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Opportunities in Blue Maize Markets for Smallholder Farmers in Central Mexico?

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Growing Demand for Blue Maize

The widespread adoption of more productive hybrid yellow and white maize varieties starting in the 1950s and the introduction of machines to make tortillas in the early 1990s fundamentally changed the diet of urban Mexicans. Local restaurants went from offering a colorful array of tortillas made from native maize to a near uniform white tortilla made from hybrid maize (Massieu Trigo and Lechuga Montenegro, 2002). The lack of price premiums for the native maize varieties encouraged many farmers to replace these native maize varieties with more productive hybrid varieties. Even though these hybrids require larger investments to purchase seeds and agrochemicals, they are much more productive and require less labor from these labor-constrained households (Lerner and Appendini, 2011). However, some Mexican smallholders resisted this trend. They conserved their local, native maize varieties that their families had grown since precolonial times, using this grain mostly for household consumption with limited quantities sold in local markets for tortillas and other traditional dishes (Bordi, 2006; Fernández-Suárez, Morales-Chávez, and Gálvez-Mariscal, 2013; Díaz Mora, 2016; Boué et al., 2018).

Demand for native maize, especially blue maize, in Mexico has expanded beyond these local markets over the last 3 years. Now, high-end restaurants and supermarkets in Mexico City and other regional cities in central Mexico offer blue tortillas, chips, and other products (De Miguel 2019). This trend reflects both a nostalgia for traditional Mexican foods and a recognition of the potential health benefits from blue maize. Antioxidants responsible for the blue pigmentation have been proven to lower risks for coronary disease, diabetes, arthritis, and cancer (Antonio Miguel et al., 2004; Cortés-Gómez et al., 2005; Salinas Moreno et al., 2013).

These new culinary trends may prove to a boon for the smallholders that have conserved these native varieties. In fact, growing demand has encouraged smallholders to expand their production and for others to begin growing it (Bordi, 2006; Lerner and Appendini, 2011; Pérez et al., 2019). However, research on blue maize demand and consumption have only explored the traditional, local markets (Keleman and Hellin, 2009; Hellin and Keleman, 2013; Boué et al., 2018). There is little information to understand the scale of these new markets, their potential for future expansion, and the opportunities for blue maize farmers to take advantage of these opportunities.

Blue Maize Production in Mexico

Before farmers started receiving much of a premium for blue and other colored native maize varieties, its production had been falling, raising questions as to whether smallholders would be able to scale up production to meet this exploding new demand. With the overwhelming growth in hybrid production for white maize, used mostly for human consumption, and yellow maize, used in livestock feed, colored maize, most of which is blue maize, made up only a small portion of overall Mexican maize production: just 0.3% of the 27.8 million metric tons (MT) of maize harvested and 0.4% of the 7.5 million hectares planted to maize in 2017.

Between 2010 and 2017, the area planted to colored maize fell by 36.9% from 49,100 hectares to 32,000 hectares and production by 6.8% from 76,900 MT to 71,700 MT (SIAP, 2018). Farmers did not have many marketing opportunities for colored maize until recently, so they had no incentivize to continuing growing this crop. They instead dedicated their land to hybrid white and yellow maize production. The farmers that continued to grow these traditional maize varieties did so to preserve a crop that was culturally significant to them (Arslan and Taylor, 2009). The colored maize that was produced was concentrated in central Mexico in the states of Mexico, Puebla, and Michoacán following historical and cultural patterns. This region of country is also dominated by smallholder farmers who have conserved these native, colored maize varieties (Lerner and Appendini, 2011; Boué et al., 2018).

Starting in 2015, SIAP, the statistical arm of the Mexican Secretariat of Agriculture, collected data on maize prices for blue maize (Table 1). Before 2015, blue maize statistics were aggregated with colored maize in the official statistics. These data reveal that over the last few years, farmers were able to earn significantly more for blue maize in comparison to white and yellow maize. In fact, in 2017 (the last year that data were available), farmers received 21.6% more for blue maize than they did for yellow maize, the maize variety used as a reference in commercial contracts and on the board of trade; the narrowing in prices in 2016 represents supply level changes between the varieties within Mexico rather than movements in international markets, as maize prices for human consumption in Mexico remain disarticulated from international markets (Motamed, Foster, and Tyner, 2008).

Experiences in the Blue Maize Value Chain

To analyze the blue maize markets, we interviewed 37 vendors in seven regional and local markets, five chefs of high-end restaurants, five supermarket distributors in the Mexico City Metropolitan area, and two large industrial processors between January and April 2019. We collected information on the products they offered, promotional strategies, volumes purchased over the last 3 years, their relationship with farmers, purchasing requirements, limitations in supply, storage capacity, and their provision of technical assistance to the farmers.

Table 1. Maize Prices in Mexico by Color, 2015-2017 (USD/MT)

Year	Yellow	White	Colored	Blue	Percentage More for Blue Than for Yellow
2015	203.46	217.11	204.91	240.63	18.3%
2016	177.10	184.16	184.59	190.32	7.5%
2017	180.70	192.07	197.88	219.67	21.6%

Source: SIAP (2018).

Table 2. Characteristics of the Principle Markets for Blue Maize in Mexico

	Local Markets	Haute Cuisine Restaurants	Large Processors
Sourcing	Self-production or from nearby farmers	Individual farmers, Informal farmers' associations	Individual farmers, accredited farmers' cooperatives, intermediaries
Buying arrangement	Infrequent purchases in local markets with no official receipts or record keeping	Verbal agreements established at planting and confirmed at harvest with farmers required to provide official invoices	Formal contracts established a few months before the harvest stating the price and quantity sold with the seller providing an official invoice
Prices (USD/kg)	0.31–0.34	0.52–0.73	0.42–0.52
Volume per buyer	A few kilograms	1–7 MT	800–4,000 MT
Services provided to the farmers	None	Transportation Technical assistance Accounting services	Transportation Technical assistance
Expectations	Prices will continue to rise with more buyers from the cities	Growing national & international market, especially to Europe	Growing national & international market, especially in the U.S.

Notes: 1 kg = 2.2 lb.

Local Markets

In local markets, smallholders sell a few kilograms of maize, mainly directly to small processors, local millers, or tortilla makers, in local markets in rural communities or wholesale markets in regional cities. All sales are informal, with no receipts and few records kept. These farmers grow, market, and sometimes mill the maize into flour, the main ingredient used in traditional dishes or tortillas. Women often complete these processing activities, which provides them with an additional income source. They can earn 2–3 times more than they would by selling grain in the market or to intermediaries, the main alternative for their grain besides self-consumption or for livestock feed. In regional markets around Mexico City, smallholders sell their blue maize at a higher price than white maize, on average 40% more (0.25 USD/kg for white maize compared to 0.35 USD/kg of blue maize). Consumers and farmers in these local markets have developed a long-term commercial relationship. Over the last 3 years, the farmers' client base has been growing especially as chefs from high-end restaurants in Mexico City and other large regional cities have frequented these markets seeking out these colored grains and byproducts such as maize flour or blue husks to make handicrafts (Table 2).

High-End Restaurants

Since 2016, a growing demand for restaurants serving traditional Mexican foods made from local ingredients has led to a boom in high-end restaurants offering such products. A part of their business model is creating an experience where their clientele feels connected with traditional, smallholder farmers in support of conserving native maize varieties and spurring rural development. Many are encouraging their farmer suppliers to obtain organic certification, as their customers are demanding organic products. To achieve this objective as well as increase the supply of blue maize to meet the exploding demand for blue maize products, some of the restaurants have started partnering with research centers, NGOs, and governmental institutions to provide extension services to these farmers.

The restaurant managers we interviewed purchase blue maize directly from maize farmers with whom they have a long-term relationship, allowing them to base their commercial relationship in trust without the need for written contracts. These direct relationships allow restaurant managers to work closely with farmers and address any challenges in meeting the grain quality requirements. Such open communication was critically important when the business relationship was first established. Farmers comply in providing quality grain and restaurants pay above market prices, consistently buy their maize, pay on time, and provide transportation for the grain. According to the farmers, receiving twice the local market price for their maize is enough to incentivize them to comply with these standards and maintain the relationship.

Even with all this goodwill, many challenges inhibit the development of this market. Farmers' lack bank accounts and are unable to provide official invoices, which limits restaurants' ability to make large purchases from them. One of the restaurant managers we interviewed described how he assisted farmers in opening bank accounts and used his own accountants to support farmers in issuing the proper receipts. Restaurants are further challenged by having nowhere to store the grain, forcing them to make weekly or biweekly purchases. Farmers also do not have access to quality storage facilities; they store the maize cobs in burlap or plastic sacks. With such poor storage conditions, restaurants only have secure source of grain for 5 months, from harvest in November to March, when the grain begins to spoil. Blue maize is particularly difficult to store and spoils quicker, as it is softer than white and yellow maize (Cortés-Gómez et al., 2005).

Even with all these challenges, the blue maize market in the restaurant sector continues to grow. Over the past 5 years, the number of restaurants that source blue maize has multiplied. The most experienced chef, with near a decade of experience sourcing blue maize, commented, "At the beginning of 2016, we were the only business in this market. Now there are five of us." With such growth in demand for blue maize, farmers cannot keep up with this demand. There is a need for additional farmers to participate in these marketing arrangements. The traditional method of seed production limits farmers' capacity to produce enough to meet demand and quickly expand (Lerner and Appendini, 2011). Nonetheless, restaurant managers are optimistic about opportunities to market blue maize in their businesses. Over the next 5 years, two restaurant managers mentioned that they have plans to increase the number of clients and restaurants in Mexico and to even export some of their product, particularly to consumers with Mexican heritage in the United States.

Large Maize Flour Millers

The production of blue maize flour for large commercial markets is relatively new. The three largest maize flour millers have only been in business for the last 10 years. They claim that demand has skyrocketed over the last 3 years, straining their current capacity. Because of this growing demand and supply shortages, these businesses paid up to 40% more for blue maize than they did for white maize in 2019. They only paid 25% more for blue maize in 2016. Due to the seasonality of blue maize production and limited storage infrastructure, farmers store it and buyers make purchases annually during winter harvest in November and December. Such practices create high storage costs for these businesses, which would prefer to make purchases at least every 6 months. Just like the restaurant managers, buyers for these large agribusinesses are challenged in encouraging farmers to provide formal receipts. Additionally, they require the farmers to sign written contracts. The buyers admit that the farmers are often

leery of signing these contracts as they do not understand the complex language in them and are unfamiliar with such processes. Even though the buyers prefer to make direct purchases with farmers and their associations to avoid intermediaries and ensure farmers receive the highest prices, they continue to make purchases from intermediaries, as many farmers do not meet these legal requirements.

Like the restaurant managers, these millers are interested in assisting farmers enhance their production, so they are partnering with the Instituto Nacional de Investigaciones Forestales, Agrícolas y Pecuarias (INIFAP), the governmental agricultural research institution; universities; and international research centers to enhance farmers production. They are particularly interested in supporting research to develop hybrid varieties that produce homogeneous grains. Currently, each community has its own native blue maize variety with a wide variability in color and flavor qualities, inhibiting millers' ability to offer a consistent product. However, many farmers are reluctant to adopt new varieties because they are proud of the varieties that have been in their families for centuries. Even with these difficulties, the millers are hopeful. They see a growing demand in Mexico and the world for blue maize flour. One has exported 2 tons of maize flour to markets with a large Mexican diaspora in Spain and Italy in 2018 and another started keeping blue flour in its storage facilities near the U.S. border, hoping to expand into this market.

Opportunities in the Blue Maize Value Chain

There is a rapidly growing demand for blue maize in domestic markets with an opportunity to open new international markets. These expanding markets offer large price differentials for blue maize compared to other maize varieties, with expectations that this differential will grow even more.

- Consumption of blue maize continues to be an important component of Mexican culture.
- Buyers from different parts of the country seek out blue maize and its products in local markets.
- Chefs in high-end Mexico City restaurants are promoting products made with native maize. Evidence suggests that consumption of these products is expanding outside these restaurants to various establishments in middle-class neighborhoods.
- In 2018, processors started to export blue maize flour to markets in the United States and Europe with plans to further expand in these markets.
- This growing demand has led to price increase over the last 3 years. Before, blue maize was the same price as white maize. Now, blue maize is sold at twice the price or more than white maize.
- The private sector—both restaurants and larger processors—has taken a leading role in promoting rural development. They support small farmers in improving their production, implementing better post-harvest practices, and complying with tax and legal requirements.
- Boué et al. (2018) pointed out that the expansion of markets for blue maize could strengthen livelihood opportunities for rural communities and strengthen the economic independence of women who own the micro-enterprises that sell blue maize in the traditional markets and products made from this maize, especially tortillas.

Challenges in the Blue Maize Value Chain

The booming blue maize market is in transition, from supplying local and informal market to increasingly sourcing formal markets for restaurants and larger millers looking to export, creating marketing opportunity for smallholder farmers in central Mexico. However, these changes are accompanied by many challenges that must be addressed to have impact at scale.

- Inadequate storage infrastructure and little knowledge of the best post-harvest practices means blue maize is only available between November and March.
- Little formality in traditional market has created a reality in which farmers and their associations are unprepared to meet the requirements of larger processors and restaurants, which require bank accounts, formal contracts, and legally acceptable invoices.
- There is an overall lack of awareness and consistency in prices, nowhere to consult blue maize prices nor any mechanism to collect them since prices vary widely by type of buyer and place of production.
- The great diversity of blue maize varieties complicates processors' ability to produce the homogeneous flour and other products that their customers desire.
- Buyers face high transaction costs in collecting blue maize from individual farmers and in local markets instead of buying from the centralized collection centers of organized groups.

Recommendations to Improve the Functioning of the Blue Maize Vale Chain

Our research has identified potential areas for policy action. While we were able to draw some preliminary conclusions from this value chain study, evidence based on larger samples and more rigorous designs is needed to draw definite conclusions and triangulate these results. Nonetheless, the our evidence indicates there is a need for coordination among businesses and institutions that support blue maize farmers to provide technical assistance in production and marketing, encourage farmers to jointly market their crop, share price information, facilitate the construction or improvement of storage infrastructure, and provide seeds that produce homogeneous and consistent grain.

- Farmers and their organizations require training on the adoption of best production and post-harvest practices, forming and maintaining farmer organizations, and marketing their products. Such efforts must extend beyond production to include basic farm management skills such as understanding contracts, maintaining bank accounts, complying with tax and other regulations, and implementing strategic plans.
- An electronic price platform collecting pricing data from all purchasing points is necessary for the overall market transparency and fairness.
- Farmers' organizations require access to credit and other financial assistance to build or improve their storage infrastructure in order to ensure the quality of their grain and ensure they have product to sell throughout the year, smoothing out supply and price shocks during the off season.
- For farmers to take full advantage of the growing markets from the large millers, research institutions need to work with farmers to analyze their blue maize varieties and develop varieties that are more productive, are disease resistant, have a longer storage life, and meet these buyers' standards.

For More Information

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