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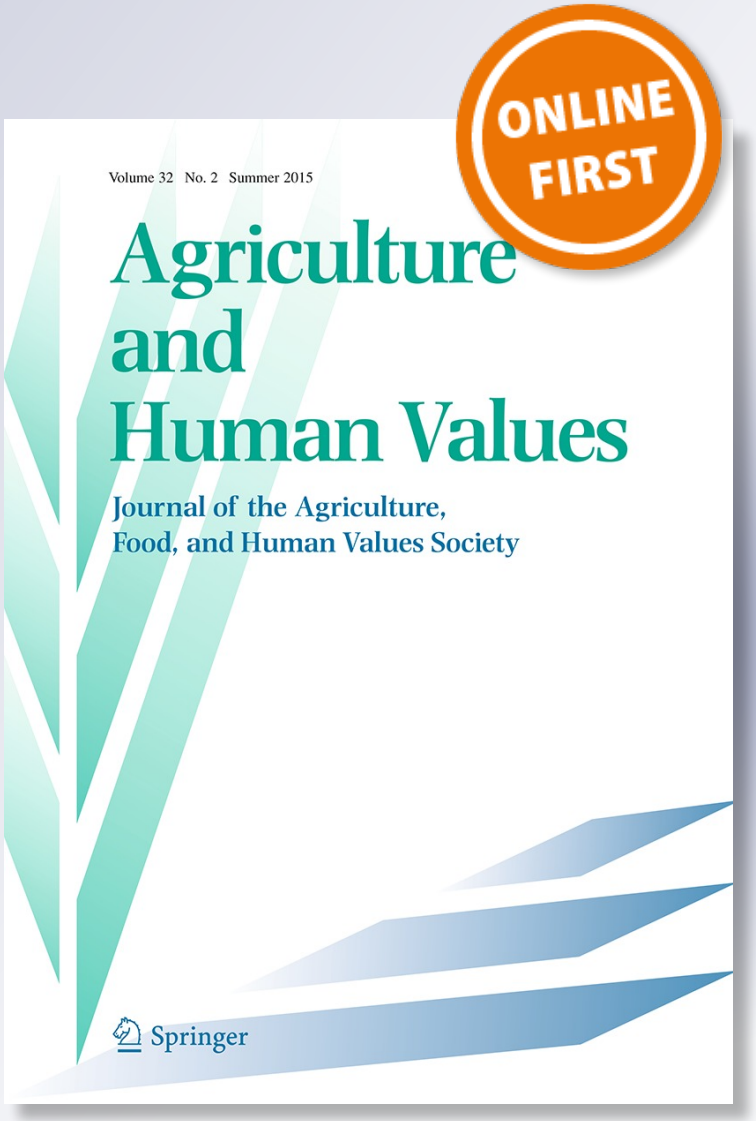

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Consumption strategies in Mexican rural households: pursuing food security with quality

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Abstract Food quality is an important issue on the global agenda, particularly in high- and middle-income economies, but of little concern in designing Mexico's food policy. Food policy has focused on quantity and in the case of maize, on satisfying domestic demand by supporting large commercial agriculture and importing from abroad. However, and as argued in this paper, obtaining a food staple (maize-*tortilla*) of quality is also an important issue for rural households and contributes to motivating continued smallholder production. Based on case studies in the rural district of Atlacomulco, in the state of Mexico, as well as in two regions of the state of Chiapas, this paper analyzes the production and consumption strategies of rural households. We focus on goals of food security and quality and note differential trends among households of varying characteristics and local contexts. We find that the motivation of small-scale producers to grow maize should be supported by Mexico's food policy.

Keywords Maize · Food security · Quality · Rural households · Mexico

Abbreviations

ANEC	Asociación Nacional de Empresas Campesinas
ASERCA	Apoyos y Servicios a la Comercialización Agropecuaria
CIMMYT	Centro Internacional de Mejoramiento de Maíz y Trigo (International Maize and Wheat Improvement Center)
CONASUPO	Compañía Nacional de Subsistencias Populares
DDR	Distrito de Desarrollo Rural
FAO	Food and Agricultural Organization of the United Nations
FIRCO	Fideicomiso de Riesgo Compartido
NAFTA	North American Free Trade Agreement
PROCAMPO	Programa de Apoyos Directos al Campo
PROMAF	Programa de Apoyo a la Cadena Productiva de Maíz y Frijol
SAGARPA	Secretaría de Agricultura, Ganadería, Pesca y Alimentación
SIAP	Servicios de Información Agroalimentaria y Pesquera

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Introduction

Maize is the most important crop in Mexico, grown on 27.6 % of its arable land and on 2.8 million landholdings. On most farms maize is cultivated on plots of 10 ha or less, which contribute 60 % of the national output.[1] In 1994,

[1] Data provided by Hugo Perales from Programa de Apoyos Directos al Campo (PROCAMPO) based on maize producers, 2009.

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with North American Free Trade Agreement (NAFTA), Mexico's food policy was linked to ensuring a supply of cheap imported grain, essential to ensuring competitiveness in the Mexican economy in general.[2] Small- and medium-scale farmers were expected to abandon maize cultivation since they were not competitive with farmers in the Mid-western United States who increasingly would be exporting maize to Mexico (de Janvry et al. 1997). And since then, Mexican maize imports have increased (from 2.5 to 9.5 million tons between 1994 and 2012); but surprisingly, so has national production (from 14 to 22.1 million tons).[3] Imports are mainly of yellow corn (US2) from the US Midwest, for the food and feed industry, while most of maize produced in Mexico is white corn including a variety of landraces, which are preferred for human consumption.

Food preferences and quality—according to multiple attributes by which it may be defined—are not questions that have been systematically considered in Mexico's agricultural and food policy—an oversight that exists throughout much of the developing world. Having enough food (quantity) to feed growing populations is accorded priority, while quality is considered only in relation to issues of food safety and nutrition. In the global market, competiveness for agricultural products (exports) is based on cheap labor, as well as weak environmental and fiscal regulations, but concerns with quality for maize (imports) is limited to a few basic safety measures,[4] while quality in the global market remains a prerogative for higher income groups (Appendini et al. 2003; Friedmann 2005). Nevertheless quality was implicit in the public debate over maize leading up to NAFTA. Peasant organizations and other social groups argued that maize imports would seriously undermine domestic production and flood the market with low-quality yellow maize (Fitting 2011). Finally, maize was given relative protection for 15 years while the market for other cereals and oilseeds was liberalized. This concession to maize producers was rapidly appropriated by large farmers and then corporate interests, as agricultural policy directed supports to large farms on irrigated land, reinforcing the agro-industrial model noted above (Appendini 2014; Eakin et al. 2014a; Fox and Haight 2010). Nonetheless, smallholders mainly on rain-fed land marginalized from agricultural supports, continued to grow maize, but withdrew from selling to the national market (Appendini 2001).

Not until the increase in international food prices in 2007, when the international community turned attention to small- and medium- scale farmers and recognized the need for more inclusive and sustainable agricultural policies (World Bank 2007; FAO 2012), did the Mexican government launch a program to support smallholders growing maize and beans known as Programa de Apoyo a la Cadena Productiva de Maíz y Frijol (PROMAF).[5] In 2010, another program was implemented by the Ministry of Agriculture and the International Maize and Wheat Improvement Center (CIMMYT). This initiative, called MasAgro, was designed to improve access to agricultural inputs and technical assistance for small- and medium-scale maize producers. Neither effort has changed the existing bias in agricultural policy favoring large producers while both programs implicitly endorse the perspective that the motivation for production is primarily one of supply/nutrition (calories) rather than food quality.[6] Nevertheless, the Mexican government further committed itself in 2013 to alleviate hunger and malnutrition throughout the country, launching an ambitious program—Cruzada Nacional contra el Hambre (National Crusade against Hunger)—which promises, among other things, to strengthen production capacity and nutrition among smallholders. This effort is linked to the implementation of existing programs for rural population, and does not address quality per se, in relation to maize. The results are yet to be evaluated.

Such programs, though supporting small farmers, are not specifically concerned with consumption practices and less so with preferences and quality at a national level. This is an issue that, we would argue, should receive greater attention in the discussion of food security and be more explicitly taken into account in public policies.[7] Nor have

[2] From the mid-1960s, maize and other basic staples were subsidized by guaranteed prices (minimum) controlled by the state agency Compañía Nacional de Subsistencias Populares (CONASUPO). Prices tended to be above world prices (Appendini 2001). CONASUPO closed in 1999.

[3] See SAGARPA-SIAP (2015). Increase in demand is due to population growth, as well as demand for animal feed and industrial use.

[4] Mexico controls aftlatoxins, produced by a fungus present in aftlatoxins B1 (over 20 μg/kg is not allowed for human consumption) (Secretaría de Salud 2002). In contrast, import of transgenic maize is allowed, though forbidden to be sown in Mexico, except in experimental fields.

[5] The program provides technical assistance, infrastructure, and equipment to farmers with less than 5 ha of land. In 2007 it covered 1.6 million hectares and 122.2 thousand maize and bean producers, but dwindled in 2012 to 330.9 thousand ha and 54 thousand producers (SAGARPA and FIRCO 2012).

[6] MasAgro has a budget of 138 million USD over the course of 10 years. In 2012 the assigned budget was 20.3 million USD (SAGARPA and CIMMYT 2012); about 38 % of the average annual PROMAF budget in 2011 (SAGARPA and FIRCO 2012). These budgets represent only a third of the subsidies supporting the commercialization of maize by the government agency Apoyos y Servicios a la Comercialización Agropecuaria (ASERCA) in 2012 of which 80 % went to entrepreneurial farmers and market agents in Sinaloa (own estimates based on ASERCA) (SAGARPA and ASERCA 2013).

[7] There have been several civil society initiatives to promote the consumption of quality tortillas. See for example, the "Sin maíz no hay país" movement (Without maize there is no country), the tortilla shops established by Asociación Nacional de Empresas Campesinas (ANEC), and the Coyote Rojo initiative in the Meseta Purépecha, Michoacan (Baker 2013; Fitting 2011; McNair 2012).

broader issues such as environment and sustainability been addressed although internationally these issues are increasingly being tied to concepts of food quality (Murdoch et al. 2000). These issues also merit attention: Mexico's maize is a multipurpose crop and has multiple roles in rural livelihoods. Not only does it play a central role in diet and nutrition, but its cultivation also preserves and protects in situ biodiversity. The quality of local and regional varieties of maize also creates new market opportunities. However, there is no evidence that these attributes are recognized in Mexico's agriculture and food policy.

As public support for maize switched to large farms on irrigated land in the Northwest, the structure of national supply changed radically (Sweeney et al. 2013). In the decades prior to neoliberal policy reforms, small- and medium-scale farmers, mainly on rainfed land in the Center and Southwest, were the main producers as well as suppliers for the market. They had benefitted from public support that promoted Green Revolution technology for maize and other basic food staples, in the pursuit for national food self-sufficiency (Austin and Esteva 1987). For example, in the years leading up to NAFTA (1989–1992), Mexico State and Chiapas, where our case studies are located, provided an average 23 % of domestic production and of maize marketed. In 2014 their participation in output was 18 % as public policy increasingly focused on large maize production in Northern Mexico, the state of Sinaloa is now the main supplier of white maize for the flour and tortilla industry and provides about a quarter of domestic output and an estimated half of maize commercialized (Appendini 2014; Eakin et al. 2014a). As mentioned, small-scale producers have continued to grow but withdrawn from supplying the national market as Compañía Nacional de Subsistencias Populares (CONASUPO) diminished its purchase in the central and southern regions in the 1990s.

In this paper we want to further the discussion of the persistence of maize among small-scale farmers and focus on the specific issue of quality as part of their motivation to grow and consume their basic food—maize. We argue that quality is an important issue in household pursuit of food security and part of the economic, social, and cultural reproduction of their livelihoods. We hope this will provide more insight into the whether there may be grounds for agricultural and food policy to explicitly address concepts of quality in efforts to achieve rural development and food security goals.

Researchers have extensively assessed the impact that neoliberal policy reforms have had on small- and medium-scale maize farmers, both at the macro and micro levels.[8] While agreeing on an overall negative impact, explanations for the persistence of smallholders center around the search for food security, household valuation of assets such as land and family labor, as well as producing other foods associated with the *milpa,* or plot planted with maize, beans, and squash. Small farmers have pursued food security and managed risks by combining farm and non-farm activities in limited labor market contexts and by refusing to abandon their *campesino* (peasant) identity (Lerner and Appendini 2011).[9] In particular, research focusing on the interaction of agricultural modernization—promoted by public policy—and traditional practices has provided insight for understanding the complexity of small-scale farmers' strategic utilization of traditional strains of maize for some purposes and hybrid varieties of maize for others. Families prefer the former in specific agro-ecological environments as well as for household maize consumption, for reasons linked to culture and ethnicity, as well as for agro-climatic reasons (Bellon and Hellin 2011; Perales et al. 2005). Research on the use of seed varieties also suggests that markets for maize are much more complex than simple distinctions between yellow and white maize or hybrid and *criollo* (traditional) maize would suggest. Yellow and hybrid maize enter into commodity markets ruled by international prices, but markets for varieties such as colored maize for specialty foods are developing rapidly at local and regional levels (Bellon and Hellin 2011; Keleman et al. 2013). Therefore research concerned with the cultivation of traditional strains of maize is particularly helpful in understanding how the issue of quality enters into judgments made by small-scale farmers.

However, with few exceptions (Appendini et al. 2003; Appendini et al. 2008; Eakin et al. 2014b; Preibisch et al. 2002; Perales et al. 2005; Perales and Brusch 2007)[10] there has been little research overall on consumption practices in rural households and especially on changes in the consumption of maize and *tortillas*, and less so to the discussion of quality.

[8] Macro level: Appendini (2001); Barkin (2002); Fitting (2011); Hewitt de Alcántara (1994); Puyana and Romero (2005); Rello and Saavedra (2010); Rubio (2013). At the household level: Appendini et al. (2003); Appendini et al. (2008); Bellon and Hellin (2011); Eakin et al. (2014b); Fitting (2011); de Janvry et al. (1997), de Janvry et al. (1995); Lerner and Appendini (2011); Yunez et al. (2000).

[9] Econometric analysis applied to rural households in Mexico has also shown that small-scale farmers may respond in complex ways to changing market prices for maize, reflecting shadow prices that may differ substantially from market prices—an obvious reason for the persistence of maize in spite of falling prices from the 1990s to 2007 (Arslan and Taylor 2009; Dyer et al. 2006).

[10] See Isakson (2011) for Guatemala.

In our earlier research in the state of Oaxaca, as well as in *ejidos*[11] in Central Mexico (Mexico State and the states of Puebla, Morelos, and Querétaro), we found that peasant households grew maize in order to secure access to a basic staple, and also because they preferred to use criollo maize to make tortillas and other maize-based dishes cooked in a traditional way, which for them assured a quality product (Appendini et al. 2003; Appendini et al. 2008).

This research highlighted different trends in the strategies that households followed in order to obtain maize and tortillas. In general, all households with a plot of land grew maize and consumed homemade *nixtamal* tortillas[12] purchasing only if needed. But the local context was key in shaping consumption patterns and a variety of practices employed to ensure quality. We found that consumption strategies were complex and changing, not only because communities had access to differing resources but also because they were undergoing different processes of social and cultural change.

The process of change in the Mexican countryside has continued: occupation in agricultural activities has fallen from 22.7 % of the gainfully employed population in 1990 to 13.1 % in 2010, but maize is still an important agricultural occupation with 33 % of the agricultural workforce in rural locality engaged in the crop.[13] Nonfarm income has become increasingly important and migration is widespread. More women work outside the household, educational levels have increased, and the influence of urban lifestyles has penetrated the countryside in tandem with wider communications networks, new public infrastructure, and services. In an increasing number of cases, agriculture (including maize production) has become a marginal economic activity and contributes little to household income (Avalos Satorio 2006; Contreras Molotla 2014; Rello and Saavedra 2010). Yet despite the fact that households have income from other sources and could achieve food security via other means than subsistence production, rural households continue to grow maize.

A decade later, in a still changing rural environment, we returned to the field to explore the questions that motivated our earlier research on the issues of maize agriculture and food quality. In three study regions we first inquire about quality: what are the attributes that rural households associate with maize and the main food consumed—tortillas—and what practices they follow to obtain the quality of their preference? Second, we ask about agricultural practices: Do households grow maize because they recognize the quality and value homegrown maize for making tortillas and other traditional foods? Third, are there other practices to obtain quality? And is maize quality and identity an issue? Finally, we use a quantitative approach, based on survey data in order to further explore the different patterns in household agricultural and consumption practices related to their resources and regional contexts.

In the following section, we introduce the research sites and regional contexts within which fieldwork was conducted and explain the methodology followed. Next we discuss the concept of food and quality revising recent literature on food studies. Then we focus on the first three research questions based on interviews; next we assess these findings with data from a household survey. Finally we discuss our findings in the light of Mexico's food policy.

Research sites and methodology

We carried out case studies in three regions which represent areas in which maize is the main agricultural activity of small- and medium-scale farmers: the region of Atlacomulco, in Mexico State; in Chiapas, both in the Highlands (around San Cristobal de las Casas), and the mid and lowlands (Comitan and Villaflores). Prior to the 1990s, Chiapas and Mexico State were, with the state of Jalisco, the principal producers of maize in Mexico (a position now held by the state of Sinaloa).

In each state we worked in the main maize producing regions, identified by data provided by the government-run system of Rural Development Districts (Distritos de Desarrollo Rural-DDR). Within each DDR, we randomly chose the communities to study. In the Atlacomulco DDR we worked in three municipalities. In Chiapas, we worked in the highlands (DDR San Cristóbal), the midlands (DDR Comitán) and the lowlands (DDR Villaflores) (See Fig. 1).

The Atlacomulco DDR is located on the central highland plateau of Mexico, 2600 m above sea level. It is a densely populated region, well endowed with public services and infrastructure, communication networks and access to labor and product markets. The influence of the metropolitan area of Mexico City and Toluca (the capital city of Mexico State) is felt in rural communities and urban lifestyles are being incorporated into rural culture, in degrees determined along generational and occupational lines (Torres-Mazuera 2008). The Atlacomulco DDR is the main maize producing region in the State. In the 1970–1980s is was a main supplier of grain to the tortilla industry in Mexico City, a role that was strongly induced

[11] Ejidos are landholdings distributed during the process of Agrarian Reform (1917–1992) organized in communities in which there are individual plots, common lands, and an urban area.

[12] Nixtamal is the process by which the tortilla *masa* or dough is made. See footnote 17.

[13] In 2000 the percentage was 35.1, a small decrease of workers in maize and bean agriculture (Contreras Molotla 2014 based on estimates data from the 2000 and 2010 population census). Rural refers to localities of 2500 inhabitants and less.

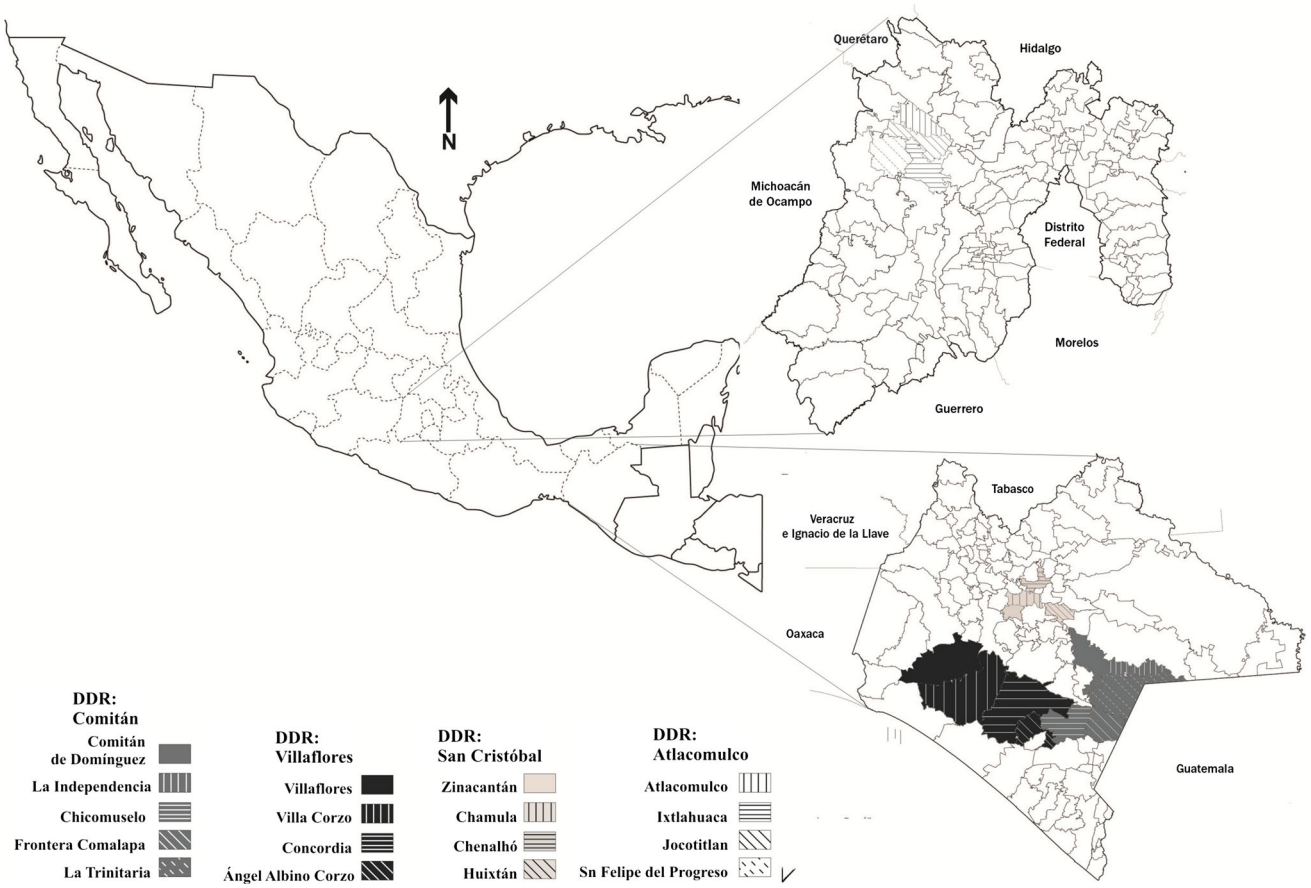

Fig. 1 Case study locations.
Source: Map elaborated by Neftali Miranda Flores

by the Ministry of Agriculture—promoting Green Revolution technology by subsidizing production and giving technical assistance—and the state marketing agency CONASUPO—which purchased maize at guarantee prices (Appendini 1988, 2001). This policy ended with the neoliberal policy reforms in the 1990s, but still remains in the nostalgic discourse of the peasants. Today, agricultural land has been subdivided for distribution to new generations and has partly been turned to residential use. Households grow maize, but their income is generated by various non-farm activities as well (Lerner and Appendini 2011).

The regions studied in Chiapas are distinctly rural. The Chiapas Highland (2000 m above sea level) is densely populated, but households are scattered in localities of 500 inhabitants or less. Indigenous cultures predominate and poverty is widespread. The main economic activity involves cultivating maize, beans, and some vegetables on small rain-fed plots—often on steep slopes. Maize has always been grown for subsistence with no public support. If any, coffee is the cash crop, grown in some localities; some households also raise sheep. Cash income is largely obtained from work as day laborers, whether on or off farm, and from temporary migration. In addition, transfer incomes from public poverty programs are important for many households.

In the region of Chiapas Midlands, Comitán is located at 1600 m above sea level; and in the Lowlands, Villaflores, is at 540 m. As the case of Mexico State, the Green Revolution also spread to the region supported by agricultural policies, in the 1970s–1980s. However households have more land in these communities than in their Highland and Mexico State counterparts and grow maize both for consumption and for market. Villaflores is the most important maize producing area in the state and hosts several agro-industrial firms, such as the Maseca corn flour mill[14] and Avimarca, which produces animal feed and markets poultry products. The use of hybrid seed and chemical inputs is widespread. According to the 2009 survey data, 33 % of households that sell maize have credit, but marketing supports (now the main subsidy for maize), technical advice, insurance, as well as specific

[14] Maseca (part of Gruma corporation) controls 71.2 % of the maize flour market in Mexico, followed by Minsa (23.5 %). Four other firms account for the rest (Secretaria de Economía 2012).

programs such as PROMAF, is non-existing. Livestock is the second important income generating activity (Eakin et al. 2014b).

During the first period of fieldwork in the autumn of 2009, we engaged in semi-structured interviews with key informants, authorities at the municipal and local levels, producers, and other household members. During the harvest season (October–January, 2009–2010) a household survey was conducted as part of the market integration and climate as the drivers of change in the Mexican maize system project.[15] In 2011, we returned to selected communities in which the survey had been done, in order to explore household consumption strategies and the issue of quality more extensively.

Interviews 2011

In order to explore in depth the meaning and valuation of quality in relation to their traditional food and the practices followed to obtain maize and tortillas, we conducted semi-structured interviews with women in households, on questions about maize agriculture, how food was obtained, how tortillas and other maize- based foods were prepared, the preferences and meaning of a quality tortilla and the changes in the practices of obtaining this food staple. Fourteen interviews were conducted with women in the Atlacomulco valley and 13 in Chiapas.

Survey data

For the purpose of assessing the results of the qualitative analysis and underlining the strategies followed by households according their resources and local contexts we explored the survey data. We classified households according to whether their consumption needs were able to be satisfied with own maize or not, by using an index to split households into surplus or deficit. Next we looked at the practices followed by each type of household, growing and/or buying grain, making tortillas and/or buying and what kind of tortillas were bought. The details on how we approached these practices are described in the section analyzing the survey data.

[15] In the Atlacomulco region, 402 households were surveyed in five ejidos located in the municipalities of San Felipe del Progreso, Atlacomulco, Jocotitlán, and Ixtlahuaca. In Chiapas 605 questionnaires were administered to households in the regions of San Cristóbal de las Casas, Comitán and Villaflores. Ejidos were randomly selected from the 2007 ejido PROCAMPO database, and households were also randomly selected within communities. We will refer to the regions as Atlacomulco, Chiapas Highlands, Chiapas Mid and Lowlands. The purpose of the survey was to provide a database for the general project. For other publications, see Eakin et al. (2014b), (2015).

Quality: a multidimensional concept

Quality is a social construction and can be understood according to the multiple meanings which different social actors give it, as well as the attributes they associate with certain foods. We distinguish two broad approaches to define quality: a technical approach which focuses on nutritional, health, and organoleptic properties of foods (properties which can be classified and measured, standardized, and regulated), and a social/cultural perspective which refers to the meaning consumers give to special foods and the place of certain elements of diet in maintaining the livelihoods of particular groups. The latter approach may also be evaluated and certified, mainly by private agents. The definition of quality by different social actors and interest groups is constructed by the interplay of economic, political, and social power (Matus Ruiz 2012; Rodríguez Gómez 2012; Cazes-Valette in Prigent-Semovin and Herault-Fournier 2005). Quality may be judged in relation to food safety, health issues, organic production processes, place of origin, ethnic/identity, fair trade, animal welfare, environmental, social and cultural sustainability, and even lifestyle. Food products are not just material goods that ensure survival but can also be understood from a cultural perspective that focuses on collective practices and knowledge of local resources (Fonte 2002).

Quality has become a key issue in the debate on food in the global economy. International conventions on trade have used quality as an element in the negotiation of trade regulations and norms (Rodriguez Gómez 2012). Private agents, including supermarkets and consumers, have gained increasing power to set norms and standards for food products in the global food chain, as products are grown, processed and distributed globally and consumers are increasingly preoccupied with the intrinsic property of the food they consume and also with symbolic and humanistic aspects (Fonte 2002; Murdoch et al. 2000; Prigent-Semovin and Herault-Fournier 2005). The negotiation of private conventions and reliance on private certification of specific standards have gained currency on a global scale. This reflects concern with problems of risk and risk perception and the need to generate trust among "active consumers" in the food system of late modernity (Malassis cited by Fonte 2002; Terragni et al. 2009).

In this global world, rural households continue to grow traditional staple crops as part of their shifting livelihood strategies. The quality of food is assured through self-provisioning or through the proximity of producers and consumers in social relationships of trust.[16] Yet they are not recognized as agents whose use of land and resources

[16] See Malassis, cited by Fonte 2002.

and engagement with food markets are motivated by quality.

We now turn to our case study in order to discuss how rural households pursue quality by continuing agricultural and consumption practices to obtain the maize and maize based foods that they prefer, as part of their identity and livelihoods.

Maize and quality in rural households: interviews

Quality and making a "good" tortilla

Every Mexican knows what a "good tortilla" is, be he/she a farmer, a rural or urban consumer, a traditional maize miller or tortilla shop owner (*tortillería*) or a corporate agent from the food industry.[17] Interviewees in Atlacomulco and Chiapas described a good tortilla as a handmade tortilla made of their own grain, or grain of a known source, which has a certain taste, smell, texture, durability, and flexibility (rolls well), and can be reheated without breaking. Respondents were concerned with the source of ingredients, meaning fresh nixtamal masa is derived from a particular variety of grain, and not mixed with flour. Households make this masa in a traditional way, grinding the grain; some women prefer to bake their tortillas on a '*comal* over a wood fire, saying the tortillas cook better than they do on a gas stove.

> I like the tortillas that I make…It's a lot of work; we prepare the nixtamal with a little chunk of limestone and water, heat it and put in the maize. It takes about an hour to cook. We try it and when it's ready, we take it off the fire and leave it without covering ….At dawn we pour some water on and then go to [the mill] to grind. When we return we start to make the tortillas [*tortear*] and we finish when we have just a bit of masa left to start cooking the meal. Then we eat, that's it. I'm done making my tortillas, I go to the mill at seven in the morning, it's a habit (MLMP Highland Chiapas).

The attributes of a "good" or quality tortilla is defined in contrast to a tortilla which is made in tortillerías shops. The grain and masa is grinded and mixed mechanically, then pressed into tortillas that are baked on a conveyor belt; grain may be of different qualities. Interviewees also state that the process for making tortillas in tortillerías cannot be trusted: tortillerías mix maize flour with the masa or use only flour; the process may not be hygienic; the tortillas tend to be too thin and do not fill well, and they crack when heated.

> We make the tortilla thick or thin, as we want them, well cooked, and they smell good. I don't know if the tortillas from the tortillerías are well cooked. We make them on the hearth, with firewood, so they are not raw, and when the belly swells they are well cooked…Yes, I like to make my own tortillas, that's maybe why I never buy, because I like to make them. My mother taught me, and I have taught my daughters (MCLH Chiapas Midlands).

It was frequently mentioned that criollo grain and handmade tortillas yielded more per kilo, and that there is no need to spend money on food. Homegrown maize is also used in Chiapas to make *pozol* (a sort of maize drink made from fermented maize masa) which is consumed daily.

In the interviews, food security also emerged as an important issue. Households' pursuit of preference and food security were inter-twined in their strategies for obtaining maize and tortillas. The following interviews underline this:

> It's cheaper if we make tortillas. Those Maseca (maize flour) tortillas doń t fill us up, so we eat more of them. But if you do them by hand, the maize has more strength. Even if [the cost] is about the same because it takes firewood to prepare tortillas at home, it's better to cook them yourself (GM Highland Chiapas).

> If I don't store [maize], what are we going to eat….what will I give to my children. I'd rather have some and not sell; if I have some left over, I'll sell …If there's no maize, sometimes there is no money, then what will we do? What will my children eat? (GS Atlacomulco).

All interviewees confirmed that they preferred tortillas made from maize grain and cooked at home. However, some households buy from tortillerías:

> …the custom now is to go to the tortillería..…In this village there are two tortillerías, and both are Maseca. They also sell good tasting tortillas that you can reheat the next day…..People are getting used to [this]… (ALS Villaflores, Chiapas).

[17] This is the method of making a traditional tortilla: First the grain is cooked with limestone, then ground and made into a *masa* (dough). Tortillas and other foods (*tamales*, *atoles*, *pozol*, etc.) are made from the masa. A small ball is formed and patted into a flat tortilla with a round metal press (traditionally it was done by hand) and baked on the *comal* (a flat clay or metal plate). Traditionally this is done over a pit with firewood, which continues to be preferred over a gas stove. Different social actors have different discourses. For example the maize flour/tortilla industry stresses the hygienic and nutritional, technical advantages of consuming industrialized maize flour and tortillas (Appendini 2012). The diversity of regional foods in Mexico also affects preferences and considerations of quality for tortillas and other maize-based foods (*sopes*, *pellizcadas*, and so forth).

> …they prefer homemade tortillas, but it's not worthwhile because there are only two [of us]…I usually buy tortillas Maseca [MSG Villaflores, Chiapas).

Other reasons for buying tortillas were that women may work outside the home, they could not make tortillas because of illness, or even that there was no money to buy firewood.

The manager of a grain marketing business in the Chiapas lowlands expressed a different opinion: Maseca had penetrated the regional market, and people begin to use more flour and less grain to make tortillas. He said that the indigenous population now realizes that it is cheaper to buy flour than to use resources in sowing and harvesting maize, grinding the nixtamal and making tortillas. People, he said, are getting lazy and want convenience, in spite of attempting to preserve customs and culture (HRC Villaflores, Chiapas).

These examples assess the attributes for quality given by households interviewed, and underline the reasons for growing maize and make tortillas. Households value and recognize the quality of homegrown maize and homemade tortillas as well as other foods, such as pozol. Making tortillas in a traditional way is as much part of quality as growing maize.

Food security emerged as a very important issue and is inter-twined with quality. By growing maize and making tortillas, households obtain both. The interviews emphasize the importance of having maize, not spending money to buy it, and not rely on shopping for tortillas (see next section). However in Chiapas Lowlands (Villaflores) one interviewee suggests there is a trade-off between investment in labor and quality, though quality is recognized, at some level, it is valued less than the effort invested in production. The manager's comment (laziness) may also reflect the implicit opportunity cost of preparing tortillas.

Regional differences in the practices households pursue to obtain tortillas are also suggested. This refers to both growing maize, and obtaining tortillas, as shown in the following sections.

Growing maize for tortillas

Over 90 % of the households surveyed grow maize and 97 % consume the grain (survey data 2009). But agricultural practices differ according to the resources available, particularly land and labor, the size of the household, buying or selling grain, and the local context.

In Atlacomulco, family labor is important, but households often hire fieldworkers because family members have off-farm jobs. Fifty-three percent of households have access to irrigation from a regional dam. At the beginning of the planting season water is run over the fields (*riego de punta*) to humidify the soil. There is 1 yearly harvest. Throughout the year, small amounts of grain may be sold; and some households may need to buy grain, especially in the pre-harvest season, or if the harvest is meager. This was the case in the fall of 2009, when heavy rainfall had flooded some of the plots in the low areas just before the harvest, and people assumed they would have to buy grain the coming year.

The following example shows how Lupe's household in the Atlacomulco district works its land in order to obtain the maize they need:

Señora Lupés household plants half a hectare with maize next to the house, and this satisfies the needs of a family of two older people, a daughter and grandson. There is another plot further out in the fields but frequently it is hit by frost and the harvest is unreliable. The cost of cultivating maize on the household plot is about 3200 pesos a year, including the hiring of a tractor service, and paying for day laborers, fertilizer, and irrigation. For cash, the family relies on a government subsidy Programa de Apoyos Directos al Campo (PROCAMPO).[18] Lupe prepares about 20 kilos of grain for tortillas every week.This equals 1.04 tons per year. She says she never buys tortillas. If this household had to buy tortillas, they would have to spend about 336 pesos a week, at 12 pesos per kilo[19] (GS DH Atlacomulco).

In the Chiapas Highlands, maize is grown on small plots and poor soil. Households rely mainly on family labor and use little purchased inputs. Though interviewees point to the preferences for home-made tortillas, household resources were often too limited to allow for growing enough grain and making tortillas. Even using money to buy firewood could limit the possibility of making tortillas.

[18] PROCAMPO (1993 to present) is the most important subsidy for agricultural producers. It is a direct payment to farmers for each hectare registered in the program (up to 100 ha). In 2013 its name was changed to Proagro Productivo, linking the payments to practices enhancing productivity.

[19] The Secretaría de Economía (2012) estimates a conversion rate of 1 kilo maize grain to produce 1.4 kilo of nixtamal masa tortillas. The production of tortillas with maize flour is more efficient than with grain/masa since the conversion rate is 1 kilo of maize to make 1.56 kilos of tortillas. The same source estimates average yearly consumption of tortillas per capita for rural population to be 79.5 kilos of tortillas (56.8 kilo maize for masa tortillas or 1.09 kilos a week, equal to about 4–5 kilos for an average household of four). This is a low consumption estimate compared to our survey results were weekly consumption of grain per household ranges from 13 to 24.6 kilos of maize per week (Table 1). The estimate is also low compared to a yearly per capita consumption of 274 kilos of maize per adult estimated by de Janvry et al. (1995) in the mid-1990s. One reason may be that de Janvry's and our fieldwork was carried out in maize growing ejidos while the Secretaría de Economía estimate refers to the total rural population in Mexico.

The Ramírez family—a middle aged couple with one daughter living in the household—plants half a hectare with native maize varieties, yellow and black. Ramírez says that white corn varieties do not produce adequate yields. The harvest is not enough to meet family needs throughout the year, and Ramirez has already bought a ton of grain to store. Ramirez prefers to buy grain and not tortillas, because this is cheaper and the family can make pozol: "If I buy 50 kilos of maize, it yields about 100 kilos of tortillas, plus the pozol, and I pay only 300–400 hundred pesos…" At a price of 13 pesos a kilo, the cost of buying tortillas would be 1300 pesos. The family members have no other income except 650 pesos from PROCAMPO and Oportunidades (APP Highland Chiapas).[20]

Chiapas Mid and Lowlands is heterogeneous and landholdings vary, some are large and some soils are of better quality (humid). Many farmers grow maize to sell, while livestock are the economic mainstay of others, who use maize for feeding cattle. In Villaflores, some farmers rely upon the standard technological package of hybrid seeds (Pioneer) with chemical fertilizers and herbicides, with which they may obtain an average of five tons per hectare. The following examples show the differences between two households.

The Olmo Pérez family in Comitan is poor. Don Olmos only has ¾ of a hectare, which supplies sufficient maize (yellow criollo) to meet the needs of a family of six for about 5 months. The plot is worked with a horse and plow. He buys grain for the rest of the year from neighbors. A sack of grain at 250 pesos lasts for about 20 days (when maize is scarce the price will go up to 500 pesos). If the family had to buy tortillas, it would need at least 28 kilos per week (at the estimate of 20.2 kilos consumed per week in Mid and Lowland Chiapas (see Table 1) spending 336 pesos a week. Even so, sometimes there is no maize available, and then it is necessary to buy tortillas. Growing maize is his only occupation, and he does not receive the PROCAMPO subsidy because the plot belongs to his father. His wife receives a monthly payment from Oportunidades (FL Chiapas Midlands).

The household in the Lowlands represents the better-off farmers producing for the market. Don Adan plants maize on 5 ha, has access to the service of a tractor (he is a member of an association owning tractors), uses hybrid seeds, fertilizers, and sprays the fields with herbicides, he also employs workers. The harvest gives good results, an average of five to six tons of maize per hectare; most of the grain is sold to the regional Maseca warehouse. He receives PROCAMPO. Adan lives with his wife, Antonia, they are an elderly couple and their children have left the household. They consume their own hybrid maize. Adan no longer grows criollo maize because there is no market for it. The couple's consumption needs are small, every 3 days Antonia uses three kilos of maize for five kilos of tortillas. The couple prefers their own tortillas saying they taste better and it is also cheaper to make them at home, a daughter-in-law helps Antonia. They also have masa leftover for pozol which is consumed daily; hence quality is implicit in how tortillas are made and having pozol. Nonetheless, they recognize that people are increasingly buying tortillas in the tortillerías (ALS Chiapas Lowlands).

In all regions, farmers invest labor and other resources in growing maize. Food security is assessed by investing to grow maize and use less cash; making tortillas at home is less costly, hence will ease the stress on the household economy, and is also preferred. In Chiapas, having pozol from own maize is also important. However, practices for obtaining tortillas differ according to the resources available and is highly determined by the local context. Poor households with small plots invest their own labor but often need to buy grain to satisfy their yearly consumption. Better-off households hire tractors and labor to work in the fields. Hence they invest cash to obtain maize for tortillas (Señora Lupe and Don Adan). In the case of Don Adan, growing for the market shows a different strategy: sowing hybrid maize that is also consumed for the homemade tortillas. Both interviewees also underline the preference for homemade tortillas even though they could afford buying tortillas. Even though grain and tortillas can be purchased, making them at home is quality and pozol. And for all, cash income is generally unstable, based as it is on informal jobs and low wages. Therefore, given a worrisome lack of money, interviewees stress that being able to produce tortillas domestically provides a certain basic level of household food security.

Other household practices to obtain tortillas: issues of quality and gender

Not all households are able to grow enough maize for tortillas, or make tortillas, because of lack of land, of time (female labor), special circumstances such as illness, convenience, etc. Tortillas are available on the market, as is maize flour, which simplifies the process of making tortillas. In nearby towns there are tortillerías, grocery shops carry Maseca flour, some women make tortillas to sell, and as we mention below, in Highland Chiapas tortillerías and the Maseca industry have penetrated the communities. The interviews illustrated the different practices which households undertake in order to obtain tortillas and the possibility to obtain quality.

[20] Oportunidades is a poverty alleviation program paid bimonthly to women in order to support health and education. The program was named Progresa when initiated in 2002 and renamed Prospera in 2013.

> Well, I buy [tortillas] all year round because my husband sells socks in San Felipe, and every eight days we buy a kilo of tortillas that the women make there [handmade]. The price is now 12 pesos per kilo (SSM Atlacomulco).

> In Mavoro the tradition of making tortillas is being lost. That's because many women and men go work in the factories (DSC Atlacomulco).

In the case of Atlacomulco, quality by purchase was confirmed: when households do buy tortillas, these are nixtamal tortillas made by women who sell handmade tortillas to a clientele who trust the quality of inputs and process.[21] Only occasionally do consumers buy at the tortillería. In fact there are few tortillerías in the communities, some had actually closed, and for example, the one we visited in Santa Cruz, San Felipe del Progreso only made tortillas from nixtamal. The price of handmade tortillas was higher—12 pesos per kilo—compared to 10 pesos for those bought in tortillerías in nearby towns.

Responses from Chiapas households differed from the above. In the Chiapas Highlands interviewees did not like tortillas bought from tortillerías, but households that do not grow enough maize must buy grain or tortillas. Local maize is limited, and so buying maize flour or tortillas is often a necessity. The giant agro-industry Maseca has penetrated the tortilla market in highland Chiapas. For example, tortillerías in San Cristobal de las Casas distribute tortillas made of Maseca maize flour on motocycles in the communities.[22] Similarly, school lunches distributed by a public school lunch program often include a package of Maseca maize flour for "mothers" to make tortillas. Hence market penetration may be changing the consumption patterns of poor households, who are not always capable of achieving quality because they lack the resources.

> Well, now [we make tortillas] because we have maize. But if ever we would find ourselves without maize, I'd have to buy, and it's likely that I'd buy a bag of Maseca. I don't know what the bag of flour costs, because they give them out with the [school] lunch for my niece (MLMP Chiapas Highland).

Interviewees in Mid and Lowland Chiapas confirmed the preference for homemade tortillas but also said they often bought Maseca tortillas, not only because people were used to eat them but also for convenience.[23]

> …[we prefer] handmade tortillas, but there is no point in making them only for the two of us [living in household]…Sometimes I buy flour, but usually it's Maseca tortillas (MSG Chiapas Lowlands).

> Few people [make tortillas at home]..Now the custom is to go to the tortillería… There are two tortillerías [here], both supplied by Maseca. They also sell tasty tortillas, warm, and the next day they can be reheated… Yes, people are getting used to it (AL Chiapas Lowlands).

It is important to emphasize that in Atlacomulco and Highland Chiapas, quality also has a meaning that goes beyond the specific attributes of the food itself. Growing maize and making tortillas is part of peasant culture and gender identity. These issues emerged sharply in conversations with some women who referred to the value of women's specialized knowledge and to confronting social change in a rural context:

> If I ask my daughter-in-law to give me tortillas, she'll say "You, a woman, are asking for tortillas! You act like a man" (JMC Sta. Cruz, Atlacomulco).

> The women who don't make tortillas, we see them as people who have money (ARJM Jalpa, Atlacomulco).

> It depends, if I had married a *mestizo* I wouldn't have to make them ….because mestizos almost don't eat handmade tortillas, I have an aunt in San Cristóbal who doesn't make them. They only eat what comes from the tortillería. (MGL Chiapas Highlands).

In these comments gender and ethnicity are emphasized. Growing maize in the field is a male activity and feeding the family is part of being a peasant woman—both essential roles for ensuring peasant livelihoods. Buying tortillas is part of a change: women working outside the home, having non-agricultural jobs, being "modern" and also related to generation and class.[24]

In sum, households employ different practices to obtain tortillas and give different importance to quality. In Atlacomulco and Highland Chiapas, tortillas made from homegrown maize are preferred both because of quality and cost. Households that do not produce enough to satisfy consumption often buy grain to make the tortillas at home.

[21] Lerner and Appendini (2011) found similar patterns in households in the peri-urban area of the city of Toluca (capital of Mexico State). Many households plant a small plot of land around the house in order to have maize for tortillas and/or buy nixtamal handmade tortillas from women who make and sell these preferred tortillas.

[22] At 12–13 pesos per kilo in 2011, a family consuming three kilos a day spends 39 pesos, 66 % of a daily wage.

[23] Keleman et al. (2009) found similar trends in La Frailesca, Chiapas.

[24] In Atlacomulco, 28 % of women older than 12 work off farm and contribute to household income; the percentage is 80 % for the Chiapas Mid and Lowlands, but 12 % for the Highlands (Survey data).

However, when tortillas are purchased there is a marked difference between the two regions: in Atlacomulco people buy handmade nixtamal tortillas (at a higher price than those from tortillerias), while in Highland Chiapas they buy tortillas made of maize flour, or they use Maseca flour to stretch the masa. Poverty rather than preferences explains this. Mid and Lowland Chiapas, on the other hand, are characterized by a changing pattern of consumption; households growing maize for the market are more likely to accept maize flour tortillas.

Regional contexts and different patterns in household consumption practices: the 2009 survey data

What does the household survey data contribute to the interview findings concerning practices followed by rural households to obtain a tortilla they prefer? First, the data confirms the importance of growing and consuming maize in rural households: as mentioned, at least 90 % of households grow maize and over 97 % consume it. But, as some interviews showed, not all households produce enough to meet their consumption needs and have to buy grain and/or tortillas. Other households may sell grain and buy later in the year; others may buy tortillas, for different reasons.

In order to explore the different patterns to obtain maize and tortillas followed by households with different production capacity to satisfy their consumption needs, we used an index by dividing the yearly production by the yearly consumption of grain. Next, we classified households as surplus or deficit according to a coefficient of 1.25. That is, households that produce 1.25 times their consumption needs are able to satisfy their consumption needs throughout the year—with a margin for animal feed, storage, petty sales, etc. Concurrently, households with an index less than 1.25 do not produce enough grain for their yearly consumption needs.[25] Next, we analyzed the patterns surplus and deficit households follow, in order to obtain tortillas and whether or not quality is important to different types of households. The survey captured data on weekly consumption of grain, how tortillas were made in the household (with nixtamal masa or use of flour), when buying, if tortillas were nixtamal. Practices to obtain quality were identified as growing and consuming own maize, or buying grain for making tortillas; when tortillas were purchased whether they were made of nixtamal. Non-quality is associated with the use of maize flour, which may be either mixed with nixtamal masa or made only from maize flour.[26]

In Atlacomulco and Highland Chiapas, only 25–30 % of households produce a surplus over their consumption needs; in the Chiapas Mid and Lowlands the figure is 64 %.

Table 1 shows that surplus households have more total land and more land planted with maize than deficit households. In Atlacomulco, both surplus and deficit households use 75 % of their land for maize. In Highland Chiapas surplus households also assign most part of their land to maize (70 %). In contrast, households in the Chiapas Mid and Lowlands with larger average landholdings use less for maize (35 % for surplus and 39 % for deficit households). Chiapas Highland deficit households, however, show a different situation with only an average of 42 % of land area in maize. In some ejidos, planting coffee or working off-farm may be a reason. Land in maize and yields account for differences in production outcome. In surplus households yields are highest—as to be expected—with Mid and Lowland Chiapas producing an average of 2.7 tons per hectare, but where landholdings vary more than in the other regions.[27] In all regions yields are lower in deficit households, ranging from 1.4 tons per hectare in Atlacomulco to 1 in both Chiapas regions.

We now turn to the data on consumption patterns and how households obtain maize/tortillas. The table illustrates the practices followed by surplus and deficit households to obtain grain/tortillas. All surplus households in Atlacomulco consume maize and most make tortillas at home, only 1 % purchases grain, this indicates that self-sufficiency is a goal. We find 18.8 % households purchase fresh nixtamal tortillas, likely to complement homemade ones when not being able to make them. No surplus households used maize flour. In the Chiapas Highlands all surplus households consume nixtamal tortillas made at home, few purchase grain (5.3 %) or use maize flour (7 %). Buying grain may be due to the inability to keep all the harvest throughout the year (distress sales, gifts, etc.). In the Chiapas Mid and Lowlands 95.5 % of surplus households consume maize tortillas made at home, and few households buy grain (7.3 %). These households may produce for the market and then buy grain later in the year.[28] But 54.7 %

[25] The index 1.25 was used by de Janvry et al. (1995) to classify maize producing households as "sellers" and "nonsellers." See also Eakin et al. (2014b).

[26] Questions referred to household consumption in the week prior to the survey: quantity of maize (own/purchased/other); use of maize flour; tortillas (homemade/purchased/other); tortillas nixtamal/maize flour.

[27] The standard deviation for land for surplus households in maize is 3.5 for Mid and Lowland Chiapas (1.9 for Highland and 2.0 for Atlacomulco). The standard deviation for yields for surplus households is 2.7 for Mid and Lowland Chiapas, 0.8 in Highlands, and 3.4 in Atlacomulco.

[28] Eakin et al. (2014b) show that 50 % of producers in Chiapas are maize sellers.

Table 1 Surplus and deficit household practices to obtain tortillas

Region		Chiapas		Mexico State
		Highlands	Mid and Lowlands	Atlacomulco
Total surplus households		**57**	**247**	**101**
		30.8%	63.8%	25.6%
Total average area	Hectares	4.0	11.50	2.7
Average area with maize	Hectares	2.8	4.0	2.0
Average household production (year)	Tons	4.2	9.3	3.5
Average yields	Ton/hectares	1.7	2.7	2.2
Consume maize	% households	100	96.4	91.1
Consume per week	Kilos	20.5	19.3	13.4
Buy maize grain	% households	5.3	7.3	1.0
Consume maize flour	% households	7.0	54.7	0.0
Consume tortilla nixtamal	% households homemade	100.0	95.5	84.2
	% households buy	0	0.4	18.8
Total deficit households		**128**	**140**	**294**
		69.2%	36.1%	74%
Total average area	Hectares	2.4	4.8	1.7
Average area with maize	Hectares	1.0	1.9	1.3
Average household production (year)	Tons	1.0	1.4	1.7
Average yields	Tons/hectares	1.0	1.0	1.4
Consume maize	% households	100.0	95.7	97.6
Consume per week	Kilos	24.6	20.2	14.5
Buy maize grain	% households	71.1	45.0	13.3
Consume maize flour	% households	39.1	52.1	1.0
Consume tortilla nixtamal	% made in household	100.0	97.1	94.2
	% households buy	1.6	2.1	8.2
Total		**185**	**387**	**395**

Source: Survey data, 2009.

households use maize flour, indicating that quality is not a priority or not attainable for some reason.

Deficit households may choose to buy maize/tortillas or both in order to complement their consumption. They may also use maize flour to mix in the masa or use the flour entirely for tortillas (non-quality). In Atlacomulco, most households consume tortillas made at home (94 %); 13.3 % purchase grain and 8.2 % purchase nixtamal tortillas. Only 1 % use maize flour. In Highland Chiapas all deficit households consume maize and make tortillas at home; 71 % buy grain. Only 1.6 % buy nixtamal tortillas, while 39 % use flour. This indicates that flour is important for the poor highland households. In Mid and Lowland Chiapas, over 95 % of deficit households consume maize and make tortillas at home, but few buy nixtamal tortillas (2.1 %). Flour is used in 52 % of deficit households.[29]

The above data suggests that there are different practices by type of household, and by region. In Atlacomulco, both surplus and deficit households pursue quality by not consuming maize flour, and buying nixtamal tortillas and/or grain (when they experience a deficit). In Chiapas for both regions, maize flour is used, but there are differences between the Highlands and Mid and Lowlands. In the Highlands, only deficit households use flour; while in the

[29] Data for consumption and provision of grain, flour, and tortillas was captured for the week prior to the survey. Deficit households may have grain and flour available.

Mid and Lowlands over half of surplus and deficit households use maize flour. This suggests that in the Highlands, using flour is a necessity more than a preference (as was also indicated in the interviews), while in the Mid and Lowlands, a preference for quality is not visible in all households. This indicates two trends: options are constrained and/or preferences are changing.

Final comments

Food quality is high on the international agenda. Consumers are increasingly aware of where and how food is produced and distributed; and public and private agencies have taken up the task of regulating and certifying food commodities in the global market. Nevertheless the issue of quality has largely been ignored in food policy oriented toward large populations that are poor.

By looking at maize agriculture and consumption practices of small-scale producers in rural Mexico, we argue that quality is not only an issue in global food markets, but recognized by populations in low income rural regions. Hence we also attempt to add to the literature on maize and its persistence in Mexico and the on-going debates in favor of a more inclusive food policy.

In the case of Mexico, public policy has encouraged the production of white maize on large farms located on irrigated land and has promoted the import of yellow maize, while supporting the consolidation of agro-industry along the maize-tortilla chain. The most important subsidy program for maize Apoyos y Servicios a la Comercialización Agropecuaria (Aserca) is directed to market transactions in which producers and buyers have formal contracts (Appendini 2014). Concurrently, small-scale producers have been largely marginalized from public support that incentivizes maize production. For example, survey data shows that less than 3.4 % households in Mexico State and Chiapas received subsidies for marketing—while in the state of Sinaloa more than 83 % of maize producers did (Eakin et al. 2014b). The most important program targeted at small farming households (and rural households in general) are poverty alleviation programs (Oportunidades) which consist of cash payments. Rather than motivate production, this motivates buying food. As interviews have shown, buying tortillas may result more costly and of less quality than growing and making them. In sum, food policy is oriented towards satisfying consumption through the market and ignores the motivation of small farmers to produce as well as Mexican consumers' (rural and urban) preferences for a "good" tortilla, associated with the attributes we have discussed.

Despite this trend, we found that growing maize and making tortillas at home, purchasing grain to make them, or buying fresh nixtamal tortillas, are strategies for both food supply and quality. Food security and quality are interrelated in rural household practices. However, we also found complex relationships between quality and consumption of maize and tortillas, as households face different opportunities and constraints, also framed by the local and regional contexts. These relationships reflect changing trends in consumption patterns.

In all regions studied, households generally acknowledge quality, but the priority and the capacity to attain quality differ. In the case of Atlacomulco, quality was strongly assessed both in interviews and in survey data. Households implicitly evaluate opportunity costs of labor versus growing and making tortillas, where it is cheaper to grow or buy grain than purchase tortillas, or for the better off to buy hand-made tortillas from a trusted source. Interestingly, in a region which is influenced by nearby urban areas, this is still a society in which the preference for nixtamal tortillas has not diminished in recent decades, and in which perception of people's cultural identity as peasants and maize consumers is still emphasized (Lerner et al. 2013; Lerner and Appendini 2011). This may also be because households are better off having access to regional labor markets and can practice their food preferences, a question for further research.[30]

In contrast, in Highland Chiapas household quality is preferred and attained (as in all cases) by women available to prepare the tortillas. However, the role of women in making tortillas was particularly emphasized in the Highland together with being indigenous, as well as being poor, underlining gender and ethnicity. At the same time, most households do not have the resources to grow enough grain or availability at local markets to buy it and so resort to Maseca flour in order to complement consumption (with lower quality). Poverty limits the capacity to obtain enough maize to satisfy quality. In both regions, indigenous cultures predominate. This may also partly explain the preference for quality grain and tortillas, as Perales et al. (2005) found in relation to landraces in Chiapas. Obviously, this question deserves further research, also in other regions of Mexico.[31]

A different situation prevails in Mid and Lowland Chiapas. Quality is acknowledged but may not be a priority. Market oriented producers grow maize using the conventional technological package for growing hybrid varieties that are demanded by the tortilla industry. Here the opportunity costs of selling the harvest/participating in

[30] Hence quality is the prerogative of relative higher income, as in the case of rich countries.

[31] Highland Chiapas rural population is predominantly Tzeltal and Tzotzil. The rural population of Atlacomulco is predominantly Mazahua.

labor markets and investing in non-hybrid varieties for consumption seem to be implicit in decisions of better-off producers. Farmers who participate in commercial agricultural markets are getting used to the tortilla from Maseca/tortillería, also for reasons of convenience.[32]

Hence, diversity persists, entrenched in complex regional and local economic, sociocultural, and ecological environments. But overall, in Mexico, quality of maize and traditional foods is being recognized and is increasingly being enhanced by regional producer organizations, specialty markets, local food providers, and civil society.[33]

The persistence of maize farming despite an adverse policy environment for small farmers since the neoliberal reforms of the 1990s highlights the capacity of rural households to produce their basic staple. Their tenacity should be rewarded with a new recognition of the role of small farmers in food production and sustainable agriculture, as now suggested international initiatives (World Bank 2007; FAO 2012). In fact, the Food and Agricultural Organization of the United Nations (FAO) declared 2014 the Year of Family Farming.

Although the government of Mexico has promoted some initiatives to support small farmers, these programs do not address quality and are marginal in the country's food policy. In a context of increasing vulnerability of the maize system with uncertainty in international markets—including sharp fluctuations in prices and climate change—that have recently affected harvests in the main maize growing region (Sinaloa) and an alarming concentration of power among corporate agents in the maize-tortilla chain, policy makers should seize the opportunity to revise the neoliberal food policy agenda.

Such a policy would acknowledge and respond to what rural people actually do and their motivations for producing quality maize for human consumption. Mexico's maize agriculture is very heterogeneous, and policy could be inclusive. Diversity would offer opportunities not only to entrepreneurial farmers who supply the bulk of grain to urban populations, but also to small-scale producers who could expand their roles of sustaining food security at the household, local, and regional levels, be guardians of maize biodiversity, and trigger endogenous development in rural areas.

[32] In the maize growing region of Sinaloa flour tortillas (wheat or maize) are mainly consumed. Criollo masa tortillas were never part of the consumption culture.

[33] See for example, the *Sin Maíz No Hay País* movement; the tortilla shops established by ANEC and the Coyote Rojo initiative in the Meseta Purépecha, Michoacan (Baker 2013; Fitting 2011; McNair 2012). After years of advocacy by civil society groups, in 2011 "The right for food" has been included in the Mexican Constitution: article 4: "Every person has the right to food that is nutritious, sufficient, and of quality. The State will guarantee this" (Diario Oficial de la Nación 2011).

This is not a new idea. Research and debate in Mexico have shown the potential of small farmers to increase maize output, using local seeds and technology (Turrent Fernandez et al. 2012). The growing local and regional specialty markets for maize suggest that considerable potential exists for up scaling these markets, also in urban areas. But, in this analysis, the most important argument for supporting smallholder agriculture is simply that the Mexican population—rural and urban—should have access both to enough food and to quality food, which small farmers are providing.

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