adams & Salois, 2010; Andrée, Dibden, Higgins, & Cocklin, 2010). These productive functions are seen as the key to improving farmers' livelihoods, and are primarily what the government supports. Though farmers' success is still evaluated largely in terms of their productivity and profitability, they are now also expected to fulfill system-wide functions for the public's benefit—such as for the hydrological cycle, air quality, regional culture, and species habitat—but many of these benefits are only narrowly compatible with

productivism and modernization. Providing public benefits can be costly for farmers, but there is minimal (if any) public financing for this. Farmers in and near cities may face more scrutiny in the gaze of urban residents and authorities than farmers in more rural areas. Yet, it is not clear that agriculture is the best instrument, or even an appropriate instrument for achieving some nonfood policy objectives (Bohman et al., 1999). Policies that primarily seek ecological outcomes from farmers' land management may have repercussions for food production and farmers' skills and knowledge, and present tradeoffs for food security in the short and long-term. This is a serious concern, and the potential tradeoffs must be evaluated.

Fourth, the concept of multifunctionality emphasizes outcomes. But, this can lead to farmers' needs, interests, and values—the people who provide the multiple benefits—being ignored. Obviously, a top-down approach to planning an ideal landscape that meets the urban government's objectives is much easier for urban managers than collaborating with a heterogeneous, potentially difficult group of urban and peri-urban farmers. But, to be successful, policies that target farmers need to productively engage with farmers, and address *their* diverse interests in, and conditions for practicing agriculture or providing public goods. Arguably, it is increasingly the systems (especially urban systems) in which agriculture is embedded that depend on farmers, not vice-versa. Cities may not depend on the farming economy or on local farm produce for food security, but, like Mexico City, they might depend on the ecological functions of farmland, and the environmental stewardship of farmers for the city's sustainability and adaptation. This shift in urban dependence on farmers comes at a time of significant socio-economic change in the farm sector: farmers are aging, fewer youth are taking up

agriculture, and the youth who are interested in farming face difficulty accessing land, and/or lack the knowledge and experience to farm well. Farmers have agency in the face of stressors, vulnerabilities, and opportunities; they can choose to persist in their farming activities, adapt, or transform by selling their land (legally or illegally) or taking up off-farm employment. There are more off-farm employment options now than ever, especially in and near cities. Democratic governments cannot force farmers or other landholders to maintain farming activities if they are neither willing nor able. This raises the questions: who will maintain or take on the increasingly difficult tasks of farming and providing the associated public benefits? What role can or should urban governments play in promoting farm retention when their objectives are not necessarily related to food or agriculture?

It is obvious that policy processes, policy content, and power dynamics matter for sustainability governance in the urban context. Farms do not become instruments for urban sustainability, development, and food security simply because the government creates policies for them. Policy design can be used to reinforce existing power dynamics and uphold the interests of those in power. However, this can undermine policy objectives (DiAlto, 2005; Ingram & Schneider, 1991). For example, at a basic level, urban policy narratives that frame agriculture in a negative light—as unproductive, a source of environmental contamination—make the city look modern, productive, clean—even sustainable—by comparison. Such narratives function to justify urban interventions in peri-urban or rural affairs. But, they are unlikely to encourage farmers to provide the benefits the city desires or needs. As city governments move into new governance domains—thus extending their authority over and/or forging new

collaborations with actor groups like farmers—it is important that decision makers carefully consider whose interests they are upholding. This will likely require urban authorities to examine whether their constructions of target populations in policies promote partnerships and invite participation. It also likely requires that they provide appropriate compensation to farmers for the public goods they provide.

Urban governments, development agencies, researchers, and practitioners working with UPA could benefit from the insights generated from cases of urban watershed and flood management involving farmers and their lands. In developing policies for farmers and farmland, especially for nonfood outcomes like climate adaptation or urban sustainability, urban decision makers should consider farmers' interests and needs as private providers of public benefits (Bills & Gross, 2005; Howgate & Kenyon, 2009). Win-wins are not guaranteed; farmers' needs and interests are not necessarily synergistic with government objectives, or the needs of other interest groups in the city (Steinberg & Clark, 1999). Governments can compensate farmers for the risks and costs accrued from providing public benefits by, for example, offering appropriate payments for ecosystem services, paying rent to farmers, or even buying farmland outright at market prices, to place farmland under public management. Such mechanisms have been applied in some contexts; though, they are not without their own challenges (e.g., Erdlenbruch et al., 2009; Grolleau & McCann, 2012; Pires, 2004). Multiple strategies may be required to address diverse farmers' needs and interests. Strategies may need to evolve over time as conditions and needs change. Governments may need to commit more resources than they expected, or than they have previously, in order to achieve their objectives. They may also need to develop or participate in hybrid forms of

governance, and partner with government agencies and civil society groups, particularly where the land or resources in question lie outside of urban jurisdiction.

Farmers, agrarian organizations, and peri-urban and rural communities should also reflect on their objectives and needs going into the future so they are not simply reacting to an urban agenda. In many cases, farmer organizations have organized for advocacy in state and national politics; they should consider what issues affect them at the local level, and what advocacy in local politics might look like. It likely will not focus on production and market access, but rather, on negotiating natural resource allocation and management, and providing public benefits such as flood mitigation or aquifer recharge. It will involve building bridges with urban actors, such as urban government officials, urban community leaders, developers, consumers, activists, voters, and environmental groups. Farmers and agrarian communities could also work together to address the aging, declining farmer population and barriers to youth entering farming, such as forming coalitions with investors and land trusts (e.g., Northeast Farm Access (NEFA), 2017), or providing guidelines for farming and accessing land (e.g., Learmonth et al., 2010). Though, in Mexico City, the *ejido* land tenure system, urbanization pressure, and corruption complicate this issue.

This study suggests several practical guidelines for developing urban policies that seek public benefits from farmers. First, by clarifying their objectives, governments could incentivize farmers to provide the desired policy outcomes more efficiently. Farmers should also communicate their needs and expectations for the collaboration, as well as their knowledge of farming and ecosystem management. In order to cultivate a genuine partnership, during the policy development phase, there needs to be an

evaluation of where and how their objectives align so that the needs of both parties can be addressed. This includes taking into consideration socio-economic change: farmers may be transitioning out of the primary sector, and thus becoming landholders rather than farmers. But, with effective collaboration and policy design, this need not imply environmental degradation, nor that those transitioning out of farming no longer serve as environmental stewards. Secondly, to encourage farmers to provide specific public benefits, governments should develop policy mechanisms that explicitly and directly promote the desired benefits, rather than tying the desired outcomes to a particular livelihood activity. Decision makers should think outside of the box of traditional policy tools, and beyond traditional policy narratives about agriculture (e.g., productivism, environmental contamination). Framing agriculture and farmers in terms of their positive contributions is more likely to encourage farmers to contribute to realizing urban objectives. Finally, governments should compensate farmers for the public benefits they provide. The appropriate compensation should be determined jointly with farmers.

Farms and cities are deeply interconnected through multiple ecological and political processes, material flows, economic flows and other connections in social-ecological systems. These connections and dynamics are shaped over decades, or even centuries, as in Mexico City. Urbanization may displace agricultural jobs and land uses. Agricultural practices may change. But, cities will always need food and water, which means agriculture-urban dynamics will always be important. The question should not be whether local/urban governance is the key to unlocking UPA's potential, or whether UPA is the solution to diverse urban challenges. These strategies may or may not be beneficial, depending on "the actors and agendas that are empowered by the particular

social relations” of that context (Born & Purcell, 2006, p. 196). Rather, the key questions lie in how agriculture-urban dynamics are evolving in the face of social-ecological changes: for example, why and how farmers and cities collaborate or come into conflict in the face of change, who adapts for the benefit of whom, and how these changes shape power dynamics between cities and farms. Social-ecological change is a key driver of the recent wave of urban policies for food and agriculture. These policies and political processes have helped bring agriculture-urban connections and their underlying power dynamics into the light, even if (as in Mexico City) they have done little to change those dynamics thus far. The insights generated from a better understanding of agriculture-urban dynamics could help cities and farmers develop more strategic collaborations as they each confront social-ecological change. Though historically uneven power dynamics between cities and farmers are a significant barrier, I am cautiously optimistic that, over time and through many deliberations and experiments, urban governance for food and agriculture can contribute to enhancing the sustainability of cities, farms, and food systems. Because agriculture-urban dynamics will continue to be shaped by social-ecological change, in the future they may be very different from how they are now, and what we perceive as the sustainability ideal today.

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APPENDIX A

MEXICO CITY'S UPA PROGRAMS, 2014

Programs	Budget (MXN)	Mechanisms	Functions	Urban or Peri urban
SEDEREC				
1. Programa de Desarrollo Agropecuario y Rural				
1.1 Fomento al Desarrollo de las agropecuarias y agroindustrias	11,829,000	Financial supports	Primary production, economy, food security, ecological services	Peri-urban
1.2 Cultivos Nativos	5,900,000	Input supply, financial supports	Primary production, culture & community, ecological services	Peri-urban
1.3 Acciones encaminadas a la Organización, Capacitación y promotores de fomento agropecuario	Data not available	Social programs, juridical assessment, project follow-up, training, soil & water testing, financial supports	Primary production	Peri-urban
1.4 Programas Concurrentes Convenio en Concurrencia con la Federación	78,468,750 (468,750 SEDEREC, 66 million SAGARPA)	Machinery supports, input supports, data collection, financial supports, training, infrastructure maintenance	Primary production, food security, economy, ecological services	Peri-urban
2. Programa de Agricultura Sustentable a Pequeña Escala				
2. Alimento Sostenible para la Ciudad de México	4,443,807 (supplemented by USD \$16,000 from Government of New Zealand)	Infrastructure supply, training	Primary production, food security, health, culture & identity, economy	Urban
2.1 Fomento a la Producción Orgánica	1,157,734	Training	Primary production	Peri-urban
2.2 Mejoramiento de Traspacios	4,500,000	Training, project follow-up	Primary production, food security, economy	Peri-urban
3. Cultura Alimentaria, Artesanal, y Vinculación Comercial				
3.1 Vinculación Comercial de Productos Rurales Alimentarios y Artesanales	11,450,000	Marketing support	culture & community, economy	Peri-urban
3.2 Conservar e Impulsar la Cultura Alimentaria y Artesanal	1,800,000	Public events	Food security, culture & community, economy	Peri-urban
SEDEMA				
4. Suelo de Conservación y Biodiversidad				
4.1 Restauración de la Zona Lacustre de Xochimilco y Tláhuac	27,300,000	Infrastructure maintenance, public education	Culture & community, ecological services	Peri-urban
4.2 Programa de	142,309,413/	Financial supports,	Primary production,	Peri-urban

Reforestación Rural y Reconversión Productiva (PROFACE)	112,370,673	reforestation	ecological services	
4.3 Ordenamiento de la Ganadería	202,904	Livestock stabling supports	Ecological services	Peri-urban
4.4 Aplicación y Cumplimiento del Programa General de Ordenamiento Ecológico del DF	37,683 / 302,627.67	Zoning enforcement & regulation	Ecological services	Peri-urban
4.4 Protección de las Razas del Maíz del altiplano Mexicano	Data not available	Monitoring/ data collection	Ecological services	Peri-urban
5. Acciones en Materia de Educación Ambiental				
5.1 Educación y Comunicación Ambiental	776,412	Public education, training	Health, economy, ecological services	urban
5.2 Mercado de Trueque	1,949,781	Public education	Health, economy	urban
5.3 Curso Mujer de Huerto	29,365	Training	Primary production, food security, health, culture & community, economy, ecological services	urban
5.4 Talleres de Huertos Urbanos	22,665	Training	Primary production, food security, health, culture & community, economy, ecological services	urban
5.5 Public Events	Data not available	Public education	Health	urban

APPENDIX B

ACTIONS (PROGRAMS) OF THE 2014 PACCM PERTINENT TO PERI-URBAN

AGRARIAN LANDS AND ACTORS

Action/ program	Objective (actor)	Benefit created (target beneficiary)	Policy Mechanism	Cost to farmers & landholders
IPU1	Integrate environmental & urban planning policies (government)	Urban quality of life (urban residents)	Land use planning, regulation	Limits land use & development options
EVI1	Increase green space per capita (landholders)	Urban quality of life (urban residents)	Reforestation, environmental management	Transaction costs; time investment in project implementation & maintenance; potential yield & income losses; opportunity costs in other employment
SC1	Increase organic farming practices (farmers)	Environmental quality, local food (urban residents); economic development (farmers)	Training in farming practices; incentive of possible government purchasing	Transaction costs; time investment in training, transitioning farm to organic, establishing market relationships; opportunity cost of other employment
SC2	Evaluate the logging ban and forest quality (government)	Carbon sequestration and other ecosystem services (urban residents)	Regulation, evaluation	Limits land use & development options
SC3	Integrate local farmers as providers of the “green purchases” program (government)	Reduced GHG emissions (urban residents); sustainable economic development (farmers)	Agreements to realize guidelines for government purchases of local produce	Transaction costs; time to transition to meet commercial standards, establish market relationships
SC4	Conserve soil & water on agricultural land (farmers)	Ecosystem services; reduced risk of landslides & floods (urban residents)	Economic supports for infrastructure, management plan	Transaction costs; time to implement & maintain conservation projects; potential financial investment; opportunity cost of other employment

Action/ program	Objective (actor)	Benefit created (target beneficiary)	Policy Mechanism	Cost to farmers & landholders
SC5	Conserve & protect native maize varieties (government)	Maize genetic diversity (farmers)	Monitoring transgenes, regulation, training & evaluation	Limits crop choice & development options
SC6	Conserve soil, water, & ecosystems in the SC (agrarian communities)	Ecosystem services; reduced risk of landslides & floods (urban residents)	Financial supports for infrastructure; monitoring	Transaction costs; time to implement & maintain conservation projects; potential financial investment
SC7	Conserve biodiversity through milpa agriculture (government)	Food diversity, ecosystem services, local food (urban residents); livelihoods (farmers)	Demonstration plots, technical assistance, maize samples collected for seed bank	Time in training; opportunity costs for economic development
SC8	Increase carbon capture in SC (government, landholders, women's groups)	Ecosystem services, quality of life (urban residents); employment (agrarian actors)	Land use plans, project implementation & maintenance on abandoned agricultural land	Transaction costs; limits land use & development options
SC9	Rainwater capture for irrigation (farmers)	Increased water supply (urban residents); improved water management (farmers)	Design & implement plan for eco-technologies for water capture	Transaction costs; time in training with new technology
ENV3	Restore environmental quality in natural protected areas (landholders)	Ecosystem services (urban residents)	Management plans	Transaction costs; time to implement & maintain conservation projects
ENV4	Conserve maize diversity & biodiversity (government)	Conserve genetic diversity (farmers) & biodiversity (urban residents)	Create lab, reactivate seed bank	None

Action/ program	Objective (actor)	Benefit created (target beneficiary)	Policy Mechanism	Cost to farmers & landholders
ENV5	Create new ecological reserves in agrarian communities (agrarian communities)	Ecosystem services (urban residents)	Market for public good (ecosystem services)	Transaction costs; time in labor, training, implementing & maintaining projects
F15	Contain urban expansion (government)	Urban quality of life (urban residents)	Land use planning	Limits land use & development options

APPENDIX C

ANALYSIS OF INTERVIEWS WITH AGRARIAN ACTORS

Total participants: N = 33

Motivations to farm

- Tradition, culture, enjoyment: N=20
- Economic: N=18
- Environmental stewardship & ecosystem services: N=17
- Household food security & self-reliance: N=11
- Health: N=7

Obstacles to success of agrarian climate actions

- Economic barriers to farming: N=20
 - Insufficient or unreliable income: N=16
 - Limited market access: N=10
 - Profits are limited, but could improve: N=9
- Other stressors and limits on farming activities: N=25
 - Urbanization: N=17
 - Infrastructural needs: N=9
 - Water supply/access: N=7
 - Space, capacity limits: N=7
 - Regulations: N=6
- Government supports: N=24
 - Insufficient: N=14
 - Transaction costs: N=13
 - Strict requirements: N=15
 - Access biased/corruption, nepotism: N=18
- Limited political participation and representation: N=15
- Lack of interest in farming: N=14

Opportunities for agricultural development in the SC and private provision of public benefits

- Field presence: N=12
- Better Funding: N=12
- Tech support: N=6
- Appropriate programs: N=5
- Integrated urban-rural planning: N=4

APPENDIX D

IRB APPROVALS FOR RESEARCH

To: Halle Eakin
GIOS Build

From: Mark Roosa, Chair
Soc Beh IRB

Date: 02/22/2013

Committee Action: **Exemption Granted**

IRB Action Date: 02/22/2013

IRB Protocol #: 1302008860

Study Title: Sustainable Adaptation to Urban Flood Risk: Enhancing Public Participation in the Rio Magdalena

Digitally signed by
Dianne DeNardo
DN: cn=Dianne DeNardo,
o=ASU, ou=ORIA,
email=Dianne.DeNardo@
asu.edu, c=US
Date: 2013.02.22 16:06:10
-07'00'

Dianne DeNardo

The above-referenced protocol is considered exempt after review by the Institutional Review Board pursuant to Federal regulations, 45 CFR Part 46.101(b)(2) .

This part of the federal regulations requires that the information be recorded by investigators in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. It is necessary that the information obtained not be such that if disclosed outside the research, it could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.

You should retain a copy of this letter for your records.

EXEMPTION GRANTED

Hallie Eakin
Sustainability, School of
480/727-7764
Hallie.Eakin@asu.edu

Dear Hallie Eakin:

On 11/13/2014 the ASU IRB reviewed the following protocol:

Type of Review:	Modification
Title:	The Dynamics of Multi-Scalar Adaptation in the Megalopolis: Autonomous action, institutional change and social-hydrological risk in Mexico City (MEGADPT)
Investigator:	Hallie Eakin
IRB ID:	STUDY00001785
Funding:	Name: NSF: National Science Foundation; Grant Office ID: BTS0320, Funding Source ID: ICER-1414052,
Grant Title:	None
Grant ID:	None
Documents Reviewed:	<ul style="list-style-type: none"> • Snowball Sample Request Script.pdf, Category: Consent Form; • draft workshop invitation_english_megadapt.pdf, Category: Consent Form; • draft interview invitation_english_megadapt.pdf, Category: Consent Form; • Recruitment_Consent Survey English.pdf, Category: Consent Form; • INFORMATION LETTER_SURVEY_ENGLISH (4).pdf, Category: Consent Form; • HRP-503a - MEGADAPT_Oct 2014.docx, Category: IRB Protocol; • Workshop Activities (Taller 1).pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);

	<ul style="list-style-type: none">• Qualitative Interview topics_english.pdf, Category: Measures (Survey questions/Interview questions /interview guides/focus group questions);• UNAM Statement Re: IRB , Category: Off-site authorizations (school permission, other IRB approvals, Tribal permission etc);• 14041049 Eakin NSF FP.pdf, Category: Sponsor Attachment;
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The IRB determined that the protocol is considered exempt pursuant to Federal Regulations 45CFR46 (2) Tests, surveys, interviews, or observation on 11/13/2014.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

Sincerely,

IRB Administrator